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Book reviews

Global Environmental Issues: A Climatological Approach by David D. Kemp (Routledge, 1990) ISBN 0 415 01109 4. Pp. xv + 220, $29.95.

David Kemp has produced a useful short monograph which provides a broad overview of those major global environmental problems that have an atmospheric dimension; specifically drought, famine and desertification, acid rain, atmospheric turbidity, the threat to the ozone layer, the greenhouse effect and nuclear winter. Pitched, as it is, mid-way between technical reports and articles prepared for popular consumption, the book will be of most use to those teaching introductory tertiary courses in geography and environmental science. However meteorologists and other specialists wishing to broaden their general understanding of atmospheric environmental problems will also find it of value, especially since the text is supported with some 300 references.

A very short Chapter 1 outlines the human background to the problems, concentrating on the relationship between population growth, technological development and increasing impacts on the environment. A useful part of this chapter is the short review of various environmental philosophies, including the controversial Gaia hypothesis which seems to suggest that the environment is inherently self-regulatory and that environmental problems will ultimately be brought under control by the environment itself. Chapter 2 seeks to provide basic information about atmospheric constituents and processes that is needed for a full understanding of the material that follows. This is the weakest chapter in the book, lacking a coherent structure and making confusing links ahead to following material.

Chapters 3 to 8 are the core of the book and indeed its strength. These chapters, covering various environmental issues, are comprehensive, well written and to the point. Coverage of controversial issues is generally fair and balanced. Chapter 3 on drought, famine and desertification, concentrating as it does on African drought, is unfortunately currently very relevant. There is useful discussion on definitions of drought and the human response to it. Parallels are drawn between drought in sub-Saharan Africa and interior North America to show that technological and economic development is no guarantee against drought. The link between drought and desertification is outlined, but surprisingly, the well known and much-debated biogeophysical feedback mechanism is hardly mentioned. A brief section on drought prediction concentrates on ENSO. Chapter 4 provides a very comprehensive coverage of acid rain, the atmospheric processes and impacts on terrestrial ecosystems, and possible solutions to the problem. The author has a problem with the use of the rather ambiguous term 'acid rain'; atmospheric acidification is the term currently preferred by most experts in the field. A further minor criticism is the concentration on the acidification problems of North America and Europe, to the exclusion of the developing problems in various tropical Third World countries with high rates of economic growth.

In the mid-1970s atmospheric turbidity was seen as one of the major environmental problems and was considered capable of inducing global cooling. Various other problems, including possible greenhouse warming, soon took centre stage but David Kemp provides a useful summary of current knowledge of the problem in Chapter 5. Chapter 6 on the threat to the ozone layer will be of great interest to Australian readers. This topic has suffered more than most from sensationalising by the media and fragmentation of the scientific literature. Beginning with a very good section on ozone chemistry, Kemp then discusses the issues that were first raised in relation to the ozone layer and then temporarily forgotten in the 1970s; nuclear war, supersonic transports and chlorofluorocarbons. The 'rediscovery' of the problem in 1985 with the discovery of the 'hole' in the Antarctic ozone layer and the subsequent frenetic research and political activity (e.g. the Montreal Protocol) are also covered.

The greenhouse effect is probably the best known of current global environmental issues, mainly because widespread and often sensational media reporting has generated widespread public interest. Again Kemp provides a wide ranging and balanced coverage of the issue in Chapter 7 emphasising the range of predicted temperature change and giving generous space to the dissenting views, most notably those of Sherwood Idso. The environmental and socio-economic impacts of potential warming are also stressed, along with various national and international initiatives. The final environmental problem, discussed in Chapter 8, is of the nuclear winter effect, an issue

which was intensively studied in the early 1980s. While the thaw in relations between the superpowers has lessened the likelihood of a nuclear exchange, Kemp points out that the issue is not yet irrelevant. Kemp traces the development of the concept, comprehensively covers the major studies, and provides adequate coverage of alternative and dissenting views. The point is made that much of the work done in model development for the study of nuclear winter has been directly applicable to other environmental problems. The final chapter reviews the present problems and future prospects, concentrating on the relationship between the media and public interest, and on political developments and solutions.

In brief, this is a well written, wide ranging and yet concise book that is well pitched for its intended readership, although the specialist may find it rather superficial. Emphasis is on the written text; tables and diagrams are few. There are few errors: excess *heat* not *radiation* is transferred by the oceans (p.26), and the flow is meridional rather than meridianal (p.64, p.176). The book has a slight Euro-American bias, but this is probably acceptable from a Canadian author. In general, this book is to be highly recommended, particularly to undergraduate students in the relevant disciplines.

Nigel Tapper

Dr Nigel Tapper is a senior lecturer in Geography and Environmental Science at Monash University. His research interests are largely in boundary-layer climate.

Radar in Meteorology edited by David Atlas (American Meteorological Society, 1990) ISBN 0 933876 86 6. 806 pp., US$95.00.

This encyclopaedic volume is dedicated to Professor Louis Battan and is an outcome of the 40th Anniversary Radar Meteorology Conference held in Boston from 9–13 February 1987. This conference commemorated the anniversary of the first weather radar conference held at the Massachusetts Institute of Technology (MIT) in 1947.

