The mathematical genius

RAMANUJAN, LETTERS AND COMMENTARY
By Bruce C Berndt and Robert A Rankin
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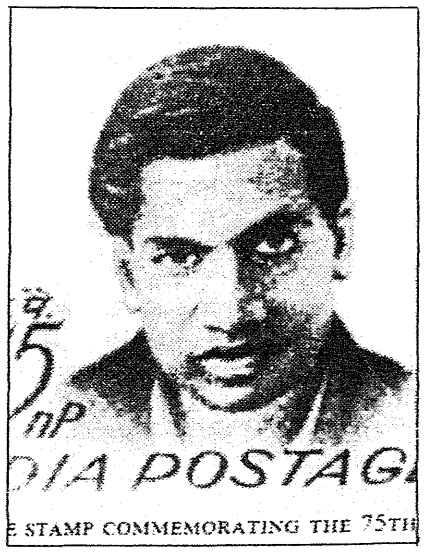
THE Arab philosopher Djahiz (late 9th century, 869) calls the numerals "Figures of Hind" and observes that with these numerals, large numbers can be represented with great facility. He asks "'Who is the inventor of the figure of Hind"? Nearly a hundred years later, the Arab historian Al Mesudi (943) writes "A congress of sages at the command of the creator Brahma invented the nine figures and also their (the Hindu) astronomy and sciences. In the present day cultural environment this statement can be taken lightly but a little serious thought points out to the fact that it required something more than intelligence to have invented the nine numerals. In other words, I would like to say such insight required intuition beyond knowledge. This intuition springs from a resonance between intellectual pursuit and our internal mental powers. Drawing a line between the 10th century and 20th century, one finds a similar question confronting the intellectuals in this country in the early part of this century. This was the phenomena of Ramanujan. How did he discover numerous results in various fields of Mathematics? He had no teachers and no books. Western thoughts in these fields had not even been disseminated in the country. Everything had to be discovered *ab-initio*.

The answer to this question is not easy. There are several books written by eminent mathematicians about Ramanujan's life and work which give some understanding of Ramanujan's mathematics and genius. Bruce C Berndt and Robert A Rankin have gone a step further in the attempt to understand the genius of Ramanujan by presenting to the reader, a complete collection of letters, many of which have never been published before, written to, from and about Ramanujan with extensive commentaries which are both mathematical and cultural. The authors discuss in detail, the history and influence, upto the present day of each mathematical result in the letters. This is especially important for the correspondence between Ramanujan and Hardy as this contains much fascinating mathematics. *In addition to the letters, the collection also* includes some newspaper articles published during Ramanujan's lifetime, office memos, medical reports, and jottings from a family diary.

The illustrations in the book consist of photographs of Ramanujan, his family, colleagues and of buildings associated with him. The Indian edition has an additional section which includes photographs of the bust of Ramanujan and a picture of the temple dedicated to goddess Saraswathi with a sculpted bust of Ramanujan on the *gopuram*. The temple is located in the campus of the Birla Institute of Technology and Science, Pilani. I am sure very few of us in India know about this! The letters have been painstakingly collected from all possible sources and are classified into groups covering various stages of Ramanujan's life. The first one goes back to the time in Madras when Ramanujan had to apply and almost beg for a job as a clerk at the Madras Post Trust Office. This job, with a steady income, provided him some leisure time to pursue mathematics. His work in mathematics made him well known to professors of various colleges in Madras and the Chairman of the Port Trust, Sir Francis Spring who took interest in Ramanujan's mathematical abilities. The letters from Sir Spring to *mathematicans in the University of London* introduced Ramanujan to well known mathematicians "back home".

While in Madras Ramanujan came across the work of G H Hardy at Cambridge and wrote *him two letters one on January 16, 1913 and* the second on 27 February in reply to Hardy's letter of 8 February; these two letters are the most famous letters in the history of mathematics. These and other letters introduced Ramanujan and his remarkable theorems to the world and stimulated much research in the 1920's and 1930's. Hardy was excited at his discovery of Srinivas Ramanujan. This excitement is reflected in the passage of a letter written by Bertrend Russell to Lady Ottoline Morrell from Cambridge "In Hall I found Hardy, and Littlewood in a state of wild excitement because they believe they have discovered a second Newton, a Hindu clerk in Madras on 20 pounds a year... I am quite excited hearing of it". Hardy's elaborate correspondence to various offices in Madras and Cambridge finally brought Ramanujan to Cambridge in 1914. The beautiful and everlasting friendship between these two most eminent



mathematicians of that period resulted in extensive contribution to the mathematics research.

By mid 1917, Ramanujan's health deteriorated and he was rarely out of nursing homes. His several long letters to Hardy with extensive mathematics show that inspite of his illness he worked and published papers in collaboration with him. In one letter from a nursing home, Ramanujan writes to Hardy, that room was never heated but he found that bathrooms are nice and warm. "I shall go to the bathroom with pen and paper every day for about an hour or so and send you two or three papers very soon". He did keep his promise. Some of his letters, though, reflect the difficulties he faced in getting a proper diet on account of his being a strict vegetarian. In 1918 he was elected as a Fellow of the Royal Society and in the same year as a Fellow of Trinity College, Cambridge.

Ramanujan returned to India in March 1919, perhaps to return to England shortly. But, as destiny would have it, he passed away on 27th April, 1920. Upon his return to India, the newspapers, *Madras Mail* and *Madras Times* published extensive articles on his life. From 1919-1920 he was ill but busy with his mathematics. *His last letter to Hardy was written on 12 January*, 1920 and for almost 60 years after this date, the only information available about Ramanujan's work in his last year was contained in this letter. It is now known that the results Ramanujan described in this letter are *part of a much longer collection now well* known as the "lost note books".

Hardy had to write several letters to colleagues both from India and abroad for collection of material and funds to publish the collected works of Ramanujan. Correspondence between Nobel Laureate astrophysicist S Chandrasekhar, and Hardy regarding the partrait of Ramanujan indicate the keen interest Chandrasekhar showed in this matter.

A family record of Ramanujan and an extensive list of nearly three hundred references form the last part of the book. Berndt and Rankin have put in immense effort in bringing out such a valuable book.

This book, in times to come is sure to get the epithet of a classic.

Chanchal Uberoi

DECCAN HERALD (SUNDAY) [illegible]