

Critical Essay on Proof

In researching *Proof*, Auburn consulted with a number of mathematicians and also read the biographies of prominent mathematicians, aspects of whose lives find their way into the play. When Hal tells Catherine that some of the older mathematicians he encounters at conferences are addicted to amphetamines, which they take to make their minds feel sharp, he is amplifying the well-known story of mathematician Paul Erdős who began taking amphetamines so he could keep up the fast pace of his mathematical work. When friends persuaded him to stop taking the amphetamines for a month, Erdős complained that he had not been able to do any creative work during that time and promptly resumed taking the drugs.

Andrew Wiles is another mathematician whose story finds an echo in *Proof*. Wiles, a professor of mathematics at Princeton University, worked for many years to prove Fermat's Last Theorem when the conventional wisdom was that such a proof was impossible. In 1993, Wiles announced at a conference that he had proved the theorem. It transpired that he had been working on it in solitude, in an office in his attic, for seven years, telling no one of what he was doing. This surely inspired the picture Drawing of a geometric calculation by presented in *Proof* of Catherine, who also works in solitude and in secret, and then suddenly, out of the blue, unveils a ground-breaking mathematical proof.

But the mathematician whose life story is most closely linked to *Proof* is John Forbes Nash, Jr, who is the subject of *A Beautiful Mind* (1998), a biography by Sylvia Nasar which was made into a popular movie in 2001. Nash was a mathematical genius. In 1949, when he was twenty-one years old and a graduate student at Princeton University, he wrote a slim, twenty-seven-page doctoral thesis on game theory (a theory of how people behave when they expect their actions to influence the behavior of others) that revolutionized the field of economics. Nash became a professor at the Massachusetts Institute of Technology (MIT) when he was only twentythree and quickly went on to solve a series of mathematical problems that other mathematicians had deemed impossible. He seemed destined to become one of the greatest mathematicians in the history of the discipline. Then, in 1959, when Nash was thirty years old, his behavior, which had always been eccentric, became bizarre and irrational. He heard strange voices and became obsessed with the idea of world government. He accused a colleague of entering his office to steal his ideas. He turned down the offer of a chair at the University of Chicago with the explanation that he was going to become Emperor of Antarctica. Nash was admitted to McLean Hospital in Belmont, Massachusetts, where he was diagnosed as a paranoid schizophrenic.

Schizophrenia is a severe mental disorder that distorts thinking and perception. It leads to a loss of contact with reality and bizarre, sometimes antisocial behavior as the sufferer withdraws into his own inner world. Schizophrenia is difficult to treat and there is no cure. Nash spent the next thirty years afflicted with the disease, which would occasionally go into temporary partial remission before returning. His career was destroyed although he made a surprise recovery during the 1990s. He resumed living a normal life and studying mathematics and was awarded the Nobel Prize in 1994.

The parallels between the real life of Nash and the fictional life of Robert in *Proof* are many, and they prompt questions of whether genius and insanity are linked and whether both are inherited. Robert is clearly a Nash-like figure. Hal reminds Catherine in act 1, scene 1 that when Robert was in his early twenties he had made major contributions to three fields: game theory, algebraic geometry, and nonlinear operator theory. These are exactly the same fields, according to Nasar, in which the young Nash made his impact. Nasar also points out that in the early days of his illness, Nash seemed to have a heightened awareness of life:

He began to believe that a great many things he saw— a telephone number, a red necktie, a dog trotting along the sidewalk, a Hebrew letter, a sentence in the *New York Times*—had a hidden significance, apparent only to him. . . . He believed he was on the brink of cosmic insights.

This is echoed by Robert, as he recalls his mental state soon after he became ill. He tells Catherine about the clarity with which he saw things, and he believed that his mind was even sharper than before:

If I wanted to look for information—secrets, complex and tantalizing messages—I could find them all around me. In the air. In a pile of fallen leaves some neighbor raked together. In box scores in the paper, written in the steam coming up off a cup of coffee. The whole world was talking to me.

Although the play does not mention the exact nature of Robert's illness, the hallucinations and delusions he suffered from make it clear that he, like the real-life Nash, was schizophrenic. Robert was no doubt mistaken when he claimed that his mind had become sharper, because during his illness his mental processes no longer bore any relation to reality. As with Nash, the insights he thought he had contained meanings known only to him and were useless for objectively verifiable mathematical knowledge. Just as Nash believed that powers from outer space, or foreign governments, were communicating with him through cryptic messages in the *New York Times* that only he could decode, so too Robert used to borrow large numbers of books from libraries because he thought that aliens were sending him messages through the Dewey decimal numbers on the books, and he was trying to work out the code.

