Schooling the Discoveries. Jesuit Education Between Science and Geographic Literacy in the Age of Iberian Expansion (15th-18th c.)*

*Part II***

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Abstract
The change of pedagogical paradigms occurred during the Sixteenth century has often been related to the rupture of religious unity and the processes of political centralization of European states. In the same period, however, historiography has neglected the influence on the school world exerted by the maritime expansion and the geographical discoveries made by the Iberian kingdoms. So far, the prevailing hypothesis stated that geography entered significantly into school classrooms only in Nineteenth century England, as an effect of modern colonialism. In this study, the two authors show the role of the Society of Jesus in redefining the assumptions of geographical and scientific teaching as a defining element of early modern Catholic education.

Keywords: Jesuit Education; Geographic Literacy; Cosmography; Age of Discoveries; Maritime Expansion.

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Resumen

Escolarizando los descubrimientos. La educación jesuita entre la ciencia y la alfabetización geográfica en la época de la expansión ibérica (siglos XV-XVIII)

El cambio de paradigmas pedagógicos ocurrido durante el siglo XVI se ha relacionado a menudo con la ruptura de la unidad religiosa y los procesos de centralización política de los estados europeos. Sin embargo, la historiografía no ha considerado adecuadamente la influencia que, en ese período, ejercieron en el mundo escolar la expansión marítima y los descubrimientos geográficos de las coronas ibéricas. Hasta ahora, la hipótesis predominante afirmaba que la geografía entró de forma significativa en las aulas escolares sólo en la Inglaterra del siglo XIX, como efecto del colonialismo moderno. En el presente estudio, los autores muestran el rol de la Compañía de Jesús en la redefinición de las bases de la enseñanza geográfica y científica como elemento definitorio de la educación católica de la primera época moderna.

Palabras clave: Educación jesuita; Alfabetización geográfica; Cosmografía; Edad de los descubrimientos; Expansión marítima.

3. A Matter of Scales. From Capillary Teaching to Long-Distance Networks

In 1571, just a few years before Clavius's arrival in Messina and the beginning of classes at the *Aula de Esfera*, local lord Count Camillo Gonzaga established a Jesuit novitiate in Novellara (a remote village in the rural heart of northern Italy) with an adjoining college where the brethren taught the young people of the community.

A couple decades later, a student attending this Jesuit school produced an interesting paper saying that the Portuguese colony of "Goa is a very famous city located in

India"[1]. At first glance this document is unremarkable. It is a common sort of hagiographic schoolwork on St. Francis Xavier, and seems to have little to do with any manner of topographical description or technical text. Nonetheless, despite its panegyrical tone, the text is an important testimony to the extent to which a new geographical awareness had established itself even in the rural peripheries of Europe.

Most of the population of Novellara, inhabited by wealthy farmers and small landowners, lived and died without ever leaving their village. The perception of the world and general mindset of these people remained strongly rooted in a medieval dimension even in the late sixteenth century. In this sense, the arrival of the Jesuits in Novellara represented a leap into the future. It shall be remembered that until the middle of the sixteenth century, local education focused on the teaching of abacus and grammar (skills to be employed in the local economy made up of notaries, copyists, craftsmen, and agrimensors). In Novellara, where the furthest horizons were hitherto represented by the nearby cities of Mantua, Bologna, and Rome, the world introduced in a small classroom at the beginning of the sixteenth century reached distant continents and oceans[2].

The impact of Jesuit schools in the region becomes relevant when we consider the density of Jesuit schools in the surrounding area. In total, seven Jesuit colleges were opened in towns within 60 km of Novellara between the

[1] Original text: "*Goa è una città assai famosa dell'India*". The source is undated but on the basis of paleographical evidence it was probably produced at the beginning of the seventeenth century. It is kept at the Novellara Municipal Historical Archives, Fondo Gonzaga, Amministrazione 1, Serie gesuiti, busta 194.

[2] Cfr. D. Salomoni, "Le scuole di una comunità emiliana rinascimentale tra religione e politica. Il caso di Novellara," *Educazione. Giornale di pedagogia critica*, V, 2 (2016): 17-42.

sixteenth and eighteenth centuries[3]. In all these colleges we find the geographical and mathematical works listed by Clavius in his suggestions for the *Ratio Studiorum*.

