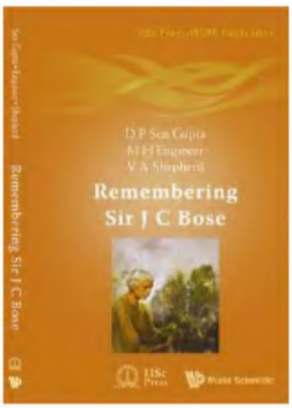


Remembering Sir J. C. Bose. D. P. Sen Gupta, M. H. Engineer and V. A. Shepherd. Indian Institute of Science, Bangalore and World Scientific Publishing Co Pte. Ltd, Singapore. 2009. 169 pp. Price: US$ 45/£ 34.

In November 2008, the Indian Institute of Science, Bangalore, organized a symposium to celebrate the 150th birth anniversary of Sir J. C. Bose. This inspiring book is the outcome of that symposium held under the leadership of P. Balaram. The book is organized into three chapters titled 'Jagdish Chandra Bose: The Man and his Time' by D. P. Sen Gupta, 'The Millennium Wave Researches of J. C. Bose' by M. H. Engineer, and 'Reflections on the many-in-one: J. C. Bose and the roots of plant neurobiology' by V. K. Shepherd. Together, the three chapters provide a glimpse into the vision and work of this scientific genius.

It will be appropriate to begin the review with a quotation from C. N. R. Rao's foreword. 'He is my icon because he created science in India at a time when there was hardly any science. He built instruments when instrumentation was not heard of. He did research on problems related to transmission of radio waves when radios did not exist. He worked on aspects of plant biology which were unknown at that time. Jagdish Chandra Bose is a superb example of a very creative intellectual.' This captures beautifully the significance of J. C. Bose's work, and also his farsighted vision leading to transformational research in fields of great theoretical and applied value.

In his early life, J. C. Bose was helped by a few fortuitous events which shaped his later career. First, Father Lafont, Reader at St Xavier's College, Kolkata, persuaded Bose to study physics. Second, his mother Bamasundari Devi not only encouraged him to proceed to England for higher studies, but also offered to sell her ornaments if required, to meet the cost of foreign education. The turning point is his educational career in the UK, was his winning a scholarship to study in Christ's College, Cambridge. Incidentally, Christ's College organized a symposium during 2009 to commemorate his 150th birth anniversary, when a bust of J. C. Bose was installed in the college premises. I also spoke at this symposium, which was addressed by many leading scientists, who all expressed disappointment that J. C. Bose was not awarded the Nobel Prize for his invention of wireless telegraphy.

D. M. Bose has classified J. C. Bose's research output into three periods. First, ranging from 1894 to 1899, when he produced the shortest of the then possible electromagnetic waves. Second, from 1899 to 1904, when he studied the similarities in the responses of inorganic and organic systems. The final phase lasting until 1937, when he passed away, was largely in the field of electrophysiology, microwaves and plant biology.

The first chapter chronicles several interesting events in Bose's personal and scientific life. The impediments he had to face in his scientific voyage would have made someone with lesser moral and intellectual courage and conviction give up science. To J. C. Bose, however, science was a passion and he was not deterred by the attempts to marginalize him as a scientist in the western world.

Imbibed with the 'we shall overcome' spirit, he continued his research in plant electrophysiology. His friendship with Rabindranath Tagore, based on mutual respect and admiration, was the highlight of his later day life. When Tagore's second daughter fell ill and had breathing difficulties, Bose fabricated an equipment to turn oxygen into ozone (by electric sparks) to help her breathe normally. Bose dedicated his book *Nervous Mechanism in Plants* to 'my lifelong friend Rabindranath Tagore'. Another great admirer of Bose was Romain Rolland, who wrote after their meeting in 1927: 'The life force and the brilliance that this man exuded for about 3 hours we were together bears no comparison. The unbelievable youthfulness of his age, bubbling with the joy of life and capability of thinking, reminded me of Albert Einstein after his glorious discovery'. Bose was elected a Fellow of the Royal Society in May 1920. In 1917, he founded the Bose Institute in Calcutta and delivered an inaugural lecture on 'The voice of life'. In accordance with his commitment to making the fruits of his work available to all he made it a rule that in the Bose Institute, 'no invention should be patented'. There is a comprehensive chronology of the events (1858–1937) connected with Bose at the end of the first chapter.

