

# The Spread of Western Science

George Basalla (1967)

Presented by Jordan Olson on April 6, 2022

# George Basalla (1928-)

- **George Sarton:** founder of *Isis* and the History of Science Society



- **I. Bernard Cohen:** first American to receive a PhD in the history of science; last person to interview Albert Einstein (in 1955)



- **George Basalla:** completed his PhD in history of science at Harvard in 1963; spent most of his career at the University of Delaware

# Outline

- Main Question
- Discussion Questions
  
- The Model
  - Phase 1: Preliminary Scientific Exploration
  - Phase 2: Colonial Science
  - Phase 3: Independent Scientific Tradition
  - Phase Transitions
  
- Gems
- Integrated HPS

# Main Question

- “How did modern science diffuse from Western Europe and find its place in the rest of the world?”

# Discussion Questions

1. Is Basalla's model a useful "heuristic device"?
2. What historical evidence does Basalla rely on? How might his choice of sources influence the design of his model?
3. Can we evaluate Basalla's model independently of his Eurocentric perspective? Or are the two inextricably linked?

# The Model

- **Phase 1:** Preliminary Scientific Exploration
- **Phase 2:** Colonial Science
- **Phase 3:** Independent Scientific Tradition

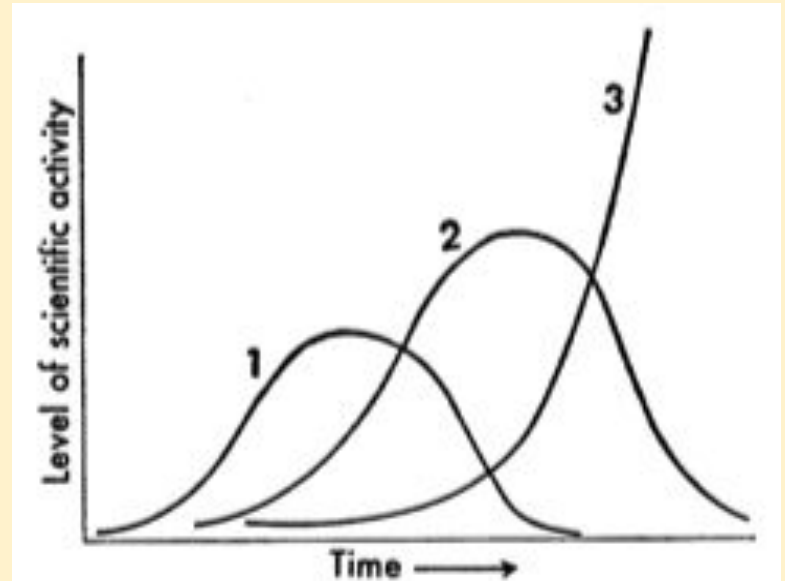


Fig. 1. Sequence of phases in the diffusion of Western science.

# Phase 1: Preliminary Scientific Exploration

What is it?

- “A preliminary period of scientific exploration, where non-European... societies serve as passive reservoirs of data.” (Raj 2013, 338)
- “The first phase of the transmission process is characterized by the European who:
  - visits the new land...
  - surveys and collects it flora and fauna...
  - studies its physical features...
  - and then takes the results of his work back to Europe.” (Basalla 1967, 611)

# Phase 1: Preliminary Scientific Exploration

Who was involved?

- **trained scientists:** educated in European universities
- **amateurs:** “in the role of explorer, traveler, missionary, diplomat, physician, merchant, military or naval man, artist, or adventurer”



# Phase 1: Preliminary Scientific Exploration

Which sciences were common?

- **primary:** botany, zoology, and geology
  - **sometimes rivaled by:** astronomy, geophysics, topography, cartography, hydrography, and meteorology
- **secondary:** anthropology, ethnology, archaeology

# Phase 1: Preliminary Scientific Exploration

Where did it take place?

- **European settlement:** “Science during the initial phase is an extension of geographical exploration” (and colonization)
- **ancient civilizations:** India and China

# Phase 1: Preliminary Scientific Exploration

- **South and Central America:** Gonzalo Fernández de Oviedo, Alexander von Humboldt
- **North America:** Thomas Harriot, Mark Catesby, John and William Bartram, Alexander Garden, Peter Kalm, John Clayton, Lewis and Clark, John Wesley Powell
- **Pacific Ocean:** James Cook, Joseph Banks
- **Australia:** Robert Brown
- **Antarctica and Malay Archipelago:** Joseph Dalton Hooker, Alfred Russell Wallace
- **China:** Jesuit missionaries
- **India:** Portuguese traders, East India Company, Joseph Dalton Hooker
- **Japan:** Andreas Cleyer, Engelbert Kaempfer, Carl Peter Thunberg, Philipp Franz von Siebold
- **Africa:** Portuguese navigators, Napoleon Bonaparte, Geoffroy St. Hilaire

# Phase 1: Preliminary Scientific Exploration

Diffusion or circulation?

