An interview with Penelope Maddy

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University of California, Irvine

Each year The Dualist *includes an interview with a contempoary philosopher chosen by the staff. This year, we are very pleased to have Penelope Maddy answer questions posed by* The Dualist.

Her work has centered on the philosophy of mathematics, especially the foundations of set theory. Her first book, Realism in Mathematics *(1990), defends a brand of mathematical realism – the view that mathematical objects have real existence – with an eye to using it to answer the outstanding methodological questions of contemporary set theory, but her subsequent* Naturalism in Mathematics *(1997) addresses those methodological questions directly and argues that matters of mathematical existence and the nature of mathematical truth are irrelevant, that they should answer to the intra-mathematical considerations, not vice versa. This naturalistic position is broadened and further developed in her* Second Philosophy *(2007), setting the stage for a fully naturalistic position on mathematical truth and existence in* Defending the Axioms *(forthcoming)*

The Dualist:

What were the questions that first got you interested in philosophy? How did you come to work in philosophy of mathematics?

Penelope Maddy:

I was fascinated with mathematics from early on. In high school I was amazed to learn that all the different branches of classical mathematics could be reduced to set theory, and that there were open questions of set theory that couldn't be settled on the basis of

the accepted axioms. I went to UC Berkeley as an undergraduate math major hoping to find out more about this, and I wasn't disappointed! In one of my set theory classes, the professor proved that a certain new axiom candidate settles at least some of the open questions in ways that seem right, but the axiom candidate itself was hardly obvious or self-evident or anything like that. When I asked what reason one might have for adopting it as a new axiom, I was told that this is a philosophical question. My transition into philosophy was a gradual one over the next several years, but this was the turning point, and this question is one I'm still thinking about and writing about today.

The Dualist:

What would you hope for a mathematician reading your work to take away from it?

Penelope Maddy:

Well, if we're dreaming here, my hope would be that a mathematician might come away with a better sense of what mathematics is. Mathematicians naturally ask themselves this question often enough, but the options on offer are usually limited to a fairly crude Platonism—we're discovering the facts about a mysterious abstract world—and a fairly crude Formalism—we're figuring out what follows from what. Neither of these is really satisfactory—to mathematicians any more than philosophers—so I'd like to provide a more appealing alternative, one more sensitive to what mathematicians actually do.

In particular, perhaps quixotically, my work is intended to engage those mathematicians involved in the search for new set-theoretic axioms. My goal is to make explicit what kind of considerations count for or against a new axiom, and why. The hope would be to remove various irrelevant distractions from these discussions and to focus attention on the truly functional components.

The Dualist:

What do you, as a philosopher of mathematics, draw on from the practice of the working mathematician?

Penelope Maddy:

The whole point is to make sense of what the working mathematician is doing. The whole enterprise is aimed at understanding and explicating the actual practice.

The Dualist:

What motivated your shift from realism to naturalism?

Penelope Maddy:

I haven't forsaken realism entirely, but I do now think the version of realism described in my first book is mistaken. Three things ultimately undermined it for me.

The motivation for that book arose from this problem of the open questions of set theory. Some observers insist that there's nothing more to truth in set theory than following from the accepted axioms, in which case questions that can't be settled in that way cease to be legitimate. One way to rebut this dismissive position is to argue for some version of realism, that is, to claim that set-theoretic truth isn't just a matter of what follows from the currently accepted axioms, but rather of what holds in some objective mathematical reality, where the open questions are true or false regardless of the inability of our current axioms to determine which. But many philosophers hold that realism in mathematics is a non-starter, because we can't have cognitive access to such a world of abstracta. So my goal was to describe and defend a form of realism that included a plausible mechanism for our knowledge of sets.

As it happens, a couple of crucial turns in my execution of this plan depend on what's nowadays called a 'Quine-Putnam indispensability argument'—roughly the idea that we ought to believe in mathematical objects because they play an indispensable role in our best scientific theories. The indispensability argument was common coin in those days, so I happily helped myself to it. But once the book was finished, I began to look more closely at how science is actually done and how mathematics functions there, and gradually came to think that no support for an ontology of mathematical abstracta was forthcoming. So that was the first problem.

