

Fermat's Last Tango

Reviewed by Robert Osserman

The Clay Mathematics Institute (CMI) is offering at cost a VHS tape as well as a (higher-quality) DVD disk of *Fermat's Last Tango*. The tape and DVD also include an 8-minute interview with Andrew Wiles. The CMI has also prepared a 16-page illustrated pamphlet to accompany the tape and DVD. The pamphlet presents the history of the Fermat problem, descriptions of the mathematical figures (historical and modern) who appear in the musical, a note from the author (Joanne Sydney Lessner), and information about the actors and the musical numbers. For further information visit the website <http://www.claymath.org/events/fermatslasttango.htm>.

A CD recording featuring the original cast is also available (\$18.00); details may be found at <http://www.fermatslasttango.com>.

Fermat's Last Tango

A musical by Joshua Rosenblum and Joanne Sydney Lessner

with Chris Thompson and Edwardyne Cowan as Daniel Keane (Wiles) and his wife, and Jonathan Raab as Fermat

Live-performance video by David Stern

In a season where one improbable event followed another, as mathematics took center stage in theaters and on the screen, perhaps none was quite as improbable as a musical comedy based on the story of Andrew Wiles wrestling with the proof of Fermat's Last Theorem. And the competition was formidable: a biography of mathematician John Nash, *A Beautiful Mind*, transformed into a major motion picture with *Gladiator* star Russell Crowe in the lead role; and a Broadway play, three of whose four characters are mathematicians, awarded first a Pulitzer Prize and then the Tony Award for best new play. That play, by David Auburn, is entitled *Proof*,¹ forcing the authors of the musical, which originally had the same name,

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¹*Two reviews of Proof appeared in the Notices, one by Mark Saul in the June/July 2001 issue (pages 596–597) and one by Dave Bayer in the October 2000 issue (pages 1082–1084).*

to come up with a new title, whence *Fermat's Last Tango*.

Fermat's Last Tango had a six-week run at the York Theatre in New York City to mixed reviews. It is clearly not everyone's cup of tea. On the other hand, there is nothing else remotely like it, and luckily Arthur Jaffe, president of the Clay Mathematics Institute, was able to arrange for a high-level professional video recording with the original cast. That recording had its premiere showing on July 16, 2001, in Berkeley at the Berkeley Repertory Theatre's brand new proscenium venue, the Roda Theatre. The occasion was a special event in connection with the Clay-sponsored miniprogram on the global theory of minimal surfaces taking place at the Mathematical Sciences Research Institute (MSRI) at the time. *Fermat's Last Tango* proper was preceded by an 8-minute video of an interview with Andrew Wiles and followed by a question-and-answer session moderated by David Hoffman of MSRI, with Kenneth Ribet of the University of California, Berkeley; Karl Rubin of Stanford University; and Arthur Jaffe. With the combination of participants in the MSRI program and members of the Berkeley mathematics department, the audience of four hundred or more was heavily skewed toward mathematicians but must have still included a majority who were not.

Although officially billing itself as a musical—or, more specifically, a “musical fantasy”—*Fermat's Last Tango* is more of a blend of a musical

and a one-act opera. It is about ninety minutes in length, with many recitatives, and the set pieces alternate between arias and musical numbers.

The story is one well known to all mathematicians and a good part of the general public: Gerhard Frey suggests a link between Fermat's Last Theorem and elliptic curves. Ken Ribet turns Frey's insight into a precise theorem, showing that Fermat's Last Theorem would be a corollary of a well-known conjecture, the Taniyama-Shimura conjecture. Upon learning of Ribet's result, Andrew Wiles retires to his attic study, working in secret to find a proof, and seven years later announces that he has succeeded.