Was Nash's insanity, or that of Robert in *Proof*, somehow related to their genius? The idea that creativity and madness are linked is an old one. Plato wrote in his dialog *Ion* that the poet was inspired with a kind of divine mania, and cultural history turns up many examples of exceptionally creative people who have been afflicted with mental illness of one kind or another, including the philosopher Friedrich Nietzsche, the artist Vincent van Gogh, and the writer Virginia Woolf. In more modern times, American poets Sylvia Plath and Robert Lowell suffered from mental illness. (In 1959, Lowell was a patient at McLean Hospital in Belmont when Nash was admitted.)

The most common type of mental illness amongst creative artists is manic-depression, also known as bipolar disorder. This is not the same as schizophrenia. Although manic-depression can produce delusions, it is mainly characterized by extreme mood swings, ranging from great elation to deep depression. Research suggests that creative artists, poets in particular, are two to three times more likely to suffer from manic-depression than scientists. For the poet or writer, it is possible that manic-depression can enhance creativity, since the mood swings may offer more acute insight into the peaks and troughs of human experience, which in turn can lend the artist's work a profundity that might escape those who live on a more even emotional keel. Creative people who suffer from manic depression are often able to function quite normally between episodes, which is usually not the case with schizophrenia.

It would seem that schizophrenia, far from being somehow linked with creativity, is in fact inimical to it, since the feeling of heightened awareness it may produce translates only into delusional perceptions, not deeper insights into truth. Although there does seem to be a certain unusual quality to the minds and personalities of many great scientists and philosophers, madness does not describe it. Nasar points out many examples of men of genius, including Immanuel Kant, Ludwig Wittgenstein, Isaac Newton, and Albert Einstein, who had emotionally detached, eccentric, solitary, inward-looking personalities that may have been useful in promoting the kind of creativity that these disciplines require. Such people—Nash was one of them before his illness—are able to think not only more profoundly but also in different ways than less gifted individuals. Nash was used to solving problems in ways that had not occurred to others. He developed this habit of thinking "out of the box" at an early age. His sister reported that Nash's mother was once told that her son, then in elementary school, was having trouble with math, because he could see ways of solving mathematical problems that were different from the methods the teachers were used to.

When Nash was a mature mathematician, his mind not only worked faster than anyone else's, he continued to approach mathematical problems in unusual ways that would unlock new possibilities that astonished his colleagues. Nasar reports that Donald Newman, a mathematician who knew Nash at MIT in the 1950s, said of him that "everyone else would climb a peak by looking for a path somewhere on the mountain. Nash would climb another mountain altogether and from that distant peak would shine a searchlight back onto the first peak." Sometimes when Nash presented his unexpected results to professional audiences, there would be some who said they could not possibly believe them, so novel was Nash's approach to the problem.

Auburn clearly incorporated this dimension of Nash's mind into the character of Robert in *Proof*. When Hal says to Catherine that hard work was not the secret of Robert's success, she contradicts him but immediately explains that the work went on almost unseen, and Robert's success resulted from his taking an unusual starting point: He'd attack a question from the side, from some weird angle, sneak up on it, grind away at it. He was slogging. He was just so much faster than anyone else that from the outside it looked magical.

Hal's immediate response, about the beauty and the elegance of Robert's work, also corresponds to what mathematicians said about Nash's work. It is quite common for mathematics to be described in this way, as if it somehow partakes in the essential beauty and order of the universe. The French mathematician Henri Poincaré wrote about the aesthetic feeling known by all mathematicians when they recognized these qualities revealed in

their work, describing it as “the feeling of mathematical beauty, of the harmony of numbers and forms, of geometric elegance.”

A final aspect of Nash’s life finds its way into *Proof* in Catherine’s worries that she may inherit her father’s illness, even though the depression she suffers from is not related to the symptoms of schizophrenia. Catherine is right to be concerned, since expert opinion considers that although the cause of schizophrenia is unknown, there is a genetic factor in the disease. It can be inherited and, indeed, Nash’s own son, John Charles Nash, was diagnosed, like his father, as a paranoid schizophrenic. Like his father also, John Charles Nash was a mathematician, brilliant but without his father’s spark of genius. Unlike schizophrenia, genius is not transmitted through genes, and there are numerous examples of geniuses whose offspring have been distinguished only by their mediocrity. So for Catherine in *Proof* to inherit both Robert’s genius and his mental illness would be a very unlikely event in real life, although of course, as *Proof* shows, it can be turned into excellent drama. Nash himself discovered this when at the age of seventy-three his biographer, Nasar, took him to see a performance of the play. An article in the Los Angeles Times by John Clark contains Nasar’s description of how Nash reacted:

‘He loved it,’ says Nasar, who admits she was a little nervous about his response. ‘It was so much fun to see him laugh and react to *Proof* because [the father] is clearly inspired by Nash’s story, and to witness John Nash seeing this on the stage in front of him—it was adorable.’

Source: Bryan Aubrey, Critical Essay on Proof, in Drama for Students, Thomson Gale, 2005.