The second chapter dealing with the 'Millimeter Wave Researches of Bose' written by M. H. Engineer, brings out the unique contributions of Bose to the study of electromagnetic radiation. The main focus of those studies, to quote Bose, was on the theory, 'that the waves had all the properties that light was known to have and that the theory of electromagnetism said that they ought to have'. Engineer has captured the state of knowledge of electromagnetism before and after Bose. The findings of radio's pioneers, G. F. Fitzgerald (1882), Hertz (1889), Righi, Lodge and Fleming (1889–1894) are described briefly. Bose's decisive year was 1894, when Hertz died. Carrying out his research with limited facilities at the Presidency College, Kolkata, Bose developed a new radiator at much smaller wavelengths. Bose also invented a new detector, which he called the spiral spring Coherer, leading to the discovery of birefringence at millimetre wave frequencies in natural crystals like tourmaline and haematite, and artificially produced bundles of jute fibres. In 1896, the *Daily Telegraph* of England reported that 'J. C. Bose has transmitted signals to a distance of nearly a mile and herein lies the first and obvious and exceedingly valuable application of this new theoretical marvel'. Bose was invited to present his discovery before a distinguished gathering of scientists at the Royal Institution, London in 1897.

Realizing that good communication needs sensitive detectors, Bose converted the 'Coherers' into delicate spiral spring coherers. In 1904, Bose obtained from the US Office of Patents, a patent for a 'Detector for Electrical Disturbance'. He did not seek any other patent because of his conviction that intellectual property should not be privatized. J. J. Thompson (1927) wrote that Bose's work 'marks the revival in India of interest in researches in physical sciences'. M. H. Engineer points out that electronic engineers, unlike the physicists, have handsomely recognized the work of all the

so-called Hertzians – Bose, Lodge, Righi and Marconi.

In the final chapter, V. A. Shepherd has described how Bose extended his knowledge of electromagnetic radiation in carrying out experiments on the life processes of plants. He developed special instruments for this purpose and used touch-sensitive plants like *Mimosa pudica* and *Desmodium* to demonstrate that plants have an electromechanical pulse, like the nervous system in animals. Bose's concepts of plant intelligence, learning and long distance electrical signalling have led to his being regarded as the 'father of the science of plant neurobiology'. He opened up a new field of research by demonstrating that plants possess an electro-mechanical pulse and experience pulsatile growth.

Bose's theory of ascent of sap based on the electro-mechanical pulsations of living cells was however not accepted by other scientists. The Dixon–Jolly tension–cohesion hypothesis is widely accepted even today to explain the ascent of sap. However, Bose's model, which envisaged the ascent of sap as an ultrastable, adoptable system, led to a considerable interest in this area of research. Bose opened up a new line of research by stating in his book, *Researches on Irritability of Plants* (Longmans, Green and Co., 1913), 'I once did not know that trees have a life like ours. They eat and grow, face poverty, sorrow and suffering. They also help each other, develop friendship, sacrifice their lives for their children'. This then was the personal philosophy and conviction of Bose, the human being, to whom the unity of life was a reality.

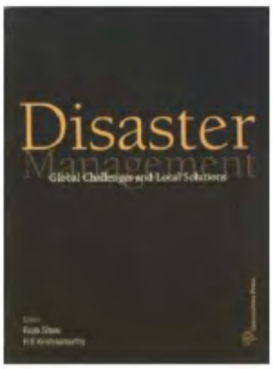
The content and get-up of this book are superb. We owe a deep debt of gratitude to the authors, the Indian Institute of Science and the World Scientific Publishing Co Pte Ltd, for this wonderful gift to Indian science.