A well-studied case is that of Mantua. A Jesuit college had been active in the city starting in 1584, which was promoted to the rank of university in 1625 (until the severity of the plague of 1630 impelled its closure, although theology and philosophy classes remained active)[4]. In Mantua, Christoph Clavius's *Commentary* on John Holywood's *De Sphaera* was taught regularly. In the didactic programs for the year 1624-1625, academic elements of mathematics and geometry were taught in the afternoon. As we find it written, Prof. Cesare Moscatelli, S.J., "*docebit elementa Euclidis, & Sphaeram, & De Horologiis Sciotericis*"[5].

The Jesuit professors of mathematics supplemented their programs with other "things of interest". In the same academic year discussed above, the Jesuit mathematicians at the Public Academy of Mantua lectured on sundials, which were still the most reliable instruments for measuring time. In 1625-1626 the Jesuit mathematicians at the University of Mantua added instruction on the use of the astrolabe, and during 1626-1627 they added more material on optics[6].

It is highly probable that the same teaching dynamic was also present in the nearby colleges. As Paul Grendler has noted, scholars such as Giuseppe Biancani (1566-1624), Niccolò Cabeo (1586-1650), and Giovanni Riccioli (1598-1671) were the teaching body of a Parma Jesuit

[3] These were Modena, 1552; Parma, 1564; Mantova, 1584; Reggio Emilia, 1610; Mirandola, 1611; Carpi 1622. See S. Pavone, "I Gesuiti in Italia 1548-1773," in *Atlante della letteratura italiana*. Vol. 2: *Dalla Controriforma alla Restaurazione*, eds. S. Luzzatto, G. Pedullà, E. Irace (Torino: Einaudi, 2011), 359-373.

[4] P. Grendler, *The University of Mantua, the Gonzaga, and the Jesuits, 1584-1630*, (Baltimore: The Johns Hopkins University Press, 2009).

[5] Cfr. *Ibid*., 81.

[6] Cfr. *Ibid*., 200.

mathematical school that likely taught or had a direct influence on the mathematicians active in Mantua[7].

It is worth pointing out that Giuseppe Biancani studied mathematics under Clavius at the Roman College, and wrote a mathematical treaty himself, the *Sphaera Mundi seu Cosmographia Demonstrativa*[8], which is clearly inspired by Clavius's *Commentary* on Holywood's *De Sphaera*. In this work Biancani describes in a lucid and accomplished style how the world was shaped: "*Iam tota terra secundum superficiem dividitur in quatuor partes praecipuas, Europam, Asiam, Africam, Novuum Orbem, seu Americam*"[9].

