

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.

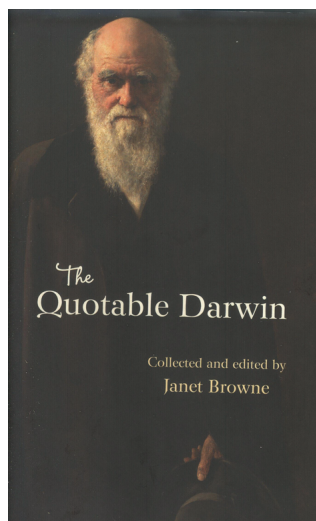
Padmanaban's scientific contributions during his second innings remained very significant. When reading the account given by him in the book, one, however, gets the impression that what satisfied him most during this period was his efforts in promoting biotechnology in India, especially through small 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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The Quotable Darwin. Janet Browne (ed.). Princeton University Press, 41 William Street, Princeton, New Jersey 08540. 2018. xxix + 348 pages. Price: US\$ 24.95/£19.95.

'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.

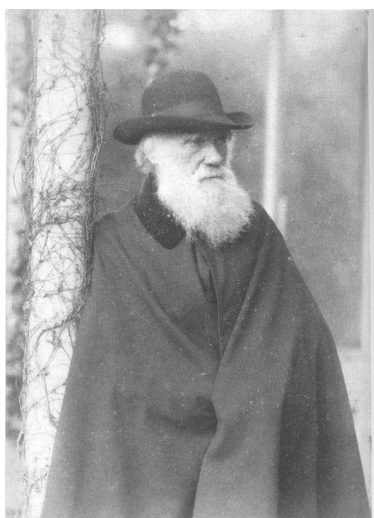
Unfortunately, Darwin has been in the news these past few months in India for the wrong reasons. His views on evolution have been challenged by those who should know better or, at the very least, know whereof to be silent, following the succinct prescription of Wittgenstein's¹ seventh proposition. Yet, 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*.

Among these, the first book mostly deals with the argument for ‘descent with modification’ and the evidence consistent with his evolutionary views, whereas really detailed exposition of selection as the mechanism driving adaptive evolution can be found in the second book. The third book deals with sexual selection and the evolutionary explanations for human behaviour.

Janet Browne’s collection, ‘The Quotable Darwin’ is an interesting but somewhat strange publication. The main body of the book consists of 306 pages of carefully selected quotes from Darwin’s various writings, ranging from working notebooks to letters to books, as well as some quotes from contemporaries and friends. The quotes are collected thematically into six major sections, and the main text is preceded by a brief chronology of major events in Darwin’s life. What this means is that there is no overview to guide the reader through the selection of quotes. Effectively, the book loses much of its charm for a reader who is not already quite familiar with the general events and historical context of Darwin’s life and work. In this sense, this is really an ‘insider’ book that is certainly a most enjoyable read and ready reference for evolutionary biologists and historians of biology, but is unlikely to be of similarly high interest to the general reader. As this book is one among the ‘Quotable...’ series by Princeton University Press, perhaps the format is a nod to the present era of social media dominating the dissemination of information in small postable packets.



Darwin, photograph by Elliott and Fry, c 1881.

One advantage of the format of this book is that it makes for convenient reading in fits and bursts, suitable perhaps for modern life. The more interesting quotes to me – a practising evolutionary biologist – were actually the ones not directly about Darwin’s work. There are a large number of autobiographical notes and observations of nature and humans in distant lands that are of interest to any fan of Darwin. Of particular interest are quotes expressing Darwin’s observations on many of his contemporaries and vice versa. Some quotes by Darwin’s contemporaries who knew him in England or visited him from Europe, like Hugo de Vries and Ernst Haeckel, sketch little word pictures of Darwin that are most interesting to read. Also of considerable interest are the quotes pertaining to religion, through which we get a glimpse into how Darwin slowly abandoned hitherto strongly held Christian beliefs, despite the disapproval of many among his closest family and friends.

Also of great interest are the many quotes reflecting Darwin’s views on science as a venture, and how he came to see scientific investigation as far superior to religious pronouncements as a means of making sense of the world. Also fascinating to read are quotes that set Darwin apart from many of the common prejudices of his time, especially his abhorrence of slavery and the unjust treatment of those considered inferior to Europeans, although in some respects he does echo the times as when he implicitly assumes European civilization to be the pinnacle of human development.

What is missing in this collection are quotes from the second book, which would be particularly relevant to a reader who happened to be an evolutionary biologist, as it was in those two volumes that the concept of natural selection was developed in its richest detail. Other than that this book is an excellent read and, importantly in the present times, a good source of ready quotes that can be posted on social media sites. The book also introduces Darwin the person to the reader, through the many quotes dealing with mundane or personal topics, or his observations of his children. Overall, it is an excellent book for those interested in, and already somewhat familiar with, Darwin and his work. For those who have read Darwin’s technical books, this little volume will be a wonderful complement to their appreciation of one of

the most remarkable figures in the intellectual history of mankind.

1. Wittgenstein, L., *Tractatus Logico-Philosophicus* (transl. Ramsey, F. P. and Ogden, C. K.), Kegan Paul, Trench, Trubner & Co., London, UK, 1922, 1st English edn.
2. Laland, K. N. *et al.*, *Proc. R. Soc. London, Ser. B*, 2015, **282**, 20151019; doi: 10.1098/rspb.2015.1019.
3. Charlesworth, D., Barton, N. H. and Charlesworth, B., *Proc. R. Soc. London, Ser. B*, 2017, **284**, 20162864; doi: 10.1098/rspb.2016.2864.
4. Gayon, J., *Darwinism’s Struggle for Survival*, Cambridge University Press, Cambridge, UK, 1998.

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Annual Review of Pharmacology and Toxicology, 2017. Paul A. Insel *et al.* (eds). Annual Reviews, 4139 El Camino Way, Palo Alto, California 94303-0139, USA. Vol. 57. xiv + 656 pages. Price: US\$ 107.

This is an important and timely collection and presentation of the concepts related to pharmacology and toxicology. It contains several chapters/units, covering a wide spectrum of topics under this subject.

The book gives an insight on major advances resulting from the recent scientific discoveries and applications of the new scientific techniques, experimental tools and approaches, and their impact in the field of basic and clinical research in pharmacology and toxicology. It also highlights the patient care aspects of the above-said practices. The concepts described in this book include: nanobodies to study G protein-coupled receptor structure, strategies to develop inhibitors of motif-mediated protein, aptamers as therapeutics, pharmacology of antisense drugs, targeted protein degradation by