

Photography: Rick Friedman

# Wrestling with the big questions

**Stephen Wolfram** reckons he can model the entire universe using tiny computer programs. But despite being the creator of a “search engine” that provides answers, he still has to convince his peers that he’s on the right track, as **David Cohen** discovers

IT WAS the summer of 2002 when Stephen Wolfram received an “incredibly emotional” phone call. “You are destroying the heritage of mathematics that has been built up since Greek times,” said the flustered caller. Wolfram listened with a mixture of dismay and bemusement, then shot back that, on the contrary, he had made his millions from building on that heritage. “He’s a famous physicist, that’s all I can tell you,” Wolfram says across our table in the Colonial Inn, a faux British pub in his home town of Concord, Massachusetts – his choice of venue.

Wolfram guards his privacy jealously. When we arranged to meet he refused to let me come to his house and suggested the pub. When I arrived I was guided to a spartan back room containing a table, two chairs and a tray of cakes. Wolfram stumbled in a few minutes later in a manner you’d expect of a fusty university professor, not a thrusting multimillionaire owner of a technology corporation. “I suppose I must be in the right place,” he said rather sheepishly. His voice is soft and low, almost a whisper, and he retains a British lilt though his accent occasionally drifts into a mid-Atlantic twang.

“I started subscribing to your magazine when I was 8 years old,” he says, disarming me immediately. The flattery doesn’t last long. “I noticed that a few years back you guys went through a bad patch,” he says. “My main conclusion was that if there was a story about something in *New Scientist* then it had to be nonsense.” I laugh nervously.

The more vociferous of Wolfram’s critics might say he’s been peddling his own form of nonsense since 2002 and, as the phone call

demonstrates, they’re not afraid to tell him. That call came shortly after Wolfram’s book, *A New Kind of Science (NKS)* was published. The book was nothing if not controversial. Taking more than a decade to write, the self-published work made claims that, by his own admission, were extraordinary. It created a minor storm in academic circles. “I think my idea is fairly big, and I thought that if I started out saying ‘this is a big deal’ people would get it.”

*NKS* is Wolfram’s manifesto for what he sees as a new approach to understanding the world. It was born of his interest in little computer programs called cellular automata – these are essentially lists of rules that describe the ways in which a system can change state given a set of initial conditions. In its simplest form, a cellular automaton can be a grid of black or white squares, with a list of rules defining under what conditions a square is to change from white to black. With just a few rules, it is possible to generate extremely complex patterns that look like leaves or snowflakes. This led Wolfram to wonder if cellular automata could be used to model many other – even all – natural phenomena. *NKS* is his investigation into this unorthodox approach to science. What makes it unorthodox

