

The Design of Experiments in Neuroscience. Mary Harrington. SAGE Publications Inc., 2455 Teller Road, Thousand Oaks, California 91320, USA. 2011. 2nd edn. xv + 261 pp. Price not mentioned.

Reading books on swimming won't make you a swimmer, but they are useful if you have been *trying* to swim. The same can be said about this book. It will not benefit the casual reader or the student merely interested in neuroscience. Rather, this book will benefit the beginning graduate student with some basic knowledge, who is *trying* to design his/her own experiments. Importantly, it is full of thought-provoking examples that not only illustrate bad experimental designs, but also the resulting interpretational problems. Given that the book succeeds primarily because of these examples, it would have been nice to see more of them even if it meant less space for exposition.

The book under review is organized into eight chapters. The first chapter deals with distinguishing science from pseudoscience and contains some interesting examples of pseudoscience. The second chapter deals with ethics – from fraud to human and animal rights. These issues are particularly important because many students (and even scientists!) do not seem to be sensitive to what constitutes fraud and even how to assess and improve animal welfare. The remaining chapters range from picking a research question (chapter 3) to basic research designs (chapter 4), controlling extraneous variables (chapter 5), and factorial and correlational designs (chapters 6 and 7). These chapters are full of examples and are an insightful read for novices and experts alike. However, the final chapter

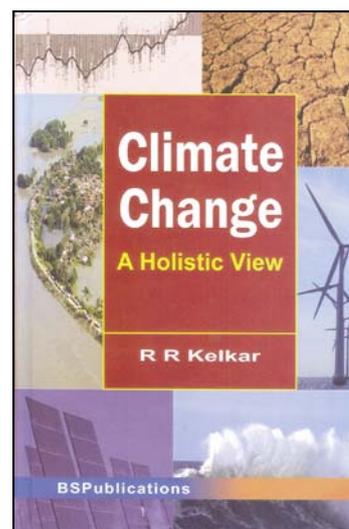
on becoming an independent investigator (chapter 8) is the most tedious. The author has quoted extensively from Ramon Cajal's classic book, but she could have done well to include brief interviews with some eminent neuroscientists in this chapter.

The book concludes with six Appendices which unfortunately live up to their name. There is some elementary statistics which could be absorbed into other chapters (Appendix A) and answers to questions (Appendix F) might be useful. But who needs instructions on formatting or writing papers (Appendix B), particularly when every journal has different styles? The same goes for the sample paper in Appendix C, which is a complete waste of ink. I would like to see a future edition do away with these vestigial appendices.

For a book with such promise, it would have been nice to read a concluding chapter that critically reviews its most fundamental premise: that the design of experiments can be taught. Can it really? Can one simply read a book and design good experiments? Are there really general principles of experiment design or does the devil lie in the details? For most great scientists, their good experimental designs and insights have come from a half-systematic, half-stumbling struggle that can hardly be verbalized, let alone systematized and taught. Arthur Koestler likens this creative process to sleepwalking and it is a deeply personal journey in which both the subject (the scientist) and the object (science) are irreversibly transformed. Clearly, elements of this process can be taught – good scientists are not born that way, they often give most of the credit to their mentors. But how much of experiment design can be taught through a book? However much this may be, there's no doubt that Mary Harrington's book has captured most of it. I strongly recommend reading it. But you may never learn swimming until you get wet.

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Climate Change: A Holistic View. R. R. Kelkar. BS Publications, A Unit of BSP Books Pvt Ltd, 4-4-309, Giriraj Lane, Sultan Bazar, Hyderabad 500 095, 2010. xvii + 208 pp. Price not mentioned.

During the past decade a large number of books have been published on climate change and global warming. These have been written by scientists, journalists, environmentalists and politicians. There are, however, few books published in India on this topic. Hence this book by a former Director-General of Meteorology is a welcome addition. In the preface the author has indicated that he has attempted to take a rational and balanced view of climate change. He has also stated that climate change is not the only problem that India is facing. The book is meant to be used as a textbook for courses on atmospheric and environmental sciences in the universities and as source of reference for scientists.

The book has seven chapters. The first chapter discusses the evidence for climate change through earth's energy balance and greenhouse effect. However, the discussion on 'greenhouse effect' in section 1.4 is weak. The author should have defined it quantitatively so that there is no confusion between the natural greenhouse effect and the additional greenhouse effect induced by anthropogenic activities. The author does not state that water vapour is the most powerful greenhouse gas in the earth's atmosphere. He should have discussed why the impact of increase in water vapour is considered as a feedback and not as direct cause of global warming. The

statement that 'except ozone, the other atmospheric gases do not absorb solar radiation', is misleading. Both carbon dioxide and water vapour absorb solar radiation, although the amount of radiation absorbed is small. In section 1.6, there is a brief discussion on the impact of volcanic activity, and changes in solar radiation and cosmic radiation on the earth's climate. The author does not state explicitly if these changes had any impact on the global warming in the 20th century. A discussion on the relative importance of natural and anthropogenic factors in the 20th century warming would have been useful.

