A History of Science in Latin America (INTD262): Unit 0

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Summary

Unit 0 Summary

The Scientific Attitude, Nomenclature, Mesoamerican Science

1. The Demarcation Problem: the line between science and non-science
2. Nomenclature: philosophical, ecclesiastical, geographical, and political
3. *Reading and discussion*
    - The Introduction and Chapter 1 of *The Scientific Attitude*
        - 3.1 Examples of good science in 19th century medicine
        - 3.2 Examples of denialism, pseudo-science, and fraud
    - Introduction and Chapter 1 of *Science in Latin America*
        - 3.1 Examples of botany, zoology, and medicine of indigenous 18th-century Mexican people
        - 3.2 Comparisons to colonial knowledge and medieval medicine
        - 3.3 Examples of knowledge transmission: Europe to Latin America, and Latin America to Europe

Unit 0 In-class activities

In-class group activities

- The Mayan numeric system, comparitive mathematics
- Classification of studies: science or non-science?
- Classification of species: hummingbirds
- Medicine: malaria and its treatmeant with quinine

Course Texts

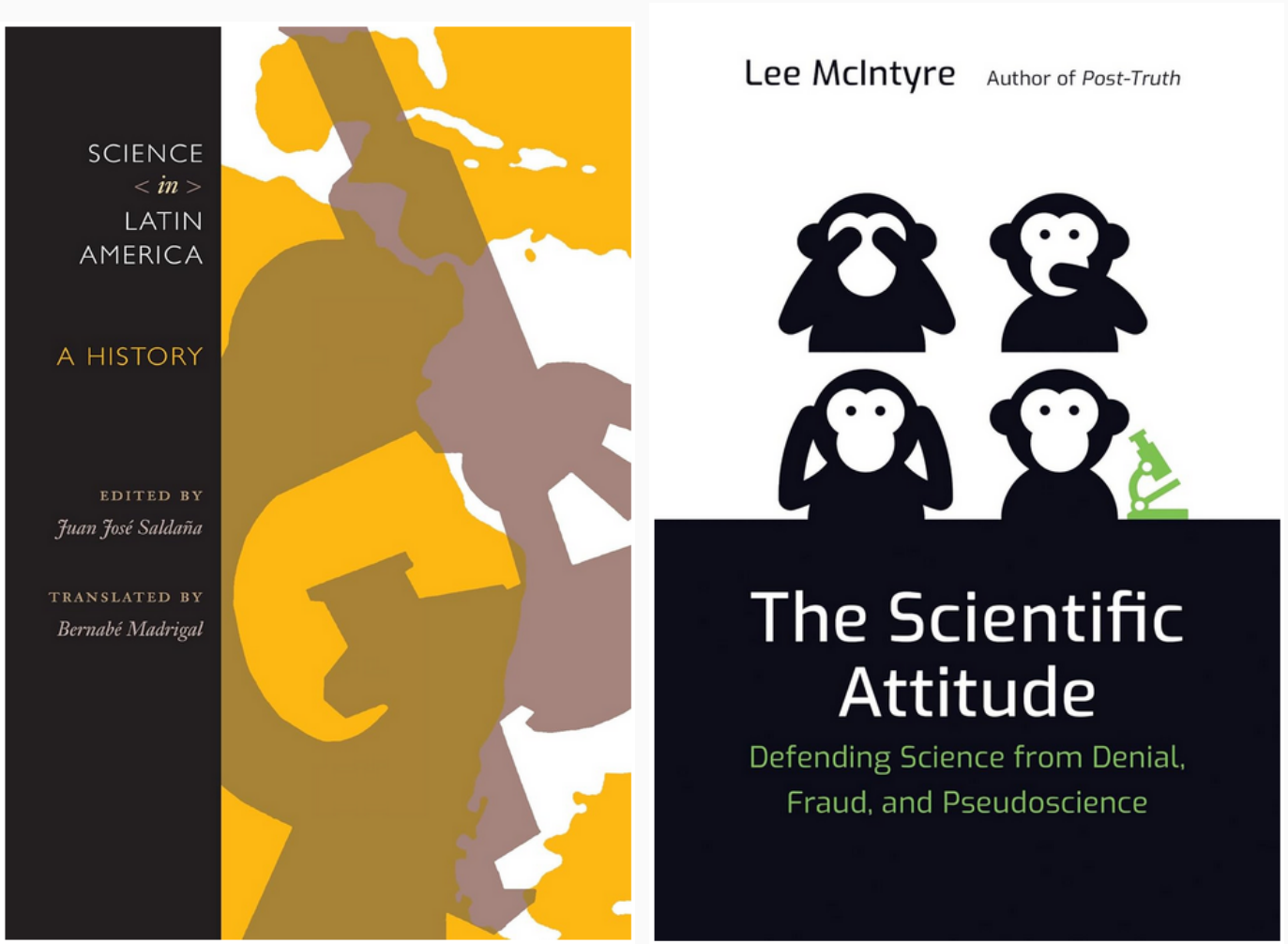

Figure 1: (Left) *Science in Latin America: A History*, edited by Saldaña. (Right) *The Scientific Attitude*, by Lee McIntyre.

The Demarcation Problem: the line between science and non-science

The Demarcation Problem: the line

If we are asked to determine whether a human activity is scientific, what criteria should we use?

Non-scientific activities:

1.
2.
3.
4.
5.

Scientific activities:

1.
2.
3.
4.
5.

Can we derive any specific criteria that distinguish the lists?

The Demarcation Problem: the scientific method

How do we define ***the scientific method****? Let's re-create the scientific method for (left column) the physical sciences, (middle column) the life sciences, and (right column) the social sciences.*

Physical Sciences:	Life Sciences:	Social Sciences:
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.

The Demarcation Problem: the scientific method

Philosophers of science provide rational justification for scientific results, even while scientific progress continues.

