Srinivasa Ramanujan: A Mathematical Genius

S Natarajan

Srinivasa Ramanujan: A Mathematical Genius
K Srinivasa Rao
Eastwest Books (Madras) Pvt.Ltd., Chennai,1998. pp.232, Price Rs. 175.

Truly great men and women in any field of human activity are products of Nature – Life's longing to express itself. Ordinary mortals like us may keep searching for the right adjective in a dictionary but they transcend all such glorifications. Srinivasa Ramanujan[1] was one such in the field of mathematics. Born in an orthodox Hindu family in 1887 in the southern part of India, he showed unusual aptitude for discovering properties of numbers even during his school days. As he grew up, his interest in mathematics grew exponentially and his senior friends were amazed at his ability to solve their problems easily. By the time he was in college, he got so much absorbed in mathematics that he neglected study of other subjects and consequently failed his examinations. But still, properties of prime numbers, continued fractions, infinite series and elliptic integrals continued to pour out of his mind and filled longsized notebooks. The story of his struggle to get a job, his letters to G H Hardy in England containing his new theorems, his subsequent visit to England and collaborative work with Hardy leading to his becoming a Fellow of the Royal Society and of Trinity College and his return to India due to ill health and his passing away in 1920 – all within a short span of about ten years – has now been told by many, notably by Robert Kanigel[1] (reviewed in *Resonance*, Vol.1, No.12, 1996).

Ramanujan had noted down his discoveries made before going to England in three *Notebooks*, but he did not stop to get them ready for publication while in England. Much of the mathematical work of Ramanujan done in England had been published in various journals and later (in 1927) in one volume entitled *Collected Papers of Srinivasa Ramanujan* edited by Hardy. To prove the results contained in the *Notebooks* proved difficult even for Hardy who is quoted to have said [2,p.56] that it took him several weeks to work out one chapter of Ramanujan's *Notebooks* – the one on Hypergeometric Series – and get it ready for publication; if he were to edit the entire *Notebook*, it would take the whole of his lifetime and he would not be able to do his own work. Hardy gave a series of lectures on subjects suggested by Ramanujan's life and works at different places during the years 1936–1940 and published them in book form in 1940. Apart from these, very little seems to have been done during 1920 –1960 in the matter of exposition and exploration of Ramanujan's mathematics. Maybe, the developments in various branches of mathematics – like set theory, measure theory and probability theory, topology, Hilbert and

[1] The month of December in 1998 will witness the 111th birthday of Ramanujan.

Banach space theory had become highly attractive and the best mathematical minds turned away from the classical type of pure mathematics that had inspired Ramanujan.

There has been a revival of interest in Ramanujan's life and works since 1960. In 1962, the 75th birth anniversary year, the Government of India issued a postage stamp in honour of Ramanujan. Making use of this publicity, an ardent mathematics teacher, P K Srinivasan at Chennai, with unbounded optimism and enthusiasm, undertook to collect and preserve letters sent to and written by Ramanujan still available with friends and relatives (especially his wife and brother) and also to collect reminiscences about Ramanujan from them. These were published in 1968; in the meantime the biography by S R Ranganathan [2] also appeared. During the seventies, research work on topics related to Ramanujan's contributions progressed well and so revived interest in his unedited *Notebooks*. Bruce C Berndt at the University of Illinois took upon himself the formidable task of editing the *Notebooks* with proofs and references during the eighties; this work is now complete and has appeared in five volumes under the title: *Ramanujan's Notebooks*. In 1976, G F Andrews discovered another manuscript of about one hundred pages in the estate of G N Watson who must have got it from Hardy. This is called the *Lost Notebook* and it will be edited and published with proofs by G E Andrews and Bruce C Berndt in the near future (cf.p.69 of the book under review). The earlier *Notebooks* as well as this *Lost Notebook* are available in facsimile edition published by Narosa Publishing Co. New Delhi.

