

Jesuits and the Cultural Field of Science

Between 1548 and 1773, the Jesuits founded about 100 educational institutions in Italy. Of these, 18 had chairs of mathematics, understood in the broad sense to include geometry, algebra, optics, astronomy, and similarly related subjects. Mathematics was particularly strong in Jesuit schools in Italy because of the more direct influence there of the Collegio Romano, but in time it flourished in other parts of Europe, particularly in France and Germany/Austria.



Figure 1. The Astronomers from the series, *The Story of the Emperor of China*, French, c. 1697-1705. Beauvais Tapestry Manufactory

Adam Schall von Bell, S.J. is shown seated at center with the emperor of China.

The dynamics among three spaces: the space of scientific discourse, its institutional setting, and the wider political context. No story about Jesuit science, the variety of subjects comprising it, and its capacity for production, reproduction, and transmission can be told without mentioning Christopher Clavius, S.J., or the extraordinary collaboration of the Jesuits and the Chinese in the fields of mathematics, geography, and astronomy from the 16th to the 18th centuries.

The Jesuit educational system, beginning in the 1540s, allowed for, and even encouraged, the differentiation of the mathematical disciplines and certain parts of natural philosophy from other fields of learning, and their emergence as a specific area of studies and research similar enough to what is recognized by us as “science.”

By the 1620s, consistent transmission of scientific knowledge by the Society of Jesus had already been secured, the professional identity of Jesuits engaged in science was more or less developed, and there was already enough differentiation within the space of Jesuit scientific discourse and its cultural field.

The 1680s signal another turning point, marked by a growing inability of the Jesuits to integrate elements of the “new science”—such as Cartesian analytical geometry, or Kepler’s laws—and thus the growing marginalization of Jesuit science, although not of Jesuit scientists.

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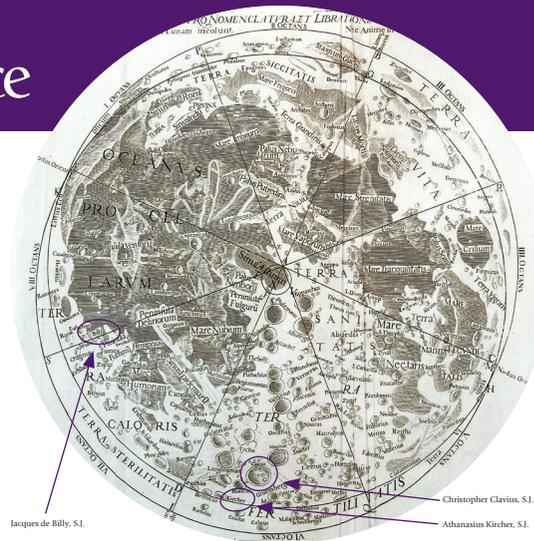


Figure 2. Selenograph, 1645 by Francesco Grimaldi, S.J. This selenograph charts the surface of the moon and named lunar craters, 35 of which are named to honor Jesuit scientists. Three of those are indicated here by arrows.

1. Mario Bettini (Italian, 1582-1657)
2. Jacques de Billy (French, 1602-1679)
3. Giuseppe Biancani (Italian, 1566-1624)
4. Roger J. Bosovich (Croatian, 1711-1787)
5. Nicholas Cabej (Italian, 1586-1650)
6. Christopher Clavius (German, 1538-1612)
7. Jean-Baptiste Cysat (Swiss, 1588-1657)
8. François de Vico (French, 1805-1848)
9. Gyula Fényi (Hungarian, 1845-1927)
10. George Fournier (French, 1595-1652)
11. Francesco Grimaldi (Italian, 1613-1663)
12. Christopher Grienberger (Austrian, 1564-1636)
13. Johann Hagen (Austrian, 1847-1930)
14. Maximilian Hell (Hungarian, 1720-1792)
15. Athanasius Kircher (German, 1602-1680)
16. Francis X. Kugler (German, 1862-1929)
17. Charles Malapert (French, 1580-1630)
18. Christian Mayer (German, 1719-1783)
19. Paul McNally (American, 1890-1955)
20. Theodore Moetius (Belgian, 1601-1667)
21. Denis Petau (French, 1583-1652)
22. Jean-Baptiste Riccioli (Italian, 1598-1671)
23. Matteo Ricci (Italian, 1552-1610)
24. Ródes (Hungarian, 1881-1939)
25. Romaña (Spanish, dates unknown)
26. Christopher Scheiner (German, 1575-1650)
27. George Schönberger (German, 1597-1645)
28. Ange Secchi (Italian, 1818-1878)
29. Hughes Semple (Scottish, 1596-1654)
30. Gerolamo Sirsalis (Italian, 1584-1654)
31. André Tacquet (Belgian, 1612-1660)
32. Adam Tannerus (Austrian, 1572-1632)
33. Nicolas Zucchi (Italian, 1586-1670)
34. Jean-Baptiste Zupi (Italian, 1590-1650)
35. Johan Stein (Dutch, 1871-1951)

Jesuits on the Far Side of the Moon?

