

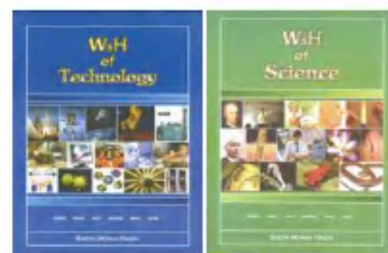
'Techno-Utopian' and 'Eco-Apocalyptic'. The 'Strategic Realism' approach implies that every country has a right to exercise its political and military might to secure energy reserves, even at the cost of annihilation of another country. The world is already seeing the disastrous consequences of this approach which is followed by some Western countries. The 'Techno-Utopian' approach attempts to provide sweeping scientific solutions to the crisis. This approach is prevalent today among the scientific community. A typical example is the frequent reference to the term 'hydrogen economy', which is considered by many scientists to be the panacea for all energy-related problems. Such a stand indicates a lack of understanding of ground realities, especially in the developing world. The 'Eco-Apocalyptic' approach suggests that there is no way out of the energy crisis, in a way suggesting the end of the world. Szeman rightly points out how the three approaches are flawed in their own ways. He then makes a case for a new approach which he calls 'Rational Futurism', based on a practical and planned system. Unfortunately, he does not elaborate much on this balanced approach.

There are various photo-features that are interspersed with the articles, but one that stands out provides a rather dramatic view of the ecological devastation caused by oil production and drilling in Nigeria. The photographs show the stark contrast between the level of impoverishment of the people of Nigeria and the oil abundance. The article by Mason White draws an interesting parallel between the large-scale infrastructure being created to tap natural gas in Russia and the man-made islands being created in Dubai to promote tourism in a post-oil economy. The article shows how the landscape is being

altered in the quest for new energy sources on the one hand, and at the other extreme, land is being created from the sea using oil wealth to promote tourism. In another article, Chris Hardwicke proposes a dedicated infrastructure for bicycles as a sustainable transportation option for cities. The design of an elevated, dedicated roadway for bicycles and the integration of this network with existing rail/road transport in the city are presented well. This is certainly a promising idea for any large city. Maya Przybylski and Kelly Doran propose ways to mitigate the ecological impact of oil-drilling infrastructure and lands used for mining tar sands in the aftermath of oil recovery. These range from converting abandoned oil platforms as resting points for migratory birds and artificial reefs for holding plant life, to converting exhausted mining pit lakes into farms for growing crops. All of these do offer interesting perspectives on the central theme of fuel. However, these are Western in character. A perspective from the developing world, where historically significant work has been done in the area of renewable energy, is missing. Inclusion of such an article would have made the book more complete and truly global in character. In summary, the book does convey one important theme, which the author mentions in the Foreword, that the future is 'energy pluralism'. There is a need to consider several options simultaneously, renewable fuels in both short and long term, and possibly other fossil-based fuels in the short-term transition period.

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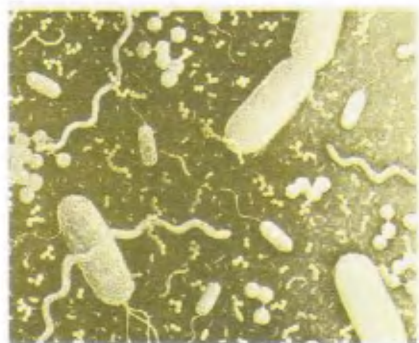


W₅H of Technology; W₅H of Sciences.
Rakesh Mohan Hallen. Vigyan Prasar,
A50, Institutional Area, Sector-62, Noida
201 307. 2008. 184 and 176 pp respectively. Price: Rs 200 each.

Before the days of the internet, a popular reference book on science and technology (S&T) was Isaac Asimov's *Chronology of Science and Discovery*, which vividly explained all areas of the scientific world, covering discoveries and inventions in astronomy, biology, physics, mathematics, etc. It was described as the History of Science from 4,000,000 BC to the present (1988). The famous science writer deciphered each event in his own inimitable style. He explained scientific discoveries of each year, showing how science influenced the world and how the world responded to scientific advances.

After the internet and the emergence of Google and other search engines of enormous reach and content, the focus of S&T reference books turned to most commonly asked questions with simple answers, not easily found on the internet. Two books can be cited as examples of this trend: *How Did They Do That And Scores of Other Questions You've Never Been Able to Answer*, and *How Do They Do That?* Both the books, written by Caroline Sutton (Quill New York Hilltown Press) posed questions that are likely to trigger curiosity in the common reader. Here are some examples: how do homing pigeons find their way? How do glasses correct near-sightedness or far-sightedness? How did they discover DNA? The very wording of the questions invariably leads to an appreciation of the wonders of science and the ingenious ways of their discovery by scientists rather than produce a mere list of names, places or bare facts. This is best illustrated by the following question: 'How does a polaroid picture develop in broad daylight' rather than 'Who invented polaroid and when and where?'. The names and other such facts can be downloaded or found out from standard reference tomes.





