

Round Table
Shaping the 21st Century
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Public perception of Mathematics as we enter the new millenium

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I shall begin with the Chicago scene which I know best. When I came to Chicago, some 30 plus years ago, the city prided itself on its hard-nosed pragmatism, on the great flamboyant gangsters of its past - such as Al Capone - . Chicago believed first and foremost in the accumulation of power and money. In other cities, in other countries, in Europe for instance, in Israel, academic pursuits, and Mathematics in particular, enjoyed a certain prestige. In Chicago, the life of the mind, the Sciences and Mathematics in particular, were relegated to the Ivory Tower, were tolerated as a piece of exotica.

And yet it was in this same city of Chicago, "the coarse and cunning city" as the poets call it, that the legendary Marshall Stone was hired as Chairman of the Mathematics Department at the University of Chicago and was given Carte Blanche to recruit – in the aftermath of World War II -. He was able to build up in the 40's and 50's the most spectacular Mathematics Department in the country and probably in the whole world. The cast of characters included: Adrian Albert, Shiing S. Chern, Irving Kaplansky, Saunders Mac Lane, Irving Segal, Andre Weil, Antoni Zygmund, later Alberto Calderon. The latter two, Zygmund and Calderon went on to work together and to create a school, the Chicago School of Analysis, now famous the world over. And yet outside lay the great City of Chicago, completely oblivious and indifferent to the mathematical wonders of Eckhart Hall.

Many years passed. In the 1980's the computer revolution started. The Internet, the World Wide Web gradually became household words. Revolutionary new technologies were introduced and the economy became global. The public at large in the United States and elsewhere became increasingly aware that without Mathematics none of this would have been possible.

And then, in the last decade of the century a spectacular mathematical breakthrough occurred. In 1994, to be exact, Andrew Wiles of Princeton University proved Fermat's Last Theorem. This problem had tantalized the best mathematical minds for more than 350 years. Pierre de Fermat, as is well known, lived in the South of France in the 17th century. This was a time when Europe was emerging from the Dark Ages and Mathematics was not regarded as a respectable, noble profession. Those who were interested in Mathematics per se, as opposed to keeping books, accounting, did their work in secret. Fermat in the daytime worked as a judge in the service of Loius XIV, but at night he devoted himself to his real, clandestine passion : Number Theory.

It is interesting to note that Andrew Wiles also kept his work secret, for entirely different reasons : he feared that others might make fun of him, or worse beat him to it.

He also wanted to be able to concentrate on his work totally, without any distractions. After 8 years of intense work, Andrew Wiles finally slayed the dragon: he solved one of the most famous problems in Number Theory. My husband Alberto Calderon and I were visiting Gottingen University in June 1997, when Andrew Wiles came to town to be awarded the Wolfskehl Prize. The whole city of Gottingen - not just the University – was galvanized by the event. Perhaps that was to be expected in a small university city like Gottingen steeped in academic tradition and basking in the glory of the mathematical giants of its past: Gauss, Riemann, Hilbert, etc.

What was much more amazing to see was the reaction of the press in the United States and elsewhere and the extent to which Andrew Wiles' accomplishment captured the imagination of the general public. Almost overnight Andrew Wiles became a star, with all the trappings of the celebrity status. According to reports in Time Magazine, he made the list of the "25 most intriguing people of the year " in People Magazine. The Gap chain-store asked him to model jeans (but could not persuade him to do so). Barbara Walters – the television Anchorwoman – wanted to interview him on her TV show. In other words Andrew Wiles became a hero of popular culture, the man of the hour.

A Math mania without precedent started. This Math mania even reached the high fashion sector. According to Time Magazine again, Fendi, the Italian high fashion designer, declaring in Pidgin English that "a Woman is theorem which cannot be solved" introduced its Theorema line of enigmatic fragrance, body lotion and bath gel.

The Technology Revolution certainly played a major role. (The quotes below are all from the New York Times). "The World Wide Web, e-mail, cellular phones have been around long enough to saturate public consciousness, yet are still new enough to feel like magic; you don't have to be able to explain them to use them or be impressed by their prevalence". Perhaps also the public got tired of lowbrow entertainment and news that only tickled the senses without stimulating the brains. Be that as it may, when Andrew Wiles produced his spectacular breakthrough, the climate was ready for the educated public and even for popular culture in the United States to embrace mathematics and the sciences. Suddenly, "the high-minded mysteries of science, became, shall we say, hip".

