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May/Jun 2011
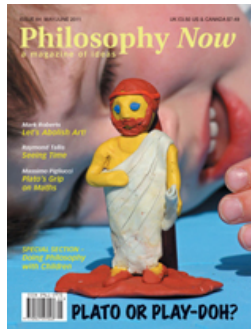
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Science

Mathematical Platonism

Our philosophical science correspondent **Massimo Pigliucci** takes a dose of it.

I'm a scientist by original training, so I tend not to believe in anything that isn't made of either matter or energy (which are two sides of the same coin, of course). When I went back to graduate school to get my degree in philosophy, I took a course on Plato. I enjoyed the dialogues, especially the often sardonic figure of Socrates. I also appreciated Plato's famous metaphor of the Cave. His vision of humanity shackled in the semi-darkness, getting a glimpse of the world as it really is only through indistinct shadows projected on the walls, easily captures the imagination. And of course it is highly gratifying for a philosopher to know that it is only philosophy which can possibly unshackle us and allow us a direct look into the way things really are. But whenever I heard of Plato's Ideas – in the technical sense of a realm of perfect Forms of things separate from the world accessible to the senses – I cringed.

Then in the Netherlands I had the mixed blessing of attending a conference on the future of philosophy of science where one of the talks was about the philosophy of mathematics. I had never read anything about the topic, but the speaker made it sound really intriguing, so when I got back to New York I downloaded the Kindle version of James Robert Brown's *Philosophy of Mathematics: A Contemporary Introduction to the World of Proofs and Pictures* (Routledge, 2008). I haven't slept well since.

The book certainly has a point of view, and the author makes that clear from the onset. Nonetheless, I was treated to a fantastic voyage, from Bolzano's insistence on purely analytic proofs in mathematics, to Hilbert's program of establishing a completely consistent mathematics; from Gödel's shattering of that program, to Wittgenstein's views on proofs and pictures. But the part that really disturbed me was Chapter 2: Platonism.

There is a difference between general Platonism and the mathematical flavor. For Plato, each apple, say, is but an imperfect example of the absolute (and perfect) Idea of an apple. But as Aristotle quickly realized, Plato has it exactly backwards: we arrive at the general idea of 'apple' by mentally abstracting a set of characteristics we think common to all actual apples. It is we who conjure the 'perfect' idea from the world, not the world copying the concept.

But now contrast the idea of an apple with the idea of a circle. Here Aristotle's approach becomes more problematic, as we don't find any true circles in nature. No natural object has the precise geometric characteristics of a circle, and in a very strong sense we can also say that the circles we draw are but imperfect representations of the perfect *idea* of a circle. Ah – but whence does such a perfect idea come from?

Consider another way to put the problem. One major difference between science and technology is that science *discovers* things, while technology is about human *inventions*. We discover the law of gravity; but we invent airplanes to allow heavier-than-air flight despite the law of gravity. But where do mathematical objects, like circles and numbers, or mathematical theorems like the Pythagorean one, or Fermat's Last one, come from? Are they inventions of the human mind, or are they discoveries?

I hope you're beginning to feel as queasy as I did when I started to take the matter seriously, because contrary to Aristotle's approach to knowledge, my gut feeling was that mathematicians discover things, not invent them. This was a huge paradigm shift from my days as a scientist. Of course, one can reasonably argue that if there were no mathematically-inclined minds around, nobody would be able to think about Fermat's theorem, while gravity would still exist. True, but nobody would be able to conceive the law of gravitation either – and that doesn't imply the law itself wouldn't exist, yes? As Brown puts it in his book: "The thought, for example, which we express in the Pythagorean theorem, is timelessly true, true independently of whether anyone takes it to be true. It needs no bearer. It is not true for the first time when it is discovered, but is like a planet which, already before anyone has seen it, has been in interaction with other planets."

Perhaps nobody should be particularly surprised by this, as, after all, the laws of nature physicists acknowledge also seem to be timelessly true independently of whether anyone takes them to be true. Where do *they* come from? Since there are somewhat mundane interpretations of what laws of nature are – including the possibility that they are accidental generalities valid in this particular universe and/or within a certain time-span – the case posed by mathematical constructs seems to be even more clear and powerful. Math, like diamonds, truly seems to be forever.

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Plato's World of the Forms

If one 'goes Platonic' with math, one has to face several important philosophical consequences, perhaps the major one being that the notion of physicalism goes out the window. Physicalism is the position that the only things that exist are those that have physical extension [ie, take up space] – and last time I checked, the idea of circle, or Fermat's theorem, did not have physical extension. It is true that physicalism is now a sophisticated doctrine that includes not just material objects and energy, but also, for instance, physical forces and information. But it isn't immediately obvious to me that mathematical objects neatly fall into even an extended physicalist ontology. And that definitely gives me pause to ponder.

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Massimo Pigliucci is Professor of Philosophy at the Graduate Center of the City University of New York. He is the author of Nonsense on Stilts: How to Tell Science from Bunk *(University of Chicago Press, 2010), among other works. His philosophical musings can be found at* www.platofootnote.org*.*

Plato's World of the Forms

Plato's Theory of Forms or Ideas, as explained through Socrates, tries to account for imperfect things sharing the same properties by claiming that there must be a world beyond our experience in which *the properties themselves* exist, in a perfect, unadulterated manner – the world of the Forms.

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