It was soon realized that the level of presentation cannot be the same for all readers, irrespective of age and comprehension. *Encyclopaedia Britannica*, for example, brought out in its three-set DVD series, one edition exclusively for children. And each section is designed to inspire the reader to do outside reading.

Still a vast field was left uncovered: the expanding range of technical gadgets and the flood of technical jargon that became part of everyday usage. Reference books were needed to explain in simple terms the technology behind everyday gadgets and the 'essential' knowledge needed for a reasonably well-informed person. Again a few examples may be cited: *The Knowledge Book: Everything you need to know to get by in the 21st century* and *The Science Book: Everything you need to know about the World and how it works*, and *The New York Times Guide to Essential Knowledge, a desk reference for the curious mind*. What is essential knowledge will of course depend on the social and technological state of a people.

A point revealed by the trend of reference books is the admirable way in which duplication is avoided in the light of the internet and the emergence of the unique role of the books to provide not only basic information in easily digestible, sugar-coated bits, but also indicate the latest trends in the chosen field without assuming any prior knowledge on the part of the readers and trigger their curiosity. The more difficult challenge in planning reference books in the post-internet age is to avoid duplication and evoke a sense of wonder and cultivate a liking for science and its ways of understanding nature. The effort is marked by a passion for accuracy and truth as well as a commitment to capture the latest developments. There is a healthy shift away from merely building up one's database towards cultivation of an inquisitive mind

ready to appreciate and understand the working of S&T.

In the light of these trends, one may assess the books under review. It has been stated by the author that they are addressed to 'curious children'. The Foreword says the author has addressed topics that are normally not covered in the Q&A books on S&T. There are about 350 topics as Q&A items, with detailed contents and an index. This is a laudable effort, though there are glaring omissions and mistakes.

The emphasis seems to be on answering, 'When, What, Where and Who' rather than 'Why and How' (indicated on the cover). Wherever the last two are addressed, the notes become interesting. Otherwise, the narrative tends to end up as storage of data, useful but does not create any further interest. The questions themselves are so worded that the answers do not give much scope for bringing out the connections that explain the facts.

First of all, everyone will agree that there should be no wrong statement in a reference book, which is likely to be cited. For example, it has been stated that a geostationary satellite rotates at the same rate as the earth. This is a common mistake, which needs to be corrected. Otherwise, the beauty of the geosynchronous orbit is not captured.

Some answers are unrealistically simplistic. For instance, the note on nanotechnology does not specify what it means but goes on to describe how the technology is modern, etc. What is essential is a simple indication of the nanoscale (generally introduced in terms of a metre, consisting of 1000,000,000 nm) or its comparison with a familiar object (1 nm being 100,000th part of a human hair, etc.)

Some important facts are terribly outdated. Alexander Graham Bell is still described as the inventor of the telephone. Even the American legislators have accepted that the true inventor is Antonio Meccui, an Italian immigrant.

Several questions do not have up-to-date answers, thereby failing to convey the extraordinary achievements in the concerned field: The note on the integrated circuit could have mentioned the most astonishing fact that today an IC has two billion transistors, a world record, and explained its significance in a few lines. Again, it is stated that the Human Genome Project is expected to be

completed by 2002. Obviously, the draft is years old and is now outdated. The reference to graphite could have been linked to the recently discovered graphene, the one-atom thick wonder material, expected to revolutionize electronics.

It is agreed that two short volumes cannot cover everything, but there are certain events and developments which cannot be left out. Such glaring omissions include the following: there is no description of the Raman Effect, or the contributions of the famous astronomer, Aryabhata. Galileo is dismissed as the inventor of the thermometer. His use of the telescope to see the sky – and the 400th anniversary of the event and the celebration of the International Year of Astronomy – do not figure at all. Nor is there a reference on Charles Darwin, whose 200th birthday is being observed worldwide exploring how modern genetics has proved him right.



The great strides made by India in the field of optical, radio and space astronomy do not find mention at all. Only Jantar Mantar in Delhi is given under Observatory! How will readers know of Hanle, where the world's highest optical telescope has been installed by Indians? 'Quill' is explained but not pulsars or quasars, not to speak of exoplanets, a familiar buzzword today.

Again, there are ten references to earth, but no mention about its pear-shaped size, a fundamental discovery of the Space Age. The note on information and communication technology does not mention the role of Claude Shannon. Even familiar terms today like 2G or 3G or Facebook or digital TV are not explained.

