100 % insane? - The depiction of mathematicians in movies vs. reality

Max Cohen is probably the prototype of a mathematician – the number theorist depicted in Darren Aronofsky‘s directional debut “Pi” (1998) is socially inept, suffers from hallucinations and paranoia and is obsessed with the idea to find underlying complete order in the real world. And if you would ask non-mathematicians how they imagine a real mathematician to be, they most likely would describe him or her like this – a genius mind but bordering on madness.

Insanity and mathematics. These terms do not seem to contradict each other. If we look at more well-known films about mathematicians, they are almost always portrayed as outsiders, socially incompetent or even mentally ill. Let us consider some examples:

There is “Proof”, a drama film directed by John Madden in 2005 based on the eponymous play by David Auburn. Anthony Hopkins plays a brilliant and well-known mathematician that in some point of his life suffers from mental illness and whose grip on reality is beginning to slip away. His daughter (Gwyneth Paltrow), also a mathematician, struggles with the idea of having inherited his mental illness as well.

Or take a look at Ron Howards’ biographical film “A Beautiful mind”. It won four Academy Awards in 2001. Starring Russell Crowe as the famous mathematician, Nobel Laureate in Economics, and Abel Prize winner John Nash who developed a paranoid schizophrenia at university with which he had to deal his whole life.

These are not the only films about mathematicians: Not to mention “Imitation game” about Alan Turing defeating the Enigma, “The Man Who Knew Infinity” about the Indian math-prodigy Srinivasa Ramanujan or “Good Will Hunting” about a young self-taught math-genius displaying behavioral problems.

What is there to this representation? Is it just Hollywood that gives us this opinion about portrayal of mathematicians? Or is there more to it? And above all: is it the mathematics that drives mad, or is it the madman who is attracted to math?

Author of “Infinite Jest” David Foster Wallace who himself studied logic, philosophy and maths states in “A Compact History of Infinity”: “The cases of great mathematicians with mental illness have enormous resonance for modern pop writers and filmmakers. This has to do mostly with the writers'/directors' own prejudices and receptivities, which in turn are functions of what you could call our era's particular archetypal template.” Wallace himself suffered from depression during his whole short life and committed suicide with 42 years of age.

First of all, one has to remark that some of the movies about mathematicians are actually biographical. For example, it is true according to today's experts that Alan Turing actually had most likely Asperger's syndrome. And also Nash suffering from schizophrenia is based on a true story. Thus, insanity is or was at least among some of the most important mathematicians of all centuries.

But maybe the depiction of mathematicians in movies just focusses on biographies, that are more interesting than the ones of mentally healthy mathematicians? After all, these are the more interesting stories and the ones that confirm our prejudices. And besides, shooting a film about maths describing mathematical themes in correct but easy terms is difficult and boring, at least more boring than a story about some exciting weirdo that is at the same time a genius. By the way, the weird professor, the mad scientist may also be so popular in cinema as this cliché maybe satisfies mathematically untalented and uninterested people envying the genius’ fame

and intelligence. They are confirmed with their hope that being gifted also has the other side of the coin and that brilliant mathematicians therefore pay the prize of being crazy.

As for the Academy Award winning film “Good Will Hunting”, it actually deviates a bit from the common portrayal of the mad scientist. On one hand Will Hunting has an undiscovered talent for mathematics, but on the other hand he is somehow a normal young person who manages to confront his past and face his future through therapy sessions. A human portrayal of a gifted young person with whose struggles, insecurities and fears many young people can certainly identify. Therefore, “Good Will Hunting” is an exception among films about mathematicians.

Everyone who ever studied math or spent time with a group of mathematicians will have found out that not just the math is often explained wrong in films, but also mathematicians are depicted exaggeratedly eccentric to the point of crazy. Jonathan Farley, math Professor in Harvard, has founded „Hollywood Math and Science Film Consulting” to advise screenwriters on how to portray mathematics realistically in films. The consulting company did it for example very successfully for the crime series „Numb3rs“. But what about the portrayal of the mathematicians themselves?

According to Wallace there is a bit of dynamic: “It goes without saying that these templates change over time. The Mentally Ill Mathematician seems now in some ways to be what the Knight Errant, Mortified Saint, Tortured Artist, and Mad Scientist have been for other eras: sort of our Prometheus, the one who goes to forbidden places and returns with gifts we all can use but he alone pays for.”

But may there actually be an increased percentage of mental illness among mathematicians? If one begins to research and collect, one would like to think that one actually finds many cases of mathematicians that have suffered at some point of their lives of paranoia, schizophrenia or depression and sometimes have even killed themselves. Besides Nash or Turing there are Newton, who according to the latest findings certainly suffered from a bipolar disorder, Grothendieck who retired in his forties to spend the rest of his life isolated in the Pyrenees after revolutionizing geometry in the fifties and sixties and Cantor, creator of set theory and most probably also bipolar. The list can be continued with statistician Nightingale, probably bipolar too and logician Gödel who developed the paranoid idea that someone wanted to poison him and finally starved himself to death when his wife was hospitalized and could not pretaste his food for some months. Or we can even go back to Pythagoras who was convinced that all numbers were rational. The Pythagorean community named after him forbade anyone to claim otherwise. According to legend, when a brotherhood’s follower presented a proof of the irrationality of the root of two, he was drowned.

