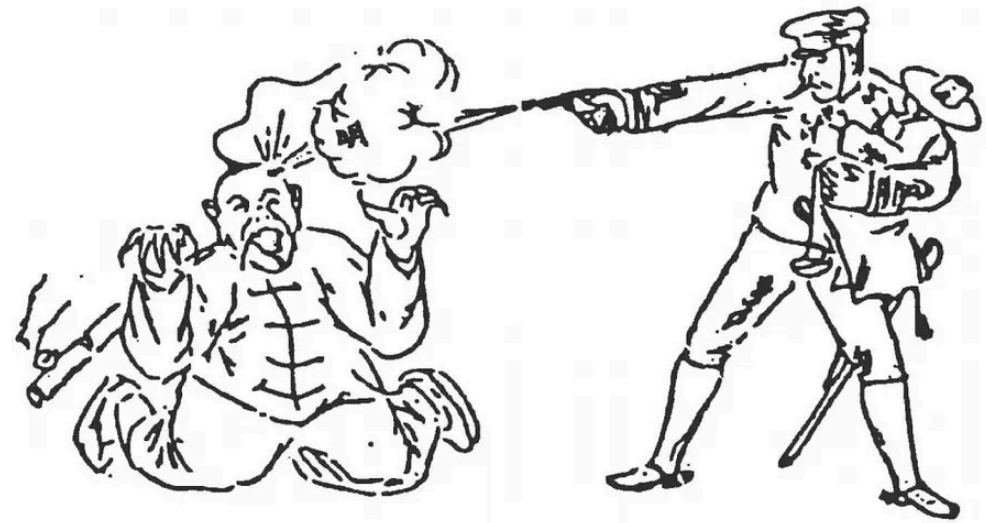


Lecture 10

Needham

GFN1000 In Dialogue with Nature

Modernity and Civilization Clash



Content

- The Needham Question
 - Joseph Needham The Person
 - Environmental Determinism
 - Structuralist Perspective
- Chinese Natural Philosophy
 - Five Elements
 - Yin and Yang
 - Comparative Perspective



Joseph Needham (1900-1995)

- A biochemist (specializing in embryology and morphogenesis) and sinologist
- Fellow of the Royal Society, 1941
- Foreign Member of the Chinese Academy of Science, 1994
- Lu Gwei-djen (鲁桂珍 1904-1991) taught Needham Chinese, igniting his interest in the Chinese history of technology and science.



Science and Civilisation in China (SCC)

- The project was proposed in 1948 by Needham.
- The first book was published in 1954.
- 7 volumes and 27 books
- An ongoing project with an international team of collaborators, including Nathan Sivin and Mark Elvin

