

Srinivasa Ramanujan: A Genius Mathematician Since Antiquity

Mahesh S Wavare

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur, Maharashtra, India

Abstract: *Srinivasa Ramanujan the Fellow of Royal Society (22 December 1887 - 26 April 1920) turned into an Indian Mathematician, with nearly no formal education in Pure Mathematics, made tremendous contributions to Mathematical Analysis, Number Theory, Infinite Series, and Continued Fractions. Even if he does not have larger access in mathematics, he contributed lot and his work made other to work more in respective field of Mathematics. In this paper his early life, relations with his mother, wife and G. H. Hardy have been discussed.*

Keywords: Srinivasa Ramanujan, G H Hardy, Janaki Ammal, National Mathematics Day

1. Introduction

The peculiar British mathematician G. H. Hardy is known for his successes in number theory and mathematical analysis. But he is even better known for his adoption and mentoring of Indian mathematical genius, Srinivasa Ramanujan who born and brought up with his self-taught and self-motivated nature. He was born on December 22, 1887. In spite of having received no formal education, this genius made unprecedented contributions to mathematical concepts such as mathematical analysis, infinite series, continued fractions, and number theory. In 1916 he was awarded a Bachelor of Science Degree for contribution in the field of composite numbers. He got a Fellow of Royal Society during 1918. He suffered from tuberculosis and vitamin deficiency and had to return to India in 1919. Due to poor health he died early. The Indian Government honors this great genius by observing his 125-birth anniversary day, December 22 as National Mathematics Day from 2012.

2. Early Life of Srinivasa Ramanujan

The mother of Ramanujan i. e., Komalatammalgaves birth to Srinivasa Ramanujan on 22 December 1887 at Erode, the place of his grandmother. This place is located towards southwest of Chennai around 400km away. It was K. Srinivasa Iyengar and Komalatammal whose names he was named after. She used to call him Chinnaswamy. When Ramanujan was around one year old his mother took him to Kumbakonam (160 km from Chennai), at where his father worked as Clerk at in a cloth merchant's shop. At age of two years, he contracted smallpox. As a child, Ramanujan was very emotional, stubborn and arbitrary in nature. Ramanujan did not speak much till he was 3 years old, so his mother became very worried about him. He would eat in the temple in the village, but if he was allowed to eat in other places, he would not eat, and if he wanted something and did not get it, he would always roll on the dirt floor. Ramanujan always gets 100 marks out of 100 in Mathematics. The funny thing is that he completed his primary school course in just two years. He entered high school at the age of 7 years. Another things of Ramanujan was that he used to go to the temple as a quiet place to solve math's problems and there sleep on the cold floor. He used to interpret dreams and make note of problems that he got in dreams. Ramanujan was influenced

by his mother. Ramanujan's mother used to sing very melodious hymns in the temple. Ramanujan used to go to the temple with her. As she was interested in many topics, she used to discuss many topics with Ramanujan. Therefore, Ramanujan has more conservation with his mother. As he regularly went to the temple with his mother, Ramanujan had great faith in Goddess Nammagiri. Ramanujan has very much faith in Goddess Nammagiri of which he always gives Mathematics knowledge credits to Nammagiri devi. He attended several schools during his childhood career. At the age of five years old, he got admitted for primary education in Kumbakonam. Later he entered in Town High School in Kumbakonam in January 1898. At this school Ramanujan shows his scholarly in all subjects. But after two years of study in this Town High school he started studying Mathematics subject only. While studying mathematics he proved how to solve cubic equation in 1902 and found his own method to solve quartic equation. During 1903, although he was not knowing that the quintic could not be solved by radicals but he tried to solve the quintic and fails to solve. He Conduct the tuitions for higher educational students at his home. He was much more influenced by the book of G S Carr entitled Synopsis of elementary results in pure mathematics which was published during 1886. Due to continue deep research he could found Euler's constant upto 15 decimal places from the series $\sum \frac{1}{n^2}$ in 1904. Due more devotion in Mathematics and neglecting other subject, his scholarship which was given by Government College in Kumbakonam could not continue. So, his financial situation became dire and, without telling his parents, he fled to Vizagapatnam, 650 km north of Madras.

3. Ramanujan and Janaki Ammal

In order to reduce the child's craze for mathematics and to improve it, his parents finally decided that he should get married. So as result of this at the age of 22, Ramanujan got married. His wife Janaki was only nine years old at the time of marriage. Janaki was born on March 21, 1899. During her childhood, Janaki grew up near Marudur Railway Station near her parents, Rangaswamy Iyengar and Ranganayaki Ammal. Ramanujans mother, Komalathammal, was friends with Janak's mother, Rangaswamy Iyengar. Komalathammal visits regularly the place of Ranganayaki

Ammal where she saw a nine year old Janaki and negotiated with the parents of Janaki to get Janaki married to her son Ramanujan. The marriage took place on July 14, 1909 and Ramanujan's father was not present at the wedding. After the wedding, Komalathammal brought Janaki and her son to Kumbakonam. The young bride soon returned to her parents and they reunited in 1912, after Ramanujan got a job at the Madras Port Trust. In George Town, the couple lived at Saiva Muthaiah Mudali Street. When Ramanujan joined the University of Madras as its first research scholar in May 1913, he first moved to Hanumantharayan Koil Street for about 10 months, then to Toppu Venkatachala Mudali Street, both in Triplicane. Ramanujan's mother and wife lived with him for some months before he left for England on March 17, 1914. Ramanujan was alone in England almost for five years. Later there he got ill and was treated for tuberculosis. Eventually after world war over he came back to India in April 1919. Janaki joined him in Madras and nursed him till his untimely death on April 26, 1920. During those months, the household was run by Ramanujan's mother Komalathammal and grandmother Rangammal.

