

Doing Science in India: My Second Innings. G. Padmanaban. IISc Press, Archives and Publications Cell, Indian Institute of Science, Bengaluru 560 012. 2018. 124 pages. Price: Rs 750.

The book under review is somewhat unusual in that it contains the memoirs of a scientist (G. Padmanaban) during a period spanning two decades after formal retirement, that too on activities carried out in the institution in which he began his career as a student and rose to become the Director. In India, it is rare that someone is enabled to carry out active research after retirement. Many of those who managed to remain active after formal retirement, have done so by establishing their own institutions. It is a tribute to the personality of Padmanaban and also to the liberal attitude of the Indian Institute of Science (IISc) that he could do so much for so long after retirement, with the Institute as the base.

Padmanaban has been an icon of Indian science for decades. In addition to being a distinguished scientist, he has been a great mentor, an active promoter of biotechnology in India and someone involved with a great many institutions and organizations. All these aspects are discussed in the book along with his own general observations. The trials and tribulations he went through in pursuing his cherished goals also clearly come through in the memoirs.

The book, which has a foreword by the distinguished biologist Inder Verma and a preface by the author, appropriately starts with a discourse on his role as a mentor. Padmanaban has been a gentle giant among his students, postdoctoral fellows and innumerable colleagues whom he mentored. His approach has

been characterized by compassion and personal involvement with colleagues. He has been an unselfish mentor, and gave his time and expertise freely to whomsoever approached him. Indeed, Padmanaban has demonstrated that excellent science can be produced without creating undue pressure on students and colleagues.

Padmanaban's mentorship was not confined to individuals. He has been involved in mentoring many institutions and programmes. Very few people would have chaired as many committees as Padmanaban has done. That led to the joke that he was probably born in a chair! There are few biological institutions in India untouched by him. He has been involved with almost all scientific departments of the country. Innumerable scientists have been selected to important positions by committees chaired by or involving him. In the programmes piloted by him, BIRAC of the Department of Biotechnology occupies pride of place. Padmanaban's description of the efforts mentioned above is fascinating. He brought to bear his gentle and benevolent touch in all the efforts he was engaged in.

Padmanaban's post-retirement career has not been free from problems. Interpersonal relations among scientists, as indeed among any set of people, are complex. Sometimes, difficulties arise even among best of colleagues and friends due to reasons for which it is difficult to apportion blame. The difficulty Padmanaban has had in access to laboratory space in his own right, caused hardship. It is perhaps important to ensure, particularly in the case of retired scientists, that one has assured access to basic facilities as long as one is active.

Another difficulty that Padmanaban faced, which has been referred to by

Verma in the foreword and has been described in the book, was caused by the anticipated but unrealized extension of the senior scientist position of the Indian National Science Academy. The decision at that time to limit the duration of the position from 5 years to 3 years was taken on account of severe financial constraint. It was not taken lightly and I know personally how much the then President of the Academy agonized over it. Academies are low-cost high-value organizations and they derive their importance from the respect in which they are held. By and large, the concerned administrative department of the Government has ensured that academies are not unduly starved of funds. During the period in which the duration of the position was curtailed, the administrative department itself might have been under severe financial pressure. The budgets of the academies are very low in relation to their utility and prestige. It is important to indemnify these small budget allocations against fluctuations in the policies of the Government.

Padmanaban's engagement with curcumin from turmeric is a story of agony and ecstasy. On sound scientific basis, he is convinced that curcumin is a wonder-drug in waiting. However, an article in *Nature* questioned the health benefits and medicinal value of curcumin. Padmanaban could publish a rejoinder in another journal refuting the arguments in the *Nature* article. However, the credibility we give to views emanating from the West is so high that Padmanaban had difficulty in carrying forward his efforts on curcumin. Yet, he persevered with the work on the compound.

Agony and ecstasy are writ large in his engagement with genetically modified (GM) crops as well. He has been a strong advocate of GM crops, where appropri-



Meeting with C. N. R. Rao and Inder Verma

ate. He had to confront vociferous and often irrational opposition in this regard. It is nobody's case that GM crops are a panacea for problems related to food security. However, it should be a component of the mix. It is a tribute to his sagacity and courage of conviction that Padmanaban stuck to his guns in relation to GM crops despite great opposition from several quarters.