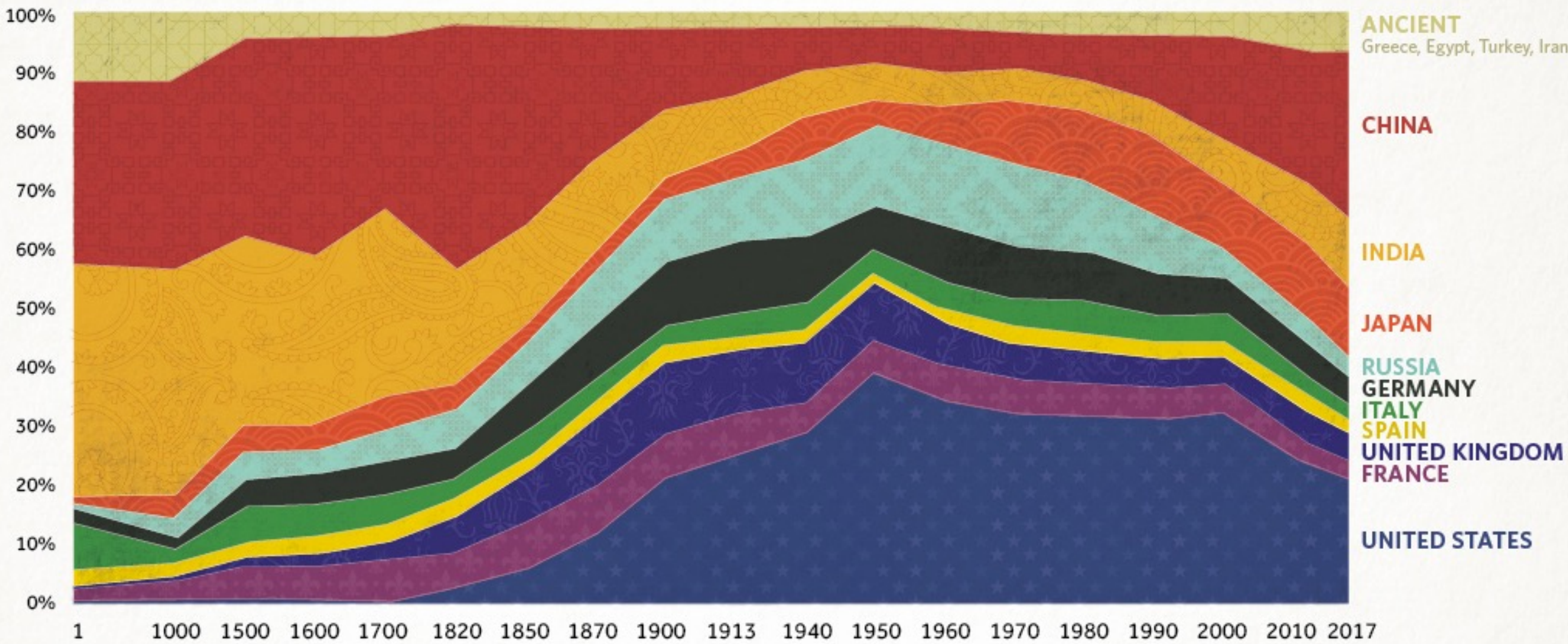


Needham in China (1964)

2,000 YEARS OF ECONOMIC HISTORY IN ONE CHART

All major powers compared by GDP from the year 1 AD

SHARE OF GDP (WORLD POWERS)



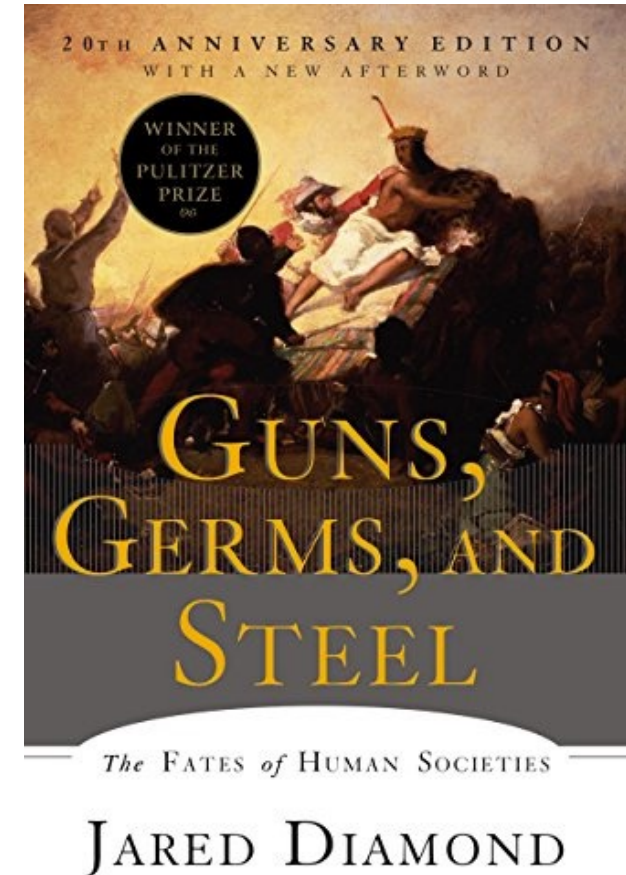
The Needham Question

“Why did modern science, the mathematization of hypotheses about nature, with all its implications for advanced technology, take its meteoric rise only in the west at the time of Galileo [but] had not developed in Chinese civilization or Indian civilization?”