In later years, after Ramanujan's death, Janaki changed into glad to state and says,

"I taken into consideration it my desirable fortune to offer him rice, lemon juice, butter milk, etc., at normal durations and to offer fomentation to his legs and chest whilst he mentioned pain. The vessels used then for getting ready warm water are on my own nevertheless with me; those remind me frequently of these days".

Mrs. Janaki ammam Ramanujan, the spouse of Srinivasa Ramanujan, acclaimed because the best Mathematician of this century, breathed her closing at the morning of April 13, 1994, at her residence (14, Hanumantharayan Koil Street, Triplicane, Chennai-six hundred 005), on the age of 94.

4. Ramanujan and Hardy

In 1911, a research paper by Ramanujan was published in the journal of the Indian Mathematical Society. At the same time, his professor Sheshu Iyer suggested that Ramanujan write to Hardy, a mathematician at Cambridge University. Because Hardy was a great mathematician. Ramanujan read Hardy's article on "Orders of Infinity". Later he realized that Hardy will understand his work and so he wrote a letter to Hardy as per suggestions made by his professor.

Ramanujan's letter fell on Hardy's table and Ramanujan's fortunes changed. Hardy did not immediately open the letter from India. But then someday he opened it and when he opened it he saw a lot of formulas and theorems in it, everything was messy. Some of them were proven but some of them were not. But at the beginning of this letter, Ramanujan was told to find a formula that would allow him to find the prime number, which aroused the curiosity of Hardy, because at this stage Hardy was thinking a lot about Riemann Zeta functions. Hardy and Littlewood discussed a lot on Ramanujan's work and later both realized the work of Ramanujan and decided to call him in England.

Hardy was only one who recognized Ramanujan's geniusness, and brought him to Cambridge University, and was his friend and mentor for many years. The two collaborated on many mathematical problems, although the Riemann Hypothesis continued to resist even their joint efforts. One famous number $i. e. 1729$ is known as Taxi Cab Number or Hardy-Ramanujan Number. Hardy lived on for a few 27 years after Ramanujan's death, to the ripe antique age of 70. When requested in an interview what his best contribution to arithmetic became, Hardy unhesitatingly responded that it became the invention of Ramanujan, or even referred to as their collaboration "**the one romantic incident in my life**". However, Hardy too have become depressed later in existence and tried suicide with the aid of using an overdose at one point. Some have blamed the Riemann Hypothesis for Ramanujan and Hardy's instabilities, giving it something of the recognition of a curse.

5. As a Fellow of Royal Society

The Royal Society is a self-governing Fellowship made up of the most eminent scientists, engineers and technologists from the UK and the Commonwealth. Fellows and Foreign Members are elected for life through a peer review process on the basis of excellence in science. It was around that time that Hardy had proposed the name of Ramanujan to be elected as the Fellow of the prestigious Royal Society, first ever Indian scientist that too at a very young age of 30.

6. About his Lost Notebook

After Ramanujan died on April 26, 1920, on the age of 32, his spouse gave his notebooks to the University of Madras. On August 30, 1923, the registrar Francis Drewsbury dispatched a great deal of this material to G. H. Hardy, Ramanujan's mentor at Trinity College, wherein he possibly acquired the manuscripts of the misplaced notebook. Sometime between 1934 and 1947, Hardy probably passed the notebook on to G. N. Watson, who with B. M. Wilson started on the project of editing Ramanujan's notebooks. However, Wilson died in 1935 and Watson seems to have lost interest in the project in the late 1930s. After Watson's death in 1965, J. M. Whittaker examined Watson's papers (which were a complete mess, due to be incinerated in a few days) and found Ramanujan's notebook, which he and R. A. Rankin sent to Trinity College Wren library on December 26, 1968. George Andrews (1986, section 1.5), following a suggestion by Lucy Slater, found the lost notebook in the spring of 1976 while on a visit to Trinity College. It was published on December 22, 1987, by Narosa publishing house.

7. National Mathematics Day

In 2012 Indian Stamp on Srinivasa Ramanujan were introduced. The Indian government announced that 22 December to be National Mathematics Day. It was introduced by Prime Minister Manmohan Singh on 26 December 2011 at Madras University, to mark the 125th birth anniversary of the Indian mathematician Srinivasa Ramanujan. On this occasion Prime Minister Manmohan

Singh also announced that 2012 would be celebrated as the National Mathematics Year. Since then, India's National Mathematics Day is renowned on 22 December every year with numerous educational events held at schools and universities throughout the country. In 2017, the day's significance was enhanced by the opening of the Ramanujan Math Park in Kuppam, in Chittoor, Andhra Pradesh. National Mathematics Day is celebrated in all schools and universities throughout the country.

8. Commemorating a genius

To get an outline of the prodigy's existence, head to the House of Ramanujan Mathematics, located interior Srinivasa Ramanujan Centre (SRC), an associate campus of the Thanjavur-primarily based totally Shanmugha Arts, Science, Technology and Research Academy (SASTRA) Deemed University in Kumbakonam. Inaugurated in 2002, the museum has archival fabric associated with the mathematician's private existence and correspondence among the Indian and British pupils who helped nurture his talent.

"There are many ways in which we could honour Ramanujan today," says V Swaminathan, Assistant professor, Department of Mathematics, SRC, who takes visitors around the museum. "We have thousands of results in his notebooks, which we in India could do more to prove, so that the world will be forced to look at Indian mathematics again."

The annual SASTRA Srinivasa Ramanujan award carries a citation of \$10,000 for outstanding research in the areas influenced by the mathematician. It is open to scholars worldwide, under the age of 32.

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