

Questions and Answers on Formal Philosophy

QUESTION 1

Why were you initially drawn to formal methods?

I suppose the natural way to interpret this question is something like “why do formal methods rather than anything else in philosophy” but in my case I’d rather answer the related question “why, given that you’re interested in formal methods, apply them in philosophy rather than elsewhere?” I started off my academic life as an undergraduate student in mathematics, because I was good at mathematics and studying it more seemed like a good idea at the time.

I enjoyed mathematics a great deal. At the University of Queensland, where I was studying, there was a special cohort of “Honours” students right from the first year. You were taught more research-oriented and rigorous subjects than were provided for the “Pass” students. This meant that we had a small cohort of students, who knew each other pretty well, studied together and learned a lot. I could see myself making an academic career in mathematics. (I surely couldn’t see myself doing anything other than an academic career. Being around the university was too much fun.)

However, there was a fly in the ointment. I was doing well in my studies, but I was losing the *feel* for a great deal of the mathematics I was doing. Applied mathematics went first, and analysis soon after. I could do the work, but I didn’t *understand* it. I wrote assignments by matching patterns from what I had written in my lecture notes, or what was in the text with what we were asked. In exams, I just bashed away at the problem, sometimes when asked in an exam to prove that $A = B$, I’d work at A from the top of a page and keep manipulating it until I’d got stuck. Then I’d work backwards from B , hoping to meet at somewhere rather like where I’d got stuck. If I was honest, I’d write “I don’t know how to get from here to there”. If I was dishonest, I’d just leave the transition unexplained. Knowing what I know now about marking assignments, it doesn’t surprise me that I did very well.

The areas where intuition and understanding lasted the longest (and which were most *fun*) were topology, probability theory, combinatorics, set theory and logic. There were so few honours subjects I really wanted to do that in my last year I struck a deal with the mathematics department that I could do a reading course in logic with the newly arrived professor in the Philosophy

Department. The professor was Graham Priest, and the reading course was my introduction to philosophical logic.

At the very same time as I was wondering how to continue with academic life, I was very involved in Christian student things: in the little group I was in, I ran study groups, I organised meetings, I wrote publicity material, and I did a bucketload of reading. In particular, while trying to figure out what I believed about things (about a lot of things), I read a lot of philosophy of religion and other philosophy written by Christians. I found the philosophy more interesting, more rigorous and more accessible than a great deal of the theology I had been reading. This piqued my interest in doing more philosophy for myself. I hadn't done much philosophy as an undergraduate (just two subjects), but I started trying to figure out how to do a major in Philosophy quickly, so that I could go on to postgraduate work in that field, rather than in mathematics.

It turned out that my work with Graham Priest went so well that I didn't need to do more undergraduate study in Philosophy to start postgraduate work. (That semester course resulted in my first genuine academic publication [5].) I was offered a place in the Ph.D. program on the strength of my background in mathematics. I was free to pursue my interest in philosophy, and logic was the bridge. This meant that I could use the formal, mathematical skills that I had learned, on topics that interested me, and that I understood. The mathematics was simple and manageable, it was applied to interesting issues, and I got to hang around with philosophers, who are interesting people.

QUESTION 2

What example from your work illustrates the role formal methods can play in philosophy?

I'll take an example from my recent work on proof theory and its application in philosophy [8, 7]. In the last few years I have been working on topics in proof theory and connections between the way we can conceive of the structure of proofs and concerns in the theory of meaning. The idea that the meaning of a word or a concept might be usefully explicated by giving an account of its inferential role is a common one — the work of Ned Block, Bob Brandom and Michael Dummett are three very different examples of ways to take this idea seriously. It is a truism that meaning has *some* sort of connection with use, and use in reasoning and inference is a very important part of any account of use.

It has seemed to me that if we are going to take inferential role as playing its part in a theory of meaning, then we had better use the best avail-

able tools for giving an account of proof. The theory of proofs should have something to teach philosophers who have interests in semantics. This is not a mainstream position — our vocabulary itself speaks against this, with the ready identification of model theory with ‘semantics’ and proof theory with ‘syntax’. The work of intuitionists such as Dummett, Prawitz, Martin-Löf and Tennant is conspicuous in its isolation at providing a contrary opinion to the mainstream. This has led to the opinion that semantically anti-realist positions — those that take proof or inference as the starting point of semantic theory, rather than truth-conditions or representation — are naturally revisionary and intuitionist. For intuitionistic logic has a clear motivation in terms of proof and verification, and it has seemed to many that orthodox classical logic does not.

