Good Will Hunting

Reviewed by Mark Saul

Good Will Hunting
Miramax Films
Starring Robin Williams, Matt Damon, Ben Affleck,
Stellan Skarsgard, and Minnie Driver
Screenplay by Ben Affleck and Matt Damon
Directed by Gus Van Sant

The place of mathematics in general culture, and particularly in the arts, has varied only a little since Plato set the basic tone. He saw mathematics as pure rationality, but also as a glimpse of divine reality contained within even the lowest slave-boy. In more recent times this rationality came to be a metaphor for a lack of emotion (Whitman's Astronomer) or transcendent but inhuman beauty (Millay's Euclid). More recently, Stoppard's play *Arcadia* sets mathematics as rationality against romanticism but views both as extremes. Luckily, mathematics (but not the physical sciences) has been spared the symbolism of forbidden knowledge, fraught with ethical dilemmas (Faust, Frankenstein, Rappacini). In contrast, the film *Good Will Hunting* is more balanced, and its mathematicians are portrayed as more complex than those in the works referred to above.

Good Will Hunting is in fact not about mathematics. It is the touching story of a young man's struggle to transcend his Dickensian childhood, to discover his place in the world, and to achieve intimacy with others. The main character, Will (the title is a play on his name), is a tough and preternaturally gifted orphan from Boston's South Side

Mark Saul teaches mathematics in the Bronxville, NY, school district. His e-mail address is MSaul@ compuserve.com.

who works as a janitor at MIT and cannot resist displaying anonymously his solutions to (supposedly) baffling mathematical problems. The identity of the solver is discovered just about the time that Will (Matt Damon) is arraigned for his part in a street brawl. His subsequent court-ordered supervision by a professor of mathematics and Fields Medalist (Professor Lambeau, played by Stellan Skarsgard) includes psychological counseling. This sets the plot in motion. Will's feelings about himself, about a woman he courts, about his gift and his background are explored and developed through his interaction with the psychologist (masterfully portrayed by Robin Williams) whose background turns out to be similar.

So what role does mathematics play in all this? Alfred Hitchcock's metaphor of the "MacGuffin" comes to mind: an object or idea that drives the plot and with which everyone in the film, but not the audience, is preoccupied. In Hitchcock's films the MacGuffin might be a military secret, a hidden treasure, or someone's identity. This film's MacGuffins are Will's talent and the mathematical problems that he solves so easily. Will could have been gifted in biology, in physics, in languages and faced similar issues in his life. In fact, his intellect is drawn larger than life, so that he can talk about economics, learn organic chemistry, and even defend himself in court, citing precedents with facility. So why mathematics?

One reason is that mathematics is perceived as so obscure that few can do it. Indeed, this is among the few comments about mathematics that this film makes with which a mathematical audience will not agree. The first frames of the film, under the open-

ing credits, are of a mathematical text out of focus and blurred, as if beheld by a general reader who cannot construe it. The mathematics referred to later on ranges from basic linear algebra, through simple graph theory, to Parseval's theorem (mispronounced in the film), Fourier analysis, and on to what seem to be some deeper graph theoretical results. Mathematics is referred to constantly, but in no scene is it presented coherently. Will's gift, it seems, is valuable partly because it is so rare.

Mathematics also highlights the class distinction between Will and the academics. Will is a tough street kid. His gift is admired but not envied by his friends. Had he been gifted in sports or rock music, the plot could not turn on the choice Will has to make between his background and his destiny. The culture of mathematics does not fit well with that of blue-collar South Boston.

And it is not particularly "our fault". Professor Lambeau takes great pains to keep Will out of jail, to find him a job which uses his talents, and to get him appropriate counseling. It is Will, out of loyalty to his background, who thwarts Lambeau's efforts, until a poorly motivated breakthrough in his therapy (the weakest detail of the film) allows him to begin a reconciliation between the two worlds he has come to know.

The people that create mathematics fare somewhat better in the film than the subject itself. Lambeau is a hard-working guy who drinks and talks tough with the Robin Williams character. He is much more patient with Will's foibles than one might expect, but not so sensitive to another graduate student, a background character who is shown up by Will's talents, is clearly miffed, but is still able to support and admire Will. A third mathematician, an established professor, is crestfallen and humiliated when Will points out an error in a proof and offers the correct alternative on the spot. Each character has a different adaptation to working with the intractable material of mathematics, and the viewer will find each in some measure familiar. The least familiar situation is Will's own. He is not portrayed as ever struggling with anything mathematical. Without the presence of such a struggle, the achievement of making a mathematical discovery easily loses its attraction, and so the film misses an essential emotional element of the experience of doing mathematics (I am indebted to Hyman Bass for this insight). Indeed, no one in the film is portrayed as taking particular pleasure in doing mathematics.

The film did have "coaches" for the mathematics. One was Daniel Kleitman, of MIT, who tells his own story in a sidebar. Listed in the credits as "math consultant" was Patrick O'Donnell, a physicist at the University of Toronto, who was originally hired as an extra. His authentic Irish brogue is heard in a bar scene late in the film, and he can be recognized from a photograph posted on his Web site. O'Donnell says that he built on references in the script to select mathematical content for filming. These references included eigenvectors, complex analysis, graph theory, and combinatorics, and the writers' choices were probably not guided by mathematical coherence. In a telephone interview O'Donnell revealed that he used a paper on graph theory (the reference from *Mathematical Reviews* appears at the end of this article). Those curious about this particular MacGuffin are welcome to look.