The second problem came from the other direction. When I set out to evaluate the kinds of arguments set theorists actually offer for and against various axiom candidates, some of which seemed sound and persuasive to me, I couldn't see how they fit with the kind of realism I'd been pushing. As soon as one thinks of mathematics as describing an objective reality in much the same way that natural science describes the physical world, these set- theoretic arguments start to sound like wishful thinking: we want our theory of sets to have a certain nice feature, this axiom generates that nice feature, so let's adopt the axiom. We all know that the physical world has often confounded the natural scientist's preferences for nice theories (think of quantum mechanics!), so something is going wrong here. I tend to think it's the philosophical realism and not the set-theoretic practice.

Finally, one of the givens of so-called naturalistic philosophy of mathematics has always been that philosophers are not in the business of criticizing the practices of mathematics, but of explaining or otherwise accounting for mathematics as it's actually done—as opposed, for example, to the philosophical intuitionists, who argue on metaphysical or semantic grounds that classical mathematicians should stop using the Law of the Excluded Middle. It took me more years that I care to admit to figure out that if philosophy can't properly criticize mathematical practice from the outside, it can't properly justify or support it either. So that was the third problem: the whole point of my realism had been to justify the search for new axioms as a legitimate undertaking.

The Dualist:

How did this shift affect your view of your earlier work? Your confidence in your current position?

Penelope Maddy:

When you start out in philosophy, trying to enter into an ongoing debate, there's almost no way around accepting the terms of that debate as you find them. But after a while, once you have time to take a breath and think a bit harder, you have the luxury of examining those presuppositions for yourself. I did some re- thinking in *Naturalism*, where I reject the indispensability argument and argue that issues of truth and existence aren't relevant to the choice of mathematical methods in the ways I'd been assuming. This got me a little closer to the ground, so to speak, but I was still relying on a common understanding of naturalism itself. In *Second Philosophy,* I try to build that position from the ground up. I suppose this gives me more confidence in my current position, but still, everything I write is only the best I can do at the moment, and I always hope and expect to be able do better in time. Other people have more stable methods, but I have to finish one piece on its own terms before I can see my way to the next step. Of course this means that I'm always pretty much convinced that whatever I write is going to turn out to be wrong!

The Dualist:

Which philosophers have had the greatest influence on your thinking?

Penelope Maddy:

Obviously Quine, though I've gradually come to disagree with him about nearly everything apart from a vague commitment to naturalism of one sort or another. Among the historical greats, Kant

and Wittgenstein. Among contemporary philosophers, John Burgess, Tony Martin, Mark Wilson, and more recently, Barry Stroud.

The Dualist:

How did Quine, Kant, or Wittgenstein change your thinking or inspire you?

Penelope Maddy:

When I first moved into philosophy from mathematics, many of the things people were inclined to say left me baffled, so it was heartening to read Quine declaring that philosophical questions are 'on a par with questions of natural science', that science is 'not answerable to any extra-scientific tribunal ... not in need of any justification beyond observation and the hypothetico- deductive method', that we should embrace 'the robust state of mind of the natural scientist, who has never felt any qualms beyond the negotiable uncertainties internal to science'. Sentiments like these from a leading figure in the field gave me hope that there might be room for me in the profession after all. Since then, much of my progress in philosophy has involved gradually shedding various Quinean doctrines, but I continue to think of myself as a post-Quinean naturalist.

As for Kant, it's hard to imagine the philosophy of mathematics without him; all three of the famous foundational schools at the turn of the 20th century claimed Kant as their forebear. Two specific examples of his influence in my recent book: Kant's transcendentalism is the paradigm First Philosophy that serves as a foil for Second Philosophy, and his account of logical truth inspired the one sketched in Part III.

Wittgenstein is many things to many people and his influences are often hard to trace. For me, he looms among the all-time greatest philosophers of logic and meta-philosophers. In philosophy of logic, I've learned most from the rigors of resisting some of his suggestions; in meta-philosophy I think there's quite a bit to his idea of therapeutic approaches. In one of my favorite passages, he talks about how a mouse might have 'come into being by spontaneous generation out of grey rags and dust'. If we're flat certain ahead of time that this can't happen, we won't bother to examine those rags and dust. At least as I read the passage, the moral is that we sometimes suffer from unexamined pre-suppositions in philosophy that keep us from looking at the ordinary things that could answer our questions. Suppose, for example, that we want to know why we should adopt the Axiom of Choice. If we think a satisfying answer must be metaphysical—something like 'because its true in the objective realm of sets'—then we won't bother to look at the details of the actual arguments that have convinced set theorists to include

Choice on the list of accepted axioms. What I do in the philosophy of set theory is examine those grey rags and dust.

