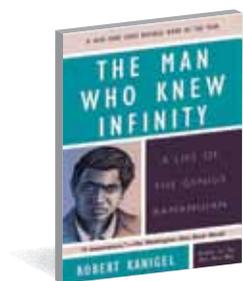


Book Reviews

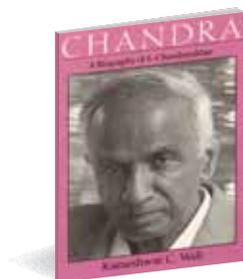
N MUKUNDA

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The Man Who Knew Infinity – A Life of the Genius Ramanujan, by ROBERT KANIGEL; Charles Scribner's New York, 1991; Rupa & Co, Calcutta 1991; 438 pp; Price: Rs. 195.00.



Chandra – A Biography of S. Chandrasekhar, by KAMESHWAR C. WALI; The University of Chicago, 1990; Viking Penguin India, 1991; 341 pp; Price: Rs. 250.00.

Keywords: Ramanujan, S. Chandrashekhar, Kanigel, Wali, Hardy, mathematician, physicist, sociology, beliefs

It is an unusual and irresistible opportunity to be invited by the Editor to jointly review these two recent biographies. Srinivasa Ramanujan, who was born in 1887 and died in 1920, is the most luminous Indian mathematician in centuries. He came upon the scene as suddenly as a meteor and left as suddenly. Subrahmanyam Chandrasekhar – Chandra – is the finest and most accomplished theoretical physicist from India, who has set standards of achievement and style. To write this review is therefore a privilege. It also provides the occasion to look upon the Indian scientific scene, past and present, and to reflect upon several social and psychological issues that are raised by these books.

Both biographies are written in an easy and non-technical style for a wide readership.

The references to mathematics in the one, and to physics in the other, are handled with a light touch. Kanigel's book is definitely journalistic in style. It is very much concerned with social conditions that prevailed in India and in England during Ramanujan's life time. Thanks to the somewhat greater distance in time, from about the last decade of the last century to about the end of the first World War, it is easier to speak of Ramanujan's family and social conditions quite objectively. Overall it reads like a fairy tale. In contrast – and quite understandably – Wali is able to paint a more personal and intimate portrait of Chandra, thanks to direct contact with his subject lasting many years. In this review I will look first at Kanigel's book, then at Wali's, and finally turn to some points of comparison and reflection.

It is appropriate to begin by recalling how Kanigel came to write his book. During 1987, India and the world celebrated Ramanujan's birth centenary. Many seminars and conferences were held – mainly in India and the U.S.A. – to look back upon his life, assess his work, and trace its impact on mathematics over the decades. It was around this time that Kanigel first heard of Ramanujan, when he was approached with the proposition that he write a biography of Ramanujan. The result is this first full-scale life story of the mathematician. It is quite astonishing that in such a short time Kanigel has been able to research and put together

such a detailed, balanced and absorbing account of Ramanujan's life and work. This in spite of the cultural gap he faced in the process. The title chosen by Kanigel is also wonderfully evocative.

I will not describe here in any detail the events of Ramanujan's life. What is more interesting is to see how Kanigel has treated his material, in the process recalling only in broad outline some facts from Ramanujan's life. And then to say something about the several important issues the author raises.