So the mathematical reader will enjoy stringing together the bits of proof and calculation that flash on the screen. Likewise, the Boston denizen will have fun trying to discern which actors grew up in Boston and which have been coached for their accent. MIT alumni and Cambridge hands will amuse themselves identifying the locations (in fact, most of the film was shot in Toronto, attracted there by tax breaks and the Canadian dollar). All these details have about the same importance to the total effect of the film.

Yet the film does contribute to the public image of mathematics. The Fields Medal gets some exposure, including an incident in a bar where it emerges that Unabomber Ted Kaczinsky is better known than any Fields Medalist. Some of the most memorable scenes in the film concern a series of job interviews that Lambeau sets up for Will. Predictably Will disdains these offers, but the sequence shows us a glimpse of the import that mathematical research has for the emerging world economy.

The film can also contribute to the self-knowledge of the mathematical community. One lesson we can learn is about social class. It is Will's background, and not just his abuse as a child, that prevents his talents from surfacing. We would do well to remember, in our efforts to include members of underrepresented groups in mathematics, that there can be as much resistance to our efforts from the students we work with as from the system we work in.

But social reality is not everything, and Will's personal struggle is at the center of the film. Perhaps the most important point in this for mathematicians is made by Lambeau's graduate student, the one who finds himself outshone by Will. When Will bridles at some of Lambeau's suggestions, the graduate student tells him, in a scene which brings life to this minor character, how lucky he is to have a teacher who cares about him.

And I think we should take this to heart. We don't nurture our young mathematicians nearly enough. Even those who have every advantage of family, education, and resources have an uphill battle establishing their careers. We would do well to examine our treatment as a community of these gifted young people. Mathematical talent is where you find it, but remains lodged in us useless un-

less there is a reason, a personal reward, for developing it. Some are lucky enough to acquire this reason on their own, but others need a helping hand. It is not enough for us to spend time hunting our good Wills. We must extend our own good will to them as well.

Reference

[1] Frank Harary and Geert Prins, *The number of homeomorphically irreducible trees, and other species*, Acta Math. **101** (1959), 141–162, MR 21 #653.

My Career in the Movies

One day this spring I got a phone call from someone asking if I would talk to two young men who were writing a screenplay for a movie. I made an appointment with them, and they appeared in my office. They told me the movie was about a young guy they had originally envisioned being a genius in physics, but after talking with Sheldon Glashow of Harvard they had decided his being a mathematician was more plausible. Glashow, who is married to my wife's sister, suggested they come talk with me. They wanted to hear mathematicians talk about mathematics, so that the lines about mathematics in the film would not be embarrassingly foolish. I felt a bit silly mumbling random mathematics to nonmathematicians, so I got ahold of Tom Bohman, a postdoc here, and we talked a bit about problems in combinatorics and graph theory, which are among our fields of interest. I even gave a short lecture (on Fred Galvin's proof that the stable marriage theorem implies the k-list colorability of a certain k by k graph). They also asked for an important unsolved problem that the hero could claim to have solved. We suggested $P = NP$ and had a discussion as to which way the hero might resolve this question. I recall that Ben Affleck suggested that after the hero announces his solution the MIT mathematician should say, "I better tell Mike Sipser about this." Unfortunately or fortunately the movie was vague about mathematics and did not resolve such serious questions even fictionally.

To be honest, I was a bit skeptical at this point as to whether a movie would actually emerge from all of this, but I was happy to help in any case.

They left after an hour or two, and we wished them good luck.

During the summer I received another call, this time from the man in charge of hiring extras for the movie. He offered me, as a sort of reward for my help, a part as an extra. My wife decided I should agree to do this. So one day in the late summer I went to Harvard Square and spent an evening being in two scenes. One was huge, with perhaps a hundred extras and involved the hero and heroine walking through Brattle Square where there were magicians, jugglers, etc., and crowds of extras watching all this amusement. This shooting lasted a long time but never appeared in the movie. In any case, I was way out in left field and never would have been seen.

Afterward a few of us were retained to walk up and down outside the Tasty, a now defunct sandwich shop in Harvard Square, while the hero and heroine smooch a bit at the counter with the window as a backdrop. Strangely enough, in the take that appears in the movie I walk by the window and then do it again in the opposite direction. I guess I was lost. Two more strange things: the scene in the Tasty with me visible outside is in one of the cuts used to advertise the movie; also—and this is a first—the review of the movie in the *Boston Globe* was full of praise for it and even praised the extras.

As another thank you I was invited to the Cambridge premiere of the movie and to the party afterward, where I got to shake hands with the two authors and Minnie Driver. They apologized for any botching of the math, and I congratulated them on the movie, which seemed to me to be prize winning, though I rarely go to the movies.

The movie is really about a troubled, intelligent young man, and the mathematics is only a gimmick to get him a sponsor who will make him see a psychiatrist. The mathematician seemed a bit of a wimp to me, but he could have been much worse, and he does indeed take an interest in the hero and is responsible for anything good that happens to him.

Well, my short movie career has brought me a credit for advising on a screenplay that has won a Golden Globe Award and a bit part that actually appeared visibly on national television. I can now retire from it with satisfaction.

—Daniel J. Kleitman,
Massachusetts Institute of Technology