I would like to end this review with another quote for C. N. R. Rao's inspiring foreword.

'The book brings out the spirit of J. C. Bose and the flavour of the great man. I do hope it will be read by a large number of people, particularly young people of India.'

M. S. SWAMINATHAN

UNESCO Chair in Ecotechnology,
M. S. Swaminathan Research Foundation,
Chennai 600 113, India
e-mail: swami@mssrf.res.in



Disaster Management: Global Challenges and Local Solutions. Rajib Shaw and R. R. Krishnamurthy (eds). University Press, 3-6-747/1/A and 3-6-754/1 Himayatnagar, Hyderabad 500 029. 2009. 648 pp. Price: Rs 1150.00

With the passage of time, the impact of natural disasters on human beings continues to increase despite advances in natural and social sciences of hazards and disasters. In the first 9 years of the 21st century several natural disasters have claimed an unprecedented number of human lives and inflicted huge financial losses globally. The *Mw* 9.3 Sumatra earthquake of 26 December 2004 and the resultant tsunami claimed over 250,000 human lives in south Asia. Hurricane Katrina of 23 August 2005 claimed 1836 lives, 705 missing and costed $90.0 billion (2009 USD); Muzaffarabad earthquake 8 October 2005 claimed 80,000 lives; Nargis storm of May 2008 and resultant floods claimed more than 120,000 lives in Myanmar. Landslides in Nepal during 2002 displaced some 266,000 people. Wenchuan earthquake of 12 May 2008 claimed 90,000 lives. The latest in the list is the Haiti earthquake of 12 December. Though only of magnitude 7, the population density and poor design of buildings resulted in an estimated loss of over 200,000 human lives.

In the *Foreword* of the book under review, Salvano Briceno, Director, UNISDR Secretariat, has noted that in the recent years there is an increasing trend in developing new disaster risk management courses as a part of higher education in the universities. However, there is a lack of appropriate text books. The existing text books have a sectoral approach and there is need for a book which takes a balanced view of hazards, risk, vulnerability, technology and education. So the aim of the current book is to fill this gap.

The 37 chapters in the book are grouped under seven headings: (1) Introduction, (2) Hazards and Disasters, (3) Risk and Vulnerability, (4) Disaster Reduction Technology, (5) Education and Community, (6) Crosscutting Issues and (7) Postscript. These 37 chapters are authored/coauthored by 48 experts, a majority of them being from Japan and India. The book is an outcome of a collaboration between Kyoto University, Japan and University of Madras, India. A generic introduction to disaster management is provided by the editors in the *Introduction*. The second group of articles, *Hazards and Disasters* addresses earthquakes, tsunamis, floods, cyclones and droughts. The issue of coastal hazards in India and vulnerability to tsunamis is also included in this group. The third group of chapters dedicated to *Risk and Vulnerability*, deals with physical, social, economic and environmental risks and vulnerability as well as climate risk and financial risk management. Under the group on *Disaster Reduction Technology*, issues addressed include implementation technology, infrastructure technology, geospatial technology, multimedia technology and indigenous technology. Ways and means as how to apply known technologies to reduce impact of a hazard are discussed. Under the group *Education and the Community*, community-based recovery and community-based resilience, and social capital are discussed. In the sixth group of chapters on *Crosscutting Issues*, there are 12 articles. This is the longest section accounting for about one third of the book. It deals with crosscutting issues of disaster management such as the linkages of disaster with environment, poverty, agriculture, forest, health, livelihood security, urban risk reduction, institutional capabilities, role of corporate sector, predisaster recovery issue, etc. An article on the *African Experience on Disaster Risk Reduction* is also included in this group of articles. In the last article under *Postscript*, what could be done in the future is visualized.

The scope of this review does not permit to comment on each article. It is not easy to cover all aspects of *Disaster Risk Reduction* in a book. It is also difficult to have 48 authors to write articles that are mutually consistent and follow a predesigned goal as spelled out by Salvano Briceno in the Foreword. Having said that, I must add that Rajib Shaw and Krishnamurthy have done a very com-