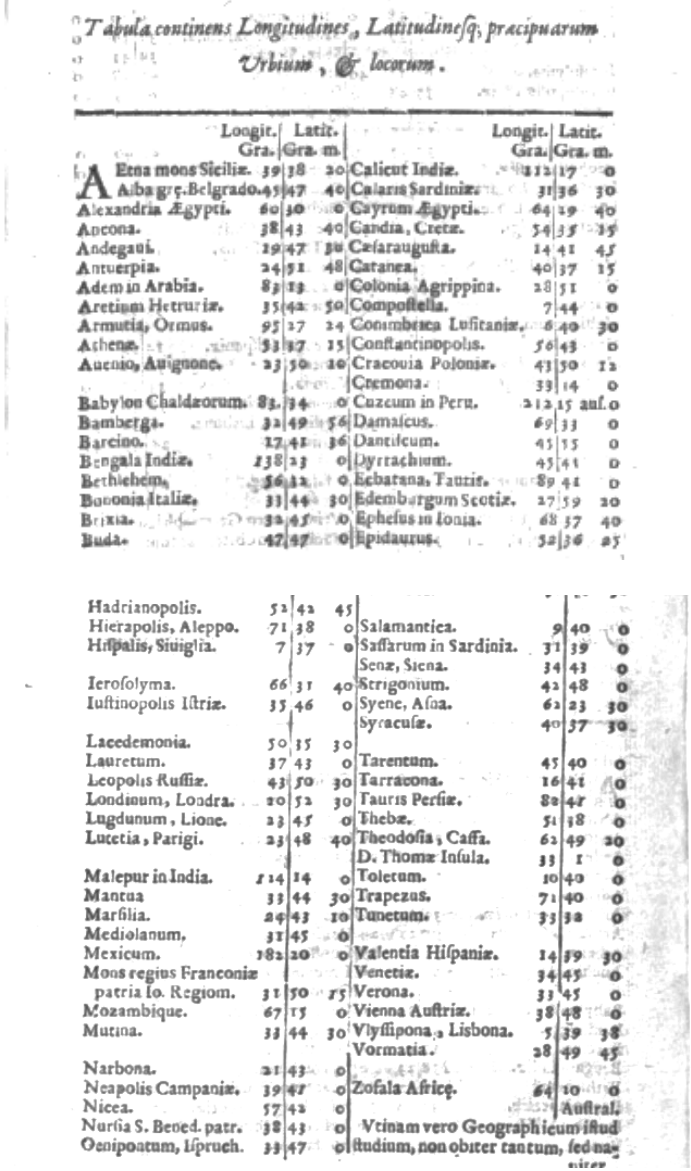
If we compare these words with Clavius's description of the parts of the world, we can grasp Biancani's adhesion to the theory of the four continents, compared to the ambivalent positions taken on Amerasian continuity seen throughout the sixteenth century. Biancani's book seems to confirm his support for the 'theory of the continents,' indulging in a detailed discussion on the calculation of latitudes and longitudes, and presenting an interesting table with the coordinates of various cities listed in alphabetical order. These tables convey not only Biancani's mental geography, but also the way it was transmitted to the students at the Jesuit college of Parma in the first half of the seventeenth century[10].

[7] Cfr. *Ibid*., 201.

[8] G. Biancani, *Sphaera Mundi seu Cosmographia Demonstrativa*, (Bononia: 1619). On Biancani's thought and his relationship with Clavius see Higashi (2018), 360-364.

[9] *Ibid*., 382.

[10] *Ibid*., 372-371.



Tabula continens Longitudines, Latitudines q; præcipuarum Vrbium, & locorum.

	Longit. Gra.	Latit. Gra. m.
Aetna mons Siciliæ.	39	38 20
Alba græ. Belgrado.	45	47 40
Alexandria Ægypti.	60	30 0
Ancona.	38	43 40
Andegaui.	19	47 30
Antuerpia.	24	51 48
Adem in Arabia.	83	13 0
Aretium Hetruriæ.	35	42 50
Armutia, Ormus.	95	27 24
Athenæ.	53	37 15
Auenio, Auignone.	23	50 20
Babylon Chaldæorum.	83.	34 0
Bamberga.	32	49 56
Barcino.	17	41 36
Bengala Indiæ.	138	23 0
Bethlehem.	56	32 0
Bononia Italiæ.	33	44 30
Brixia.	32	45 0
Buda.	47	47 0
Calicut Indiæ.	112	17 0
Calaris Sardiniæ.	31	36 30
Cayrum Ægypti.	64	29 40
Candia, Cretæ.	54	35 35
Cæsaraugusta.	14	41 45
Catanea.	40	37 15
Colonia Agrippina.	28	51 0
Compostella.	7	44 0
Conimbrica Lusitaniæ.	8	40 30
Constantinopolis.	56	43 0
Cracouia Poloniæ.	43	50 12
Cremona.	33	14 0
Cuzcum in Peru.	212	15 aust. 0
Damascus.	69	33 0
Dantiscum.	45	55 0
Dyrrachium.	45	41 0
Ecbatana, Tartiæ.	89	41 0
Edembargum Scotiæ.	27	59 20
Ephesus in Ionia.	68	37 40
Epidaurus.	52	36 25
Hadrianopolis.	52	42 45
Hierapolis, Aleppo.	71	38 0
Hispalis, Siuiglia.	7	37 0
Ierosolyma.	66	31 40
Iustinopolis Istriæ.	35	46 0
Lacedemonia.	50	35 30
Lauretum.	37	43 0
Leopolis Russiæ.	43	50 30
Londinum, Londra.	20	52 30
Lugdunum, Lione.	23	45 0
Lutetia, Parigi.	23	48 40
Malepur in India.	114	14 0
Mantua	33	44 30
Marsilia.	24	43 20
Mediolanum.	31	45 0
Mexicum.	182	20 0
Mons regius Franconiæ patria Io. Regiom.	31	50 15
Mozambique.	67	15 0
Mutina.	33	44 30
Narbona.	21	43 0
Neapolis Campaniæ.	39	47 0
Nicea.	57	42 0
Nursia S. Bened. patr.	38	43 0
Oenipontum, Ispruch.	33	47 0
Salamantica.	9	40 0
Saffarum in Sardinia.	31	39 0
Senæ, Siena.	34	43 0
Strigonium.	42	48 0
Syene, Asua.	62	23 30
Syracusæ.	40	37 30
Tarentum.	45	40 0
Tarracona.	16	41 0
Tauris Persiæ.	82	41 0
Thebæ.	51	38 0
Theodosia, Caffa.	62	49 30
D. Thomæ Insula.	33	1 0
Toletum.	10	40 0
Trapezus.	71	40 0
Tunetum.	33	32 0
Valentia Hispaniæ.	14	39 30
Venetiæ.	34	45 0
Verona.	33	45 0
Vienna Austriæ.	38	48 0
Vlyssipona, Lisbona.	5	39 38
Vormatia.	28	49 45
Zofala Africæ.	64	10 0 Austral.