The mad genius best known today among mathematicians may be Grigori Perelman who has solved the Millennium problem of the Poincaré Conjecture but rejected both Fields Medal and Clay Millennium Prize worth one million dollars. He shuns publicity and lives with his mother. Maybe the idea for a new Oscar-winning biopic?

“I would not dare to say that there is a direct relation between mathematics and madness,” said John Nash, “but there is no doubt that great mathematicians suffer from maniacal characteristics, delirium and symptoms of schizophrenia.”

There are yet few studies about the connection between mental insanity and the ability of doing maths. But already Seneca is supposed to have said: "There has never been a great mind without admixture of madness" Is he right? In fact, there are many examples that seem to confirm the

assumption that there is and has always been a relation between creativity and mental health. Maths can be seen in some way as a combination, an interaction, between creativity and an analytical, scientific way of thinking.

So, the biographical investigation of mathematicians seems to verify Seneca's assumption. And now also genetics may do:

In 2001 Jon L. Karlsson published his paper "Relation of mathematical ability to psychosis in Iceland". A study that reveals that mathematically gifted Icelanders actually have an increased risk of mental illness and that also their relatives are more likely to suffer from psychotic disorders, two to three times more than expected on average. Much to the chagrin of Catherine, the protagonist in the film "Proof" mentioned above who may have really inherited the insanity of her father.

Biographical research and studies seem to confirm what Hollywood tells us in its movies. But what could be the reason?

To answer this question, one must go into further detail in the topic of brain research. Several important psychologists have stated a hypothesis concerning this matter. Exceptional creativity and therefore also brilliance in mathematics may result from the inability of the brain to filter out seemingly irrelevant information. This lack of adequate amount of filter may also lead to disordered thought, as it happens for psychotic persons whose filters mostly fail completely when the disease breaks out. "Somewhere between the rigidity of everyday consciousness and disinhibited madness must lie the optimum of filtering power that enables creative achievement," concluded psychologist Hans Eysenck in the nineties. In later studies the correlation between higher creativity and reduced latent inhibition was confirmed. The transition is fluid between a stadium of psychosis and high creative productivity as the possible awareness of more information can provide associations between unrelated concepts.

But this may not be sufficient to explain the brain of a "mad genius": cognitive control and high intelligence must also be present. "There are abnormalities of the brain that, when they co-exist with certain cognitive strengths, allow visionary thought to occur," says psychologist Shelley Carson, professor at Harvard.

Psychologists are therefore particularly concerned with persons with autistic traits. You may have seen "Rain man" – another film about a mathematically gifted person who is actually an autistic person incapable of living on his own.

Thus, autist equals good mathematician? Or is a gifted mathematician always an autistic person? Not really. The special case of the protagonist of "Rain man" is really rare. He belongs to the so-called "Savants" who are capable of extraordinary achievements like really fast calculations, but otherwise incapable of social relationships or a normal life.

The „Rain man" example is pretty rare, but there is a group of autists with whom communication is possible and who are strongly represented among the highly gifted: people with Asperger's syndrome.

Psychologists assume that among mathematical geniuses there are some that both lie inside the autism spectrum and have a high probability of becoming psychotic, thus, have reduced latent inhibition. They are highly creative and hyperintelligent. "True genius in any field of endeavor [may rely on] a mind that is not merely more or less balanced between autistic and psychotic but actually represents an overdevelopment of both," postulates sociologist Christopher

Badcock. The other way round, such traits may provide when encouraging the right interest a prototype of the mad genius – a genius mathematician.

One can conclude that one cannot say one hundred percent whether madness and mathematics go together. There are many cases that speak against it and again many that strengthen this hypothesis. But it can be said that to solve a mathematical problem, to tackle it at all, requires a certain degree of obsession and urge and more even if you actually manage to succeed with it. To quote the mathematician Andrew Wiles: “Pure mathematicians just love to try unsolved problems – they love a challenge.” Madness?! Depends on the definition.

Somehow Nash himself admitted that: “Rationality of thought imposes a limit on a person’s concept of his relation to the cosmos” and that his return to a normal mental state was in some way detrimental to his occupation with unsolved problems.

And even if it does not always have to be madness that leads us to the result of a mathematical problem, the occupation with itself often makes us drift into other dimensions that can make us think of madness for the non-initiated. Many mathematicians experience thereby a degree of distraction that lets them forget the reality around themselves. For topologist Witold Hurewicz his obsession with such a problem even led to death when he fell off a Mayan pyramid in Mexico in a moment of inattention.