



CROWN JEWEL

'Nature doesn't know what infinity is'

'When I was working on my dissertation, there were a lot of major questions in physics about elementary particles and the forces that work between them,' says Gerard 't Hooft, professor of theoretical physics at Utrecht University. 'It was a great time; every few years, there was a discovery that turned everything on its head.'

With his supervisor, Martinus Veltman, 't Hooft worked on the rules of one of the forces: the weak interaction. 'When used in calculation, the calculations were not convergent; outcomes were often infinities. But nature doesn't know what infinity is, so that meant something was wrong.' Working with Veltman, he found a solution, which earned the pair the Nobel Prize in Physics in 1999.

Now, elementary particles and their mutual forces are well described by the standard model of particle physics. 'But

we know this isn't the whole story, because quantum mechanics, on which the standard model is based, doesn't work well when you combine it with gravity, again resulting in infinities.' This problem reared its head in the 1970s. 'At the time, we thought we would solve this in about ten years as well. After all, that's how it had been with particle physics. But by now we're fifty years down the road.'

'Some people think we'll never figure it out. I don't believe that. Just look at the history of our field. If we put our heads together, we can work the wrong ideas out of our system. Could it take thousands of years to find the right method? If it does, we're not giving up. In a thousand years, I will come back with the answers.'

Text: Dorine Schenk