- Marx: “Gunpowder blew up the knightly class, the compass discovered the world market and found the colonies, and the printing press was the instrument of Protestants and the regeneration of science in general.”
- Whitehead: “Chinese science is practically negligible. There is no reason to believe that China if left to itself would have ever produced any progress in science. The same may be said of India.”

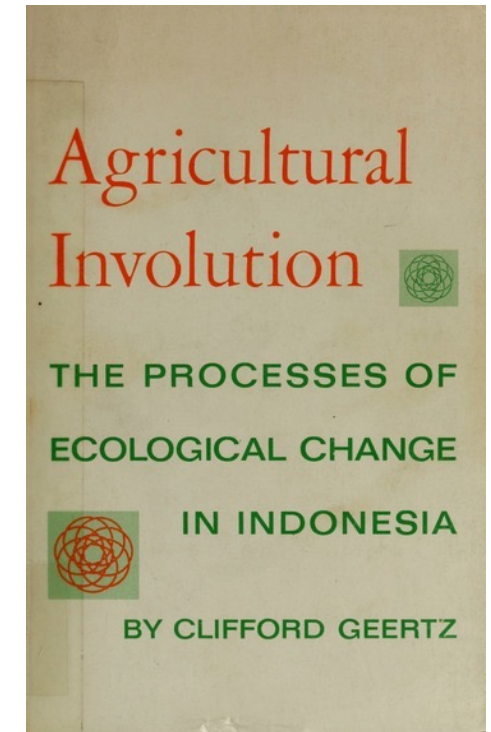
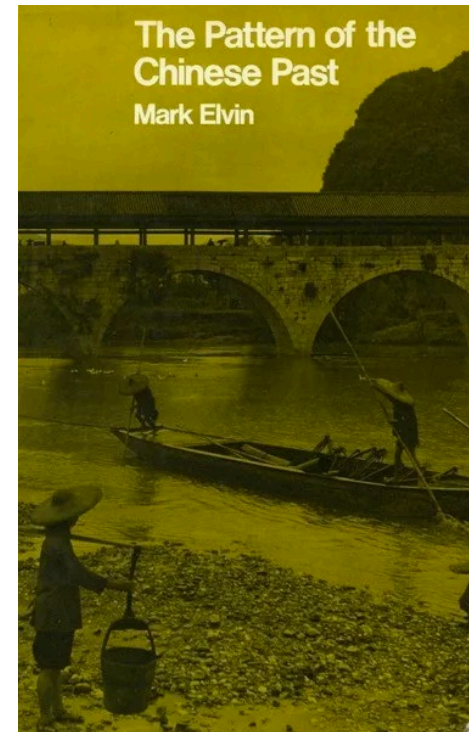
Environmental Determinism

- The physical environment **predisposes** societies and nations towards particular development trajectories.
- Critics: Environmental determinism enables a **scientific justification** of the supremacy of white European races and the naturalness of imperialism. It also devalues human agency in non-Western societies.

