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the species of *Phyllotreta* attacking canola, is a useful example, which discusses the damaging roles of specific, more-damaging insect taxa inundating the canola-*Brassica* agroecosystems. Knodel's chapter includes comprehensive information on the biology of the species of *Phyllotreta*, their hosts (*Phyllotreta* are selectively oligophagous), damage thresholds and established steps of integrated pest management (IPM). In the section on IPM, information on monitoring, chemical management, cultural management and biological management is available. The chapters on other specific insects, considered to be of high-economic significance, also include in-depth information.

Since it would be difficult to comment on every chapter included in this book, I will refer to chapters 10 and 19, selectively. Chapter 10 by Tom Royer and Kristopher Giles refers to the success story of the management of winter canola used as a rotational crop along with winter wheat in the Oklahoma-Kansas agroclimatic region in USA. This project considered the management of pestiferous insects in canola ecosystem, when local growers identified insects as the most serious problem in their farms. Royer and Giles talk extensively on how the Aphidoidea and Lepidoptera populations could be managed in canola fields by recruiting both cultural and biological management tactics. The fundamental driver of OKANOLA, they emphasize, is crop rotation, further to many other management tactics. For further details, the readers are referred to <http://canola.okastate.edu>. An educative and a useful chapter. Chapter 19 by Shrestha *et al.* provides an elegant summary of the effects of GM herbicide-resistant canola on various predatory and parasitic arthropods, which are important in regulating populations of the herbivorous, damaging arthropods. Between the two popular weedicides, viz. glyphosate and glufosinate, which are widely used, the authors conclude that glyphosate bears less harmful effects on the biology and population dynamics of the third-level trophic organisms, the parasitoids and predators. A useful summary by Shrestha *et al.*, given that presently the propaganda to cultivate GM crops is rising in meteoric proportions.

The editor, Gadi V. P. Reddy (Montana State University, Bozeman, USA), indicates that this book incorporates in-

formation on the integrated management of arthropods that infest and inflict damage to canola and *Brassica* productivity, and also comprehensively deals with insects and mites of high and moderate significance that live on the canola and *Brassica*. On this basis, Reddy further indicates that this volume would serve as an essential source for entomologists and other allied personnel working in the management of insect populations that affect the productivity of canola and *Brassica*. I gained a feeling that this volume largely meets those targeted purposes.

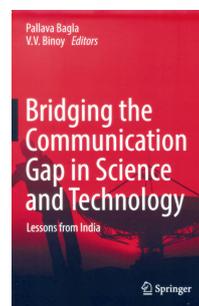
The text is easily readable and generally free of any striking error or omission. Nevertheless, I felt that some of the images used in the book (e.g. chapter 14) could have been of better quality. An articulate introduction outlining the context for the book and a synthetic conclusion identifying the existing gaps in a big-picture context were strikingly absent. IPM is one significant tactic useful in the management of biological problems in agroecosystems. In dealing with IPM tactics used in canola-*Brassica* ecosystems, this book does adequate justice. It has largely met the intended outcomes.

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Bridging the Communication Gap in Science and Technology: Lessons from India. Pallava Bagla and V. V. Binoy (eds). Springer, Singapore. 2017. xxvi + 324 pages. ISBN: 978-981-10-1025-5 (e-book). Price: Paperback, Rs 3280.00; Kindle, Rs 1980.18; Overseas, 34,99 € | £26.99 | \$39.99 | CHF 38.50.

In a country as diverse as India, with a large rural-urban divide, multiple cultures and languages and widespread activism that often blurs the borders between public good and private good, policy making, especially relating to matters dealing with science and technology, is a challenge. This was evident during 2010s in the cases of siting of nuclear power stations, genetically modified food, land acquisition for large infrastructure projects, water sharing between states and so on. Much of this has been due to inadequate public understanding of the underlying issues from a rational and scientific point of view. This calls for more public dissemination of knowledge related to science and technology (S&T) through the right forums. In this context the book under review comes as a valuable guide to the status of science communication in India, and also

to the various obstacles faced by communicators in effective dissemination of developments in S&T among the masses. Although it is a collection of essays on a diverse range of topics, not all are directly related to science communication. The contributors include both veterans with long experience in science communication and youngsters who can infuse fresh ideas into the field.

The tone of the deliberations is set by V. V. Binoy (National Institute of Advanced Studies, Bengaluru) who in his introduction presents a brief overview of the contents, highlighting the increasing dependency of society on science and its outcome technology, and the key role these two elements play in determining the growth and position of a nation in the global playing field. At the same time he cautions that 'bridging the public, who are heterogeneous in their interests and values, with scientists, who focus on specific problems and communicate their findings in a language filled with "subject-specific jargon and terminologies" that are unhandy even to their own counterparts from other disciplines, is not a trivial task'. His contention becomes amply clear in the chapters that follow.