Books on Mathematics and Mathematicians appeared and made the best-seller lists in the United states and elsewhere. There was "Fermat's Enigma" (by Simon Singh, 1997) – an enchanting book that tells the full Fermat story

including the history and the mathematics that go with it -. The book is an elaboration of the documentary film on Fermat's Last Theorem that aired on Public Television's "Nova " series in the U.S. There was the book "A Beautiful Mind" (by Silvia Nasar, 1998) the tale of a schizophrenic mathematical economist who overcomes his illness and wins the Nobel Prize – that was the story of John Nash, of course. There were not one but two engaging and informative books on that most peripatetic and beloved mathematician, Paul Erdos : One was called "The Man Who Loved Only Numbers" (by Paul Hoffman, 1998), the other one was called "My Brain Is Open" (by Bruce Schechter, 1998). There was the romantically colorful Fictional Biography of Evariste Galois called "The French Mathematician" (by Tom Petsinis, 1998), etc.

And then there were actual novels, in the literary sense of the word, written by professional mathematicians, on mathematical themes. They reveal the inner workings of the mathematician's mind, in search of truth and beauty, and they convey the enthusiasm, the passion and the drama that Mathematics inspires, thus building bridges between the Humanities and the Sciences. One of the most acclaimed such novels is "Uncle Petros and the Goldbach Conjecture" (by Apostolos Doxiadis, originally in Greek, 1992; in English translation 1998).

Hollywood was quick to acknowledge the new trend, by producing movies about mathematicians, such as "Good Will Hunting", and "pi". The last bastion to be conquered was the stage. But as the New York Times proclaimed at the beginning of June, 2000 : Science is Finding a Home Onstage.

The play that caused a real sensation first in London, then in New York, was "Copenhagen". This play resurrects two of the great physicists of the century, Niels Bohr and Werner Heisenberg, and gives an imaginative account of their mysterious encounter in September 1941, in Nazi occupied Copenhagen. Considering that the play has to do with (the quotes below are again from the New York Times) "nuclear fission, the making of the atom bomb and such esoteric concepts as the uncertainty principle and complementarity – which are the fundamentals of quantum physics" – and considering also that it is heavy in scientific jargon, the success of the play is remarkable indeed. But the play is also "about friendship, personal loss, patriotism and the gravest of moral responsibilities. In Copenhagen, Mr. Frayn (the author) used the character of Bohr's wife, Margrethe, a highly intelligent woman but not a world-class physicist, as an intermediary between her husband and Heisenberg and in some ways as a stand-in for the audience. To include her in their conversations, they have to explain things they would silently assume with each other".

But it turns out that "Copenhagen" was not an isolated phenomenon. Indeed it appears there has been a fantastic proliferation of plays on science and scientists this season, on Broadway and off. Among these there are at least 4 plays dealing with Mathematics and Mathematicians.

The play "Hypatia" (by Mac Wellman) celebrates the life and death of the 5th century woman mathematician and philosopher who lived in Alexandria.

There is the acclaimed play "Proof" (by David Auburn) about a University of Chicago mathematician of genius who goes crazy in his later years and about his very gifted and tormented daughter who has inherited the father's genes, mathematical and otherwise.

And unbelievable as this may seem, there is a new musical also called "Proof" (by Joshua Rosenblum and Joanne Sydney Lesser), whose protagonist is none other than Andrew Wiles, the hero of Fermat's Last Theorem.

It seems that, in the United States at least, the public is more aware of Mathematics and Mathematicians now, than it has been in the past. I understand this is much less the case in Europe. But it would be a mistake to assume that Mathematics has made it into the mainstream of public consciousness. If the Mathematician is no longer thought of as a nerd, or geek, or mad scientist, it is because the public image of the Mathematician has softened. Still the Mathematician is regarded - albeit endearingly - as an esoteric, harmless, creature, living in a mysterious world of its own. In other words, things are looking up, but we have a long way to go.