S. Chandrashekhar, Man of Science.
Radhika Ramnath (ed.). HarperCollins
Publishers, A-53, Sector 57, Noida
201 301, India. 2011. xiv + 251 pp. Price:
Rs 499.

'Where the mind is without fear and the
head is held high;
Where knowledge is free;
Where words come out from the depth of
truth;
Where tireless striving stretches its arms
towards perfection;
Where the clear stream of reason has not
lost its way into the dreary desert sand of
dead habit; into the heaven of freedom,
Let me awake.'

Subrahmanyan Chandrashekhar or
Chandra, as he was popularly known
among his peers, quoted the above beau-
tiful prose of Tagore in his address at the
Nobel Foundation[1]. Chandra was a man
of elegance and poise. His love for litera-
ture, arts and science made him unique
amongst his peers. He is remembered as
a great astrophysicist who made seminal
contributions to our understanding of
stellar objects, black holes, white dwarfs
and his remarkable work on Newton's
Principia.

The book under review edited by
Chandra's niece Radhika Ramnath to
mark his birth centenary, complements
other scholarly biographies. In the edi-
tor's note, Ramnath calls this book a col-
lection of Chandras selected writings and
articles to cover the various aspects that
made him a legend. In a foreword, the
former President of India, A. P. J. Abdul
Kalam points out that Chandra, kept in

touch with his family without fail,
though being away from his home coun-
try; a trait that may be valuable in a
globalized world.

This book has been divided into two
parts: a compilation of Chandra's popu-
lar lectures and reminiscences by mem-
bers of his extended family.

Chandra's pursuit of science and his persona

The dictionary defines the word 'pursuit'
as an activity to which one gives time or
effort. However, in words of Chandra,
this word altogether finds more relevance
as he never failed to appreciate the hard
work a scientist puts to make a discov-
ery. There is mention at various occa-
sions and lectures, where Chandra defines
research as a quest after the unknown to
chart territories whose existence we may
not even be aware of when we started[2].

Chandra always wanted to be like
Newton. His early motivation is evident
in the description in this book by his
brother, S. Balakrishnan, of Chandra as a
schoolboy going to the beach to be alone,
and there prostrating himself devoutly on
the sands with the prayer: 'Oh God, may
I be like Newton!'[3] (see pp. 98–112). His
fascination for Newton is reiterated by
Shiv Visvanathan, his nephew in one of
the chapters in the book, mentioning how
much Chandra loved the anecdote by
Newton, in which the latter compares
himself to a child collecting shells on the
seashore, while the whole ocean of
knowledge lay unexplored before him.

Receiving the Nobel Prize from King Carl
XVI Gustaf of Sweden, Stockholm, De-
cember 1983.

The book gives interesting glimpses of
Chandra's personality as revealed in
family reminiscences. Despite his legen-
dary status, Chandra has found a place in
the hearts of the much younger genera-
tions of his family many years after his
demise. One of his nieces, Vasanti Ram
remembers him as a wonderful racon-
teur – a story-teller. For Uma Parames-
waran, he was someone who was a
priority-setter; once Chandra did not take
a phone call as she was sitting with him
(at his University of Chicago office),
unlike many of us who would excuse
ourselves from our visitors and respond
to the phone.

Chandra's desire for getting things
done perfectly and being fastidious is
well projected by V. Chander, who re-
calls, how he was reprimanded by
Chandra for having scribbled on the up-
per corner of his book, showing disre-
spect towards it. According to him,
Chandra was also an avid letter writer,
who in his meticulously neat handwriting
and flawless English tried to keep in touch
with almost everyone in the family.

The racist comment made by President
Hutchison about Chandra, prohibiting
him from delivering lectures at the Uni-
versity of Chicago is a well-known story.
Only people of his stature could have
dealt with it. Chandra's remarks to his
wife, Lalitha when she placed news clip-
pings which carried Hutchinson's racist
comments were: 'there is much to do, do
not bother with this'. And the story of his
survival is described. Similarly, he
stopped working on a problem after it
was outrageously criticized by Edding-
ton, whom he thought very highly of,
withdrawing from the controversy grace-
fully and altogether leaving it. In a poeti-
cally written letter to his sister Malathi
Ramanathan, Chandra explained how
controversies with Eddington had upset
his enthusiasm.

Chandra's devotion towards anything
which he was committed to has been
talked about at great length. Shiv Visva-
nathan tells the tale of Chandra's com-
mitment to teaching, for he drove miles
to teach a class of two students, Chen
Ning Yang and Tsung Dao Lee. Later,
both were bestowed with the Nobel
Prize. There is a mention by his wife
about how Chandra was once moved to
tears for having realized that he had ne-
glected her while being submerged com-
pletely in his duties as the editor of the
Astrophysical Journal[3].

Chandrasekhar with his uncle C. V. Raman, 1951.

D. Ashok, son of Chandra's sister, compares Chandra and C. V. Raman, the nephew and the uncle. He recalls Raman as a dominating personality, while on the other hand, Chandra was soft-spoken, with a mischievous smile while cracking a joke. V. S. Ramesh describes Chandra's reading tips; read the entire book, from cover to cover, almost as if reading a book of fiction.