Vtinam vero Geographicum istud studium, non obiter cantum, sed na-

Images 1-4. Tables showing cities' latitudes and longitudes contained in Biancani's De Sphaera Mundi (1619)

The language of geography was mathematics, and this became the standard in European schools between the sixteenth and seventeenth centuries. Jesuits played a leading role in extending this language from universities to secondary schools. Yet at the same time it is in Jesuit schools that we can observe a gradual relocating of geography from an ancillary discipline of mathematics, to an independent or semi-independent subject of study.

The kingdom of France and the Spanish Netherlands (approximately present-day Belgium) hosted a particularly high number of Jesuit schools, with about 90 established between 1558 and 1639[11]. If we peeked inside these school libraries, we would see that the mathematical corpus was largely composed of the books listed so far[12]. At the Jesuit College library of Namur, for instance, we find Christoph Clavius's *Opera Mathematica*, Peter Apian's *Cosmography*, Münster's *Horologiographia*, and the ubiquitous *Tractatus de Sphera* of John Holywood (all shelved in the Arts and Science section). A copy of Ptolemy's *Geography cum tabulis geographicis Gerardi Mercatoris* of 1574 was also kept in that library, albeit in the History section. In the Jesuit college library of Bruges, we encounter once more Cristoph Clavius's *Opera Mathematica*, as well as Pliny's *Naturalis historia*, Giovanni Riccioli's *Geographia et Idrographia reformatae* (ed. 1662), Nicolaus Copernicus's *De revolutionibus orbium celestium* (ed. 1543), Piccolomini and Holywood's books on the Spheres, Kepler's *Astronomia Copernicana* (ed. 1635), and Galileo's complete works.

What is slightly unexpected about the Bruges library is that in the history section, in addition to the usual

[11] P. Grendler, *Jesuit Schools and Universities*, 59.

[12] All references concerning the books mentioned here which are contained into the Jesuit libraries' catalogues can be found at the end of the article among the "Published sources".

geography books produced by the ancients (Ptolemy's *Geography*, Strabo and Pomponius Mela's *De situ orbis*, etc.), we find also modern books. Among those worth noting are Johann Huttich and Simon Grynaeus's *Novus orbis regionum ac insularum veteribus incognitarum*, Abraham Ortelius's *Theatrum orbis Terrarum* (eds. 1570, 1596, 1635), Münster's *Cosmographiae univerialis* (both in Latin and French, ed. 1552), and André Thevet's *Cosmographie Universelle* (ed. 1575).

In the Jesuit college libraries of Brussels and Malines, the situation is, in a way, reversed. Their Arts and Science sections are populated with ancient authors (Pliny's *Naturalis Historia*, Ptolemy's *De Perfectis Celestium Motibus, Opera Omnia*), while their History sections are repleted with modern cosmographic treatises. A similar scenario, in which the logic of Jesuit College libraries is hard for the historian to grasp, can be found in other places, such as Clermont, Alost, Luxembourg, Ghent, and Roermont.