The Dualist:

Your work has undergone a number of changes since your 1990 Realism in Mathematics. *Each shift seems to have moved further from an attempt to solve the original problem of explaining how cognitive access to mathematical objects is possible, and closer to an attempt to dissolve the problem or to avoid the problem altogether. What, in your opinion, is the relevance of the problem for the philosophy of mathematics today; and what influence do such straightforward problems have over the shape of your current thought?*

Penelope Maddy:

Maybe it's clear by now that I don't see 'explaining how cognitive access to mathematical objects is possible' as 'the original problem'. The goal was to establish the legitimacy of the open questions of set theory (and then to figure out what methods are proper for answering them). The problem of cognitive access only arose when I proposed a certain form of realism in the pursuit of this goal. I now think that form of realism was misguided, that there are better ways to defend the legitimacy of the open questions, so the problem of cognitive access now seems to me less central.

The Dualist:

In your most recent book you adopt what you call the "austere" position of the second philosopher, whose goal is to explain the role of concepts like truth and existence in science rather than to answer standard philosophical questions about those concepts. Yet you provide examples of the second philosopher inquiring into typical questions of first philosophy like "the ground of logical and mathematical truth" and "how we come to know" those grounds. What kind of reply does the second philosopher have to the objection that a naturalistic answer to these sorts of first-philosophical questions wouldn't even count as an answer?

Penelope Maddy:

The short answer is that the Second Philosopher has no reply to this objection. A slightly longer answer:

I don't think the questions themselves are first-philosophical. As part of her comprehensive investigation of the world and our place in it, an ordinary inquirer like my Second Philosopher will naturally want to know about the ground of logic, about the nature

of mathematical truth, about our ways of finding these things out. What's first-philosophical is a certain approach to answering those questions, namely, the insistence that these are matters can't be answered in our usual ways, that they require some special point of view. This insistence can take various forms, for example, that only philosophy can answer these questions and philosophy is an a priori discipline.

So suppose the Second Philosopher offers her account of, say, logical truth, in ordinary empirical terms. The First Philosopher insists that she has failed to account for the 'sublime' nature, for the 'crystalline purity' of logic (in Wittgenstein's words)—and that these challenges can only be met with a priori, philosophical theorizing.

The Second Philosopher's response is to ask what evidence there is for this 'sublime' or 'crystalline' aspect of logic, to ask what kind of a priori methods the First Philosopher proposes for getting at this, and so on. The answers he gives are unlikely to strike her as persuasive, so she ends up going her own way. But beyond pointing out her reasons for thinking she's accounted for logical truth as it is in the world, she has no further grounds on which to persuade the First Philosopher to accept her answer, and she makes no such attempt. He's playing a different game, whose rules and purposes she doesn't understand.

My modest hope is that some philosophers, observing this exchange, might find the Second Philosopher's answers surprisingly satisfying, and might begin to wonder if the First Philosopher's insistence on answers of a entirely certain sort is really so well-motivated after all.

The Dualist:

What new questions do you think you will investigate in the near future, and why do you see your attention turning that way?

Penelope Maddy:

Right now I'm working on a short book [*Defending the Axioms*, forthcoming] that I hope will flesh out the position on the philosophy of set theory sketched at the end of *Second Philosophy*. This would complete the journey from my initial interest in the problem of how axioms are properly defended. More or less in parallel, I continue to think and write about meta-philosophical issues surrounding Second Philosophy, about its historical roots (Hume, Reid, Moore, Austin, etc.), about the complexities of radical skepticism and the philosophy of logic.

The Dualist:

What about philosophy as a profession surprised you after you entered it?

Penelope Maddy:

Coming from mathematics, I was surprised at the faith philosophers seemed to place in first-order predicate logic. I knew, for example, that no theory expressed in this language could pin down even the structure of the ordinary finite numbers, and it seemed to me that it was being called upon to do far more than that! There's less of this nowadays.

The Dualist:

What do you think is most valuable about the study (or practice) of philosophy?

Penelope Maddy:

I figure philosophy is like any form of inquiry: it helps us understand the world and our place in it.