

# Thinking About Science in History: Ideas, Suggestions, Warnings and Open Questions

Waseda University, SILS,  
Introduction to History and Philosophy of Science

# Why do we study history?

- ▶ What are the practical advantages? The theoretical ones?
- ▶ What do nations, institutions, professions, etc., gain from supporting research into their own history?
- ▶ What do individuals gain from reading historical studies?
- ▶ What are the personal motivations of historians?
  
- ▶ What is the relationship between history and identity?

# Why do we study the history of science?

- ▶ How integral is science to our current worldview?
- ▶ How is science related to our social structures?  
government, economy, military, industry, education, health services, other national and international institutions?
- ▶ Is it important to understand how this situation came about? Why?
- ▶ What personal reasons do people have for studying the history of science?

# Taking a journey into the past

- ▶ If we are serious about understanding past science, we must take some time to learn the local languages, customs and ideas.
- ▶ By learning about past ideas and practices, we can expand our understanding of the **horizon of human experience**.
- ▶ We learn that things were once *very different* than they are now. And, hence, that they will someday be very different again. (Some people don't believe this. We can call this a belief in "the end of history.")

# The words *science* and *scientist*

- ▶ The word *science* comes from *scientia* (Latin: knowledge, understanding, skill).
- ▶ *Scientist* was coined by William Whewell in 1833. (He made an analogy with the words *art* and *artist*: art → artist, science → scientist.)
- ▶ In the 19th century, *scientist* began to replace the earlier term *natural philosopher*.
- ▶ In this course, we will often talk about *natural philosophy* and *natural philosophers*.

# Some definitions of science

## Definition

“Science is a systematic explanation of perceived or imaginary phenomena, or else is based on such an explanation.”

– David Pingree

「科学とは伝達できる知識。」

“Science is knowledge that can be transmitted.”

– Shigeru Nakayama

## Definition

Science is the study of the natural world.

- ▶ There is a natural world *out there*.
- ▶ There are humans engaged in the activity of studying it.

# What is *science* and the scientific?

- ▶ What is the role of **control** in the sciences?
- ▶ What is the **kind of knowledge** that is produced by science?
- ▶ Is science primarily a system of **statements** or **procedures**?
  - ▶ What is the role of *mathematics* and *quantification* in science?
  - ▶ What is the function of *experiment* and *observation* in science?
- ▶ What is the *status* of scientific knowledge? Is it fundamentally different from the knowledge produced in other fields?
- ▶ Is science a particular **set of beliefs**? a particular **set of methods** for producing belief? a certain **attitude towards belief**?
- ▶ What is the relationship between science and technology?
- ▶ What is the relationship between science and ethics?
- ▶ What do we mean when we say something is *scientific*?

# How does science change?

- ▶ When we talk about change in science are we primarily interested in changes in (a) *ideas*, (b) *practices*, (c) *institutions*, etc?
- ▶ What does this change look like, and how does it affect, and how is it in turn affected by, the larger social context in which science takes place?
- ▶ Are there specific **mechanisms** for scientific change? If so, what are they?
- ▶ We will discuss some ideas that have been put forward for such mechanisms in following classes.



# Approaches to the history of science

Three historiographic<sup>1</sup> approaches to the history of science, of which **we should be cautious**.

**Wig history:** Looking at the past *through our categories* in an attempt to explain how the past leads to us. (*We are the goal.*)

**Triumphalism:** Looking at the history of science as *naturally revealing* what is true. (*What has come to be is the natural goal. There can only be one goal.*)

**Social constructivism:** Science is *entirely*<sup>2</sup> constructed by human and social actors. (*All goals are entirely subjective.*)

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<sup>1</sup> Historiography is the study of the history and methodology of the **discipline of history**.

<sup>2</sup> There is a weaker sense in which science is certainly socially constructed.

Other conceptual practices **we should avoid** when thinking about history.

- ▶ Avoid explanatory shifts from historical episodes to the present. Ex., Ancient atomism, Newton's particles of light, Faraday's electro-chemistry.
- ▶ Avoid assuming that the motivations and concerns of historical practitioners can be judged on the basis of those of our contemporaries.
- ▶ Avoid using contemporary categories and disciplines to categorize historical activities.
- ▶ These are some examples of *anachronism* or *presentism*.

# Who practices science?

*In principle*, who is able to practice science?

- ▶ What is their age, ethnicity, gender?
- ▶ What is their culture, language, religion?
- ▶ What do they do for a living?
- ▶ Do they have specific philosophical, spiritual or ethical beliefs?
- ▶ How do they learn their field?

Do these things matter? Why, or why not?

# What are the non-human actors?

- ▶ What objects and instruments contribute to scientific practice?
  - ▶ How are they found or constructed?
  - ▶ How do they contribute?
- ▶ What is the role of *social constructions*?
- ▶ How do *nations, religions, institutions, organizations, etc.* contribute?
- ▶ What is the role of *intellectual constructions*?
- ▶ What about the *objects under study*?

# Where does science take place?

- ▶ What are the spaces that have been specially designed for the production of new scientific knowledge?
- ▶ Its preservation?
- ▶ Its transmission?
- ▶ What are the *institutions* which support and create these places?
- ▶ What are some of the differences between the sciences that are practiced in these institutionalized places and those that are practiced in the natural environment?

# How is science communicated, preserved, transmitted?

- ▶ What are the standard venues for scientific communication (in print and other media, meetings, etc.)?
- ▶ How is scientific knowledge transmitted from one generation to the next?
- ▶ What are the institutions that preserve scientific traditions and knowledge?
- ▶ What institutions regulate these processes?

# Science, *What is it good for?*

- ▶ Who benefits from science and technology?
- ▶ Who is harmed by science and technology?
- ▶ What institutions, or nations, are benefited by science? Are harmed by it?
  
- ▶ Is the overall effect of science beneficial or harmful?
- ▶ What's to be lost and what's to be gained?