Kanigel's narrative breaks naturally into four parts. It begins with the period of Ramanujan's childhood and early education; exposure to the book by Carr entitled *Synopsis of Elementary Results in Pure and Applied Mathematics*; his experiences and disappointments at college; difficulties in his attempts to secure recognition, understanding, support and employment; till the departure for England in March 1914 by which time many around him had sensed his extraordinary talents and come together to help him. Next Kanigel turns to a brief life sketch of the English mathematician G. H. Hardy, aptly called the "discoverer" of Ramanujan, covering his social background, education, personality and achievements. The third part is in a way the happiest part – the first two years of Ramanujan's stay in Cambridge – the fulfilment of all of Hardy's hopes, and the flowering of the collaboration between the two. Last comes the tragic part – tragic in a manner distinct from Ramanujan's early years – the onset of World War I; its impact on Ramanujan; his illness, breakdown and hospitalisation in the midst of recognition of various kinds; his return to India in 1919; and death in April 1920 while still at the height of his creative powers. The conclusion of the narrative takes up later events – Hardy's and others' assessments of Ramanujan's work; publication of the *Collected Works*; the finding of the "Lost Notebooks" and the rediscovery or rebirth of Ramanujan in recent times, thanks to the devoted efforts of the U.S. mathematicians George Andrews, Richard Askey and Bruce Berndt. Within this broad framework each chapter covers a short period of a few years, building up in rich detail the atmosphere and events of that period.

Kanigel's account of Ramanujan's early years pays great attention to South Indian life and customs characteristic of the time and the social group to which he belonged. There are many references to the river Cauvery and its bounties, which remind one of passages from Hesse's Siddhartha; descriptions of the countryside; and occupations of ordinary people. Family details – a dominating mother completely overshadowing a weak and ineffectual father, death of many of Ramanujan's siblings at very young ages – are recalled. Ramanujan is outstanding in school, and by age thirteen discovers for himself Euler's infinite series expressions for exponential and trigonometric functions. His extreme sensitivity to perceived humiliations also surfaces early – indeed, incidents and behaviour attributable to this aspect of his personality occur often later in the book. The exposure in 1903 to Carr's book becomes a turning point in Ramanujan's life.

One realises, however, that it both stimulated him and limited his growth. Being a logically arranged compendium of some 5000 formulae stated without proof, Ramanujan was led to find proofs for them, extend them and find new results, but record everything in the same style completely omitting derivations. This style, which became his hallmark, was later to cause difficulties. On the other hand, since the mathematics underlying the book stopped at around 1850, Ramanujan was denied access to all later European advances. One cannot help feeling that there is a bittersweet quality to the entire episode. Carr's book became Ramanujan's entry point to mathematics, but also left him "cabined, cribbed, confined".

Total absorption in mathematics leads to neglect of other subjects, failure in college, and loss of scholarship. The celebrated "Notebooks" also start in this period. After an arranged marriage to Janaki in 1909, the need for employment and steady income becomes acute. But all through this troubled period, Ramanujan's self-confidence and belief in his powers remain supreme. Kanigel describes Ramanujan's travels up and down South India, meeting so many people with letters of introduction, seeking recognition and support. Fortune finally smiles when Ramachandra Rao,

Collector of Nellore and Secretary of the Indian Mathematical Society, recognises his genius and begins supporting him so that he may devote all his energies to mathematics. Soon a job at the Madras Port Trust also materialises. In this part of the narrative, Kanigel gives an account of the origin of the Indian Mathematical Society set up in 1906. And Ramanujan's earliest papers start appearing in the Society's Journal. By about 1912, there are many around Ramanujan wanting to help, including the Englishmen Francis Spring, Gilbert Walker, and the Madras University Registrar Francis Dewsbury. But if one had to pick just two, they would have to be Ramachandra Rao and Narayana Iyer, Ramanujan's superior at the Port Trust. Recognition had come, but not comprehension of his work, and with it the realisation that contact with the West was absolutely essential.

At this point Kanigel turns to England and a life sketch of Hardy. In a biography of Ramanujan this has an essential place, and what Kanigel has presented is a special attraction of this book. In social aspects, educational systems, and care and opportunities for the gifted, South India and England are total contrasts. Kanigel highlights the Public School and University systems with their centuries-old traditions, and speaks of both their strengths and weaknesses objectively. We are given an insightful account of Hardy's social and family milieu. Both parents were school teachers, and though they came from modest backgrounds they bred in Hardy and his sister the desire always to excel. He inherited a softness from the father and a sternness from the mother, and grew up into a very private and reserved person. The description of intellectual life in Cambridge; Hardy's crucial role as the leading British mathematician of the era bringing back an appreciation of the Continental values of purity and rigour; and his extraordinary lecturing and writing skills, all make fine reading. One also sees the "other side" of the much vaunted Tripos examinations, and what they had been reduced to by this time.