The inclusion of a heavy dose of cosmography and geography books in the History sections of college libraries, as opposed to the Science sections, is an interesting fact. Such a distinction may produce the impression that geography texts were divided between outdated and more advanced ones. I consider it to be more likely, however, that geography was in transition, at once detaching itself from mathematics and forging new ties with history.

After all, Abraham Ortelius, in the preface to his *Theatrum Orbis Terrarum* (which we often find in Jesuits libraries), defined geography as the "eye of history", inextricably joining the two subjects and stressing the need of one for comprehension of the other[13]. While this

[13] Cfr. P. Binding, *Imagined Corners: Exploring the World's First Atlas* (London: Review, 2003), 222-224. On Ortelian thought see: G. Mangani, *Il «mondo» di Abramo Ortelio. Misticismo, geografia e*

association between history and geography was not an absolute novelty, from the end of the sixteenth century this connection became more recurrent, thus creating a new epistemological tool by which the two disciplines could complement each other[14].

The bibliographical situation with regard to cosmography seen in French and Belgian collegiate libraries shows how important geographical subjects became in Jesuit pedagogy from the end of the sixteenth century. Books were both instruments and manifestations of the curiosity about the world inculcated by Jesuit education. The reflection of this pedagogical situation can be observed in another of the most influential works produced within the Society: Antonio Possevino's *Bibliotheca Selecta*, published in Rome in 1593. The importance of this reasoned bibliography, whose intent was to give an organized structure for human knowledge in conformity with the norms of the Council of Trent, was enormous. Its effects were particularly felt in the educational field. As Emanuele Colombo has noted,

> La sezione centrale del primo tomo (libri VI-IX) è un vivace affresco di un piano di evangelizzazione del mondo, dall'America al Giappone passando per la penisola scandinava. C'era un duplice nesso tra i libri e il mondo. Da una parte i libri, quelli buoni, dovevano servire a conoscere i popoli e ad apprendere il metodo migliore per evangelizzarli, ed erano uno strumento per diffondere il cristianesimo. Dall'altra il mondo stesso era un libro: Dio, secondo un'espressione di Possevino, era l'autore del libro del mondo e il professore alla cui «celeste scuola» bisognava imparare[15].

collezionismo nel Rinascimento dei Paesi Bassi (Modena: Panini editore, 2006), pp. 184-216.

[14] During the Middle Ages, some theologians stressed the usefulness of knowing the conformation of the Holy Land for a better understanding of the scriptures.

[15] E. Colombo, *Il libro del mondo. Un documento di Antonio Possevino*, in., *Milano, l'Ambrosiana e la conoscenza dei nuovi mondi*

For his selection of geographic books on the most remote parts of the world, Possevino relied on the work of Jesuit missionaries (who, as we shall see shortly, played a key role in the elaboration and diffusion of geographic knowledge). Among them were the works of José de Acosta concerning the American continent, and for China the writings of Michele Ruggeri[16].

The weight given to geographical education in Jesuit pedagogy, as Restif-Filliozat Manonmani points out, is confirmed by the widespread presence of maps and atlases in the colleges of the Society of Jesus from the seventeenth century onward. These objects were, furthermore, often displayed on the walls of the classrooms where lessons were held[17].

The use of geographical texts and cartographic objects in Jesuit classrooms brings us to another key vehicle for the Society's didactic program: the letters and reports from the missions, rife with both information and evangelizing zeal. As the aforementioned anonymous school text written in Novellara on Francis Xavier shows, the role of Jesuit missionaries in the early modern global world represented a powerful stimulus to the teaching of geography. These documents came from the most far-flug regions of the world where the Jesuits had established their missions, ranging from Japan and the Philippines at the eastern extremities of Asia; to India and Africa; and, in the New

(secoli XVII-XVIII), edited by M. Catto, G. Signorotto (Roma: Bulzoni Editore, 2015), 339.

[16] *Ibidem*.