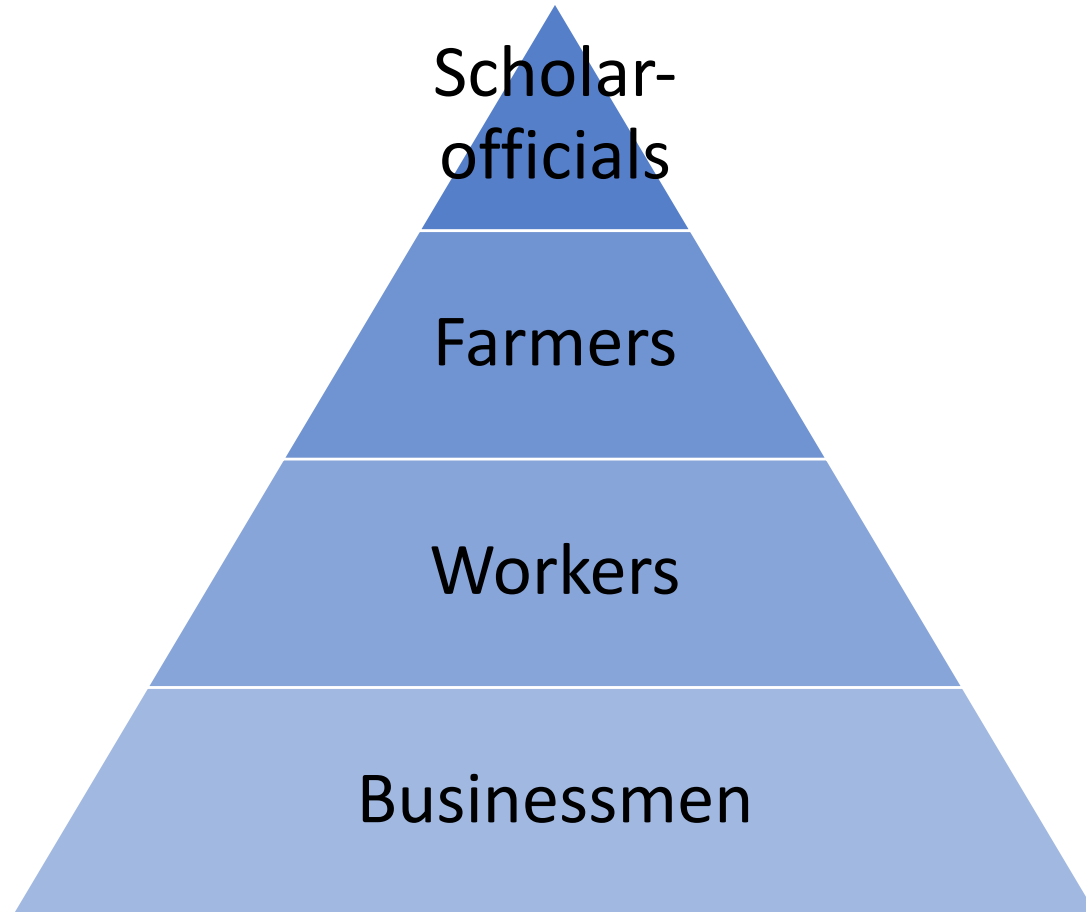


Perspectives from Political Economy

- **High-Level Equilibrium Trap** (Mark Elvin): the issue of the rising **man-to-land ratio** was a significant setback for China to start a full-fledged industrial revolution
- Agricultural **Involution**: centuries of intensifying wet-rice cultivation produced greater social complexity without significant technological or political change (Clifford Geertz)



Social Structure



Hundred Schools of Thought

- Concerning Humanity
 - Confucianism
 - Taoism
 - Legalism
- Concerning Nature
 - Mohism
 - The School of Names or Logicians
 - The School of Naturalists or Yin-Yang



Mohism

- Mohism flourished during the Warring States era (479–221 BCE) and was seen as a major rival to Confucianism.
 - Diminished quickly
- Mo Jing is a book covering topics in epistemology, logic, astronomy, geometry, and physics.
 - Pinhole imaging experiment



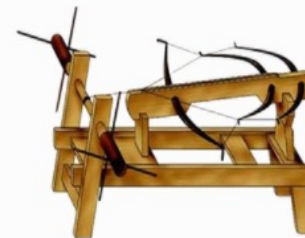
Scaling Ladder to climb city wall



Rotating Transmitter



Archery Shooter



Archery Tool



Handheld Archery Shooter



Mangonel

Five Elements (Wuxing)

- The five elements gradually came to be associated with every conceivable category of things in the universe that it was possible to classify in fives.