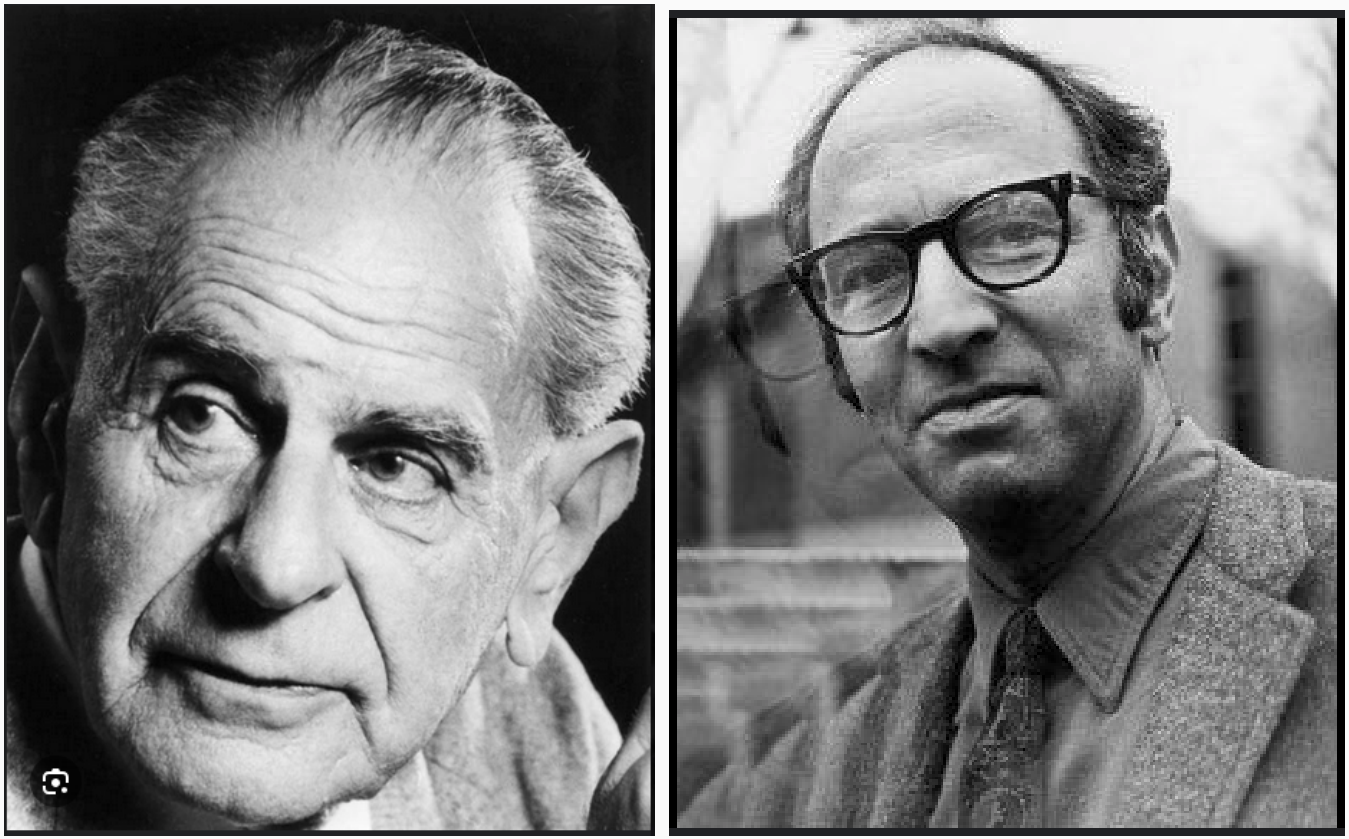

Figure 2: (Left) Karl Popper, a philosopher of science (1902 - 1994). (Right) Thomas Kuhn, also a philosopher of science (1922 - 1996).

The Demarcation Problem: induction and deduction

Examples of induction:

1. “When I observe hummingbirds, I note they are all green. Therefore, all hummingbirds are green.”
2.
3.

Examples of deduction:

1. “Given that there are no camels in Germany, and that Hamburg is a city in Germany, I know that there are no camels in Hamburg.”
2.
3.

The Demarcation Problem: falsification

Falsifiable scientific hypotheses:

1. “Noble gases are made of molecules, and this leads to a predictable relationship between their temperature, pressure, and volume.”
2.
3.

Un-falsifiable scientific hypotheses:

1. “Cutting taxes leads to an increase in economic opportunity for our citizens.”
2.
3.

