Conversations about Mathematics

Rob Kirby

Over the past few years Robert Osserman has hosted a series of public events called "Conversations", in which he talks with prominent playwrights and other cultural figures who have used mathematics in their work. Osserman, who is the Special Projects Director at the Mathematical Sciences Research Institute in Berkeley, held conversations with Tom Stoppard about Stoppard's play *Arcadia*; and with G. V. Coyne, director of the Vatican Observatory, and Michael Winters, who played Galileo in *The Life of Galileo*, a new English version by David Hare of the play by Bertolt Brecht. Osserman's third and most recent conversation was held on November 29, 2001, in San Francisco, with David Auburn, author of the Pulitzer Prize- and Tony Award-winning play *Proof*.

It would be wrong to think of these conversations as interviews by Osserman of Auburn et al. Instead Osserman prepares at great length, looking not just into the history of the characters in the plays, but into interesting topics related to the plays. In my estimation (I've attended all three conversations), he brings even more to the conversations than do his interviewees, partly of course because he is a mathematician bringing up issues that may be closer to him than to his interviewees. The conversations have been extremely successful, and Osserman is due much praise for these marriages of the humanities and math.

Proof has already been reviewed twice in the *Notices* (by Dave Bayer, October 2000, pages 1082–4, and by Mark Saul, June/July 2001, pages 596–7), so rather than describe the play again, I must assume some familiarity on the part of the reader.

After asking Auburn about his background (Auburn was a University of Chicago student who began by writing Second City-style comedy sketches), Osserman raised three issues during his conversation with Auburn: drugs, women in math, and mental illness and mathematicians. Together they read an excerpt from *Proof,* in which the character Hal describes mathematicians at conferences taking amphetamines to keep themselves in high gear. Auburn—who has a great deadpan sense of humor and got more laughs from the audience while reading Hal's lines than did the actor in the actual play—offered Erdős as an example of a mathematician thought to have used amphetamines, but agreed that he was taking dramatic liberties here. Of course, to mathematicians, this suggestion of common drug use seems laughable.

Auburn did not start out with the idea of a woman finding a remarkable mathematical proof. Rather he had a vision of a woman sitting on a porch and an older man coming up to her and saying, "Can't sleep?" (the opening line in the play), and also of two sisters quarreling. Only later did math and proofs get added. But Auburn was certainly aware of the scarcity of great female mathematicians (Auburn went only as far as calculus but has read further about mathematicians), and he and Osserman went on to discuss Sophie Germain, Hypatia, and the plays *Arcadia* and *The Five Hysterical Girls Theorem*, a recent off-off-Broadway play by Rinne Groff.

Rob Kirby is professor of mathematics at the University of California, Berkeley, and a member of the Notices *Editorial Board. His e-mail address is* kirby@math.berkeley.edu.

As for madness, Auburn cited John Nash as an obvious example and remarked, "Some very edgy personalities are drawn to it [math] as a way to find order in the world" (*San Francisco Chronicle* story on Auburn and *Proof*, November 25, 2001). But Osserman had done his homework and searched the literature for research on madness and professions. According to him, "More than one source reported a far higher incidence of mental instability among writers and poets than among natural scientists."

Auburn thought of us mathematicians as an "eccentric subculture," a somewhat "unusual guild, with a strong sense of belonging." Osserman responded that "we are different, but not differently different."

Robert Osserman, left, and David Auburn, San Francisco, November 29, 2001.

As with his other conversations, Osserman brought in many other issues and facts, e.g., Reuben Hersh's "Mathematical menopause" (*Mathematical Intelligencer*, vol. 23, no. 3, 2001) regarding math being a young person's game and other works of art including the play *Breaking the Code* about Alan Turing and the forthcoming movie on the same subject, *Enigma*.

Osserman's conversations are rich and fascinating, and it is unfortunate that he does not go on tour (with his interviewees) as the plays do. The conversation on Galileo can be found on tape at `http://www.msri.org/calendar/events/galileo/`, but the conversation with Auburn at the Curran Theater in San Francisco could not be videotaped due to union contracts and costs.

I'd like to finish with an illuminating comment by my colleague Beresford Parlett concerning the most important point of the play. Catherine has shown her trust in Hal by allowing him to find the manuscript of her proof of something amazing in number theory (an example that would fit is Goldbach's Conjecture that every even number is the sum of two primes). The proof is written in one of her father's notebooks, in handwriting similar to his, and presumably she is not advanced enough in mathematics to have done such work. Hal points this out, raising doubt that she rather than her father actually discovered the proof. When Hal wishes to take the manuscript to his peers so that they may examine the proof, she becomes very angry, arguing that she trusted him in letting him see the manuscript, but now he is not trusting her when he does not immediately believe that she wrote it (in the previous scene, they had become romantically involved for the first time). In other words, Hal wants to look over the manuscript primarily to sort through the math but also to see if it sheds light on who wrote it, whereas Catherine, who has trusted Hal emotionally by showing him the manuscript, wants to be trusted that she would not lie about authorship (she appears to have no doubt as to the correctness of her proof).