Readers of this Journal would be interested in the account Kanigel gives of the discovery of the

celebrated Hardy-Weinberg Law of Population Genetics. There are also several historical aspects worth recalling here. The problem concerns the question whether a dominant trait in a given population would proliferate and completely wipe out a recessive one as one progresses from generation to generation. R. C. Punnett, who was editor of this journal from 1910 to 1946, sometimes alone and sometimes with Bateson or Haldane, mentioned to Hardy that there was an argument to this effect, due to one Mr. Udny Yule. However, by a rather elementary mathematical analysis, Hardy was able to show that this would not happen – the ratio of dominant to recessive genes would quickly stabilise and then stay constant from generation to generation. Hardy communicated his results in a letter to the Editor of Science in July 1908, but did not pursue the subject any further. In the same year, independent of Hardy, the German physician Wilhelm Weinberg arrived at the same law, but published it in a comparatively less well known journal. Much later, Curt Stern in a note in Science in February 1943 recalled the entire episode and in particular emphasized that Weinberg had followed up his original work in several directions, which Hardy, had not. It was Stern who suggested that as a matter of justice one should attach the names of both discoverers to the law. This incident also illustrates well the fact that the significance of a mathematical result need have no relation at all to the complexity of the mathematics involved!

Perhaps the high point, the most gripping part of the book is the story of the day in January 1913 when Hardy received Ramanujan's first letter. Kanigel reconstructs the events in great detail, tracing hour by hour the growing impact on Hardy, until late at night Hardy and Littlewood realised they were looking at the work of a mathematician "of altogether exceptional originality and power". Hardy responds appreciatively but stresses the importance of supplying proofs for Ramanujan's numerous claimed results. Thanks to Hardy's prestige and influence, after much negotiation, Madras University rises to the occasion and awards Ramanujan a two-year scholarship to pursue his researches. Hardy's efforts to bring Ramanujan to

Cambridge, however, face much opposition – from Ramanujan himself, more so from his mother. Hardy "solves" the problem by sending his younger colleague E. H. Neville to Madras to speak to Ramanujan on the spot and persuade him to go. The problem is only resolved by a family trip to the Namagiri temple, planned by Narayana Iyer, to seek divine guidance from the family deity – in a manner Hardy would never have understood, and involving psychological aspects Kanigel analyses sympathetically.

The period of adjustment and attendant strains on Ramanujan, upon reaching England in early 1914, are overtaken by happiness in work. Hardy is soon reassured that he had taken the right initiatives. The meeting of two persons with such vastly different backgrounds, training and gifts, their collaboration, the delicacy and care exercised by Hardy in making up for Ramanujan's ignorance of modern advances while protecting his brilliantly intuitive mind – all these make fascinating reading. In time Hardy would declare: "I have never met his equal, and I can compare him only with Euler or Jacobi".

To this happy period and soon after belongs their finest joint work on the theory of partitions. Each with his unique gifts, together they achieved what neither could have done on his own; yet as Kanigel says, Ramanujan was the irreplaceable component in the collaboration! But soon the war commences, devastating life in Cambridge and for Ramanujan too. Privations and lack of proper nourishment build up till Ramanujan's health gives way in early 1916. Here Kanigel finds fault with Hardy for having been blind to Ramanujan's emotional needs, being concerned only with progress in work, and also pushing him unduly hard. There may be truth in this, but it is no easy matter to take sides. Hardy did not pay attention to, never bridged, the cultural gap – each was being true to his own nature. Those aspects of Hindu life which were crucial as sources of sustenance to Ramanujan, as Kanigel says, made little sense to the very British Hardy. Yet through Hardy's efforts Ramanujan won the formal recognition he wanted and richly deserved – Fellowships of the London Mathematical Society, Cambridge Philosophical Society, Royal Society and Trinity College.