For centuries the basic map used for lunar nomenclature was the first complete selenograph drawn in 1645 by the Jesuit astronomer, Francesco Grimaldi (1613-63), and published by John Baptiste Riccioli, S.J. (1598-1671). Today, it is found at the entrance to the moon exhibit at the Smithsonian Institution.

The following list of lunar craters named to honor Jesuit scientists is taken from the National Air and Space Museum (NASM) catalog. The International Astronomical Union (IAU), founded in 1922, codified lunar nomenclature eliminating conflicts: five Jesuit names were deleted, bringing the present number of lunar craters named for Jesuits to 35.



Figure 3. Christopher Clavius, S.J. Rome, 1606. Archivio Storico della Compagnia di Gesù, Rome.

The Jesuit Who Stole Ten Days from the World

The next time you look at the calendar on your phone, computer, desk or wall, remember that it is a gift from a Jesuit.

In 1579, Pope Gregory XIII decided to replace the outdated Julian calendar with an accurate one, but an accurate calendar demands accurate astronomical observations. Gregory assigned this challenging task to the Jesuits, who under the leadership of Christopher Clavius, S.J. (1538-1612), undertook the observations that would serve as groundwork for the new calendar.

Clavius’s task of calculating the time of the vernal equinox and correcting the shift was enormous, considering the meager astronomical and mathematical resources available at the time. The accuracy of Clavius’s calculations has earned him historical fame. He found the correct date for Easter and also found that 97 days needed to be added to the calendar every 400 years to absorb the fraction of a

day left after the 365 days of the year. To this day, no one knows how he accomplished this feat. It took 800 pages to explain and justify his results. It is comforting to know that the next time an extra day will have to be added will be the year 4317.

In order to bring the calendar into sync with the seasons, Clavius had to omit 10 whole days and nights: thereupon Thursday, October 4, 1582 was followed by Friday, October 15, 1582. Clavius “stole” 10 days from the world and the populace was not happy about it. Protestant countries were reluctant to accept any decree from a pope and Europe became a patchwork of dates as people struggled with different calendars. This resulted in an interesting array of travel adventures. If you left Catholic Regensburg in Germany on April 8, you would arrive in Lutheran Nuremberg 60 miles away on March 29. England did not accept Clavius’s calendar until 1751, while Orthodox Russia would require the Bolshevik Revolution before it changed. The American colonies did not adopt it until 1752, when 11 days were then skipped from the calendar, with the result that we

Not Everyone Was Enamored of Jesuit Scientific Genius

16th Century Europe
When Christopher Clavius orchestrated the changeover to the Gregorian calendar in 1582, Jesuit houses across Europe were stoned by crowds blaming the Society for the theft of the ten days stolen from them in the name of astronomical accuracy.

17th Century China
Native Chinese astronomers, displaced as trusted advisors to the emperor by Adam Schall von Bell, S.J. (1592-1666), eagerly sought their revenge. Allegations that Schall had caused the death of an empress and used his astronomical expertise to select an inauspicious day for the burial of an imperial prince, led to the pitiable sight of the 72-year-old Jesuit being carried into court on a stretcher, paralyzed and mute as the result of a recent stroke. He was sentenced to death, and only the timely arrival of an earthquake and a fire at the palace—interpreted as divine displeasure at the court’s verdict—managed to save the priest’s life.

18th Century Europe
Maximilian Hell, S.J. (1720-92), director of the Jesuit observatory at Vienna University, found himself above the Arctic Circle in 1769, at the end of a decade in which his fellow Jesuits had been banished from most of Catholic Europe. He was on the desolate island of Vardo, off the Norwegian northeast coast; not as an exile but, thanks to the sponsorship of Christian VII of Denmark, to observe the transit of the planet Venus across the surface of the sun.