The chapters of the book are grouped into five parts, each with focus on a specific area. Part I titled 'The big picture: communicating science to win the hearts and minds' has a single chapter titled 'Responsibilities of science, responsive to society: a new dialogue' by Jairam Ramesh (former Cabinet Minister of India) who candidly presents his experience during his tenure as Minister of Environment and Forests, Government of India (GoI). He highlights four major contexts where, as he puts it, 'different branches of science collided with the Indian society', and narrates how his ministry formulated policies on the sensitive issues of *Bt* brinjal, atomic power plant at Jaitapur, mining in Niyamgiri Hills, and the report of Intergovernmental Panel on Climate Change (IPCC) suggesting that glaciers of the Himalaya would disappear by 2035 due to climate change, all of which were highly sensitive and controversial issues and needed tactful handling. He proposes five basic principles for taking forward the dialogue between science and society: First, science needs to be less arrogant, and society needs to be less suspicious; second, science needs to listen, and society needs to hear; third, science needs to be open to

scepticism, and society needs to be open to questioning; fourth, science needs to be proactive in communication, and society needs to be less sensationalist and conspiratorial; and lastly, science needs to develop trust, and society needs to nurture confidence. These are valuable tips for those who aspire to become effective science communicators.

Part II titled 'The Indian landscape of communicating science and technology' has seven chapters and covers a wide canvas, including India's maiden mission to Mars, defence research, land and natural resources, natural hazards, earthquake risk communication, risks associated with use of mobile phones, and atomic energy, each contributed by a scientist or science journalist specializing in the specific field.

In the chapter 'India's maiden mission to Mars: many firsts and some missed opportunities in ISRO's efforts at public outreach and communications', Pallava Bagla, who has long experience in covering and reporting major scientific developments, points out many firsts and some missed opportunities in the efforts of Indian Space Research Organisation (ISRO) for communication and public outreach. He argues that using the Mars mission as the vehicle ISRO could have, if it wanted, reached out to countless engineering colleges and schools, but unfortunately, it failed to capitalize on the excitement the mission had generated. He comes out with the startling fact that the entire programme of public outreach for ISRO is handled by only three technical persons with a budget of Rs 15–16 million a year of the Rs 56,150 million budget. But here Bagla slips in getting the percentage figure; from the given figures the budget for outreach would amount to 0.027%, and not 0.000002% of the entire budget of ISRO, as mentioned by him.

K. S. Parthasarathy (Atomic Energy Regulatory Board, Mumbai) brings out some startling facts about cell phone radiation in 'The queer case of communicating risks associated with use of mobile phones and neighbourhood mobile towers: are people contracting more brain cancers?'. According to him cell tower/phone radiation has a million times lower energy than X-rays and gamma rays that can make structural changes in cells in the human body. Unfortunately, people do not understand this and have often sought and obtained information

from sources other than responsible agencies such as the World Health Organization (WHO). Government agencies attempted to clear the air, but those efforts were mere drops in the ocean. He laments that in spite of extensive studies and reassuring conclusions, the health concerns on cell tower/phone radiation grew disproportionately, mainly because, as he puts it, 'vendors of so-called protective accessories made virtually a carpet-bombing effort to exaggerate the effects. They used cleverly designed programmes of disinformation by mixing myths with technical jargon. They deliberately propagated wrong concepts, misinterpreted internationally accepted safety standards and accused telecommunications companies for making profits without caring for the health of the public'.

Nuclear power is another area that has been mired in controversy in India. In the chapter 'Atomic energy: reaching out to the people for perception management', Swapnesh Kumar Malhotra (Department of Atomic Energy, Mumbai) underscores the point that none of the public perceptions about the harmful effects of nuclear energy is based on scientific facts; they are mostly the consequence of 'fear of the unknown' and, many a times, imaginary exaggerations of figures and facts. He suggests setting up of well-established information centres outside the security limits of nuclear facilities, which could be interactive platforms to explain facts about nuclear energy in a subtle manner using very simple language to the general public.

The five chapters in Part III titled 'Old is gold: time tested ways of communication' are first-hand accounts of well-known science communicators in their respective areas of specialization. Writing on 'Communicating science for a better tomorrow', Hasan Jawaid Khan (editor, *Science Reporter*) underlines the importance of effective science communication in further strengthening the functioning democracy that India is. He mentions that spreading scientific literacy, inculcating a rational outlook and questioning unfounded beliefs are important functions of science communicators. There are important environmental issues too that science communicators need to address lest they spiral out of control. He rightly stresses the vital role of science communicators in kindling awareness in the young about the techniques of science and encouraging them to engage in

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scientific pursuits, especially considering the scenario that the young are fast losing interest in the basic sciences.