I think that this is a mistake. It seems to me that natural proof-theoretic accounts of classical logic (starting with Gentzen’s sequent calculus, but also newer pieces of technology such as proof-nets [8, 9]) can have a central place in a theory of meaning that starts with inferential role and not with truth. We can think of the valid sequents (of the form $X \vdash Y$, where X and Y are sets of statements) as helping us ‘keep score’ in dialectical positions. The validity of the sequent $X \vdash Y$ tells us that a position in dialogue in which each statement in X is asserted and each statement in Y is denied is out of bounds according to the rules of ‘the game.’ In fact, the structural rules in the sequent calculus can be motivated in this way. Identity sequents $X, A \vdash A, Y$ tell us that asserting and denying A (in the same context) is out of bounds. The rule of weakening tells us that if asserting X and denying Y is out of bounds then adding an extra assertion or extra denial would not aid the matter. The cut rule tells us that if a position in which X is asserted and Y is denied is not out of bounds, then given a statement A , either the addition as an assertion, or its addition as a denial will also not be out of bounds. If asserting A is out of bounds in a context, it is implicitly denied in that context. Explicitly denying is no worse than implicitly denying.

Thinking of Gentzen’s sequent calculus in this way gives an alternative understanding of classical logic. We think of the rules for connectives as ‘definitions’ governing assertions featuring the logical vocabulary. Proof-theoretical techniques such as the eliminability of the ‘cut’ rule tell us that these definitions are *conservative*. No matter what the rules of the game concerning our primitive vocabulary might be, we can add the classical logical connectives without disturbing the rules of assertion in that primitive vocabulary [1]. The logical vocabulary allows us to ‘make explicit’ what was merely ‘implicit’ before [2]. The interpretation of the rules of the quantifiers is particularly enlightening.

It allows us to sidestep the debate between ‘substitutional’ and ‘objectual’ accounts of quantification [4].

In my recent work I have tried to flesh out this picture, and to show how we can expand this story to take account of appropriate conditions for use for modal connectives such as possibility and necessity. The key idea is that in modal discourse we not only assert and deny, but we make assertions and denials in different dialectical contexts, and an assertion of a necessity claim in one context can impinge on claims in other dialectical contexts [8]. This means that we can give a semantics of modal vocabulary that motivates a well-known modal logic (in the first instance, the simple modal logic $S5$, but the extension to other logics is not difficult) in which possible worlds are not the starting point of semantic explanation. Modal vocabulary needs not be conceived of as a way of describing possible worlds. It can be understood as a governing discourse in which we not only assert and deny to express our own commitments, but also to articulate the connections between our concepts. The structures of dialectical positions need not merely contain assertions and denials, but these may be partitioned into different ‘zones’ according to structure of the different suppositions and shifts of context in that discourse.

QUESTION 3

*What is the proper role of philosophy
in relation to other disciplines?*

I find it very hard to isolate one single role for philosophy to play in relation to other academic disciplines. Philosophy and the other disciplines are complicated things and interaction between them should occur in many different ways. I will focus on one aspect of philosophy’s relationship to other disciplines that I think is worth highlighting, and which does not receive as much attention as it should.

Frege’s revolutionary account of quantification — which has meant so much in so many areas of philosophy — was motivated by trying to understand the structure and content of mathematical reasoning. In just this way, other philosophical tools and techniques can be informed by motivations outside philosophy. Contemporary predicate logic with quantifiers and variables is such an advance over Aristotelian logic because it provides a natural and perspicuous way to give understand reasoning in mathematics. The Bolzano–Weierstrass ϵ – δ account of continuity that revolutionised calculus did not fit well with an Aristotelian understanding of logical validity. On an Aristotelian view we cannot straightforwardly *state* the condition for the continuity of a function f at a

point x : $(\forall \epsilon > 0)(\exists \delta > 0)(\text{if } |x' - x| < \epsilon \text{ then } |f(x') - f(x)| < \delta)$, let alone give an account that explains why the mathematicians' reasoning is actually correct. New work in logic and philosophy arose out of attempting this task of understanding and articulating mathematical reasoning. (This story is clearly told in Albert Coffa's *The Semantic Tradition* [3].)