Such transits were frustratingly rare—they came in pairs, eight years apart, every twelve decades—but they were vital for anyone interested in calculating the distance between the earth and the sun. At the time, estimates for this crucial distance ranged between 8 million and 111 million miles. A sorry state of affairs, as Sir Edmund Halley pointed out, but rectifiable if, as he suggested, astronomers would cooperate in observing the next two Venusian transits in 1761 and 1769.

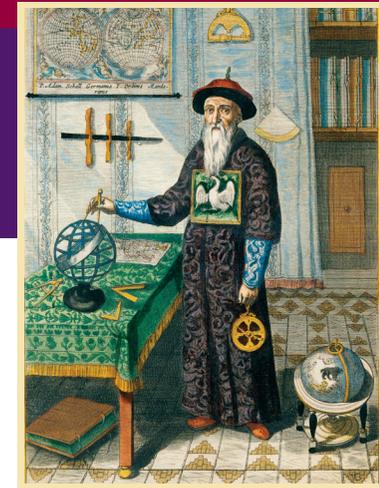


Figure 4. Adam Schall von Bell, S.J., German Mandarin of the first order and president of the Royal Highest Council of Astrology at Peking. Hand-colored engraving, 1667. Dressed in the silk robes of a Qing mandarin (the white crane indicates his imperially authorized rank) and holding compasses and a mariner’s astrolabe, Schall stands in front of shelves of books and a world map.

In concert with Fr. Hell in Vardo, observations were made, among other places, at Hudson Bay, in California, Mauritius, and, courtesy of Captain James Cook, on the island of Tahiti. Collation completed, the mean distance to the sun was calculated to within one percent of its currently accepted value—just shy of 93 million miles.

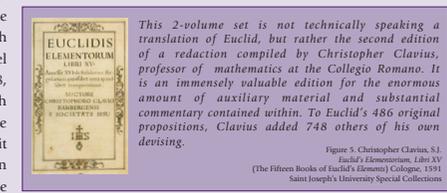
What some people could not ignore, however, was that Fr. Hell was a Jesuit. Enemies of the Society, hardly in short supply at the end of the 1600s, suggested that Hell had falsified his calculations and the accusation was still reverberating when, in 1835, Carl Ludwig Littrow found Hell’s astronomical diary in Vienna and claimed to be able to make out blatant erasures and alterations. It took almost 50 years for Hell to be vindicated, thanks to the intervention of the astronomer Simon Newcomb, who pointed out that, while there were rubbings out and corrections in the diary, these had been made in good faith at the time. Hell had, in fact, been striving for accuracy; Littrow had been theorizing from prejudice.

—Marta Reed and Paula Demant, eds., *China on Paper: European and Chinese Works from the Late 16th to the Early 19th Century* (Getty Research Institute, 2007)
—Jonathan Wright, *God’s Soldiers* (Doubleday, 2004)

celebrate George Washington’s birthday on February 22 even though he was born on February 11, 1732.

Today Clavius’s calendar is virtually universal. Without it, our calendar would now be about 13 days slow. Since Clavius’s calendar was introduced to the world in 1582 by Pope Gregory XIII, it is called the Gregorian calendar. With equal truth, it could be called the “Jesuit calendar” or the “calendar of Christopher Clavius, S.J.”

— John Scott, S.J., *Creighton University Magazine*, 1999



This 2-volume set is not technically speaking a translation of Euclid, but rather the second edition of a redaction compiled by Christopher Clavius, professor of mathematics at the Collegio Romano. It is an immensely valuable edition for the enormous amount of auxiliary material and substantial commentary contained within. To Euclid’s 486 original propositions, Clavius added 748 others of his own devising.

Figure 5. Christopher Clavius, S.J. Euclid’s *Elementorum Libri XV* (The Fifteen Books of Euclid’s *Elements*) Cologne, 1591. Saint Joseph’s University Special Collections

Jesuit Students

What About those 16th- and 17th-Century Jesuit Students?

The boys at Gubbio were tough—unmanageable and like beasts, who have been known to kill each other.

From many schools came enthusiastic reports about the progress the students made in studies and virtue and about the hope they inspired for the future. Although the Jesuits were proud of their triumphs, they were also pragmatic observers and frank communicators to each other about what succeeded or failed.