Hal returns a few days later saying that the proof is indeed remarkable and probably correct, and furthermore it uses newer material that her father (mentally ill for some ten years) is not likely to have known. But he finds Catherine disgusted with life and about to leave for another world with her sister. At the end of the play, Hal has cajoled Catherine into sitting down and explaining the proof, after admitting that he was wrong not to trust her.

Parlett's point is that Hal (i.e., Auburn) missed the chance to speak to Catherine like a mathematician. Hal might have said, " We mathematicians usually let the math speak. Let us read the manuscript and if it appears correct, then our saying so will mean much more than if I say I believe you due to my affection for you. And the manuscript may shed light on who wrote it, and again if the manuscript indicates that you wrote it, that will carry much more weight than belief due to affection. Let us appeal to the scientific method rather than to emotion."

On the other hand, this resolution may not be dramatically viable or even correct. Catherine and Hal, even though mathematicians, may (at this point in time) have been more intent on getting the romance straight than the mathematics, and an audience of nonmathematicians may well prefer the romance of Auburn's ending, rather than the rigor of Parlett's.

Note: Photograph courtesy of Robert Osserman/David Zetland.

What follows is a list of resources, annotated by Robert Osserman, that he used in preparing for the conversation with David Auburn.

Mathematical Biographies:

Alan Hodges, *Alan Turing, the Enigma*

As described (accurately) on the cover: "The extraordinary story of the brilliant scientist whose 'enigma' device broke Germany's most secret WWII code, who pioneered the modern computer age and who finally fell victim to the cold-war world of military secrets and sexual scandal."

This biography led to the play *Breaking the Code* in which actor Derek Jacobi played the part of Turing, first in London, then in New York, and then in a television version of the play which is available on video.

Sylvia Nasar, *A Beautiful Mind*

Biography of John Nash. Title used for film "based on incidents in the life of John Forbes Nash Jr.," with Russell Crowe playing the part of the semifictionalized John Nash.

Tony Rothman, *Science à la Mode: Physical Fashions and Fictions*

Six essays, including one, "Genius and Biographers: The Fictionalization of Evariste Galois" that recounts the story of Galois' life and some of the distortions in its retelling. (Another essay in the book has a fascinating account of "geodesic domes" and their history prior to their "invention" by Buckminster Fuller.)

Anita Burdman Feferman, *Politics, Logic, Love: The Life of Jean van Heijenoort*; paperback issued under the title *From Trotsky to Gödel*

Jean van Heijenoort is one of the least known and most romantic figures in mathematics. He led a double and at times triple life in mathematics, politics, and the world of artistic and intellectual ferment at mid-century. This biography is a fascinating account of his life and includes an appendix by his friend and co-worker, Solomon Feferman, on van Heijenoort's scholarly work.

Novels about Mathematicians:

Rebecca Goldstein, *The Mind-Body Problem*

With the great opening line: "I'm often asked what it's like to be married to a genius," Rebecca Goldstein's brilliant first novel tackles the problem of the title literally and metaphorically. The disclaimer "no reference to any living person is intended or should be inferred" was apparently not enough to prevent at least one living person from contemplating a lawsuit, since the author was a graduate student at Princeton and describes the scene there in some detail.

Robert Harris, *Enigma*

A beautiful evocation of England during World War II and life in and around Bletchley Park, where teams of code breakers, one of them headed by Alan Turing, had a major influence on the course of the war by breaking some of the codes using the Enigma machine that the Germans thought was unbreakable. Made into a movie, coproduced by Mick Jagger, with a screenplay by Tom Stoppard.

Books about Genius and Madness:

Kay Redfield Jamison, *Touched with Fire: Manic-Depressive Illness and the Artistic Temperament*

The author writes, "The main purpose of this book is to make a literary, biographical, and scientific argument for a compelling association, not to say actual overlap, between two temperaments—the artistic and the manic-depressive…." Includes (Appendix B) lists of writers, artists, and composers with probable mental illness.

Daniel Nettle, *Strong Imagination: Madness, Creativity and Human Nature*

Describes different forms of "madness" and asks the question of why madness persists and is not wiped out as evolutionarily undesirable. Proposes the answer that it is linked to creativity. Cites various studies of eminent people and their incidence of mental disorders, broken down by profession. It appears that scientists are among the least affected, and creative writers among the most.

Music, Mathematics, and the Brain:

Edward Rothstein, *Emblems of Mind: The Inner Life of Music and Mathematics*

From the Prelude: "The Need for Metaphors"—"Math and music are both so abstract they can seem other-worldly, but both also have extraordinary this-worldly power—music in its effects on the listener, mathematics in its applications in the world." Edward Rothstein was the chief music critic for the *New York Times* after having pursued mathematical studies to a considerably advanced level. This book is often hard going on both the musical and mathematical fronts but is very well written and has many interesting insights.

Robert Jourdain, *Music, the Brain, and Ecstasy*

A detailed account of the many different aspects of music, the specific parts of the brain connected to each, and speculations on the evolutionary reasons for those developments.