

# Another Step Toward Fermat

On October 25, 1994, e-mail hounds hungry for news of Andrew Wiles' assault on Fermat's Last Theorem were tossed a meaty bone. The following e-mail, sent by Karl Rubin to his colleagues at the Ohio State University, gives a brief description of recent work by Wiles and Richard Taylor on Fermat's Last Theorem.

From rubin@math.harvard.edu  
Tue Oct 25 11:04:11 1994  
Date: Tue, 25 Oct 94 10:24:46 EDT  
From: rubin@math.harvard.edu (Karl Rubin)  
To: announce@math.ohio-state.edu, faculty@math.ohio-state.edu, grads@math.ohio-state.edu  
Subject: Update on Fermat's Last Theorem

As of this morning, two manuscripts have been released Modular elliptic curves and Fermat's Last Theorem, by Andrew Wiles

Ring theoretic properties of certain Hecke algebras, by Richard Taylor and Andrew Wiles.

The first one (long) announces a proof of, among other things, Fermat's Last Theorem, relying on the second one (short) for one crucial step.

As most of you know, the argument described by Wiles in his Cambridge lectures turned out to have a serious gap, namely, the construction of a Euler system. After trying unsuccessfully to repair that construction, Wiles went back to a different approach which he had tried earlier but

abandoned in favor of the Euler system idea. He was able to complete his proof, under the hypothesis that certain Hecke algebras are local complete intersections. This and the rest of the ideas described in Wiles's Cambridge lectures are written up in the first manuscript. Jointly, Taylor and Wiles establish the necessary property of the Hecke algebras in the second paper.

The overall outline of the argument is similar to the one Wiles described in Cambridge. The new approach turns out to be significantly simpler and shorter than the original one, because of the removal of the Euler system. (In fact, after seeing these manuscripts Faltings has apparently come up with a further significant simplification of that part of the argument.)

Versions of these manuscripts have been in the hands of a small number of people for (in some cases) a few weeks. While it is wise to be cautious for a little while longer, there is certainly reason for optimism.

Karl Rubin

The basic outline of Wiles' proof has not changed since his announcement of the proof in July 1993 at the Newton Institute in Cambridge, England. Further details about this work can be found in the *Notices*, "Fermat's Last Theorem: Wiles Announces Proof" by Kenneth Ribet (July/August 1993, 575-576) and "Update on Fermat's Last Theorem" by Allyn Jackson (March 1994, 185-186).

—Allyn Jackson