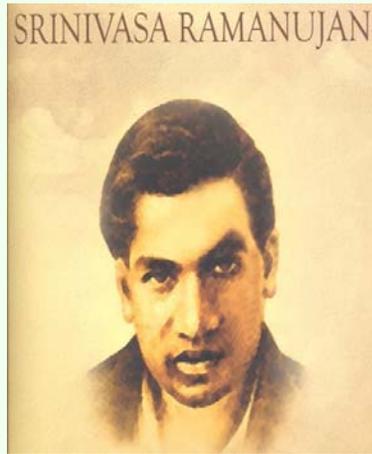


Srinivasa Ramanujan



(22nd December 1887 - 26th April, 1920)

Srinivasa Ramanujan Iyengar, the greatest mathematical genius produced in India in the modern times, was born on Thursday, the 22nd December 1887, at Erode near Kumbakonam in Tamil Nadu. He had his early education in Kumbakonam, the Prayag of the South, for it is the only place in South where a Mahamakham (a function resembling the Kumbh Mela) is held once in 12 years.

Ramanujan had earned a name for mathematical ability even as a child. He had read Loney's Trigonometry while he was still a student of the 8th class. Around this time he came across Carr's Synopsis of elementary results in pure and applied mathematics published in 1880 by an Englishman named Carr, a teacher in London. The book contained the statements of about 6,000 (6165 to be precise) results in various branches of mathematics. This book had a profound influence on the subsequent development of Ramanujan because the book contained only results and had no proofs. The proofs were worked out by him independently.

He passed his matriculation examination at Kumbakonam at the age of 16 and secured junior Subramanyam Scholarship for further study at the Government college at Kumbakonam. He was so much engrossed in mathematics that he hardly paid any attention to any other subject with the result that he failed in English at the first examination and lost the scholarship. This made him leave Kumbakonam for Madras, where he appeared at the first examination in arts in December 1906. As luck would have it, he failed and never attempted to pass this examination again. He spent the next few years studying mathematics independently. On the 14th July 1909 he got married to Janaki and it became necessary for him to search for some permanent employment for he had to support himself and also his wife. Consequently, Ramanujan was constantly in search of a job.

When we pause to reflect on Ramanujan's life, we see that there were certain events that seemingly were necessary in order that Ramanujan and his mathematics be brought to posterity. One of these was V. Ramaswami Aiyar's founding of the Indian Mathematical Society (IMS) in 1907, for had he not founded the Indian Mathematical Society, then the next necessary episode, namely Ramanujan's meeting with Ramaswami Aiyar at his office in 1910 would not have taken place, Ramaswami Aiyar was then a Deputy Collector in the services of the then Madras Province. Before joining the post of a Deputy Collector, Ramaswami Aiyar was a Lecturer of Mathematics in the Maharaja College of Mysore.

The only recommendation Ramanujan had with him was his notebooks containing several new results proved by him in various topics of Mathematics. A scrutiny of the entries in the notebooks was sufficient to convince Ramaswami Aiyar that Ramanujan was a gifted mathematician.

Ramaswami Aiyar sent Ramanujan back to Madras (Chennai) with a letter of introduction to P. V. Sheshu Aiyar, then at the Presidency College. Sheshu Aiyar (who had known Ramanujan as his student at the Government College, Kumbakonam, when he himself was working there as a Lecturer of Mathematics) met Ramanujan after a gap of few years. He was greatly impressed with the contents of the notebooks.

Sheshu Aiyar gave Ramanujan a note of recommendation to the lover of mathematics, Dewan Bahadur R. Ramachandra Rao, who was then the District Collector of Nellore. Ramachandra Rao was also highly impressed by the original results proved by Ramanujan in various topics of mathematics. The best description of Ramanujan's first meeting with Diwan Bahadur is in his own words: "A short uncouth figure, stout, unshaved, not overclean, with one conspicuous feature – shining eyes – walked in with a frayed notebook under his arm. He was miserably poor. I asked him what he wanted. He said he wanted a pittance to live on so that he might pursue his researches."

Ramachandra Rao was so much impressed by Ramanujan that he supported him for some time, but Ramanujan was not willing to live on somebody's help indefinitely. He also tried to obtain some scholarship but without success.

Later on he got a job of a clerk in the office of the Madras Port Trust.

While at the Port Trust he received encouragement from the manager of the Port Trust, S. Narayana Iyer (also the Treasurer of the IMS) and Sir Francis Spring, Chairman of the Trust. There were several other people as well who were highly impressed by Ramanujan's capabilities. These included Sir Gilbert Walker, Director General of Observatories in Simla who was on a visit to Madras. Sir Gilbert wrote a letter to Francis Didsbury, the then Registrar of the University of Madras recommending him to provide a place to Ramanujan in the University for a few years before he could be sent to England for higher studies. Walker's letter had the desired effect. The Madras University granted him a scholarship of Rs. 75/- per month for two years. This was communicated to him in a letter dated the 9th April 1911. He was granted leave for two years by the Port Trust and with effect from the 1st May, 1913 Ramanujan joined the University at Madras as the first research scholar of University (It is only befitting that the Government of India set up the Ramanujan Institute of Advanced Study in Mathematics in the early fifties and the Institute is now synonymous with the

Department of Mathematics of Madras University.)