Kanigel brings out the pathos of the situation – years of illness and hospitalization, the wasting of a luminous intellect, the effects of loneliness, cut away from his roots, and lack of support from the family, all coupled with the war. The return to India leads to more treatment and diagnoses and movement from place to place, all to no avail. All the while Ramanujan keeps working on his mathematics, while surrounded by family tensions and strife. He finally succumbed on April 26, 1920, aged just over 32.

Of further developments, Kanigel writes about Hardy's later career at Oxford and then back at Cambridge; his lectures at the Harvard Tercentenary in 1936; and the contributions of Watson, Wilson, Askey, Andrews, Berndt and others to the "rediscovery" of Ramanujan. Kanigel also refers to the impact of Ramanujan on contemporary figures like the physicist Freeman Dyson and the mathematician Atle Selberg. There is a good discussion on the roots of creativity contrasting Hardy's and Hadamard's attitudes. While Hadamard acknowledges the roles of unconscious mental activity, intuitive thinking and flashes of inspiration in the creative process, and while to some extent Hardy sympathised, in the end Hardy seemed to believe that there was nothing inexplicable, and indeed was reluctant to speak on the issue.

Kanigel's sympathy for and involvement with Ramanujan shine through the book. With pain we recognise the tensions between his mother and his wife, that hurt Ramanujan so badly. His life and fortunes were often so delicately balanced that they have a razor's edge quality. Maybe Kanigel sometimes gives excessive detail, yet it is good to see what an outsider finds most interesting. In the end, Neville's assessment comes back to us: "Srinivasa Ramanujan was a mathematician so great that his name transcends jealousies, the one superlatively great mathematician whom India has produced in the last thousand years". And seeing how our institutions failed him, we are moved to say that Ramanujan turned out to be the man who knew too much about infinity for the society into which he was born.

Now let me turn to Wali's biography of Chandra. Here the personalities, the times, the social conditions, the fields, and even the backgrounds of the two biographers are all totally different. Yet, as we shall see later on, there are several points of contact which any perceptive reader will surely notice. Chandra has already attained the status of a legend. When the Nobel Prize in Physics for 1983 came to him, at the age of seventy three, it was in a way a recognition of a lifetime of extraordinary achievement in theoretical astrophysics in particular, and theoretical and mathematical physics in general. Just as in mathematics Ramanujan could only be compared to Euler and Jacobi, so here, on the occasion of the award of the Dannie Heinemann Prize in 1974, the citation of the American Physical Society compared Chandra to Lord Rayleigh and Henri Poincaré for the range and depth of his scholarship. It was sometime around 1970 that Wali first thought of writing an account of Chandra's life. There were many obviously unique and unusual aspects to it – initial training in India; a six-year stay in Cambridge in the early 30's immediately following the Golden Age of Theoretical Physics; contacts with so many leading personalities of physics and astrophysics over such a long period of time; and then from 1937 onwards a member of the faculty of the University of Chicago. Wali felt convinced, and rightly so, that a record of so rich a life and so much accomplishment ought to be made. This conviction grew, with a sense of urgency, after Chandra's heart attack and by-pass surgery in 1975. It was in 1977 that Wali formally obtained permission from Chandra to proceed with his plans, and the result is this delightfully written, absorbing and splendid book. Wali is acutely conscious of the difficulties inherent in being biographer to a living person, but he has handled the situation with sensitivity. This is a book written at a personal level, touching only lightly upon technical matters. And the author has capped his effort by a beautiful device – he provides at the end an extended conversation with Chandra, covering both a wide variety of issues and a great span of time.