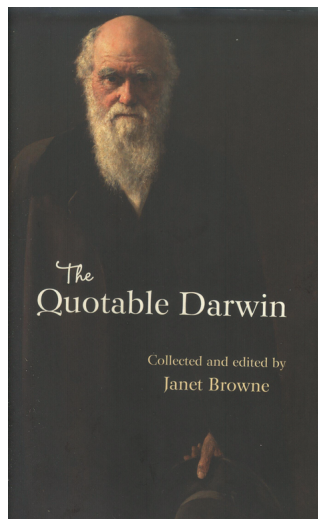
Padmanaban's scientific contributions during his second innings remained very significant. When reading the account given by him in the book, one, however, gets the impression that what satisfied him most during this period was his efforts in promoting biotechnology in India, especially through small entrepreneurs. The success of his efforts was most striking in the health sector. BIRAC was probably the programme which helped him most in this effort. What is remarkable is that Padmanaban remained a simple, quintessential Institute professor in spite of being involved with the corporate sector.

Padmanaban's views on science education, innovation, organizational matters and a host of other issues are distributed in different chapters of the book. Among other things, the description of his relationship with Abdul Kalam makes interesting reading. Happily, Padmanaban has chosen to write about his extended family in the book. The closeness among the family members and the strength it has provided to them, including Padmanaban, are touching. Spirituality and faith are important components of his life and beliefs. He is also a distinguished, rational scientist. It is fascinating to see how these two aspects co-exist in him without any conflict.

I have been, like many others, an admirer of Padmanaban. Reading this book has served to enhance this admiration. He has handled complex scientific facts and simple things in life with equal ease. Clearly, his great achievements and the respect in which he is held by the community, have not affected his innate simplicity and modesty. In this book, Padmanaban comes out as a good man who has accomplished great things. That perhaps aptly describes the person.

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'man che goyam, wasf-e-aan aalee janaab/ neest paighambar wale daarad kitaab'.

The above lines, by the 15th century Sufi and Persian poet Nuruddin Abdurrehman Jami, say 'What can I speak in praise of that exalted one? Though not a prophet, he had a book'. Jami, of course, was referring to Jalaaluddin Rumi, the legendary 13th century Persian poet and mystic, and his epic mystic poem the *Masnavi-e-Ma'anavi*, but what he said so beautifully could equally apply to Charles Darwin, whose book *On the Origin of Species* quite literally transformed our perception of the living world and ourselves as few books have done.

Unfortunately, Darwin has been in the news these past few months in India for the wrong reasons. His views on evolution have been challenged by those who should know better or, at the very least, know whereof to be silent, following the succinct prescription of Wittgenstein's¹ seventh proposition. Yet, the reality is that, today, when we look back at Darwin's remarkable contribution to our understanding of the living world, we are struck by how broadly applicable his basic schema still is, even as advances in biology bring about an increasing appreciation of non-genic forms and modes of inheritance in what is often, and controversially, termed the extended evolutionary synthesis (see for example Laland et al.² and Charlesworth et al.³).

Darwin's fundamental insight, of course, was to link rates of reproduction to success in the ecological 'struggle for existence', and to further note that rates of increase of a type would increase with realized rates of reproduction of that type, provided there was a tendency for offspring to inherit characteristics of their parents. Given these correlations, variant types better suited to survive and reproduce in a given ecological setting would gradually increase in proportion in any population in a manner entirely analogous to how a breeder alters the characteristics of a variety of domesticated plants or animals by selective breeding. This insight was also attained by Wallace around the same time; indeed germs of this notion of 'natural selection' can be found even in the work of the pre-Socratic greek thinker Empedocles in the 5th century BCE, and the Persian polymath Nasiruddin Tusi in the 13th century CE. Darwin, however, developed the basic idea of natural selection and its implications for how we understand the living world to a far broader, deeper and subtler degree than anyone else, including Wallace.

In particular, Darwin collected vast amounts of evidence that showed how observations were entirely consistent with his hypothesis of natural selection. He also extended the concept of selection to explain the evolution of traits that were ornamental in nature, and likely to be detrimental to survival. In addition, he also drew heavily upon the cumulative experience of plant and animal breeders in developing his view of evolution. Finally, he did not shirk from extending this new insight into how characteristics of species changed over time to the evolution of human behaviours and instincts. As is reasonably well known, Darwin was rushed into writing *The Origin of Species* because Wallace had come up with a similar view of evolutionary change via natural selection, although there were subtle but important differences in their conceptions of the units of natural selection, as discussed by Gayon⁴. Darwin had originally been planning a monumental work on the topic of evolution by natural selection and, in some ways, this planned magnum opus finally appeared as four separate books: *The Origin of Species*, *Variation of Animals and Plants under Domestication* (in two volumes), and *The Descent of Man and Selection in Relation to Sex*.