Then as now, issues of student recruitment, diversity and representation were important. The Jesuit University of Mantua had student organizations called nations, which were formal associations of students from a particular region, each with at least one officer, a councilor. In 1625-26, it had sixteen student nations from various Italian cities. Duke Ferdinando Gonzaga insisted that his new university should have all the features of established universities to attract students from distant lands. Like other Italian universities, Mantua particularly wished to attract German students because many were nobles or otherwise privileged, and after obtaining degrees, usually in law, assumed leadership roles in their home states. Also, civic authorities, landlords, and merchants saw German students as free spenders who aided the local economy. Consequently, Italian universities welcomed German students, including Protestants.

Some schools reported intractable problems with discipline. In Florence, the “insolence” of some students caused ongoing problems for the Jesuits. As early as 1548, Jerome Nadal, S.J., laid down the rule in Messina that students could not enter the school buildings bearing arms. This was a somewhat standard regulation for educational institutions of the day, but the Jesuits kept repeating it for their schools.

A composite list of problems consistently arising in such institutions, which has an almost timeless quality to it, went somewhat as follows: Jesuits talked with students about things concerning the school that students had no right to know; the students complained about the quantity and quality of the food; prefects were so overburdened as to lose all privacy; and by their frequent contact with students, lost their respect; the boys invented cruel nicknames for their teachers and prefects and united against them; students had a lingo of their own in which they communicated to frustrate those in power.

How to discipline unruly students was no less a problem for the Jesuits than it has been for educators through the ages. The Jesuits were repeatedly admonished to do so gently, sparingly, by word rather than deed, to prefer rewarding good behavior to punishing bad. According to Ignatius, the Jesuits themselves were never, under any circumstances, to resort to physical punishment. It would be difficult to find a single issue on which he was more adamant and intransigent than this one, and behind which he more repeatedly threw the full weight of his authority.

In the reputedly militaristic discipline of the Society of Jesus, commands issued “under holy obedience,” that is, in virtue of the vow, were extraordinarily rare. But once Ignatius realized by 1553 that he was not being heeded in the matter of physical discipline, he imposed on all Jesuit teachers in Italy precisely such an injunction, from which he would not tolerate the slightest deviation. Ignatius believed that physical punishment diminished respect for the one administering it and ruptured the bond of affection between Jesuits and those they were trying to “help.”



RULES FOR EXTERN STUDENTS*

From the *Ratio atque Institutio Studiorum Societatis Iesu*, or “Plan of Studies of the Society of Jesus,” the first document on pedagogy approved by the General of the Society of Jesus for all the educational establishments of the order (definitive version, 1599).

Among the 15 rules for extern students are the following:

Finally, let them so conduct themselves in word and action that everyone may easily understand that they are no less earnest in acquiring virtue and integrity in life than in making progress in learning.
—Rule 15

1. Those who attend schools of the Society of Jesus in pursuit of learning should be convinced that with God’s help, we shall make as great effort to advance them in the love of God and all other virtues as we shall do to perfect them in the liberal arts.
5. None of our students shall enter the school with weapons, daggers, knives, or anything else which may be forbidden by reason of peace or circumstances.
6. Students must never indulge in swearing, ridicule, insult, detraction, falsehood or forbidden games. They must keep away from places of ill repute and from such as have been proscribed by the prefect. In short, they should not do anything that is contrary to good morals.
9. Pupils must apply themselves seriously and consistently to their studies; they must be prompt and regular in coming to class, and faithful in paying attention to the prelections [lectures], in repeating the matter explained, and in performing the tasks assigned. If there is anything they do not clearly understand or are in doubt about, they should seek the assistance of the teacher.
10. In the classroom they should not move about, but each must remain at the place assigned him and be well behaved and quietly intent on his own work. No one is to leave the classroom without permission of the teacher. All disfiguring or marking of benches, the professor’s chair, seats, walls, doors, windows, or other furniture by drawing, writing, or carving is strictly forbidden.
12. They should refrain altogether from reading pernicious as well as worthless books.
13. They may not attend public spectacles, comedies, plays, or public executions of criminals except those of heretics.* They must not take part in theatricals outside the school without obtaining permission of their teachers or the prefect of studies.
14. All should strive to preserve sincerity of soul and purity of conscience and be especially exacting in their observance of the divine law. They should frequently and sincerely commend themselves to God, to the Blessed Mother of God, to the other saints, and earnestly implore the protection of the angels, in particular of their guardian angel. They should behave well at all times and in all places, but especially in church and the classroom.

*The term “extern students” refers to non-Jesuit students

** This latter sentence was omitted in Farrell’s translation