It is necessary to recapitulate here in barest outline the course of Chandra's career, so that

later comments can be understood in the proper perspective. Chandra was born in October 1910 into a family which had, within a span of two generations, come to value highly academic attainment and scholarship.

Indeed his uncle, C. V. Raman, was later to win in 1930 the Nobel Prize for Physics, for the effect named after him. By the time Chandra completed his undergraduate studies in Madras in 1930, he had already begun independent researches in theoretical astrophysics and published several papers. He was also noticed by and known to the leading Indian physicists at that time. All his formative years in India were spent during the days of British rule; and Wali succeeds in capturing the moods, aspirations and, values of educated Indians of those days extremely well. As Chandra recalls, those were inspiring times for the young in India, thanks to figures like Rabindranath Tagore and C. V. Raman, Ramanujan, S. N. Bose and M. N. Saha, and men like Gandhi and Nehru leading the Independence Movement.

With the aid of a Government scholarship, Chandra went to Cambridge in 1930, planning to work with R. H. Fowler on problems of theoretical astrophysics. Already before leaving India, he had a most fortunate chance to meet the German physicist Arnold Sommerfeld, from whom he learnt of the most recent advances in quantum mechanics and statistics. Based on this and Fowler's earlier work, during the sea voyage to England, Chandra was able to work out the startling consequences of applying the relativistic quantum statistics and degeneracy formula for electrons in the late stages of evolution of massive stars. This led to the famous mass limit named after him, the Chandrasekhar limit of 1.4 solar masses; below and above this limit the evolution of stars follows dramatically different courses. During his stay in Cambridge, leading to the Ph.D. in 1933, and then as a Fellow of Trinity College, he branched into many areas of astrophysics, and steadily built up a world-wide reputation. Among those who influenced him deeply in this period, and who had intimate contact with him, were Fowler, Paul Dirac, Arthur Eddington and Edward Milne. (In passing it is interesting to note

that generally Chandra found no sympathy, among any of these luminaries, for India's freedom). There were also extended visits to Bohr's Institute in Copenhagen and to Gottingen, which greatly increased his circle of contacts.

In particular, the relationship with Eddington is a very peculiar one, carrying all sorts of overtones. During Chandra's continuing researches into the processes of stellar evolution, he had the clear feeling all along that he was being supported and encouraged by Eddington. But the occasion of his final presentation of his results at a January 1935 meeting of the Royal Astronomical Society turned out to be a shattering experience – in a totally unexpected manner, Eddington publicly disagreed with and ridiculed Chandra's results and humiliated him.

Such treatment at the hands of the most distinguished astrophysicist of that time deeply influenced Chandra's attitude to research and manner of working as well. Instead of carrying on a public controversy with Eddington, which would not have led him anywhere, he decided to complete his researches in that area, write them up in a book, and then move on to other things. This he has made into the pattern of his life, devoting his attention in turn to stellar structure, stellar dynamics, radiative transfer, hydrodynamic and hydromagnetic stability, ellipsoidal figures of equilibrium, the general theory of relativity, and the mathematical theory of black holes. To quote Goldberger, during each period "he has produced an infinite series of papers followed by an infinitely thick book on the subject".

After his marriage to Lalitha in 1936, Chandra moved in 1937 to the Yerkes Observatory of the University of Chicago. He has remained with this University ever since, becoming Professor in 1944, and Morton D. Hull Distinguished Service Professor in 1952.

Wali's success in recounting Chandra's story lies in combining the elements of involvement and objectivity to just the right extent. It is this that enables him to trace the development of Chandra's personality, and describe his triumphs and troubles, in so moving and eloquent a manner.

Wali's own background as an Indian-born physicist settled in the U.S.A. makes it possible for him to bring out aspects of Chandra's personality, relationships with people, views on science and scientists in India, in a rather special way. In a sense this is comparable to the American Kanigel, rather than an Indian, writing on Ramanujan from the perspective of a total outsider. There are so many things one learns about Chandra and about many others with whom he interacted, which are sobering, and are worth recall and comment.

