

(0) Introduction

Authors:

- Barry Barnes, David Bloor & John Henry, all took post in SSU, Edinburgh
- Barnes moved to the University of Exeter in 1992

Aims:

“to state precisely and clearly where and why sociological analysis is necessary in the understanding of scientific knowledge” (p. viii)

- Inside the general field of science studies, SSK is given **specific properties**: to the authors, the SSK approach is simultaneously **non-exclusive** and **essential** to the study of science.

“sociology makes a necessary contribution to a larger project of obtaining an understanding of science” (p. viii)

- More ambitiously, the authors also “see the SSK as **part of the project of science itself**” (p. viii).

Book outline:

- A **fairly recent** contribution to SSK, built for the most part around **historical case studies**
- **Chapter 1** is called “Observation and Experience”, which you have all virtually read yesterday during Pr Bloor’s class. The chapter ends on the following two conclusions:
 - (1) Scientific knowledge is subject to **social processes** that “come into play” (p. 16)
 - (2) Therefore, from the **SSK stance**, “the goal is simply that of seeing how the individual’s commerce with reality is taken up into the patterns of interaction between people – all of whom are in return interacting with reality” (pp. 16-17).
What the authors designate by **interpretation** lies in this process “in which individuals responses are taken up into patterns of social interaction” (p. 17).
- **Chapter 2** exemplifies the notion of interpretation through a case study, the Millikan experiment.

(1) The Millikan experiment

Characteristics:

- **Classic and simple** physical experiment
- Ridden with **controversy** at the time
- Already studied by **Gerald Holton**

Experiment:

- Aim: measure the charge of a single electron.
- Empirical method: isolate the variable.
- Experimental arrangement:
 - 1: **Falling oil drop**
Variables: gravity, friction, droplet radius/density, speed of fall.
Known: yes (Stokes' Law).
 - 2: **Falling, ionized oil drop**
Added variable: droplet charge (1+ electron).
Known: no, $N \cdot e$.
 - 3: **Falling, ionized oil drop through charged plates**
Added variable: metal plate charge.
Known: yes.

Results:

- Interaction plate/droplets **modify droplets courses** (rise, fall, stable);
- Droplets charged with $N = 1$ rise last;
- Millikan observes rising droplets and writes:

*“The whole apparatus... represented a device for catching and **essentially seeing** an individual electron riding on a drop” (p.21).*

Two concordant analyses:

(1) SSK and interpretation:

The authors rectify Millikan's notes: **“seeing” the electron** hitting the droplet is not what is usually understood by seeing. It is a view of the mind, which connects prior knowledge and immediate, sensory perception: **interpretation.**

(2) Holton and plausibility:

Very sensitive arrangement, thus heavily error-prone, produced many **discordant values**. Millikan ruled out some of his results because he was **expecting larger values** for the charge of the electron. Holton concludes that Millikan was using “**plausibility arguments**” (p. 24).

(3) Shared conclusions:

- Not **possible to separate empirical and theoretical** elements in the process of scientific reasoning and therefore in scientific knowledge.
- Sociological analysis contributes to science and science studies by exposing this **weave between sensitive and mental data**.

“[Holton] takes Millikan’s procedure to be no more than a bit of inferential risk-taking of a kind that is inseparable from scientific theorizing (Holton, 1978, p. 54). As far as it goes this is surely correct.” (p. 24)

Two types of explanation:

(1) The ‘hermeneutic cycle’/Mannheim’s documentary method (p. 25):

Knowledge is **fragmented** and needs to be assembled from scattered amounts of data; **conjectures** (educated guesses) are made essential by this state of fact.

(2) The SSK analysis (pp. 25-33):

Millikan’s experiment accounts for the **presence of prior knowledge** that interferes with empirical observation; this knowledge is **time and space critical**: the authors call it ‘local cultural tradition’ (p. 25). As to its effects, this knowledge **influences conjectures and expectations**, both being preminent aspects of scientific activity.

Personal remarks:

- Implies that **science is incremental**, and therefore makes a point for **gradualism** in science;
- Overlaps to a considerable extent with **Holton’s themata**¹, except that it uses ‘culturalized’ language (I criticize this point later). Very clear on p. 32 (theorems).

¹ *Thematic Origins of Scientific Thought. From Kepler to Einstein* (Harvard Univ. Press, 1988).

(2) The Millikan-Ehrenhaft controversy

The second part of the text, starting on p. 33, uses SSK further. Up to now, the text concentrated on Millikan alone. The authors then turn to a SSK approach at the collective level, by considering a controversy between two physicists.

Facts:

- Ehrenhaft came with **different apparatus and results**.
- **No way** was found to reconcile both scientists.
- **Outcome:** Ehrenhaft sunk into oblivion (Holton's account).

Analysis:

- **Question:** can SSK provide insights on this event?
- **Answer:** yes, even if solving the controversy is (and should stay) out of its reach.
- **Method:** look at arguments from all protagonists, one of them being the famous French mathematician Paul Dirac.

Conclusions:

- Ehrenhaft "**switched his allegiances**" (38) away from the dominant paradigmatic view represented by Millikan. Millikan will become a Nobel Prize in 1923.
- The Kuhnian terms are mine. The authors prefer to speak of "**norms of interpretation**" (40).
- As a result, what was true at the individual level about the 'local cultural tradition' **stays insightful at the collective level**, to explain outcomes in scientific controversies.

(3) The Holton-Franklin controversy

Towards the end, the authors evoke in much less detail a second controversy:

- Holton's account of Millikan's work is turned into a **case study itself**, since it was challenged by another account, Franklin's;
- The grounds for controversy were methodological, but the conflict between both authors **never reached any clear, satisfying end**.

What this tells us is that the SSK approach, or lens, is **recursive**:

“Perhaps the most striking feature of the episode is the way in which the interpretive process we first encountered within the workings of physics are replayed at the level of the history and sociology of scientific knowledge.” (p. 45)

Three personal comments:

- (1) This conclusion assumes there is **no Sirius point**, i.e. a viewpoint that offers perfect objectivity (Voltaire).
- (2) Since it links social to exact sciences, it also implies a certain **degree of continuity, if not unity** in science.
- (3) Last, it also portrays science as a **perpetually reflexive analysis**.

(4) Discussion

- If the purpose of science is to make the world more intelligible to us, then this text is successful as one definitely feels **more cognizant** after going through it.
- The authors call in a **valuable ally, Gerald Holton**, which makes the text an even more remarkable contribution to the sociology of science as a whole.
- Last, the authors’ **original aim** (to be “part of the project of science itself”) is reached.

According to my reading, the most prominent qualities of this text are:

- **Its density**: makes it empirically sound, not to be challenged by accusations of reductionism or extrapolation.
- **Its exemplarity**: gives a good idea of what a good historical case study can look like.

Minor shadows:

- The **sectioning of the text** is close to non-sensical. Most of its sociological reading resides outside section 2.3. It looks very much like an editor's job, and I think it is botched.
- There is a **lack of explanation** concerning the 'hermeneutic cycle'. It looks like a late adjunct to the text.
- Also, the use of the term '**culture**', collated to the terms '**tradition**', is misleading in the absence of a clear definition for both terms, and their combination.

Additional minor comments:

- **Alternative views** are less convincing. For instance, Latour states that the electrons themselves are directly affected by the contracts passed between Millikan and the Bell Company (*Science in Action*, end of chapter 3). Unacceptable from an empiricist point of view.
- **Importance of language**, e.g. crucial starting point is Millikan's "seeing".