You wouldn’t understand it

Peter Doyle, as told to Steve

In 1993 I was teaching mathematics at Princeton when an undergraduate named Steve Gubser asked me to supervise an independent project—a kind of warm-up for the senior thesis, though he was only a junior. I don’t remember who sent him to me, and at the time I had no idea who he was. I tried to send him to John Conway.

For some reason he persisted.

He did a fine job and presented his results to the physics faculty’s condensed-matter seminar. I learned later that he had earned the highest individual score at the 1989 International Physics Olympiad and would graduate as Princeton’s valedictorian. The following year he wrote his senior thesis under Igor Klebanov.

Toward the end of that year I ran into him in the library. He told me the general topic of the thesis.

“That sounds interesting,” I said. “I’d like to hear more about it.”

“You wouldn’t understand it,” he said.

By then I knew him well enough to believe him.

Steve went on to become one of the leading theoretical physicists of his generation. His 1998 paper with Klebanov and Polyakov helped make precise the holographic correspondence between gravity and quantum field theory. He was a professor at Princeton when he died in a climbing fall near Chamonix in 2019. He was forty-seven.

I recently came across a description of mathematics as, among other things, “exploring the limits of human understanding.”

For all of mathematical history, the reach of mathematics and the reach of human understanding have been easy to confuse. Mathematics was wherever human mathematicians could get to. What lay beyond was not part of the subject as we knew it.

That coincidence is ending.

One stage of our adjustment will be to say that the machine may produce proofs, but it will not understand them. It will generate the steps, perhaps verify them, while understanding remains with us.

That is not how it is going to be.

AI will understand, not merely verify. To prove something, it will have to grasp why it is true: what makes the proof work, which abstraction reveals it, where else it applies, and what makes it beautiful. Its reach will exceed ours, extending to concepts and connections we cannot follow.

Mathematics will not stop where human comprehension stops. It will go on, understood—just not by us.

I’ve taken to referring to whatever AI I happen to be working with currently as ‘Steve’.
