

Early Modern “Big Science”



Map of the Amazon
Fr. Samuel Fritz, SJ
Published: Quito in 1707

Questions to Consider

- What does the Scientific Revolution have to do with this period?
- Historians of science distinguish between “little science” and “big science.” What do these terms mean? Does it make sense to talk about “big science” in the time of the Scientific Revolution?
- In what ways were certain early modern organizations, such as the Spanish Empire, the Jesuits, and the Dutch East India Company already doing “big science” in the early modern era?

I. “Little” vs. “Big” Science

Derek J. de Solla Price (1922-1983)

- 20th century physicist and historian of science
- coined terms “little science” and “big science” in 1963
- concerned with social organization of science

Little Science: done by individuals for their own personal goals and at their expense

Big Science: done by groups of scientists financed by governments or large businesses expecting practical results

Price’s Argument: Science was “little” during the Scientific Revolution and only became “big” in the 20th century

Does his argument stand up to historical evidence?



Little Science, Big Science (1963)

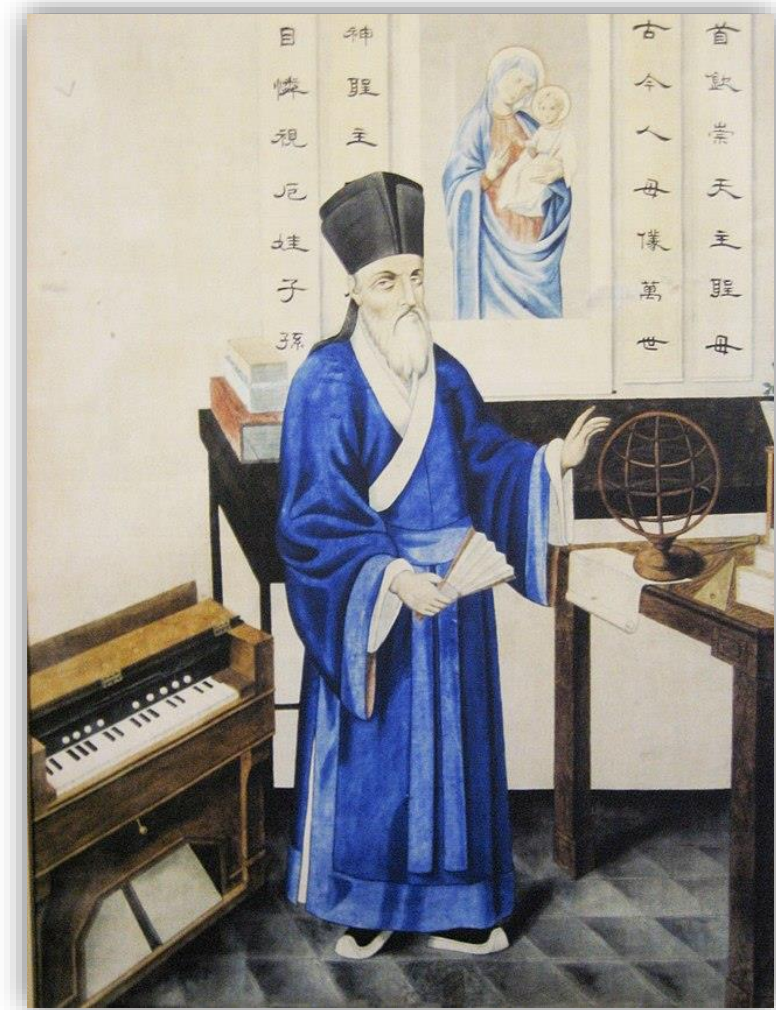
A. The Society of Jesus (Jesuits)

Society of Jesus (est. 1540)

- **global order of Catholic priests**
- university educated; knowledge of natural philosophy
- mission: education and conversion of peoples beyond Europe
- translation, cultural exchange, and interaction with foreign peoples around the globe
- problem: priests get sick and die overseas in large numbers

What kind of knowledge about the physical world do you think Jesuit officials would need to help keep their priests healthy?