Communicating science in vernacular languages presents special challenge in a multilingual country like India, although science popularization is well developed in several Indian languages like Kannada, Bengali, Malayalam, Hindi and many others. A. S. K. V. S Sharma (science writer in Kannada) and Nimish Kapoor (Vigyan Prasar, Noida) highlight the problems encountered in communicating science in vernacular language mainly due to inadequacy of technical terms and suitable expressions to explain difficult scientific concepts.

Four chapters in Part IV, titled 'The bold new world: using television, internet and social media for communicating science' discuss in general the strengths and pitfalls in communicating science through the new electronic media. T. V. Venkateswaran (Vigyan Prasar) is highly critical of the scanty coverage of S&T in Indian television. Writing on 'Enhancing science content on Indian television: status, issues and way forward' he observes, 'Even a cursory glance at Indian television industry shows stark absence of specialised units, except one or two. It also does not seem practical that many of the private channels would invest resources for a science unit from their own revenue. It is in this context that institutions such as Vigyan Prasar assume significance, and their potential for establishing such unit(s) and providing science feature service to media needs to be explored.'

SciDev.Net is a website on science and world development that is a relatively rare example of a journalist-driven service that demonstrates the power of the (web) medium for rich communication. Writing on 'Advent of online science journalism in India', T. V. Padma (SciDev.Net) comments that perhaps what proved fortuitous for the website was the emergence of the internet as a powerful medium to communicate information.

We get a glimpse of a few unique initiatives launched in India to disseminate developments in S&T among the masses in the four chapters in Part V, titled 'Bridging the gap between scientists and the public'. Writing on 'Vigyan Rail: science exhibition on wheels', Vinay B. Kamble (formerly Vigyan Prasar) narrates the story of conceptualization and

execution of the unique project, which was conceived and implemented by Vigyan Prasar, and executed in collaboration with the Ministry of Railways, GoI, with active participation of 18 departments/ministries of Government engaged in various scientific and technological activities. Designed to showcase developments in S&T in India for the masses, the train attracted lakhs of visitors during its entire journey that covered a distance of over 15,000 km. The main objective was to motivate people to learn, understand and appreciate through exhibits, working models and slide/multimedia shows and demonstrations, how S&T has helped improve their quality of life and the new challenges that have emerged.

Writing on 'Organising children's science congress: challenges and opportunities', Anuj Sinha (Network of Science Communicator Organisations, Delhi) focuses on yet another unique initiative launched by the Department of Science and Technology, GoI, to encourage children to opt for science. Now in its 25th year, the yearly event has been providing a platform to thousands of children in the age-group of 10–18 years from all over the country to showcase their scientific talent.

In the chapter 'Bridging educational institutions for a citizen science project: a case study from Malappuram', Binoy *et al.* write about their experience of connecting two major compartments of the educational system, namely school and college, in the Valanchery region of Malappuram District, Kerala, via a 'student network' for a citizen science programme to monitor the local mammalian diversity. They narrate the problems they encountered due to the reluctance of students and teachers in taking up the problems suggested to them. They observe that the success of bridging academic institutions and developing such a network into a permanent and successful citizen science project would be possible only if the basic elements of the scientific method such as systematic observation and recording, logic, criticism and professionalism are blended in right proportion with the components of social science research, namely beliefs, culture, attitude, traditions, freedom, history and so on. 'Only then will volunteering students become capable of noticing local problems, asking their own questions, obtain guidance from experts, develop

protocol, collect data and build their own models and grow into successful communicators who can bring science to common.'

The last chapter in the book, titled 'Communicating science to the common: perspectives of the science communicators from India' is a collection of the perspectives and experiences of the luminaries of science communication in India – D. Balasubramanian, Milind Watve, S. Ramadorai, K. Kasturirangan, R. S. Sundar, Prabir Purkayastha, T. V. Jayan, Rajendra Singh and Arvind Gupta.

Kalinga Prize winner D. Balasubramanian presents a brief overview of science communication through the ages, and the conflict between scientific deductions and traditional thoughts that often led to persecution. He mentions about science communicators such as Jacob Bronowski, George Gamow, Arthur Clarke, Lewis Thomas and Stephen Jay Gould who 'wrote in simple language, using analogies and no graphs, pie charts or mathematics, with humour and in conversational style. They shared their joy and excitement with us'. Balasubramanian also has sound advice for the beginners: 'Scientists cannot communicate in an adiabatic, science-first fashion. A communicator should advocate, educate, entertain, share experience, and criticise when needed. Above all, he should not preach or take the high ground, but treat the other party as an equal.'

To sum up, this book is a goldmine of valuable resource material on how to reach out to the masses and make science communication more effective. The credit goes to the editors for being able to bring together a galaxy of authors specializing in diverse fields related to science communication and judiciously weaving their contributions together in a single volume that will be of interest to not only science communicators but also researchers from science, social science, mass communication and public relations departments, and journalists. The book will also be useful to policy makers from government and non-government institutions involved in S&T policy, practice and communication, and those who want to understand the complex S&T landscape of India.

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