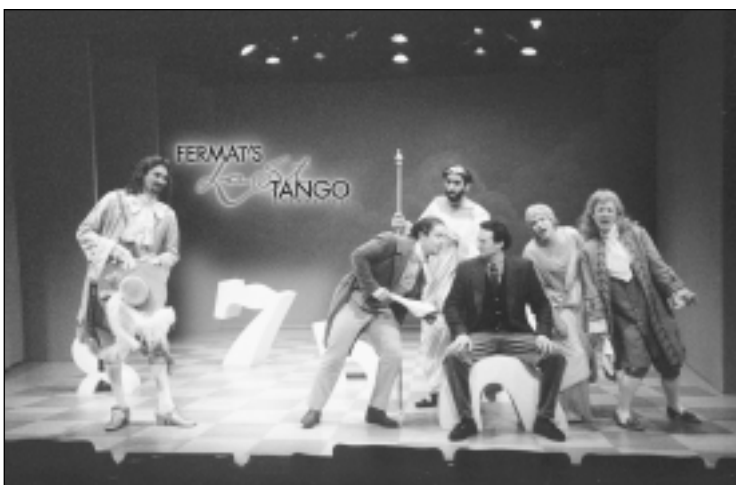
Fermat's Last Tango takes up the story from there (filling in the background along the way). The names of Wiles and his wife are changed—he is now “Daniel Keane”—while all other names are retained from real life. After Daniel informs his overjoyed wife that he has finally finished with Fermat and can return to a normal life, he is besieged by reporters, then asks his wife for just a few more minutes alone with his papers and the fruits of his seven years' labors. At that point he is startled by the appearance of none other than Fermat himself, who is portrayed as a somewhat diabolical version of the original. They engage in a good bit of banter until, during a visit to the “Aftermath”, Fermat suddenly confronts Keane, in one of the catchiest numbers of the show, with “Your proof contains a big fat hole.” From then on, as Daniel sinks back into the isolation of his study, trying to plug the hole and save his proof, Fermat plays the part of an anti-muse to Daniel, continually teasing and taunting him. He is assisted by a quartet of supporting characters—Pythagoras, Euclid, Newton, and Gauss—from the Aftermath. Daniel's wife, in contrast, is portrayed as remarkably sympathetic, loyal, tuned in to every change in Daniel's mood, and constantly assuring him that she will always be there for him. Unfortunately, Fermat points out that he too will always be there, and the three of them perform a tango-à-trois, the title tango of the piece. I would not be giving away anything to reveal that a happy ending is in store.

As I said earlier, there is nothing else I know that is remotely like this, so that comparisons are pretty well impossible. On one level it is a farce, and as with any farce, reactions are likely to range from finding it just plain silly to thinking it hilarious. Personally, some parts struck me as silly and others really worked. There were also sections that seemed to go on a bit too long. But that may have been part of the design, because by the time the story builds to its dénouement, the slapstick tone yields temporarily to a more serious one, and I found, to my surprise, that I was really moved. Part of the credit for that is due to the three leads, all of whom are excellent, both as singers and as actors. And part is clearly due to the music and



Photos courtesy of Joanne Lessner (Joey Corp).

Chris Thompson (left) as Daniel Keane and Jonathan Raab as Fermat in the play “Fermat's Last Tango”.



“Your proof contains a big fat hole...”

lyrics, which become progressively stronger. But what makes *Tango* truly unique is not only the choice of subject matter for a musical but the fact that no attempt is made to mince words. Equations are written, spoken, and sung; theorems are stated in full; the history is occasionally simplified, but is basically correct; and we hear “Taniyama-Shimura conjecture” so often that it begins to roll off the tongues of the performers as if nothing could be more natural.

What is a “general audience” to make of all this? For that matter, what is a mathematical audience to make of it? My impression at this first screening was that reactions ranged from mildly amused to enthusiastic. Nonmathematicians seemed generally to feel that they learned something as well as having been entertained. The fact is, the story of Wiles's wrestling with and finally subduing Fermat's Last Theorem is a gripping one, well worth retelling in whatever form. These days, with great interest by the mathematical community in outreach to the general public, the

screening of *Fermat's Last Tango*, followed by a question-and-answer period such as the one at this premiere, could be a marvelous vehicle for reaching a new audience. At the least they could not help but learn that mathematics is very much a live subject, with mathematicians endlessly engaged in the act of discovery.

In a production billed as a musical fantasy, it seems pointless to quibble about historical accuracy, but since the portrayal of actual events is for the most part quite faithful, it may be worth pointing out one departure that I found rather unfortunate. It is the depiction of Andrew Wiles/Daniel Keane as having withdrawn completely for seven years, holed up in his attic study night and day, neglecting wife and children, as he doggedly pursued the will-of-the-wisp Fermat. The testimony of Wiles's friends is quite the contrary. It is true that his working hours were devoted to the single-minded goal of proving Fermat's Last Theorem. But it is too bad that in order to increase the dramatic effect, the authors chose to reinforce stereotypes about the supposed incompatibility of long hours of intense mathematical concentration with an active family and social life, to say nothing of other interests and pursuits. A postshowing discussion could provide the occasion for raising this point, along with at least two others where the authors made a deliberate decision to simplify the history: the role of Richard Taylor is omitted, and Wiles is said to have solved the complete Taniyama-Shimura conjecture.

With or without a discussion, much of *Fermat's Last Tango* is just plain fun. A general audience should enjoy many of the spoofs, the jokes, and the songs. Mathematicians may well find themselves haunted by the refrain "Your proof contains a big fat hole" while their nonmathematical partners go out ruefully humming "Math widow". As for the graduate students and postdocs in the audience, they have one of the liveliest tunes for themselves, "Mathematics is a young man's game", which incidentally opens up two further obvious topics for a lively subsequent discussion.