The book under review gives a cross-section of various developments in India and abroad related to perpetuating the memory of Ramanujan. The role played by the renowned astrophysicist S Chandrasekhar in the founding of Ramanujan Institute of Mathematics in Chennai (which became part of the University of Madras later) and the stupendous efforts of P K Srinivasan in establishing a fitting Memorial for Ramanujan, which has so far resulted only in establishing a museum in Chennai are described in detail. Complete list of all documents related to Ramanujan available in the Wren Library of Trinity College (most of which have been reproduced in Berndt and Rankin's book[3]) and in the National Archives, New Delhi and Tamilnadu Archives, Chennai are provided. A large part of the text is in italics being quotations from other sources; that probably cannot be helped. The author has included his own reviews of the books [1], [2] and [3] and of R P Agarwal's two volumes on *Resonance of Ramanujan's Mathematics* which have appeared elsewhere. This naturally contributes to a lot of repetitive information. All these add up to making the book a useful *collage* rather than a beautiful *vignette* (cf.p.137).

There is a well written chapter giving glimpses of Ramanujan's mathematics at the level of college students; the discussion on Hypergeometric Series (pp.111–119) could fit in well

in this chapter. Ramanujan's τ-function is defined on page 71 and some of its properties are mentioned. A conjecture of Ramanujan on its order of growth defied proof for a very long time. In 1974, P Deligne proved the Weil conjectures regarding the congruence zeta function for algebraic varieties over finite fields proposed by A Weil in 1949, for which Deligne was awarded the Fields medal in 1978. Ramanujan's conjecture on the τ-function followed as a corollary to the results of Deligne. It would therefore be misleading, as has been done on p.72, to assert that Deligne was awarded the Fields medal for proving Ramanujan's conjecture!

One unusual item in this book is a section called 'Notes' at the end where a number of mathematical terms are explained and information about various societies, medals, awards etc. are given. One minor correction: International Congress of Mathematicians (ICM) is referred to as International Mathematical Congress.The list of References is adequate, though I would have liked to see item 101: *The Lost Notebook of Srinivasa Ramanujan* among the Principal References with roman numbering. Proof reading of the list of References (pp.209–217) seems to have been done in a hurry; there are quite a few typos here. One usual item that is missing is an Index at the end. It is hoped that the author gets one ready for the Second Edition of this book.

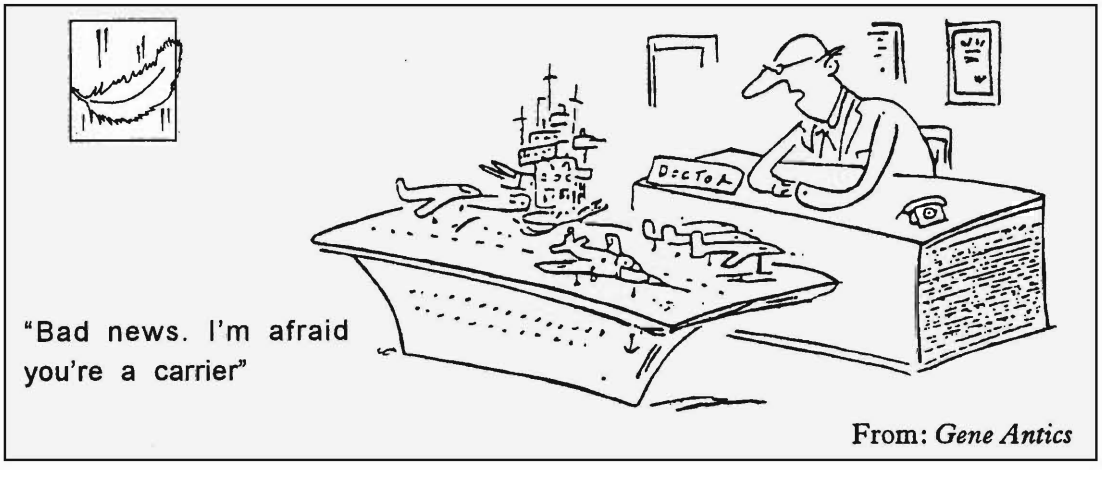
Suggested Reading

[1] Robert Kanigel. *The Man Who Knew Infinity: A life of the Genius Ramanujan*, Charles Scribner's Sons, New York (1991); Indian Edition by Rupa & Co.(1993).

[2] S R Ranganathan. *Ramanujan. The Man and the Mathematician.* Asia Publishing House. 1967.

[3] Bruce C Berndt and Robert A Rankin. Ramanujan: Letters and Commentary, *Amer. Math. Soc. and London Math. Soc.* (1995) Indian Edition by Affiliated East West Press Pvt. Ltd.(1997).

S Natarajan, Indian Statistical Institute, Bangalore 560 059, India.



From: *Gene Antics*