In chapter 2 on 'climate monitoring', there is a detailed discussion on how global mean temperature is calculated. This is followed by a section on monitoring of greenhouse gases and sea level. The discussion on sea-level changes is too short. The author indicates the accuracy of measurement of carbon dioxide, but not the sea level. The last section in this chapter deals with climate of the past derived from tree rings in the continents and ice cores in the Arctic and Antarctic regions. The last sentence in this chapter states: 'An important outcome of the ice core data analyses is the realization that it is the internal dynamics, rather than external forcing'. This sentence is incomplete and hence it is not clear what the author is trying to convey. Does he imply that internal dynamics is more important than external forcing in controlling the earth's climate? The ice-core data show clearly the importance of positive feedback in the earth's climate. This has not been stressed adequately in the book. A book on climate change should have devoted one chapter to the concept of feedback because it highlights how small changes in carbon dioxide can have such large impact on the earth's climate.

In chapter 3 there is a good discussion on the need for climate models to predict the future. There is a detailed discussion about the scenarios used by IPCC regarding the future concentration of greenhouse gases. The inability of the models to predict present and future monsoon precipitation is presented well. Chapter 4 deals with the impact of climate change on glaciers, sea level and tropical cyclones. The author highlights the concern in India about the impact of melting glaciers, rising sea levels, monsoons and cyclones. Concepts such as vulnerability and adaptive capacity are

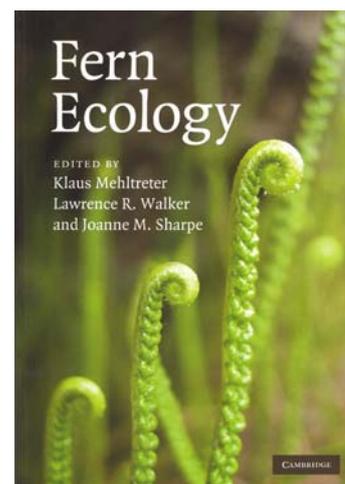
explained well. The interpretation of IPCC terms such as 'very likely' and 'more likely than not' are highlighted nicely. There is a good discussion on uncertainty in climate change science. Section 4.4.2 provides a summary about what we know and do not know about retreat of the Himalayan glaciers. The discussion about sea-level rise in section 4.5 is quite exhaustive. The debate about the impact of global warming on cyclones is presented well in section 4.6. The author has stated clearly that no firm conclusion can be drawn about the influence of global warming on tropical cyclones as there is equal evidence both for and against it. In chapter 5 the impact of climate change on monsoon, agriculture and human health is presented. There is a good exposition of the trends in temperature in different parts of India. There is an exhaustive discussion on the prediction of future monsoon precipitation by 22 different climate models. The author has indicated that most models predict an increase in monsoon precipitation in the future, but has highlighted the large uncertainty in the prediction by these models. The importance of agriculture in India has been argued well in section 5.3. This is followed by a cogent presentation on crop models. The author has indicated that the major weakness in crop models is their inability to account for the effect of pests and diseases accurately. He has pointed out that errors in climate models will have an adverse impact on the prediction by crop models. The impact of climate change on the incidence of malaria in India has been delineated in section 5.4. Chapter 6 deals with politics and economics of climate change. The author states categorically that developed countries have created this problem and hence must take the lead in mitigating climate change. The next two sections discuss the Montreal Protocol and India's role in it. There is a critique of IPCC and some of the mistakes in the last IPCC report. This is followed by a brief discussion on the Kyoto Protocol, carbon trading, and 'clean development mechanism'. The last chapter, 'Preparing for the future' deals with the Copenhagen accord, renewable energy technology, food security and ethics of climate change.

This book will be useful for anyone looking for information about issues related to climate change with a special reference to India. I am, however, not sure if it will be a good textbook for

undergraduate courses in atmospheric sciences. The book should have more quantitative information on greenhouse effect, feedback, stability of the earth's climate, and simple climate models to enable students to appreciate subtle issues in climate change science. Any text book should have problems at the end of each chapter to help students understand the concepts. I hope these will be incorporated in the next edition of the book.

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Fern Ecology. Klaus Mehltreter, Lawrence R. Walker and Joanne M. Sharpe (eds). Cambridge University Press, 2010. xvi + 444 pp. Price: \$58.99.

Any discussion on ecology, environment-related issues or conservation of biodiversity focuses on higher plants; the lower plant groups are generally neglected. The 'Pteridophyta' is a mystical plant group of lower vascular plants. Despite being the dominant vegetation in the past, little emphasis is laid on how these plants existed and adapted during the long journey of periodical changes in the environment.

The science related to the interaction between living organisms and environ-