

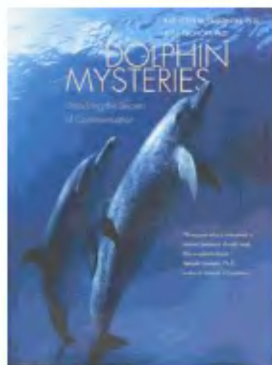
sity among the readers about the working of S&T and its results. Mere dumping of information will not do. And being Indian publications, more emphasis on less-known developments and achievements relating to India is called for.

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.

Dolphins are a flagship species and the association between them and humans dates back to thousands of years. Following from the second chapter on communication between dolphins, the fifth chapter, 'Where humans and dolphins meet', describes human-dolphin communication in the form of mimicry, touch and play, and 'mis'communication when humans misinterpret signals from dolphins, assuming them to always be friendly. The chapter also describes instances when dolphins have assisted humans at sea, swim programmes with captive dolphins, how these are managed and how dolphins can often be aggressive towards humans, contrary to popular belief. Finally, 'Communicating conservation', details the threats to dolphins from killing by humans, reduction of prey due to the fishing industry, pollution of waters and synthetic underwater noise. It also

revisits the swim-with-the-dolphin programmes and discusses the welfare needs of captive dolphins in the light of what is known about their behaviour. Useful information on dolphin signals and on etiquette for interacting with dolphins is included as appendices.

Believing that the 'plural of anecdote is data', the authors draw not only from various published sources, but also from their personal experiences and those of their colleagues. The book is written in a lucid style and adorned by beautiful photographs and line drawings illustrating dolphin behaviour. The separate first-person accounts of the authors provide some extra clarity and individuality, but are also sometimes distracting. The book is written for the lay person; however, adequate numbered references allow the more interested reader to find the original sources of the different studies that

are cited. The ordering of the chapters is slightly counterintuitive and there are repetitions in the book across chapters. Most chapters, especially the first, would have also benefitted from having section titles since they cover several different aspects that do not seamlessly flow into one another. All in all though, as a book that presents new, interesting information on dolphins in an engaging style, it is well worth a read.

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