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A way out?

I earlier told you about my youthful belief that mathematical proofs offer absolute certainty. We have now seen, however, that the situation is more complicated than it first appears. Mathematical proofs presuppose axioms and rules of inference. And, as we have seen, an axioms that appears obviously true can turn out to be false.

At the beginning of the 20th century, the German mathematician David Hilbert suggested a program to overcome these difficulties. To a rough first approximation, the program was based on two ideas, a mathematical hypothesis and a philosophical hypothesis:

> **Mathematical Hypothesis**
> There is an algorithmic method capable of establishing, once and for all, whether a set of axioms is consistent.
>
> **Philosophical Hypothesis**
> All it takes for a set of axioms to count as a true description of some mathematical structure is for it to be consistent.

If Hilbert's hypotheses had turned out to be true, it would have been possible, at least in principle, to establish conclusively whether a set of axioms is a true description of some mathematical structure: all we would have to do is apply our algorithm to test for consistency. And, of course, once we know which of our axiom systems are true, we can be sure that anything proved on the basis of those systems (on the basis of valid rules of inference) will be true as well. The dream of my youth!

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