It appears that in the early stages of his career Chandra definitely felt that he had begun to work in astrophysics more or less by chance. There was always a strong desire to change over to "mainstream physics", which then meant atomic and nuclear science, and not merely remain in the periphery. Indeed many times he tried to make this change, but for various reasons it never worked out. This was also the period of a feeling of inadequacy and self-doubt. Chandra keenly felt that even being among the most distinguished Indian scientists of the time, such as Raman and Bose and Saha, was nowhere near being in the stimulating environment of Cambridge, in the company of people like Fowler, Eddington and Dirac.

This strong desire to move into the mainstream of physics, and the events following the incident with Eddington, form very interesting material for an analysis into the psychology and sociology of science. In turn Chandra sought help and vindication from such leading figures as Bohr, Dirac, Pauli and Rosenfeld. But while everyone of them agreed privately that Chandra was in the right and Eddington had erred, not one wished to say so publicly. Apparently all these leaders in "mainstream physics" had concluded that Eddington was not to be taken seriously, that he was past his prime. But within the "peripheral field" of astrophysics Eddington's reputation and standing were enormous, and there was no resolution available to Chandra. The whole episode held back the development of the subject, of neutron stars and black holes, by almost half a century. One is reminded of Huxley's well-known remark that "a man of science past sixty does

more harm than good", and is led to believe that sometimes this can happen at a younger age!

Chandra's attitude towards his father is in the Indian tradition – deep respect, a sense of obedience and duty, yet the desire to be left free and alone to follow one's own path. He was also extremely anxious to be, and to appear to be, totally independent of his uncle Raman. This was the advice given to him by his mother (to whom he was very close), and also by his father, at various times. On many occasions we read of Chandra's fears about not being left alone to continue his work, were he to return to India. And his descriptions of events and relationships among many of the leading Indian physicists of those days – the bickering and sniping – the desire of each to be treated and to appear as a prima donna – makes one understand the causes of his fears. While all this makes sad reading, one may hope that the situation is somewhat better today. But here one must remember Chandra's account of a visit to the TIFR in Bombay in 1961 – all he heard was constant criticism of its founder and director Homi Bhabha, not a single good word! In spite of all this, comparing life in India to that in the U.S.A., he would write of the latter: "Life here, in spite of its wholesome climate for my intellectual work, has the quality of distilled water, and I feel curiously desiccated".

All these tales retold make one ponder over such questions as: what should a country such as India provide for its most gifted, and in turn what may it expect from them?

Originally Chandra had gone to Cambridge with a Government scholarship which stipulated that he return and serve the Government for a certain term. Over the years there were many opportunities, many occasions to return; and on every occasion Chandra was under great pressure from his father to do so. But each time something intervened – either the award of the Trinity Fellowship, or the wish to avoid competing with a dear friend, or a three-year position at Yerkes. And in the case of the invitation from Raman to join the Indian Institute of Science, his father advised Chandra by cable to "keep off his orbit". All this

against the constant background of fear of return to an unhelpful environment.

In other countries and at other times, we read of remarkable individuals who showed great sensitivity to the needs of scientists and to the growth of science at the level where it really matters. Thus Constance Reid, in her biography of David Hilbert, speaks of Friedrich Althoff who “was no bureaucrat but an administrator who had been academically trained. His great goal was to build up mathematics in Germany”. Similarly in the Italy of the early 30’s we have “Professor Corbina’s boys” led by Enrico Fermi revitalizing Italian physics. In India, sad to say, since the days of Asutosh Mukherjee in Calcutta in the early part of this century, there have been precious few visionaries of this kind.