[17] R.-F. Manonmani, "The Jesuit Contribution to the Geographical Knowledge of India in the Eighteenth Century," *Journal of Jesuit Studies*, 6 (2019): 74. See also L. Nuti, "La cartographie jésuite: Du plan de quartier à l'atlas du monde," in *François de Dainville S.J. (1909–1971) pionnier de l'histoire de la cartographie et de l'éducation*, edited by C. Bousquet-Bressolier (Paris: École des chartes, 2004), 187–201.

World, sites in Mexico, Brazil, and Peru on the American continent. The letters and reports from the missions, therefore, introduce us to another crucial resource for Jesuits striving to cultivate geographical literacy among their pupils: the Society's global network[18].

The Jesuit educational system was not limited to Europe. It rapidly spread, as the early case of the Goa school attests, to the four corners of the globe, following on the heels of colonial expansion. As we have seen, between 1543 and 1548 Jesuits took control of the school opened in Goa by the presiding bishop and the Portuguese governor of India in 1541[19]. In the second half of the sixteenth century the Society of Jesus established four colleges in the Portuguese colony of Brazil: at Piratininga, Bahfa, Rio de Janeiro, and Olinda. These schools lasted until the Society's expulsion in 1759. In the rest of Spanish Latin America, dozens of colleges and universities were set up in the viceroyalties of New Granada, Mexico, Chile, Peru, and Rio de la Plata, making the Jesuit presence nearly as capillary as it was in Europe[20].

Jesuit colonial pedagogy did not overlook local traditions, languages, and cultures, and was very attentive to the peculiarities of each territory. The Jesuits added significantly to European geographical knowledge of the regions where they settled, as the example provided by the cartographic contribution of the Society in Portuguese India shows[21].

[18] M. Friedrich, "Circulating and Compiling the *Litterae Annuae*. Towards a History of the Jesuit System of Communication," *Archivum Historicum Societatis Iesu*, 77 (2008): 3-39.

[19] Cfr. P. Grendler, *Jesuit Schools and Universities in Europe*, 4.

[20] Cfr. J. Pimentel, *The Iberian Vision: Science and Empire in the Framework of a Universal Monarchy, 1500-1800*, 27.

[21] Cfr. L. M. Brockey, *Journey to the East: The Jesuit Mission to China, 1579-1724*, (Cambridge: The Belknap Press of Harvard University Press, 2007); M. True, "Travel Writing, Ethnography, and the

The colonial educational framework was completed by the schools of other religious orders, which played as important a role as the Jesuits, and by the viceroyal administration, opened with motivations similar to those highlighted earlier for the viceroyalty of Sicily. The earliest-inaugurated universities in America, for instance, were the Franciscan Imperial College of Santa Cruz de Tlatelolco, and the Dominican University of Santo Domingo, established on the model of Alcalá de Henares and opened, respectively, in 1536 and 1538. These were soon followed, in 1551, by the University of Lima and the Royal and Pontifical University of Mexico, both chartered by Emperor Charles V.

In addition to these universities we find colleges in the cities of Quito, Merida, Lima, Cuzco, Panama, Santa Fe de Bogota', and Havana[22]. These universities and colleges were created in the image of their European counterparts, with their own statutes, privileges, and idiosyncrasies. In America, just as in Europe, the Jesuits educated colonial elites and the local ruling classes. Sometimes these schools were conceived as seminaries or theological faculties for the religious orders that created them, and later took on the education of lay students.

Even in these contexts we witness the production of works of geographical knowledge. For example, the Jesuit Antonio Arias, who lived in Mexico at the beginning of the seventeenth century, wrote his own *De Sphaera Mundi* (in the mode of Sacrobosco), which dealt with the problem

Colony-Centric Voyage of the Jesuit Relations from New France", *American Review of Canadian Studies*, 42, 1 (2012): 102-116.

[22] See J. Higgins, *Lima: A Cultural History*, (New York: Oxford University Press, 2005) and E. Luque Alcaide, *La educación en la Nueva España en el siglo XVIII*, (Sevilla: Escuela de Estudios Hispano-Americanos, 1970), and J. Elliott, *Empires of the Atlantic World: Britain and Spain, 1492-1830*, (New Heaven: Yale University Press, 2006), 189-190. See also Pimentel, *The Iberian Vision*, 26-27.

of calculating latitudes and longitudes. The work would later be exported to Europe, proving that not only 'raw' material, but also complete and refined works were exported from the colonies[23].