- The Mutual Generation Order

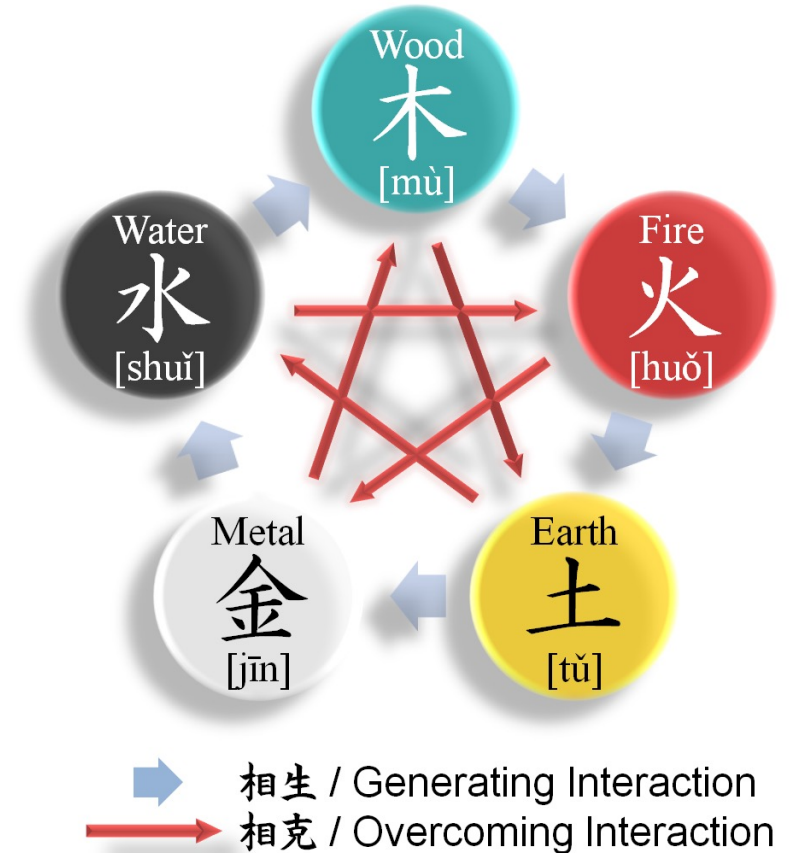
W → F → E → M → W

木 → 火 → 土 → 金 → 水

- The Mutual Overcoming Order

W ← M ← F ← W ← E

木 ← 金 ← 火 ← 水 ← 土

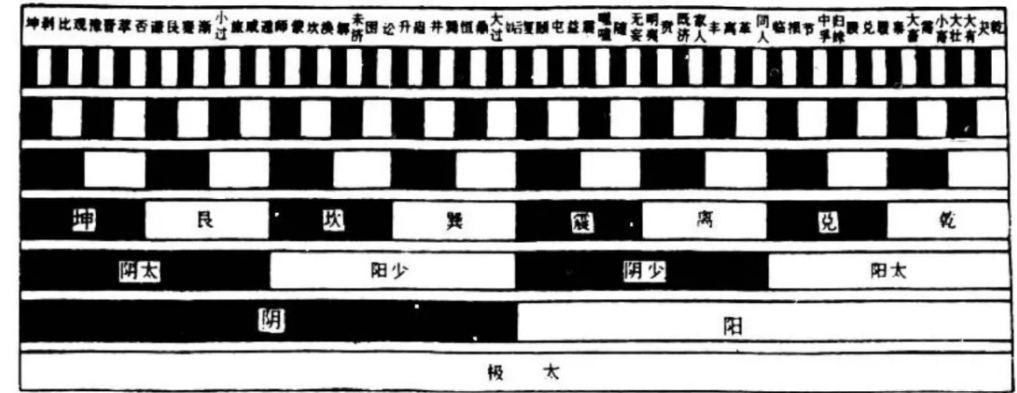


The Case of Fengshui



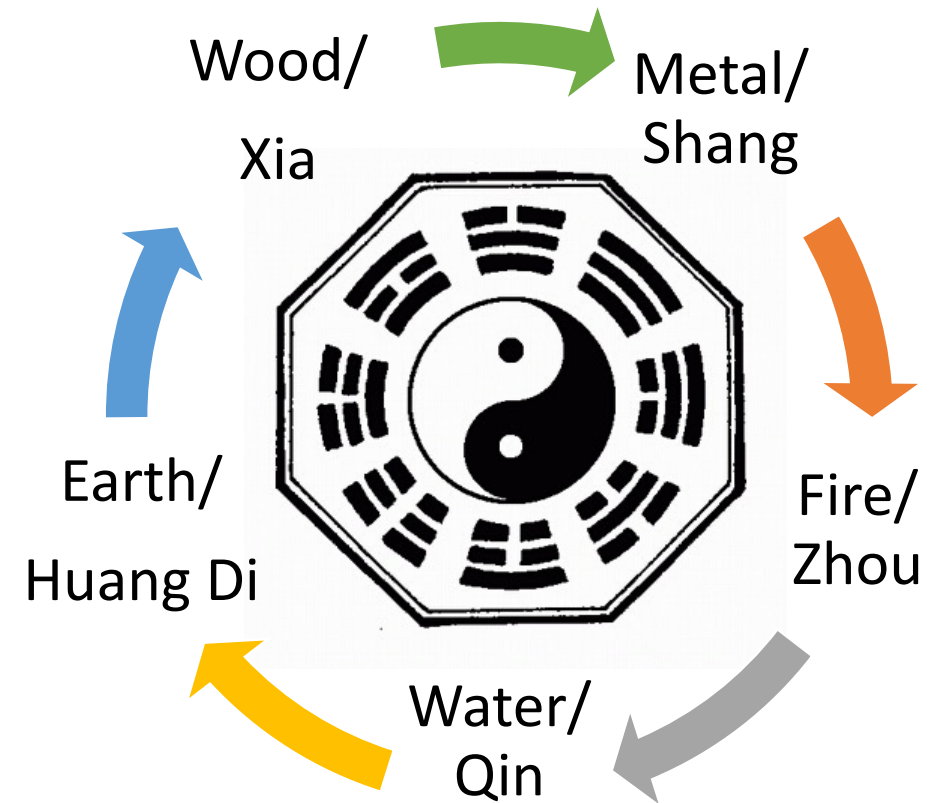
Yin and Yang

- Only two components of Qi operate in nature, one yin and one yang.
 - Yin and yang are both opposite and complementary to each other.
 - Everything has properties of yin-yang
- The operation of the cosmos can be illustrated and predicted by Eight Trigrams (八卦)



The Yin-Yang School

- Needham views Zou Yan (邹衍 305-240 BCE) to be the founder of Chinese scientific thought
- The operation of the cosmos can be illustrated and predicted by the Segregation Table.
- Dong Zhongshu (董仲舒 179-104 BCE) used the Five Elements Theory to explain and legitimize dynastic transitions



Comparative Perspective

Western

- Logical Reasoning
 - Identifying causality: the relationship between a cause and its effect
- Modern Western Science
 - Experiment
 - Mathematical Law
 - Mechanical Explanation

Chinese

- Associative Thinking
 - Causation is not “responsive” but “environmental.”
 - Things occur in cycles.
 - Politics and Omens
 - Correspondence between Man and Heaven (天人感应)
- Number Mysticism

Sinology

- Sinology is the study of things related to China, i.e., Chinese language, literature, history etc.
- Sino → [Late Latin] Sinae → [Greek] Sinae → [Arabic] Sin (秦)
- Fairbank Center for Chinese Studies
 - Mark Elliott, 2013–2015
 - Michael Szonyi, 2016–2022