In his own long career at the University of Chicago, Chandra was subjected to subtle and not so subtle acts of discrimination on many occasions. These are openly and honestly documented by Wali. But while it is true that Chandra did not allow such events and treatment to distract him from his work, one suspects that the trust he enjoyed in the eyes of the President of the University, Robert M. Hutchins, was a source of much strength to him. What could be more revealing than Hutchins’ 1971 remark: “I have always been proud that I had a part in bringing you to the University of Chicago”.

The years from 1952 to 1971 spent by Chandra as editor of the *Astrophysical Journal* merit an entire chapter in Wali’s book. One is astonished and humbled by this account of total dedication, integrity and self-sacrifice that characterised Chandra’s stewardship of the *Journal* over this long period. Starting from an in-house publication of the University of Chicago, it grew in his hands into the world’s leading journal in the field.

This kind of total dedication and involvement characterise many other aspects of his life and work. His deep aesthetic sense and feel for language are well known among physicists, and they deserve being known more widely. Indeed he deliberately studied the literary styles of writers like Virginia Woolf and T. S. Eliot, in order to

fashion a distinctive style of his own. Sometime ago the theoretical physicist Victor Weisskopf lamented: “It is regrettable that among scientists the presentation of ideas is not as highly valued as the creation of ideas. This is in stark contrast to music, where the performer is a partner equal to the composer”. In recent times, few have done more than Chandra to redress the balance. As Weisskopf says of him: “...His deep education, his humanistic kind of approach to these problems, his knowledge of world literature, and in particular English literature, are outstanding. I mean you’d hardly find (another) physicist or astronomer who is so deeply civilized”; and “Good English style is a lost art in physics, but he has it and this wonderful feeling for the essential, and a feeling for beauty”.

With the passage of time, Chandra has evolved a very personal and detached attitude to achievement and recognition in science. Thus he reveals a deep humility when he says: “One’s place in science, as posterity will duly assign, depends very largely on one’s continuous exertion, at the edge of one’s ability;... I think one could say that a certain modesty towards understanding nature is a precondition to the continued pursuit of science”. Chandra has had a great deal to do directly with preserving Ramanujan’s legacy in recent times. This is a most absorbing part of the conversations at the end of Wali’s book, and supplements Kanigel’s account in important respects. Just as Hardy became the discoverer of Ramanujan, Chandra regards his “discovery” of Ramanujan’s passport photo as one of his most important ones!

Returning finally to what we may learn from Ramanujan and Chandra – in Chandra’s own words, Ramanujan was a giant and rare fluctuation, an event one could hardly be prepared for, though a stronger academic environment would surely have helped. There are no rules to be made in advance to care for such genius. And the only reasonable answer to the question in what sense Ramanujan belonged to India is in Gibran’s words from *The Prophet*: “Your children are not your children. They are the sons and daughters of Life’s longing for itself. They come through you

but not from you, and though they are with you yet they belong not to you. You may give them your love but not your thoughts. For they have their own thoughts. You may house their bodies but not their souls, for their souls dwell in the house of tomorrow, which you cannot visit, not even in your dreams”.

As for Chandra himself, as we recalled, there were several times when he might have returned to India, but it was not to be. In his concluding conversations Chandra admits that if he had come back, and had done only half as much for Indian science as he has done for science in the

U.S.A., the net gain would have been greater. One can only agree with this assessment. Still, while it may be hard indeed to change the sociology of science, the appearance of these two books at this time, the unbelievable story of Ramanujan, and the example of standards and dedication set by Chandra, should surely inspire many. If so, then varying somewhat Chandra’s favourite passage from Virginia Woolf, we may say that that will be our consolation and their triumph.

Centre for Theoretical Studies, Indian Institute of Science Bangalore 560012, India N. MUKUNDA

N MUKUNDA was Professor at IISc , Bangalore from 1972 till 2001; earlier he had worked at TIFR, Mumbai . He has been involved with the science education programmes of the three national science academies for several years.

Solution to number crossword 3

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