Chandra believed that discovery was not the finding of an unknown phenomenon, but only bringing to prominence what others have dimly recognized. He had a deep sense of self-motivation. He thought motivation was like brush fire, rather than a raging forest fire; one had to constantly keep lighting the fire. Ramnath also writes about her close association with Chandra and his wife and her last meeting with her uncle.

This book can be read by anyone, be it a pupil of science or a layman who knows nothing about physics. It provides an insight into the man behind the legend.

1. Subramanyan Chandrasekhar – Banquet Speech. The Nobel Foundation; http://www.nobelprize.org/nobel_prizes/physics/laureates/1983/chandrasekhar-speech.html
2. Chandrashekhar, S., *Nature*, **344**, 1990, 285–286.
3. Chandrashekhar, L., In *S. Chandrashekhar: Man Behind the Legend* (ed. Wali, K.), Imperial College Press, London, 1997, pp. 9–16.

MEGHA PRAKASH

(S. Ramaseshan Fellow)
e-mail: prakash.megha@gmail.com
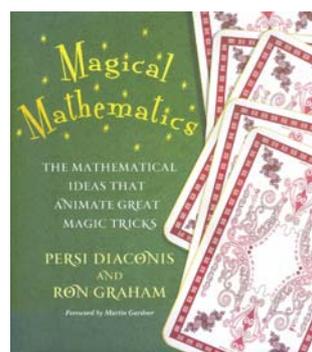
Magical Mathematics: The Mathematical Ideas that Animate Great Magic Tricks. Persi Diaconis and Ron Graham. Princeton University Press, 41 William Street, Princeton, New Jersey 08540, USA. 2012. xii + 244 pp. Price: US$ 29.95.

How many times while watching a magic trick did you feel a logical explanation existed but could not quite put your finger on it? If the answer is more than once, then this is the book for you. Here you have two mathematicians, Ron Graham and Persi Diaconis, each famous in his own field, combinatorics, both pursuing magic with a passion and endowed with the gift of words as well. The product of their collaboration therefore is this book which has all the ingredients needed to make a success of popular scientific writing.

The book explains the mathematics that goes into many card tricks, and it does not stop there. It tackles various scientific aspects underlying tricks of different sorts, for instance, paper-folding and juggling. A concept for a book such as this, exposing the mathematical principles behind magic tricks could suffer from many drawbacks. It could become pedantic if not careful; it could be heavily loaded towards mathematics; when discussing sophisticated mathematics the authors could frighten away those having a fear of mathematics, and so on.

The authors deal with all the above aspects skillfully, both by means of structuring the book as well as leading the reader gently into the subject and concealing the structure in their conversational style, magicians that they are! The book gives equal importance to card tricks as it does to the mathematics behind them. When some of the aspects are not clear on reading, the reader is induced to pick up a pack of cards and try out the tricks, and this leads him/her to figure out the math of the sequences. Starting from simple tricks such as the 'baby Hummer', the authors lead us onto more complex tricks and concepts. Woven into the dialogue are leads to further reading and suggested exercises, some of which, as they point out, are open problems in mathematics.

The de Bruijn sequence, introduced in chapter 2, has many ramifications, as we learn in chapter 3, 'Is this stuff actually good for anything?' – from applications in robotic vision to constructing codes to revealing patterns hidden in DNA strings, the de Bruijn sequence is ubiquitous. Along with learning about established and some speculative mathematical truths in these fields, we also hear some amusing stories. For instance, the authors narrate their experience of working on crypto chips. 'We did our best, designing a complex scheme of sixteen S-boxes with linear de Bruijn sequences in each. To get an export license we had to let a division of the government's spy service test our chip. We passed the test, which means our scheme wasn't really good…' – a wry comment on the times before truly secure cryptic systems were allowed to be used in products sold overseas.

In chapter 4, 'Universal cycles', we are introduced to variations on the methods and tricks explained in chapters 2 and 3. Some of them lead to new tricks and others to new math problems. The concept of Bell cycles is introduced here and tricks that use them: 'For years we have been intrigued by the numerical coincidence $B(5) = 52$…. After brooding about this for years, we finally saw a trick.' And they explain the new trick and how it works. In what follows, they take up k-subsets of n-sets and describe the mysteries in them, for instance, involving the prime factors of $^{2n}C_n$, and the
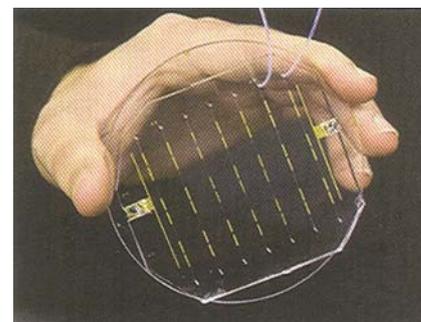
DNA sequencing chip (courtesy of Berkeley Lab, www.lbl.gov).