The rationale for bringing out Q&A books in S&T in the Internet Age is simply not to duplicate the information available easily on the screen, but to create a sense of wonder and a spirit of curio-

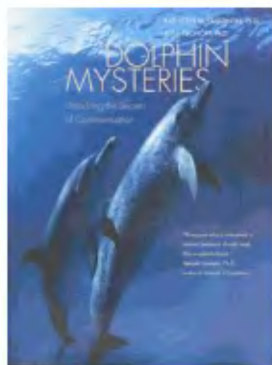
sity among the readers about the working of S&T and its results. Mere dumping of information will not do. And being Indian publications, more emphasis on less-known developments and achievements relating to India is called for.

A word about the illustrations. Indian printing has come a long way from the hazy reproductions in the past. The pictures could have been brought out more sharply and some of them call for the use of more than one colour. The power of simple line drawings could have been generously utilized. The cover design too needs the touch of a good designer and can project more of Indian achievements. A full list of internet sites would have been useful.

In conclusion, while the books would be a useful reference, most of the contents need updating and more imaginative questions, especially related to India's progress in S&T. A supplement may be brought out to update and correct the contents where needed and incorporated into the books to enhance their value.

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Dolphin Mysteries: Unlocking the Secrets of Communication. Kathleen M. Dudzinski and Toni Frohoff. Yale University Press, 47 Bedford Square, London WC1B 3DP. 2008. 224 pp. Price: £18.99.

Having watched the stunning IMAX film *Dolphins*, which was advised by Kathleen Dudzinski, I was eager to read this book when the opportunity presented itself. Written by Kathleen Dudzinski and Toni Frohoff, two women scientists with

40 years of collective research on dolphin behaviour in various waters of the world, this book provides an important perspective on dolphins from under the water. Dolphins spend about 99% of their lives under water, but most studies are boat- or land-based, thus losing valuable information. By focusing on dolphin-dolphin interactions and dolphin-human interactions, Dudzinski and Frohoff provide insights into dolphin communication, cognition, culture and conservation.

Dolphins are among the most intelligent animals. Second only to humans if Encephalization Quotients (EQs; calculated by comparing the weight of an animal's body to the weight of its brain) are anything to go by, they are capable of self-recognition, can understand syntax, and can achieve incredible levels of behavioural synchronization. The first chapter 'A dolphin's life' is an introduction to dolphin anatomy, physiology, evolution and dolphin society. 'The expressive dolphin' describes the different ways in which dolphins communicate. Being social animals, communication is crucial, especially in coordinated feeding, during which they drive fish together and hunt them or, less often, beach themselves onto banks to catch prey. Dolphins can communicate using tactile means, primarily using their flippers, but more importantly, have perfected underwater acoustic communication. A bisonar signal generator allows them to create ultrasonic pulses, which are used for echolocation and possibly also for communication. They also have, in the place of the right nostril, four sets of air sacs, which are used to produce whistles for communication. They have a large repertoire of whistles, and the authors debate whether different whistles convey different meanings or act as signatures of individual recognition. The information on prowess in acoustic communication is interrupted by an account of social organization in dolphins. They live in a fission-fusion society, like primates and elephants. However, there are important differences in the social structure of two well-studied dolphins, the bottlenose dolphin and the killer whale, and the contrast between these societies is elaborated upon.

The third chapter, 'Eavesdropping' includes rather disconnected paragraphs on various behaviours that dolphins engage in (some being repetitions from the previous chapter, and a significant amount on vocal communication that would have

been more appropriate in the previous chapter), and their possible meaning or intent in the context of other dolphins and humans. The tools available to study behaviour and the many questions left unanswered are discussed, as are the difficulties in interpreting behaviour. The last is important because not only are the tools available to understand the behaviour of other species limited, but as humans, our senses limit or bias the way in which we perceive or understand the capabilities of other species.



'Beyond the dolphin's smile' is the most interesting chapter of this book and describes studies of the dolphin brain and cognition experiments with dolphins. As mentioned above, dolphins are among the most intelligent animals, going by certain defined attributes of 'intelligence' as we can measure it. They can understand word order and also possess the extraordinary ability to improvise solutions to meaningless or confusing sentences. They can readily interpret what they are shown on television in relation to what they know about their real world. They recognize themselves in the mirror, understand pointing gestures and mention to parts of their body, and synchronize action on a trainer's request. Dolphins are also sensitive to 'joint attention', in which they understand that echoes are a result of the echolocation of other individuals and are therefore capable of knowing others' states of attention. Finally, they are capable of tool use and also pass the false belief task, which even chimpanzees struggle with. Thus, explaining that the dolphin's smile is a result of the structure of its jaw (which is used to direct sound, akin to our pinnae) and is not related to its emotional state or intelligence, the authors exhort us to look beyond the dolphin's permanent smile to understand its mind and emotions.