

A Biography of Gopalamudram Narayana Ramachandran

The Famous Indian Biophysicist

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Narayana Ramachandran*

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Raghupathy Sarma

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Science has a unique way of distinguishing between ephemeral fame and enduring reputation. Newspapers and popular science magazines glorify the sensations of the moment; textbooks and scientific dictionaries record discoveries of lasting importance. Thus, the Smiling Buddha (and what a smile that was, my countrymen!) is unlikely to be remembered even a few years from now. On the other hand, even after a century or more, practitioners of science will continue to study the Bose (Einstein) statistics, the Raman effect, the Mahalanobis distance, the Chandrasekhar radius – and the Ramachandran plot.

We have been fortunate enough to see the publication, in recent years, of very comprehensive biographies of eminent Indian scientists such as Srinivas Ramanujan, C V Raman and S Chandrashekar. It is only

fitting that this extremely timely and readable biography of G N Ramachandran (GNR to his colleagues, students and admirers), has now been added to this list. The author, Raghupathy Sarma, has successfully portrayed the brilliant scientific career as well as the succession of triumphs and setbacks of his former teacher. The story of GNR is the story of a ceaselessly active mind that even today prefers to be engaged in intense intellectual pursuits.

In terms of lasting scientific contributions originating in post-independence India, GNR can rightly be described as the most accomplished of the Indian scientists. Most textbooks, monographs and research publications dealing with protein conformations and especially the articles reporting newly determined protein structures prominently feature the 'Ramachandran plot'. This simple, powerful and elegant visual representation not only provides (to the initiated) many insights into the secondary structures of proteins but also serves as a quality-control device for evaluating the reliability of the reported crystal structures. This, however, is but one example of the many major contributions he has made to several areas of science, ranging over X-ray crystallography, optics, molecular biophysics, image reconstruction and mathematical logic. More importantly, almost all of this work was carried out entirely in India, and that too against great odds. An account of his struggles and victories is therefore a source of tremendous inspiration.

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Publication of the (eagerly awaited) biography of GNR written by Raghupathy Sarma is thus a very welcome development. However, when I actually saw the book, my immediate reaction was a sense of acute disappointment. Instead of the famous Ramachandran map, the background of the cover page depicted a bizarre map of India showing, of all things, places like Taxila, Hastinapura, Ayodhya, Kasi and Mathura! The publisher's note inside provides an even more weird explanation of the choice – which includes an atrocious analogy involving characters from Mahabharata. The pedestrian beginning of the book (how else can you describe it when the opening line is just a statement of the year of birth!), was therefore a welcome relief. The description of the social and cultural scene of the Southern India of 1920s was somewhat charming though mostly dull – and seemed mildly irrelevant. However, as I reached the part of the book where GNR begins his research under the supervision of Sir C V Raman, the account suddenly became quite fascinating. The sheer volume and range of research projects successfully tackled by GNR, and the level and quality of scientific creativity displayed by him in the brief stint as a graduate student was phenomenal. The author has very ingeniously included the summary of GNR's MSc thesis in the book – and the reader can immediately see why the examiner described it as worthy of at least two PhDs. The next highlight of the book is an enchanting description of the next two decades, spent by GNR under the enlightened

and benevolent reign of Sir A Lakshmanaswamy Mudaliar, the vice-chancellor of Madras University. Thanks to Sir Mudaliar's wholehearted support based on mutual respect, the department of biophysics and crystallography founded and developed by GNR became one of the finest centers in that subject – comparable to those in the best of Western Universities. However, when GNR's discoveries threatened to overshadow those of the established stalwarts in the field, things took a very different turn. What follows next is the most absorbing part of the book where the author has described the roller-coaster ride of dramatic successes and severe setbacks. The announcement of the extremely original and beautiful collagen structure was immediately followed by the infuriating gamesmanship of the competitors and their persistent attempts at denying the credit to GNR. Fortunately, the acute disappointment did not last long. The fightback in response to the unfair criticism of his collagen model led to the development of the stereochemical criterion that provided a rational and quantitative method of judging the validity of biomolecular conformations. This approach eventually produced the celebrated Ramachandran plot. In the two major International Symposia organized at Madras in the 1960s, these as well as other outstanding results (dealing with anomalous dispersion, Fourier synthesis, etc.) were highly appreciated by the international community of eminent scientists.

This golden era, unfortunately, came to a



rude end once Sir A L Mudaliar retired. His successor, with a mindlessly petty attitude, effectively stifled almost all the ongoing research. In fact, running the department itself became an ordeal. GNR, therefore, was forced to move out of Madras. The Indian Institute of Science in Bangalore, fortunately, offered him an opportunity to start a new research program in molecular biophysics (an old and unfashionable name for a topic that is currently being aggressively marketed as the Exciting Discipline of Structural Biology). This transition from Madras to Bangalore began on a very promising note. However, in the long run, it did not seem to have worked out too well. The problem was never with GNR's creativity or productivity – both remained undiminished for the next several decades. Thus, in the early seventies, he pioneered the development of a highly efficient mathematical method for reconstructing the three-dimensional shape of an object from its two-dimensional projections. Unfortunately, for want of adequate support, he could not proceed with the implementation of this idea. Other scientists outside India perfected this technique – which eventually led to the CAT scanners, and a Nobel Prize. Literature on that subject acknowledges GNR's contributions both directly and intentionally by citing his pioneering articles, as well as indirectly and unintentionally by using the notation $G_n(R)$ for the density function that describes the object. The next important project was the mathematical formulation of SYAD-NYAYA, the doctrine of the 'May be', and related ideas that matured

towards the end of 1980s. Work on RAGA, a novel method for determination of crystal structures by modifying the electron density at fixed gridpoints, had also started in the early 1980s, though the pioneering paper was published only in 1990. That none of these projects blossomed into major successes was due to the rather dismal environment. In complete contrast to Sir Mudaliar, the powers-that-be seemed to have a rather patronizing approach towards GNR and the support offered to him was grudging, indifferent and inadequate. The response of peers, colleagues and students to the intense intellectual adventures envisioned by GNR was not as enthusiastic as he had desired. Eventually, he had to continue his work almost entirely on his own. Of course, hindrances like advanced age, failing health and lack of assistance were utterly powerless to stop GNR's research.