Sheshu Aiyar also communicated the earliest contributions of Ramanujan to the Journal of the Indian Mathematical Society in the form of questions. These appeared in 1911. Ramanujan proposed in all 59 questions or solutions to the questions in this Journal. The first fifteen page article entitled "Some properties of Bernoulli numbers" appeared in the same volume of the Journal.

On the suggestion of Sheshu Aiyar, Ramanujan wrote to Professor G.H. Hardy at Cambridge. His letter to Hardy dated January 16, 1913 ran as follows:-

“Dear Sir,

I beg to introduce myself to you as a clerk in the Accounts Department of the Port Trust office at Madras on a salary of only Rs. 20 per annum. I am now about 23 years of age. I have had no university education but I have undergone the ordinary school course. After leaving school I have been employing the spare time at my disposal to work at Mathematics. I have not trodden through the conventional regular course which is followed in a University course but I am striking out a new path for myself. I have made a special investigation of divergent series in general and the results I get are termed by the local mathematicians as ‘startling’.

I would request you to go through the enclosed papers. Being poor, if you are convinced that there is anything of value, I would like to have my theorems published. I have not given the actual investigations not the expressions that I get but I have indicated the lines on which I proceed. Being inexperienced, I would very highly value any advice you give me. Requesting to be excused for the trouble I give you, I remain, Dear Sir, Yours truly
S. Ramanujan”

Alongwith this letter he enclosed about 120 theorems. Hardy took pains to go through the results sent by Ramanujan and congratulated him at his work. Hardy sent him an invitation to come to England. On the 17th March 1914, Ramanujan sailed for England. After 27 days of journey on the ship, he reached England where he was welcomed by Professor E.H. Neville whom he had already met at Madras. On the 18th of April 1914 he joined as a research scholar on an annual scholarship of 250 pounds.

In 1916 Ramanujan was awarded the B. A. degree of the University of Cambridge on the basis of his research work. While in England Ramanujan was honoured in several ways. In 1918 he was the first mathematician whose name was accepted for Fellowship of the Royal Society at the first proposal. In the same year he was elected a Fellow of the Trinity College, Cambridge. He was the first Indian to have been so elected. Ramanujan lived in England for five years. These were the most fruitful years of his life. He collaborated with Hardy and Littlewood to produce some of the most outstanding work. In 1917 Ramanujan fell ill and had to be admitted to a nursing home. The cold climate of Cambridge did not suit him. The illness grew from bad to worse and it was decided in 1919 that he should be sent back to India where the warm climate might help in his recovery. But

alas, that was not to be! He arrived in Madras on the 2nd April, 1919 and passed away a year later, on the 26th April 1920 at Chetpet near Madras. Even on his death bed he devoted himself completely to Mathematics and produced research work of the highest order, a glimpse of which he communicated in his last letter to Hardy, but most of it remained unnoticed till it was discovered accidentally by George Andrews in 1976.

During the last quarter of the present century, there have been many admirers of Ramanujan, of whom three American mathematicians – Professor George Andrews of University of Pennsylvania, Professor Bruce Berndt of the University of Illinois, Urbana, Illinois and Professor Richard Askey of the University of Wisconsin, Madison, Wisconsin, stand out head and shoulders above the rest. Through their enthusiasm, determination and Herculean efforts, each in his own way, they have succeeded in giving a fresh impetus to work in the areas which were of interest to Ramanujan.

Professor George Andrews, a student of Prof. H. Rademacher, wrote his Ph.D. thesis on η -functions. During the summer of 1976, Andrews while looking through the old papers of the late Prof. G. N. Watson accidentally came across some 140 sheets in Ramanujan's own handwriting and containing some 600 formulae. This was the work that Ramanujan did in the last year of his life after returning to India. Andrews has since then been working on them and has written extensively on the material contained therein. But for Andrews this important work might never have seen the light of the day.

Richard Askey paid his tribute to Ramanujan in a very different way. It was Askey's enthusiasm and effort which was solely responsible for requesting Paul Garlund, sculptor at Gustavus Adolphus College at Saint Peter, Minnesota, USA to prepare a bronze bust of Ramanujan. The seven busts commissioned are at: Mrs. Ramanujan's residence, Madras; Raman Research Institute, Bangalore; Department of Defence, Government of India, New Delhi; Tata Institute of Fundamental Research, Bombay; Trinity College, Cambridge; Askeys, Madison (Wisconsin) USA; and Chandrashekar, Chicago, USA.

Paul Erdos has passed on to us Hardy's personal ratings of mathematicians. Suppose that we rate mathematicians on the basis of pure talent on a scale from 0 to 100. Hardy gave himself a score of 25, Littlewood 30, Hilbert 80 and Ramanujan 100.

So long as our planet continues to exist in the Universe, and so long as civilization exists on our planet, Ramanujan will be remembered because of the outstanding research contributions made by him to Number Theory and Analysis, because his work has kept first rate mathematicians busy till this date, because his work has had a tremendous influence on modern mathematics and has opened up new vistas for research, but also because he was able to do so without any formal training, without any means of support, and more so because he continued to produce work of the highest order even in the face of death.