Who might have been involved in these kinds of early modern scientific endeavors?



Fr. Matteo Ricci, SJ (1552-1610)
Head of the Jesuit Mission to China

B. Dutch East India Company

Dutch East India Company (VOC), est. 1602

- **first global shipping company**
- transport of goods between Indonesia and India and Europe
- sailors died an alarmingly high rate of disease while overseas
- replacing crew was expensive

What kind of knowledge about the physical world do you think VOC managers would need to help keep their sailors healthy and keep costs down?

Who might have been involved in these kinds of early modern scientific endeavors?



17th Century VOC “East Indiaman” Ship

C. The Spanish Empire

dominant global empire, 1500-1650

- **imperial government**
- built under Emperor Charles V (r. 1516-1556)
- “Council of the Indies” in Seville, Spain
- ruled Spain, Belgium, Netherlands, Austria, Central and South America, Philippines, etc.

What kind of knowledge about the physical world do you think Spanish officials would want to help rule this empire?

Who might have been involved in these kinds of early modern scientific endeavors?



The Relaciones Geográficas: 1577-1586

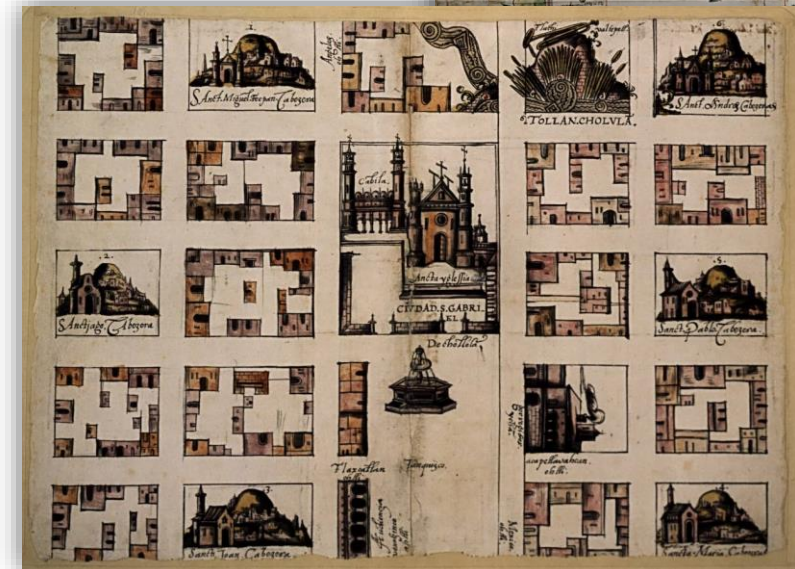
Massive mapping project of the Spanish holdings in its overseas Empire (mostly Americas)

- Ordered by King Philip II (r. 1556-1598)
- Overseen by Council of the Indies in Seville

Questionnaire with Instructions (1577)

- sent out from Council of the Indies
- sent to *corregidores* (local officials) or to *cabildos* (town councils) in the overseas Empire
- 50 questions: geography, cartography, demography, navigation, botany, geology, history, religious beliefs
- 208 total responses with maps, including 166 from “New Spain” (Mexico). Many made by Native American town councils and artists.

Local Maps
Created as Part
of the Relaciones
Geográficas



The Relaciones Geográficas: 1577-1586

Key Excerpts from the Questionnaire:

Question 6

State the latitude in which these towns of Spaniards lie, if this has been taken or if known, or if there is anyone who knows how to take it. State on what days of the year the sun does not cast a shadow at noon.

Question 10

Describe the site and state the situation of said town, if it lies high or low or in a plain, and give a [map] or colored painting showing the streets, squares, and other places; mark the monasteries. This can be easily sketched on paper, and shall be done as well as possible. It is to be noted which parts of the town face North and which South.