The seventy-six Mathphil reports single-handedly authored by him during this ten-year period are a glowing testimony to GNR's intellectual stamina and vitality. This motif of triumph-disappointment-triumph seems to be a hallmark of GNR – the triumph of coming out with yet another important and original contribution; the disappointment stemming from the unwillingness or inability of peers to grasp and recognize its significance. In an astonishing and welcome contrast to this overpowering gloom comes one of the most attractive parts of the book – a collection of no less than twenty-five poems written by Prof. GNR. All of them reflect an optimistic, cheerful and occasionally even a playful mind

– here celebrating Logic, Reason and Knowledge, there gently making fun of experts, and mostly expressing the deep and mysterious ideas of the philosophy of Vedanta with refreshing clarity. The same clarity of thought and expression is seen in the masterly article ‘Biomolecular Conformation: Retrospect and Prospects’ (A Philosophical Review) – written by GNR in 1981 and reproduced in the book.

In fact, the most readable portions of the book are not at all the ones that are written by the author. The direct quotations from GNR, his article, the summary of his MSc thesis, his list of publications, and, above all, the poems stand out from the rest of the text, which is rather banal in most places. The only exception is provided by the technical descriptions of crystallographic matters. The author, Prof. Raghupathy Sarma is a practising protein crystallographer with more than three decades of experience. His account of the intricate details of structure of collagen and of the subtle features of the X-ray diffraction pattern was a pleasure to read.

A critical book-review can sometimes become quite unfair to the author, especially if the reviewer is unaware of the motivation and tribulations of the author. Luckily, I did get an opportunity to listen to the very appealing and moving speech by the author, about why and how this book came to be written. Among many other things, the author pointed out that in his opinion, there are quite a few people who would have produced a much better book – but they did not seem to be willing to undertake this extremely important

task. Having read the book several times, I am happy and grateful that the author intelligently rushed in where others (angels or otherwise) feared to tread.

To say that this must have been an extremely difficult book to write is an understatement. Many of the turbulent events were so multifaceted that they defy any comprehensive description. Moreover, many of the participants of these episodes are also colleagues, friends, potential readers and well-wishers of the biography project – and this book is far too limited in scope to cover their diverse viewpoints and versions. In fact, alternative accounts of some of the events may soon be forthcoming if what transpired during the ceremony of the release of this book becomes a reality. There was an enthusiastic demand for the biography of one of the editors of *Current Science*. This was followed by a wry promise of an autobiography by the other editor. Publication (or even a formal announcement) of these two volumes will naturally be very eagerly awaited.

The strength and weakness of the book under review is that it is written not by a professional writer, but by a scientist. It can be far more easily read and appreciated by crystallographers, structural biologists and their ilk. This is true especially of the earlier chapters, where technical terms like reciprocal lattice, meridional reflection etc. are used extensively and without adequate explanations. The sequence of some of the major chapters is based on themes, and not on strict chronology; this is a little jarring at times. Some of the



non-technical part, especially that dealing with health aspects seems to have been retained merely for completeness, and could easily have been omitted. On the other hand (and this is one of my major complaints), the author has been completely (and inexplicably) silent on his scientific interactions with Prof. GNR. The book would certainly have been richer had the author shared with the readers how it was to work with his research supervisor. Another negative point is the surprisingly large number of minor errors in the book e.g. names spelt wrongly, an incomplete list of students, omission of the brief post-UK stint in Bangalore from the list in the appendix, the not-so-accurate

description of the RAGA method, etc. Lack of adequate time and the author's dependence on numerous other sources were probably responsible for these avoidable lapses. This sloppiness is rather unbecoming for a book on GNR, whose insistence on meticulousness is remembered with awe by all his associates. One hopes that the second edition of the book will take care of these aspects. In summary, a most inspiring and interesting book, a welcome addition to the collection of scientific biographies, and a must-read for all practising and aspiring scientists.

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'Call of Indian Birds' – An Audio Cassette

Lt. General Baljit Singh

On the sixth day of Creation, the Bible tells us that "God saw everything that he had made and, behold, it was very good". And that is how I felt all of the sixty minutes listening to the audio cassette, produced by the *Nature Club*, Surat. After the cassette had played out, I shut my eyes and sat for long, the auditory resonances lingering in the ether around me. Yes, "it was very good".

Several days later, I replayed the cassette, three times over, for an objective assessment of the recording. I am no music aficionado

but I do trust my senses to stimulate me when a quality recording pours out. Of the 58 bird calls recorded there is none of indifferent quality. I place three calls in average recording effect. Balance 55 recordings are of good quality. Sixteen calls have one to three other bird species chirping in the background; no distraction from the main performer, rather lends to a more natural setting. There are thirteen recordings which carry background electronic-hum which is certainly unwelcome. By my judgement twenty six calls recorded are simply flawless. As an added attraction, the wrapper of the cassette doubles as a booklet with very attractive colour illustrations of all the 58 performing birds.

For technically the most perfect sound effect, I would put my money on the call of the