The Demarcation Problem: falsification

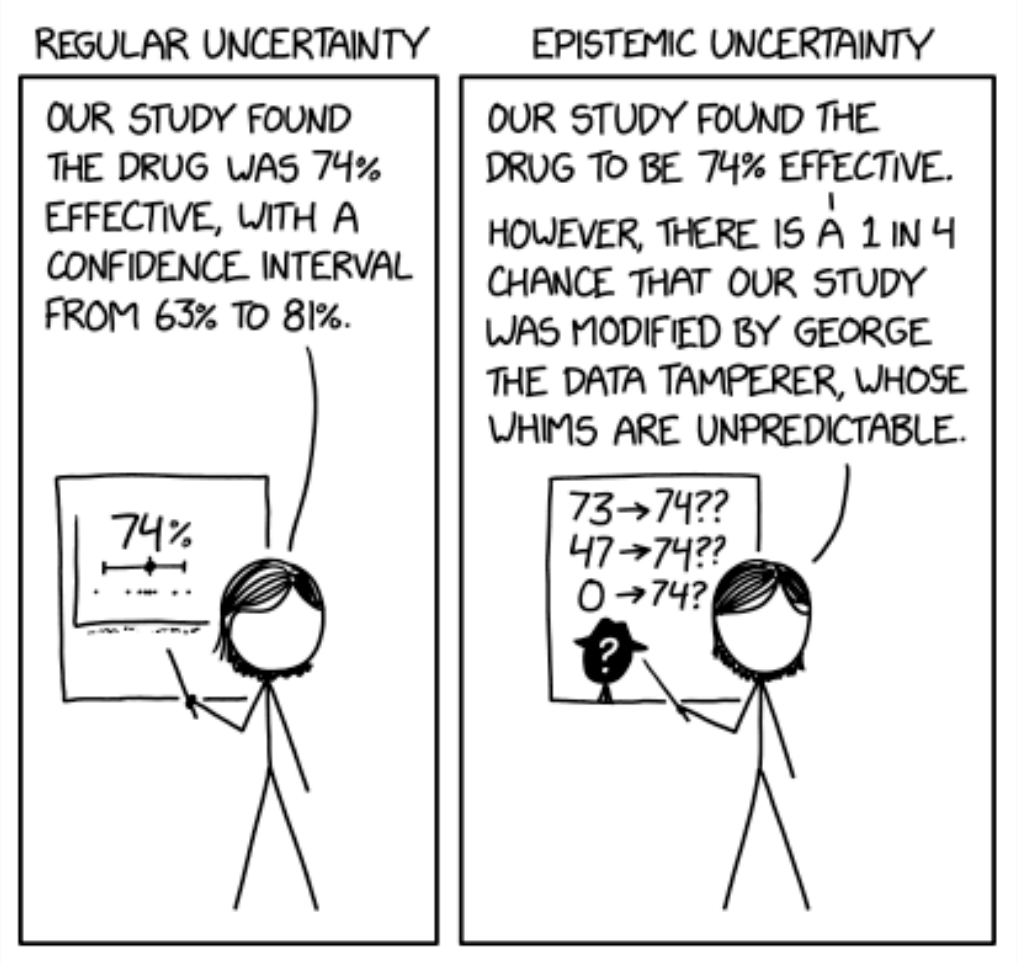

Figure 3: Credit: xkcd.com.

Nomenclature: philosophical, ecclesiastical, geographical, and political

Nomenclature: philosophical

- **Epistemology**: the philosophy of how we know something to be true
- **Metaphysics**: first principles, including abstract concepts such as being, knowing, substance, cause, identity, time, and space.
- **Cartesianism**: philosophy of René Descartes, *Discourse on the Method*, *Geometry*
  - "I think, therefore I am." Start with doubt, then find concrete ideas in which to place belief
  - *Geometry* was an appendix to *Discourse*, unified algebra and geometry. Translating geometric areas and volumes into algebraic equations was unique and new at the time. From this moment we get the notion of a coordinate system
  - Offered three proofs of the existence of the Lord
  - Also worked on cosmology, optics, and the psychology of emotions

Nomenclature: philosophical

- **Rationalism**: the theory that reason rather than experience is the foundation of certainty in knowledge
- **Empiricism**: the theory that all knowledge is derived from sensory experience, stimulated by the rise of experimental science
- **Theology**: the study of the nature of God and religious belief, systematically developed
    - Example of a theologian: Saint Thomas Aquinas (Dominican priest within the Catholic Church, from Sicily).
        - Scholasticism, *Summa Theologica*, reconciling faith and reason,
        - Influential philosopher from the Medeival period
        - Epistemology, ethics, economics, social justice

Nomenclature: philosphical

Empiricism: epistemology based on sensory experience

1. Clearly has implications for experimental science
2. Modern sciences (especially the physical sciences) are divided into three branches:
    - theoretical
    - experimental
    - computational
3. Mathematics is also divided into various branches, including applied math, pure mathematics, which itself is divided into topology, algebra, real/complex analysis ...

Nomenclature: ecclesiastical

The Catholic Church: the Christian Church founded by Jesus of Nazareth. Adopted the hierarchy of the classical Roman Empire:

1. Pope - the formal leader of the Church
2. Cardinal, archbishop, bishop, priest
3. Archdiocese, Diocese
4. Orders: Franciscan, Dominican, Society of Jesus (Jesuits)
5. Monks, nuns, priests from orders, and from dioceses

Role in teaching: often in the colonial period, modern universities grew from universities founded and run by the Catholic Church

