A Mathematician with No Job and No Home — Paul Erdős

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“Mathematics is the surest way to immortality. If you make a big discovery in mathematics, you will be remembered.”

Hungarian-born Paul Erdős (1913–1996) was a legendary mathematician of the 20th century. He is famous for having published more research papers than anyone since Euler. Both of his parents used to teach mathematics.

At 16, his father made him familiar with two of his lifetime favorite subjects; set theory and infinite series. Erdős always remembered his parents with great affection and love. At 17, he started university in Budapest then he left for the

US during the pre-war years. At 20, he was successful in constructing an elegant proof of famous Bertrand's postulate in number theory. It stated, "for every number greater than 1, there always exists at least one prime between it and it's double".

His work spread across many fields including discrete mathematics, graph theory, mathematical analysis, approximation theory, set theory, and probability theory. He contributed mainly to the branch of combinatorics known as the Ramsey theory. Much of his research centered around cracking formerly unsolved and open problems of the field, rather than constructing new areas in mathematics.

He was born with outstanding mathematical capabilities. As a teenager, he could square 4-digit numbers in his brain and knew 37 different ways to prove the Pythagorean theorem. He could even calculate in his head, the number of seconds a person lived given the age of that person.

His biographer — Paul Hoffman recorded in his book named "The Man Who Loved Only Numbers" of him as:

"... a true eccentric — a "mathematical monk" who lived out of a pair of suitcases, dressed in tattered suits, and gave away almost all the money he earned, keeping just enough to sustain his meager lifestyle; a hopeless bachelor who was extremely (perhaps abnormally) devoted to his mother and never learned to cook or even boil his own water for tea; and a fanatic workaholic who routinely put in nineteen-hour days, sleeping only a few hours a night."

According to him, Erdős had his own idiosyncratic language and own meaning of life; to him, women were bosses, men slaves, he used to say when one is married one's captured when divorced one's liberated, if one is giving a lecture he would say one is preaching if one would stop doing mathematics he'd assume one is dead if one is really dead he'd say one's left.

He used to work non-stop, almost 19 hours a day, 7 days a week. He was known to use drugs (amphetamines) and stimulators to keep himself awake and active.

One of his friends once bet him about not consuming the stimulators for one month. Erdős proved to him that he was able to take the bet and succeeded. When he arrived to collect his reward, he told his friend, "You've shown me I'm not an addict. But I didn't get any work done. I'd get up in the morning and stare at a blank piece of paper. I'd have no ideas, just like an ordinary person. You've set mathematics back a month."

After fulfilling the bet, Erdős immediately restarted satisfying his addiction. This time he boosted it up with shots of strong espresso and caffeine pills. "A mathematician," he famously used to say, "is a machine for turning coffee into theorems."

He expressed his love towards the subject in his following famous quote:

“In a way, mathematics is the only infinite human activity. It is conceivable that humanity could eventually learn everything in physics or biology. But humanity certainly won’t ever be able to find out everything in mathematics, because the subject is infinite. Numbers themselves are infinite. That’s why mathematics is really my only interest.”

Erdős numbers

Erdős always liked working in intense collaborations with other fellow mathematicians, for that reason he used to travel around the globe seeking innovative and fresh talent. He’d sometimes stay in colleagues’ homes while they worked on some serious problems together. He had over five hundred collaborators that some network called Erdős number was introduced by mathematicians.

The Erdős number described the “collaborative distance” between Paul Erdős and the other person, as measured from the authorship of mathematical papers. For example, Erdős number one corresponds with the person who has published a paper with Erdős and Erdős number two with the one who has published a paper with the collaborator of Erdős, and the list goes on.

Mathematicians happily bragged about their association with Erdős by citing their ‘’Erdős number’’. For example, a renowned Indian mathematician Srinivasa Ramanujan has an Erdős number of only 3 (through G. H. Hardy, Erdős number 2), even though Paul Erdős was only 7 years old when Ramanujan died.

The American Mathematical Society provides a free online tool to determine the Erdős number of every mathematical author listed in the Mathematical Reviews catalog.
The collaboration graph

As per one of his colleagues:

“… he only needed three hours of sleep. He’d get up early and write letters, mathematical letters. He’d sleep downstairs. The first time he stayed, the clock was set wrong. It said 7:00, but it was really 4:30 A.M. He thought we should be up working, so he turned on the TV full blast. Later, when he knew me better, he’d come up at some early hour and tap on the bedroom door. “Ralph, do you exist?” He’d want to work from 8:00 A.M. until 1:30 A.M. Sure we’d break for short meals but we’d write on napkins and talk math the whole time. He’d stay a week or two and you’d collapse at the end.”

His crazy number of research papers

His number of research papers even beat Leonhard Euler. Erdős published more than 1,500 mathematical papers during his lifetime with his collaborators, a figure that remains unsurpassed.

His highest number of publications goes to the year 1978 when he published forty-nine research papers at the age of 65. Moreover, he published 118 papers in his 80s.

His material belongings

Erdős had no time for material aspects of life. He thought of property as a waste. He had no home and no possessions. His only assets included his two suitcases. His colleagues looked after him, bought him food, clothes, etc, and even paid his taxes. In return, he showers upon them mathematical ideas and amazing solutions.

He would sometimes go door to door, knocked on his colleague's doors, and said “my brain is open”, which meant, hit me with the most challenging mathematical problems.

He was so forgetful in real life, he used to misplace and lose his wallet, his glasses, his passport, etc very often.

His mystical thoughts

Dr. Erdős, like many other mathematicians, was confident that mathematical truths are always discovered and not invented. He had a very impressive way of delivering that opinion. He said that the most elegant proofs of every mathematical theorem are documented by God in his “Great Book” in the sky. He once jokingly mentioned that if he could just have a glimpse of that book, he would be able to discover much more.

Although he was an agnostic atheist, he had a visualization of that special “Book”, as if God had jotted down the best and most ingenious proofs for mathematical problems.

Death

His death was so sudden that it happened while he was attending a conference in Warsaw. The circumstances were very close to the way he wanted to die. He once said,

“I want to be giving a lecture, finishing up an important proof on the blackboard, when someone in the audience shouts out, ‘What about the general case?’. I’ll turn to the audience and smile, ‘I’ll leave that to the next generation,’ and then I’ll keel over”.

— Paul Erdős, Math & Mathematicians: The History of Math Discoveries Around the World

Ernst Strauss, his collaborator paid him tribute in very gentle words as “In our century, in which mathematics is so strongly dominated by ‘theory doctors’, he has remained the prince of problem solvers and the absolute monarch of problem posers. Dr. Erdős is ‘’the Euler of our time.’’

His grave is located next to his parents in Budapest.

Dr. Graham, with Erdős number 1, mentioned, he had given away most of the money he has earned from mathematical conferences, to help poor students, or as prize money for solving problems, he had posed. Erdős left behind only $25,000 when he died. Dr. Graham said, he had plans to consult his

collaborators about how to give the money away for the sake of mathematics. He was never married and hence left no immediate survivors.

“When asked why numbers are beautiful, he answered: “It’s like asking why is Ludwig van Beethoven’s Ninth Symphony beautiful. If you don’t see why someone can’t tell you. I know numbers are beautiful. If they aren’t beautiful, nothing is.”

His life was documented in the movie N is a Number: A Portrait of Paul Erdős, released while he was still alive.

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