Overall, the European educational footprint proved more decisive in defining the cultural destinies of the American colonies than the Asian ones, where local cultural and educational traditions were not overwhelmed, but mounted firm resistance. Nevertheless, some schools opened in Asia proved influential (among them the Goa school, and those of Macau and mainland China)[24]. These schools made a significant cultural impact and formed a huge, unprecedented global network. Colonial schools, both in Asia and the Americas, allowed the collection and systematization of immense amounts of scientific knowledge, which formed the basis of the great natural histories produced in the seventeenth century[25].

Buut as Steven Harris has pointed out, the gathering of this material did not represent a simple accumulation of scientific notions. This practice profoundly affected the structure of the schools of religious orders, particularly those of the Jesuits. In other words, the same type of pedagogy that transmitted this knowledge was simultaneously forged by it. The great mass of information on geography, climate, flora, fauna, and ethnography created a new

[23] S. Gruzinski, *Les quatre parties du monde : Histoire d'une mondialisation*. Paris: Éditions de La Martinière, 2004, 390.

[24] L. M. Brockey, *Journey to the East*, 207, ss.

[25] See J. A. Cervera Jiménes, *Los misioneros españoles como vía para los intercambios científicos y culturales entre el extremo oriente y Europa en los siglos XVI y XVII*, Memoria presentada para optar al Grado de Doctor en Ciencias dirigida por el Doctor Mariano Hormigón Bláquez, Universidad de Zaragoza, 1999.

awareness of the world as an integrated and unique system[26].

Within the classroom this synthesis took place naturally, and it is exemplified in the works of natural history produced and used in colleges. For instance, José de Acosta's *Historia Natural y Moral de las Indias* contains information about geography, geology, ethnography, flora, and fauna, earning him the nickname of Pliny of the New World[27]. Acosta wrote this work during his professorship at the Peruvian College of St. Martin, in Lima, between the 1570s and the 1580s, giving us a glimpse of what was taught in the school.

The *Historia Natural* returned with Acosta to Spain as a manuscript, but once published it enjoyed broad circulation in the Jesuit school network. In this circular motion of information, the very concepts of periphery and center were redefined. Such scholarly production would long endure within the Society of Jesus, and made an indelible mark on the geographical education given in Jesuit schools.

This educational circulation was ended with the expulsion of the Society from the Catholic colonies at the close of the eighteenth century. The return of many Jesuits from America and Asia to Europe (mainly to Italy) gave rise to a series of publications that deepened the Old Continent's understanding of the world.

Such is the case of the *Escuela Universalista Española* and its leading members, including Juan Andrés, Lorenzo Hervas y Panduro, and Antonio Eximeno. These scholars, together with about thirty other authors, helped define and implement a neo-Latin way to the

[26] S. J. Harris, *Confession-Building, Long-Distance Networks, and the Organization of Jesuit Science*, 297-298.

[27] *Ibid*., 310. See also C. M. Burgaleta, *José de Acosta (1540–1600): His Life and Thought*, (Chicago: Loyola University Press, 1999).

Enlightenment based on empiricism. It brought to completeness the global vision of the world and science that had started with maritime expansion during the fifteenth century[28].

Among the works associated with this schoool, *La figura de la Tierra* merits special mention. The text, written by Juan Andrés, a leading figure of the Universalist School, has only recently been recovered. It comprises a brief dissertation tracing the history of geodesic representations. As noted by Pedro Aullón de Haro, this discourse on the shape of the Earth offers a historical-scientific conceptualization that, curiously enough, also becomes aesthetic, as well as epistemological[29]. Juan Andrés's writing is a brilliant and early contribution to the history of science, a discipline then still in its infancy. Andrés was well aware of the importance of nautical techniques and of the transcendence of the voyages of exploration. At the time he wrote this dissertation, the frequency and relevance of such expedition was only increasing.