- “As early as the 17th century it was realized that contact with the new lands is certain to affect the development of science at home.” (613)
- “The scientist who went out on an exploratory expedition often found that the experience gained from studying natural history in a foreign land modified his own scientific views.” (613)

# Phase Transition: 1 $\rightarrow$ 2

How does transition between phases occur?

- “Colonial science begins when a small number of native workers or European settlers in the land recently opened to European science first participate in phase-1 exploration and then gradually shift their interest to a wider spectrum of scientific activity.”
- “All this takes place while the colonial scientist relies upon an external scientific tradition.”

# Phase 2: Colonial Science

What is it?

- A period “of colonial dependency in which European scientific institutions encourage Western scientific activity outside of Europe by European colonists or settlers or else by acculturated indigenes.” (Raj 2013, 339)

# Phase 2: Colonial Science

Who was involved?

- **European settlers:** native or transplanted, who are...
  - **attached:** to European institutions
  - **formally trained:** in European universities, or...
  - **informally trained:** by studying the works of European scientists, and who...
  - **purchased:** books, laboratory equipment, and scientific instruments from European suppliers
- “Colonial scientists are oriented toward an established scientific culture but they cannot share in the informal scientific organizations of that culture.”

# Phase 2: Colonial Science

Which sciences were common?

- **early phases:** natural history (similar to phase 1)
- **later phases:** “coincides with the spectrum of scientific endeavor in the nation, or nations, supporting the activity”
- **possibility:** of opening up new fields of science (but this is unlikely)



# Phase 2: Colonial Science

Where did it take place?

- “phase 2 can occur in situations where there is no actual colonial relationship”
- 18th and 19th century **North** and **South America**, **Russia**, and **Japan**
- 19th century **Australia** and **India**
- 20th century **China** and **Africa**

# Phase Transition: 2 $\rightarrow$ 3

How does a transition between phases occur?

- “Colonial science has passed its peak when its practitioners begin a deliberate campaign to strengthen institutions at home and end their reliance upon the external scientific culture.”
- “If a colonial, dependent scientific culture is to be exchanged for an independent one, many tasks must be completed.”

# Phase Transition: 2 → 3

Tasks to be completed:

1. resistance to science must be overcome
2. the social role and place of the scientist needs to be determined
3. the relationship between science and government should be clarified
4. the teaching of science should be introduced into all levels of the educational system
5. native scientific organizations should be founded
6. channels must be opened to facilitate formal national and international scientific communication
7. a proper technological base should be made available for the growth of science

# Phase 3: Independent Scientific Tradition

What is it?

- “Eventually, colonized societies gain maturity, a phase characterized by a struggle to establish independent national scientific traditions based nonetheless on Western professional standards.” (Raj 2013, 339)
- “Scientists in the third phase are struggling to create an independent scientific tradition; they are attempting to become self-reliant in scientific matters.” (Basalla 1967, 617)

# Phase 3: Independent Scientific Tradition

Who was involved?

- **trained scientists:** whose major ties are within the boundaries of the country in which they work
- **goals to be attained:**
  1. receive training in home country
  2. gain some respect, or earn a living, in home country
  3. find intellectual stimulation within own expanding scientific community
  4. be able to communicate ideas with fellow scientists at home and abroad
  5. have a better opportunity to open up new fields of scientific endeavor
  6. look forward to the reward of national honors for superior work

# Phase 3: Independent Scientific Tradition

Which sciences were common?




- all scientific disciplines

# Phase 3: Independent Scientific Tradition

Where did it take place?

- “The leadership achieved by Western Europe at the time of the Scientific Revolution was not challenged until the **United States** and **Russia** emerged as leading scientific nations in the period between world wars I and II.”
- “**Japan**, **Australia**, and **Canada** have shown signs of vigorous scientific growth, but they definitely rank below those two nations.”
- “**China**, **India**, and perhaps some **South American** and **African** countries may be placed in a third grouping of nations with great potential for future scientific growth...”

# Gems

-  ambition → this is BIG history
-  asks an interesting question, and introduces an important topic
-  useful as a heuristic, and as a starting point



# Integrated HPS...?

- **main question:** “How did modern science diffuse from Western Europe and find its place in the rest of the world?”

# Discussion Questions

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