

Empirically-informed philosophy of logic?

Guest lecture for ‘Core Logic’

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Philosophy of logic

- It discusses the philosophical foundations of logic as an enterprise.

“ . . logic is, at root, a philosophical enterprise. Since at least the beginning of the twentieth century, however, logic has become a branch of mathematics as well as a branch of philosophy. [. . .] Our main question here concerns how that wonderful mathematics relates to the philosophical targets.” Shapiro (2005, 651)

- Logic: “the art and science of correct reasoning.” So it does have something to do with reasoning.

Logic and the correctness of reasoning

- But if the emphasis is on ‘correct’, then it might seem that logic does not pertain to how humans **actually** reason, but rather only to how humans **ought to** reason.
- What is the exact relation between logic and human reasoning as it actually occurs?
- If none, then the idea of incorporating findings from psychology and cognitive science into the philosophy of logic seems to be entirely misguided.

Philosophy of logic and empirical data

- But if there is **some** relation, then presumably these empirical data could be relevant for philosophical discussions.
- More generally, this is a general question concerning philosophical methodology.
- To what extent should philosophical discussions be informed by results in the empirical sciences?
- Naturalism.

History of the philosophy of logic

- Logic ‘as we know it’ was basically invented by Aristotle. But Aristotle did not seem to have a unified conception of ‘logic’.
- If something at all, for him logic is the art of good **argumentation**.
- This is essentially the main conception of logic that remained pervasive in most of the history of logic (under the influence of Aristotle).

Logic and language

- For many centuries, logic was thus seen as pertaining essentially to the realm of language; it provided principles for arguing and discussing.
- Concern with truth, inferential relations between sentences, and the different interpretations that portions of language can give rise to (semantics).
- This went on all the way up to and including the (Latin) Middle Ages. Logic was essentially viewed as the ‘art and science of correct argumentation’.

Modern Period

- In the modern period, there was a reaction to the language-based methodology of scholasticism; it was seen as a lot of ‘hair-splitting’.
- More generally, also less prominent role attributed to logic in philosophical investigations (with a few exceptions, Leibniz).
- So generally, in the modern period there is a turn away from the **public** sphere of argumentation towards the **private** sphere of thinking (Descartes).

Kant: crucial turning point

- Kant re-conceptualized logic in terms of reasoning as opposed to a theory of argumentation.
- General logic “... contains the absolutely necessary rules of thought without which there can be no employment whatsoever of the understanding.” (KrV:A52/B76)
- Kantian critical project: to establish the limits of knowledge and of the understanding. Strong normative component – **correct** reasoning.

Post-Kantian period

- The Kantian characterization of logic as pertaining to the laws of thought was very influential in the 19th century.
- Boole: *An Investigation of the **Laws of Thought** on Which are Founded the Mathematical Theories of Logic and Probabilities*
- Two possible interpretations of the Kantian approach: logic is about **reasoning** vs. logic is about **correct reasoning**.

The normativity of logic

- Is logic a descriptive or a normative enterprise?
- Does it describe how we actually reason, or does it describe how we ought to reason?
- Kant himself was very clear on the normative component, but the descriptive approach was quite influential in the 19th century.
- Is a psychologistic grounding for logic possible?

Frege

- Frege offered a sustained critique of psychologistic approaches to logic (and mathematics) (Pelletier *et al.* 2008)
- Frege's main concern was with the implication of subjectivity in logical and mathematical knowledge that would follow from a psychologistic approach.
- He also wanted to argue that mathematical and logical knowledge belonged neither to the sphere of physical objects nor to the mental sphere
- Rather, it pertained to a third, platonic realm: **objectivity**.

After Frege

- Frege's criticism of a psychologistic account of logic was very influential.
- At the same time, logic became increasingly used in the project of providing foundations for mathematics, i.e. axiomatizations of portions of mathematics (arithmetic, geometry, analysis etc.)
- The motto of logic as 'the science of correct reasoning' was still often repeated, but in practice, in the first half of the 20th century logic was essentially about describing mathematical structures.

A new epistemic turn

- After decades of predominance of the logicist program (logic being used to study the foundations of mathematics), somewhere in the second half of the 20th century, logical tools started to be used for applications other than the foundations of mathematics.
- In particular, connection with computer science.
- Connection with the idea of ‘reasoning processes’, but then typically not of human agents.

Logic and philosophy of logic

- In philosophy, anti-psychologism about logic remained the predominant position after Frege.
- From a philosophical point of view, logic is traditionally seen as an a priori, normative enterprise.
- So it would seem that, even if logic and reasoning have been ‘reunited’ after the hiatus in the first half of 20th, actual empirical data concerning how humans actually reason still has no bearing on logic as an enterprise.

Empirically-informed philosophy of logic?

- It might be thought that 'empirically-informed philosophy of logic' is something of an oxymoron.
- However, closer inspection shows that, in the philosophy of logic literature, there are quite a few arguably quasi-empirical claims being made.
- They are typically presented as non-empirical, or in any case as demanding no more than 'armchair reflection'.

‘Getting real’

- But shouldn't philosophers of logic then 'get real' and to seek empirical corroboration for such claims, when they are indeed empirical claims?
- The idea is not that *all* issues within philosophy of logic should be reduced to empirical issues, but rather that *some* of them are (quasi) empirical to start with (typically, regarding human cognition), and thus should be treated as such.
- Example: ‘our’ understanding of logical constants.

Practice-based philosophy of logic

- The ‘logic’ that philosophers of logic talk about is typically a floating, independent entity, whose existence is not related to actual human practices: platonism.
- But if the goal is to shed light on logic as an activity undertaken by humans, the enterprise must be empirically-informed.
- One way this can be done is by incorporating empirical findings on cognition into the analysis.

Possible questions

- Similarities and discrepancies between the precepts of logical reasoning and everyday-life forms of reasoning.
- Subjects typically do not do well in experiments with deductive reasoning tasks (that is, if measured against the traditional canons of logic and deduction).
- What does this tell us about logic as an enterprise and about the role of logic in human cognition generally speaking?

More questions

- Given these discrepancies, what are the prospects for a psychologistic account of logic?
- Recent years have witnessed a resurgence of psychologistic accounts of logic: *naturalism* in philosophy.
- But now psychologistic accounts of logic seem to stumble upon lack of empirical corroboration.
- If they are not compatible with empirical data, such accounts may well be no more than 'just-so stories'.

More questions

- Perhaps logic as traditionally construed is indeed not to be found in human cognition; but there might be another ‘logic’ underlying human cognition.
- In particular, common-sense reasoning appears to be essentially non-monotonic, whereas classical logic is monotonic.
- If that is the case, is this a reason for us to rethink our very conception of logic?

More questions

- If logic is fundamentally a normative enterprise (dealing with *correct* patterns of reasoning), how can attention to actual patterns of human reasoning contribute to a better understanding of the enterprise as a whole?
- More generally, logic is often thought to deal with purely aprioristic matters: is ‘empirically-informed philosophy of logic’ an oxymoron, or is it an enterprise worth pursuing?
- What about the is/ought divide?

More questions

- What (if anything) can results from cognitive sciences and psychology tell us about how professional logicians operate on a cognitive level?
- Even if one maintains the view that logic is not naturally or universally present in human cognition, logic as a discipline is obviously practiced by human agents having (roughly) the same cognitive apparatus.
- What new insights can we gain on such practices by bringing in experimental results?