Conclusions

The chronological and geographical span examined in this article is broad, ranging from the fifteenth to the eighteenth century, from Renaissance Florence to sixteenth-century Lisbon, from the remote rural villages of Counter-Reformation Italy to the dense network of Jesuit schools scattered throughout Europe, up to the colleges established by the Society in the Asian and American colonies. Such an

[28] P. Aullón de Haro; D. Mombelli, *Introduction to the Spanish Universalist School: Enlightened Culture and Education versus Politics*, Leiden-Boston: Brill, 2020.

[29] J. Andrés, *La figura de la tierra*, ed. y trad. de C. Casalini y D. Mombelli, Madrid: Casimiro, 2017, 7-9.

approach is consistent with the preliminary nature of this research, and nonetheless permits us to draw some sound conclusions concerning the questions raised in the introduction.

We have seen how, in the periods prior to and following the Iberian expansion, the teaching of geography underwent a considerable transformation. An education that instilled an awareness of the known world went from being the prerogative of a few (nobles, university students and wealthy individuals, such as the humanist merchants of Florence), to touching wider social segments. What changed in geographical teaching between the fifteenth and sixteenth centuries was not the aim of the educational program, which remained essentially of a practical nature (albeit with horizons expanded from the Mediterranean to a global scale). The real innovation lay in the conceptual premises according to which the earth began to be preceived. This shift embraced an improved visual representation of the planet earth, with new continents, oceans, islands, placed and proportioned in novel ways. Such cartographic improvements were not enough, however, as shown by the long-lasting competition between the theories of American insularity and Amerasian continuity. The real change was in the dawning awareness of the earth as a coherent system. The world drifted from the Aristotelian-Ptolemaic notion of a planet consisting of distinct concentric spheres, to that of a single, integrated object. Oceanic voyages were the key element in this transformation, as shown by the continuous references made by Cristoph Clavius to Spanish and Portuguese navigation in support of his scientific and pedagogical theories.

In this regard, during the seventeenth and eighteenth centuries, the diffusion of the cosmographic books suggested by Clavius for the preparation of the *Ratio Studiorum* in European Jesuit college libraries is illuminating. Although educational historiography has pointed out the

fact that the *Ratio* paid little attention to mathematics and science, a look into Jesuit collegiate libraries discloses an abundance of cosmographical and geographical texts, largely corresponding to those suggested by the German Jesuit in the sixteenth century. It is by no means implausible that the proliferation of this type of literature in Europe was both a cause and an effect of an intellectual curiosity about nature in all its aspects, very widespread among the Jesuits. This attitude was embodied in the great 'natural histories' of the seventeenth century, which represented one of the most important contributions of the Society of Jesus to modern science.

At the basis of this epistemological change in the way of thinking the world, with its new reliance on empirical knowledge rather than ancient authorities, there was the maritime expansion that demonstrated, on the basis of direct experience, that the planet earth was not consistent with classical and biblical teachings. This shift had an enormous effect on schools, namely on the way of producing and transmitting knowledge. It is probably at this epistemological turning point, which links the world of the school to that of the technological-maritime progress of the sixteenth century, that we find the foundations of the modern way of doing research in higher and university education. Moreover, in Jesuit libraries and classrooms, and later in secular and other religious orders' schools, a synthesis between different pedagogical and scientific traditions was developed. In these contexts, the ancient geographical tradition (Ptolemy, Strabo, Pomponius Mela) rubbed shoulders with the theoretical cosmography of geographers and mathematicians from central Europe (Ortelius, Münster, Apian, Thévet) and the practical cosmography of their Iberian and Mediterranean colleagues (Nunes, Maurolico). The synthesis was negotiated through characters such as Cristoph Clavius, who became the interpreter of this combination of cosmographic cultures and, through

his pedegogical recommendations, instigated its spread across Europe. We are not talking about schools of cosmography in this article, but about cosmography in schools. That the site of this investigation is outside specialized institutions allows us to fully appreciate how, between the sixteenth and seventeenth centuries, a wider diffusion of mathematical and geographical competences in the European populations came about. This new awareness, in turn, deeply influenced ways of thinking about science. The demonstrability of phenomena and natural objects was becoming indispensable, and the oceanic expansion was certainly one of the main engines of the early modern pedagogical turning point.

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