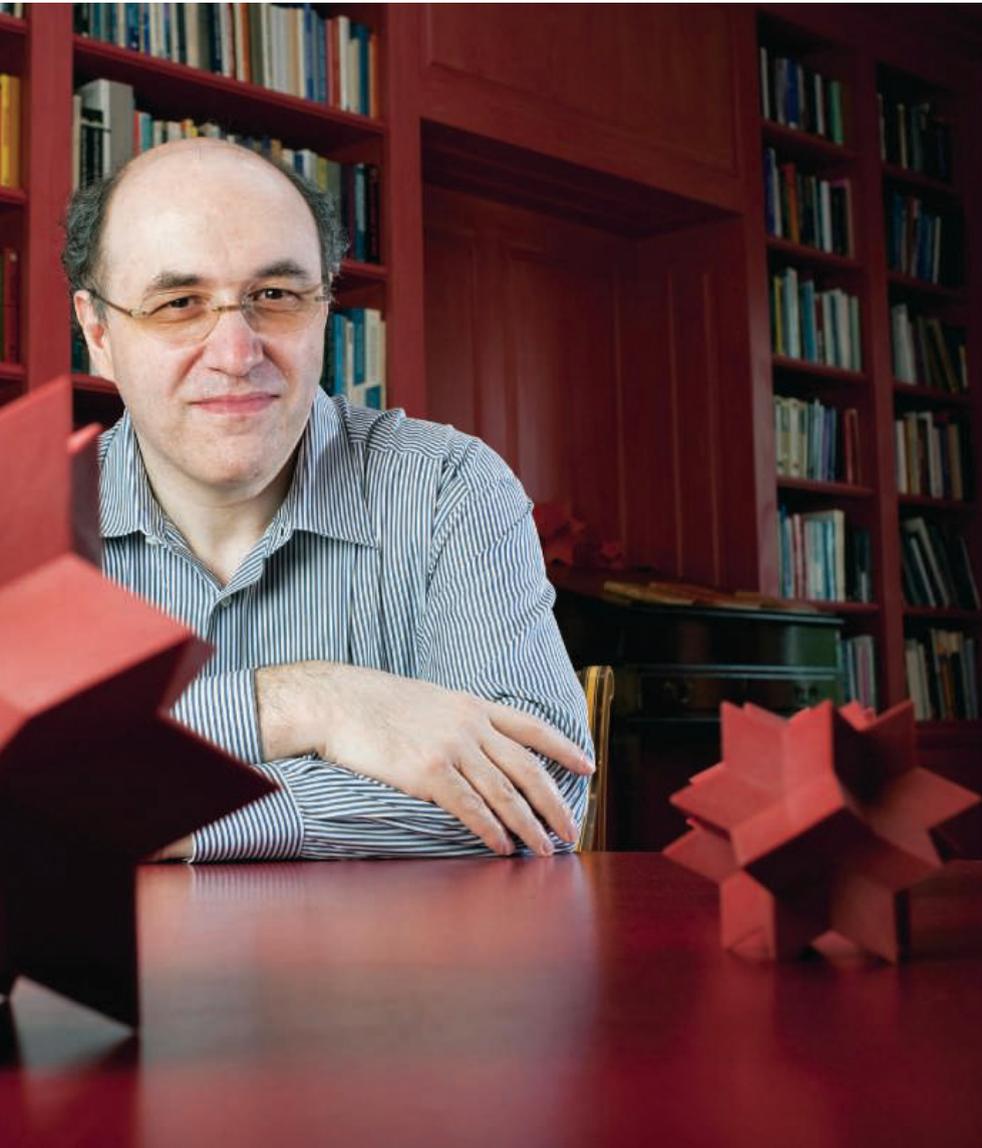
## PROFILE

Stephen Wolfram set up Wolfram Research and produced the computer programming package *Mathematica*. In May his company launched the website [wolframalpha.com](http://wolframalpha.com), which attempts to answer a user’s questions by analysing a huge database of facts



is that instead of using formulae and equations as mathematical models of the real world, Wolfram claims a far better way to model the world is to use these tiny computer programs. Unfortunately, the idea flies in the face of millennia of scientific thought. Freeman Dyson, the eminent physicist at the Princeton Institute for Advanced Study, famously gave the book a one-word review: “Worthless.”

So far *NKS* has failed to set the world alight, but this doesn’t bother Wolfram; he says he’s playing the long game. “I think it’s still early days for developments to come out of *NKS*. It’s going to be a decade or two before things happen.” Meanwhile, Wolfram has high expectations for his next project. “I want to find the fundamental theory of physics,”



## “If I can’t understand something, then it’s probably nonsense”

he says, by modelling the universe using the ideas roughed out in his book.

This would sound like the ravings of a madman were it not for Wolfram’s impeccable credentials. Born in 1959, he won a scholarship to Eton College at the age of 12, became interested in particle physics aged 14 and two years later wrote a paper that was published in a prestigious journal (*Australian Journal of Physics*, vol 28, p 479). At 17 he went to the University of Oxford, but left two years later to take up a research post at the California

Institute of Technology in Pasadena. By the age of 20 he was working alongside legendary physicists Richard Feynman and Murray Gell-Mann. He won a MacArthur “genius” award a year later. “If I can’t understand something, then it’s probably nonsense,” he says.

Around that time he drifted away from particle physics and began work on cellular automata. He claims to be single-handedly responsible for bringing the field back into fashion. This interest has dominated the last 28 years of his life. It led him to develop *Mathematica*, popular software that allows scientists and engineers to program and manipulate formulae and equations, and display their results in a myriad ways. It made his fortune.

## Stephen Wolfram’s goal is nothing less than to rewrite the science books - all of them

In 1991 he retreated into a decade-long, hermit-like existence during which he wrote *NKS*. “I did do something a bit bizarre at that time in that I said I wasn’t going to deal with the outside world. I had to really focus,” he says. Even today his only hobby is going to the cinema: “Usually on Friday evenings I go out to see a trashy movie. I view it as being a way I connect and find out what’s going on in the world at large.”

Throughout our conversation, two Dictaphones have sat between us, only one is mine. “I’m an information pack rat,” he confesses. Recording our interview is just the tip of his peculiar obsession with documenting every moment of his life. “I have a keystroke logger that has collected my every keystroke for the last 22 years,” he says. “Every day I get an email that tells me how many keystrokes I typed the previous day into each application. I find it slightly interesting.” He shrugs off my suggestion that it’s a way of securing his immortality; he believes that soon everyone will be doing it.

Hoarding information is precisely what Wolfram is now doing on a much larger scale. In May he launched WolframAlpha, which he describes as an “answers engine”. Unlike web search engines, WolframAlpha doesn’t try to return relevant web pages to a particular search term. Instead it treats your query as a question and attempts to compute an answer using its massive and growing internal databases.

“It’s completely different to a search engine. It’s a much higher bar to say ‘we want to get the answer’.” I ask why typing in *New Scientist* returns no meaningful results. He doesn’t believe me and whips out his iPhone to check. “You’re right,” he says, taken aback. “It hasn’t worked. It knows about a lot of periodicals but that’s shocking. We should fix that.”

Whilst he continues to iron out the glitches in WolframAlpha, the physicist is continuing to work on his unifying theory of everything by way of cellular automata. I ask if he’s disappointed that his old academic colleagues didn’t take to his idea more openly. “I think I perhaps had a higher opinion of a lot of science and physics types than I should have done,” he says. In spite of the negativity, we might not have to wait that long for the final verdict. Wolfram claims to have already found a model which describes the universe, even containing something that looks like general relativity. “I would give myself even odds of succeeding,” he says. ■

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