CURRENT SCIENCE

Volume 65 Number 1 10 July 1993

Fermat's last theorem (1637)—Proof at last?

A message from our Editorial Board member V. Srinivas of TIFR says: 'Andrew Wiles of Princeton University, USA, has announced a proof of the notorious "Fermat's last theorem" this week (on 23rd, to be precise) at a conference in Cambridge. The 'Theorem' states that if $n > 3$, the equation $x^n + y^n = z^n$ has no solution in positive integers x, y, z. *Current Science* ought to contain some announcement of this in its next issue.'

Some time ago we wrote in these columns about Fermat's last theorem little realizing its solution was so near.

V. Srinivas had also sent us the copy of the e-mail from Karl Rubin and Ken Ribet, who were participants at the conference, together with some relevant information. The following gives some extracts.

In 1637 Fermat wrote this deceptively simple theorem in the margin of the book *Arithmetica of Diaphantos* stating, 'I have found a remarkable proof. This margin is too small to contain it'. Now after thousands of claims which proved wrong, mathematicians say, this unsolved problem has 'most probably' been solved. Sophie Germaine and later Ernst Kummer proved that Fermat was right for any power $n \leq 100$.

The work leading to the proof began in 1954 when the late Japanese mathematician Yutaka Taniyama made a conjecture about elliptic curves, now known as the Shimura–Taniyama–Weil conjecture. For two decades most mathematicians had no perception that these conjectures had anything to do with Fermat's last theorem.

In the mid-eighties, Gerhard Frey of the University of Saarland, Germany, came up with a strange and simple connection between the Taniyama conjecture and Fermat's last theorem; in 1987 Ken Ribet of the *University of California proved this connec*tion.

A small conference was held at Cambridge on 'Padic Galois Representations, Iwasawa Theory and the Tamagawa Numbers of

Pierre de Fermat

Motives'. Andrew Wiles, a 40-year-old English mathematician who works at Princeton University, gave three lectures on 'Modular Forms, Elliptic Curves and Galois Representations'. There was no hint whatsoever in the title that Fermat's last theorem would be discussed. Finally at the end of his third lecture, Wiles concluded that he had proved the general case of the Taniyama conjecture. Then seemingly as an afterthought, he said: this means that Fermat's last theorem is true. QED.

It is said that less than one in a thousand of professional mathematicians will be able to understand this proof. Experts cautioned that Andrew Wiles could of course have made some subtle mis-step. The experts who heard the lectures are convinced that the new proof is likely to be right. They are extremely excited.

★ ★ ★

However, until the proof is published in a mathematical journal, which could take at least a year and until it is checked many times, there is always a chance it is wrong. .... but the proof has to be taken seriously.

H. M. EDWARDS

A lot more is proved than Fermat's last theorem. One could envision a proof of a problem, no matter how celebrated, that had no implications. But this is just the reverse. This is the emergence of a technique that is visibly powerful. It is going to prove a lot more.

BARRY MAZUR

With Wiles' result, mathematical landscape has changed.

KEN RIBET

The structure of the whole proof is very tight and very solid—the proof appears to be beautiful—I do not claim to understand it in complete detail.

ENRICO BOMBIERI