Nomenclature: geographic and political

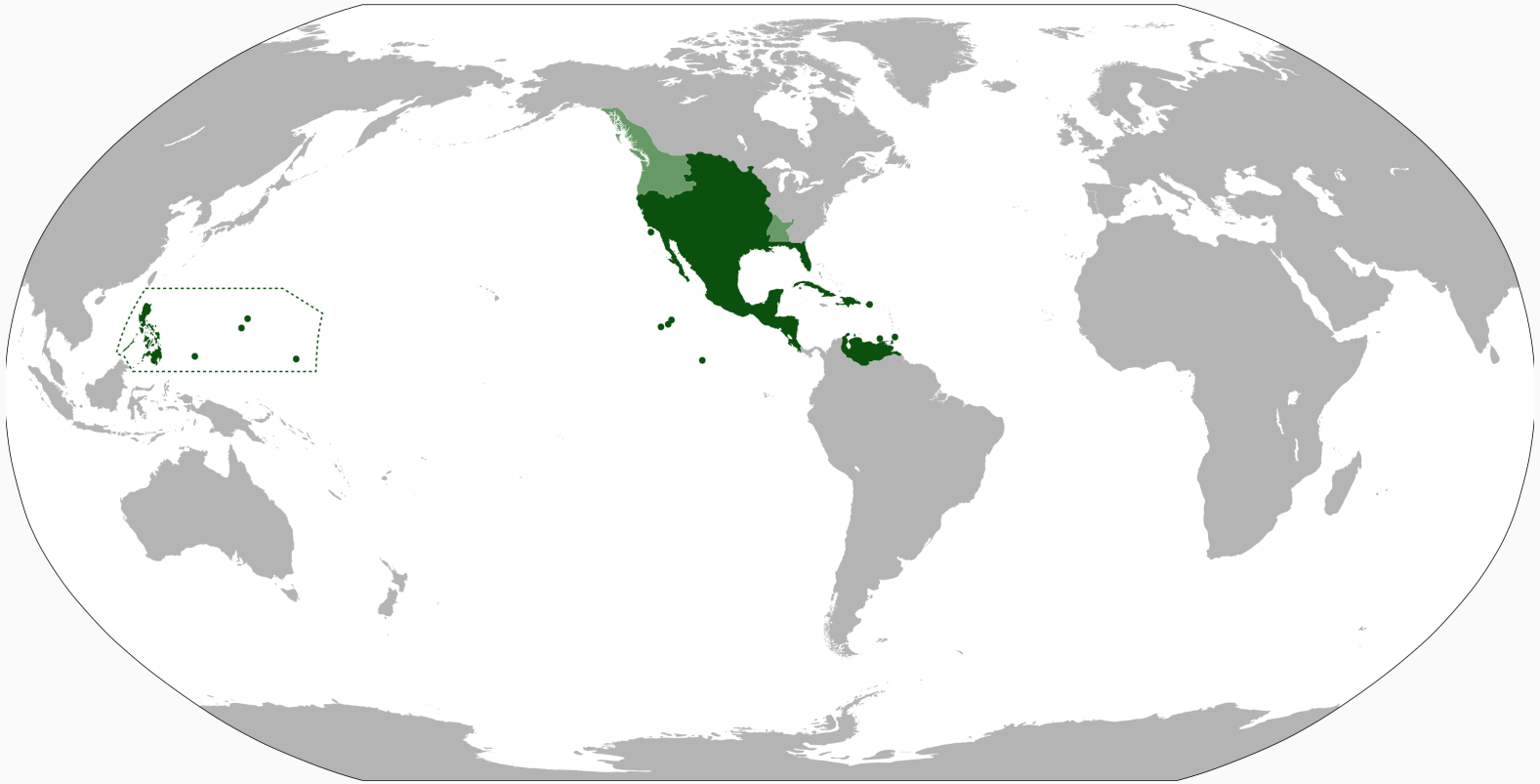

Figure 4: The largest extent of the (northern) Spanish colonies in America, up to 1803.

Nomenclature: geographic and political

The four major Spanish *virreinatos*: a local, political, social, and administrative institution, created by the Spanish monarchy in the sixteenth century, for ruling its overseas territories.

- **Virreinato de Nueva España**, former Aztec empire
    1. Capital: Ciudad de México, Tenotchitlan, modern Mexico City
- **Virreinato del Perú**, former Incan empire
    1. Captial: Lima, Perú. The original capital of the Incans was Cusco. *Note: Incan empire was the largest in the world at the time.*
- **Virreinato de Nueva Granada**, modern day Venezuela, Columbia, Panama, Ecuador
    1. Capital: Santa Fe de Bogotá, modern Bogotá, Colombia
    2. Caracas and Quito are also within this province
- **Virreinato del Río De la Plata**
    1. Capital: Buenos Aires
    2. Modern Argentina, Chile, Bolivia, Paraguay and Uruguay

Nomenclature: geographic and political

Figure 5: Virreinato de Nueva España

Nomenclature: geographic and political

Figure 6: Virreinato del Perú

Nomenclature: geographic and political

Figure 7: Virreinato de Nueva Granada

Nomenclature: geographic and political

Figure 8: Virreinato del Río De la Plata

Conclusion

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