Whose Job is it to Study Mathematical Practice?

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- What is at stake?
- What do we mean by ‘history’?
- What do we mean by ‘social’?

A New Epistemology of Mathematics?

- What was wrong with the old one?
- Concentrating solely on formal logic, it leaves out the non-logical mathematical content, and also the social and the historical aspects of mathematical knowledge-making.

Why would anyone do that?

- Basic principle: rationality is general and can therefore be formalised.
- In Epistemology: the canons of rational enquiry can be represented as formal principles.
- In Mathematics: these formal principles are realised in formal logic.

Fundamental Question:

Is rationality

Universal and Formal

Or

Local and Substantive?

What is at Stake?

- Only if rationality is universal and formal, can we hope to prove that our favourite beliefs, institutions, habits, *etc.* are rational.
- Otherwise, there is no guarantee of defeating scepticism, totalitarianism *etc*.
- (Or, philosophers could get out of the validation business.)

What do we mean by ‘History’?

Traditional Contrast:

History	Philosophy
• Temporal	• Atemporal
• Particular	• Universal

But: Bernard Williams’ elusive distinction between *history of philosophy* and *history of ideas* suggests that the relation between history and philosophy is more subtle.

What do we mean by ‘History’? (…cont)

“H.J.M. Bos’s recent (2001) book on Descartes’s mathematics… though written by a historian of mathematics, seems motivated by a thoroughly philosophical interest in how changes in mathematical procedures, representation, and ontology take place. Professor Sasaki’s concern, by contrast, is to chart how ideas are transmitted textually from one era or culture to another, and to make precise the chronology of Descartes’s acquisition, or relinquishing, of certain ideas.”

(E.R. Grosholz, reviewing Sasaki’s *Descartes’s Mathematical Thought* in PM)

What do we mean by ‘History’? (…cont)

1. Temporal dimension of logic (or methodology)
2. Appeal to Context rather than Explanatory Principles
3. Heraclitean Flux
4. All history is the History of Thought
5. History is Non-Judgmental

What do we mean by ‘History’? (…cont)

1) <u>Temporal dimension of logic (or methodology)</u>

- Popper: we adopt theory T_n in part because it solves a problem present in T_{n-1}
- Lakatos: we use concept C_n in part because it is an improvement on C_{n-1} brought about by our efforts to prove a conjecture or solve a problem.

What do we mean by ‘History’? (…cont)

- The case of Popper shows that recognising this temporal dimension does not entail anti-realism, historicism, irrationalism, *etc*..
- But wholly formal rationality has to go (you can’t formalise criteria for ‘improves on’ or ‘solves a problem for’).
- Rational Reconstruction, not historiography.

What do we mean by ‘History’? (…cont)

2) Explanatory Appeal to Context rather than General Principles

- Mathematical Context
- Intellectual Context (philosophy, theology, ideology)—Koyré
- Institutional/Social Context

Any of these can be epistemologically respectable (ask Hegel)

What do we mean by ‘History’? (…cont)

3) Heraclitean Flux

- Nothing acts in history that is not temporal (i.e. subject to change)
- Therefore there are no unchanging essences
- E.g. There is no mathematics as such, but rather Ancient Greek mathematics, Chinese mathematics, C17 mathematics, *etc*..
- Popper & Lakatos both got muddled about this.

What do we mean by ‘History’? (…cont)

4) <u>All history is the history of thought</u>

<u>(Collingwood)</u>

- Therefore, the real, the true, the rational and the reasonable are not historically effective. History is rather driven by people’s thoughts about these.
- Our earlier question in a new form: is reason immanent or transcendent?

What do we mean by ‘History’? (…cont)

5) History is Non-Judgmental

- Moral evaluation requires anachronism and de-contextualisation. We can judge Caesar by Roman standards but not by ours.
- But: The central terms in epistemology (‘knowledge’, ‘progress’, ‘true’, *etc.*) are normative.

What do we mean by ‘social’?

1. Division of Labour and the coordination of Expertise
2. Sociology of Knowledge
3. Social Constructivism

What do we mean by 'social'? (…cont)

1) Division of Labour and the coordination of Expertise

Kitcher (1990) "The Division of Cognitive Labor," *The Journal of Philosophy* 87: 5-22.

Sound method realised in institutions rather than individuals. Not Radical!

What do we mean by 'social'? (…cont)

2) Sociology of Knowledge

- Bourdieu *Homo Academicus*
- Bloor 'Polyhedra and the Abominations of Leviticus'

What do we mean by ‘social’? (…cont)

- Scientific content tends to drop out of the explanations
- Azzouni’s point: mathematical results, proofs & concepts are far more stable than social structures
- Like methodologists, sociologists aim at a general model of mathematics (but a social-causal one rather than a normative one). Hence, unhistorical.

What do we mean by ‘social’? (…cont)

3) Social Constructivism

…is an ontology.

This is a *brief* talk about epistemology!

A new epistemology for mathematics?

Something like Bernard Williams' conception of history of philosophy

Chief Merit: Its status as ***philosophy*** (i.e. concerned with features of mathematical practice that are epistemologically significant and relatively stable) of ***mathematics*** (rather than mathematicians, institutes or texts) is a matter of emphasis rather than poorly motivated distinctions and dogmas.