This feature of philosophical research is a general one: Some of the best and richest work in philosophy is done in trying to understand X , where X is some discipline that not necessarily itself obviously 'philosophical.' The job of a philosopher and a logician is not only (and not even *primarily*) to be an intellectual hygienist who cleans up the messy reasoning of our colleagues in other disciplines. We perform a much more useful function when we learn from the specialist X -theorists (whatever field X might be) who develop new ways of doing things in their own fields. Philosophers can be one avenue of communication between disciplines, as we attempt to incorporate the findings of different fields into a general, coherent picture of the world. In logic, a crucial X for the last 200 years has been mathematics, but it is clear that now computer science is also playing a role. New work in logic in computer science is finding its way into philosophical logic, and expanding the field yet more [6].

QUESTION 4

*What do you consider the most neglected topics
and/or contributions in late 20th century philosophy?*

I think that something we philosophers do not expect so much is that the revolution in logic and our understanding of the form and structure of what we can say is a revolution that is ongoing. The 19th and 20th Century overthrow of the Aristotelian conception of the fundamental logical form of judgement has yet to work its way through our conceptual scheme. Many philosophers to this day conceive of every judgement as a predication of a property to an object, despite our best understanding of logic showing us that many things we say cannot be viewed in this way. Other views (think of Quine, as one influential example) take it that anything that can be said can be said in the language of first-order classical predicate logic. I think that contemporary work in logic will continue to a kind of revolutionary impact on our conception of the significance of our own language and concepts. As we find more and more interesting, appropriate and useful ways of conceiving of the structure and semantics of our language this will have significant consequences throughout philosophy. This kind of constructive work in logic can play its role in the perennial philosoph-

ical trio of understanding the relationship between mind, world and language (or, if you like, between thought, action and talk).

For example, contemporary debates over the significance of modal logic are not merely sterile ontological questions of metaphysics. It is not so interesting to be concerned merely over whether or not you we should happy with the ontological extravagance of possible worlds. It seems to me that the much more interesting question concerning modal vocabulary concerns how we wire up the connection between the modal concepts and our world. How do modal concepts work? What are we talking *about* when we make judgements of possibility and necessity? Just what can we *say* with our modal ideology? These questions are not merely a matter of semantics in the thin sense of providing a catalogue of the way that we use the terminology. It is the much more interesting task of giving an account of the proper functioning of an important segment of our conceptual scheme. The best work in philosophical logic plays its own role, contributing to these questions, and telling a central part of the story of how mind, world and language relate to one another.

QUESTION 5

*What are the most important open problems in philosophy
and what are the prospects for progress?*

New ways of conceiving the relationship between belief, speech-acts and propositions will provide a rich way of understanding our place in the world and our thought and talk about that world. The question of how we ought to understand semantics is not so much an open 'problem', but a wide open field of debate in which there is a great deal of room for the development of options and rival programs. These options impinge on many different issue in philosophy. I will give two examples of how this debate plays out.

EXAMPLE 1: META-ETHICS. Central questions in moral philosophy involve crucial semantic issues. Different options in semantics play an important role in debates in moral philosophy — can we give an *expressivist* account of the significance and semantics of moral terminology? For example, Simon Blackburn's moral 'quasi-realism' hinges on a non truth-conditional account of the meaning of moral vocabulary. Can this account succeed? Any account of the significance of our moral vocabulary will take a position on these core semantic issues. Logic and semantics here acts not so much as an arbiter between different positions, but a field of investigation providing options for the development of particular projects in meta-ethics.

EXAMPLE 2: PHILOSOPHY OF MIND. Semantic issues play also their part in questions in the philosophy of mind. Our understanding of mental concepts and the relationship between mental states and physical states turns on questions of the understanding of modality and analyticity. The application of so-called 'two-dimensional modal logic' in articulating these issues shows that the possible positions we can take on the mind–body problem hinge on views of modal semantics.

In these kinds of philosophical debate, the role of logic is not merely one being a neutral arbiter between competing positions. The role is much more important than this, and playing the part is much more interesting and engaged. The fact that logic plays an expressive role means that we logicians can help provide new ways of conceiving the significance of what we can say about the world and our place in it.

What is the scope for *progress* on these issues? It seems to me that we will have made progress in philosophical questions if we have a broad and diverse community of people engaging in the distinctive mix of critical and creative work that is philosophical logic, engaged with issues in philosophy and other disciplines in the academy. The world of the late 20th Century has been one of increasing academic specialisation and isolation between experts in distinctive fields with their own problems and traditions, tools and techniques. I hope that in the 21st Century, the globalisation of communication will foster new and exciting bridges of collaboration between philosophical logicians and others working within philosophy and those working outside it, from different traditions and backgrounds. In this way our understanding of the world and our place in it stands to be expanded and enriched, challenged and renewed. I hope that it will be to the benefit of us all. *That* would be progress.

References

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