In all, over 200 participants and authors were involved in the production of this massive volume under the editorship of David Atlas. The volume is structured to provide historical accounts and, for a range of topics, critical reviews of progress and status in radar meteorology, each supplemented by an expert panel review aimed at broadening the perspective and providing some insight into possible future development. The approach is unique and in my opinion succeeds. The historical accounts, often provided by those directly involved, give unique insight into the development, personalities and institutions involved, and national programs undertaken during the formative years of radar meteorology. The reviews of the present status are comprehensive and self-contained, with little duplication. Commensurate with a healthy science, controversial and unresolved issues are treated appropriately so that the reader is aware of differing viewpoints. The supplementary panel reviews are particularly attractive additions from this viewpoint, especially for the researchers reading this volume.

The initial eighteen chapters cover the historical development of radar meteorology up to the present time. This account alone makes this an interesting and worthwhile volume. A combination of institutional and national reviews that are encompassing and representative is provided although, understandably, somewhat dominated by US contributors. The early and important contributions from a program perspective include those in the United Kingdom, the Stormy Weather Group at McGill University, Canada, and at MIT. These programs cover those responsible for the invention of radar, the foundations of rain rate and reflectivity relationships, signal fluctuation statistics, raindrop spectral characteristics, the first Doppler radar observations etc. Then in a complementary fashion, the histories of specific application areas (e.g. rainfall measurement, precipitation physics, polarisation diversity, severe storm detection, Doppler radar and other applications) are provided, linking the roles that the various groups played.

The following eleven chapters then proceed to document the science and technology of radar meteorology including many topics of operational interest. Each chapter is written by an expert in the area with a following critical panel review. Instrumental aspects such as polarisation diversity, signal processing, VHF/UHF radar techniques, mobile and spaceborne radars are first presented followed by chapters discussing scientific aspects of cloud microphysics and radar, convective dynamics, radar observations of tropical and mid-latitude precipitation systems, planetary boundary-layer aspects and radar observations of the free atmosphere. Precipitation measurement by radar, severe weather detection and applications to aviation meteorology are the subject of chapters with an operational emphasis.

This volume will undoubtedly form a basic text for students, meteorologists, engineers, managers and researchers interested in radar meteorology. However, it is by no means the traditional text in the vein of Battan's *Radar Observations of the At-*

mosphere. It is much more. The history presented, the range of topics covered and the approach adopted make it unique and unsurpassed. It does provide basic information and references as required of a basic text but the state-of-the-art discussion, range of topics and detail provided on both the scientific and technological aspects of radar meteorology found in this volume are unavailable elsewhere. In addition, the linkage with and discussion of current research problems in the reviews compiled by acknowledged experts are aspects that are normally not presented in traditional texts. Such discussion is usually only available from individual perspectives in less critically reviewed situations within the more limited confines of conference proceedings.

In my opinion, the volume presents the best available summary of the history of meteorological radars and the role radar has played in many scientific and technological applications. The effort of the contributors and the editor in providing such a detailed, encompassing and state-of-the-art volume is to their credit and unlikely to be matched for some time.

It is difficult to criticise such an extensive and thorough volume. I found only one what I consider major topic somewhat overlooked. The coverage of multi-Doppler radar techniques and associated techniques for retrieval of buoyancy and pressure fields was somewhat neglected given their obvious importance. A chapter devoted to this subject would certainly have made this the most definitive book on radar meteorology, although in my opinion is still retains that status without this addition. In addition, much of the information presented on the structure of mesoscale precipitation systems (including tropical systems) is available elsewhere, although often somewhat dated compared with this volume. However, if such duplication does exist it is acceptable as it adds to the completeness and almost all encompassing subject range of this volume, with the reader guided by the wisdom and experience of the editor and the very people responsible for the field of radar meteorology. Almost every chapter represents the place I would look first for reference information and initial guidance relevant to radar meteorology.

In summary, in my opinion this is the book to have on radar meteorology and judging by the number of times I have found it missing from my bookshelf this opinion is shared by many others. I thoroughly recommend it for all involved in radar meteorology and consider it an essential volume for any meteorological library.

Tom Keenan

Tom Keenan is a research meteorologist with the BMRC. His research interests include radar remote sensing and studies of tropical precipitation.

Meteorological Aspects of Emergency Response edited by M.L. Kramer and W.M. Porch (American Meteorological Society, 1990) US$40.00.

This book is the outcome of a meeting of the Advanced Studies Institute sponsored by the American Meteorological Society's Committee on the Meteorological Aspects of Air Pollution. It was edited by the organisers of the meeting and consists of an introduction and five extended papers.

Just as the meeting which led to the book consisted of a mixed audience of meteorologists and non-meteorologist plant managers and emergency response team leaders, so the content of the book includes a range of specialist and generalist material. Much of the material in the book is of greater interest to the non-meteorologist. However, the book will interest the meteorologist who is involved in or concerned about the use of meteorological information in decision making for the very short term or in situations of risk.

The introduction presents the results of a survey of potential participants in the meeting, which were then used to plan the presentations made at the meeting. The survey showed that the key points which participants wanted discussed were in relation to:

- meteorological observations — what observations are needed, availability of real-time data, and adequacy of routine public weather and aviation observations;
- emergency response models — the inadequacy of the simple Gaussian model, improvements in long-range models post-Chernobyl, using predictive meteorology in models, the meteorology of flammable liquified gases, and the adequacy of the parametrisation of the physics and chemistry of denser than air gases in the ambient; and
- evaluation of models — the appropriate meteorological scenarios for evaluating the models, methods for evaluating various modules in models, adequacy of meteorological data bases to include worst case scenarios, and the risk assessment lessons from Bhopal and Chernobyl.

The first extended paper covers the basics of the application of the role of meteorology in emergency response. Although it is mostly concerned with dose exposure and its estimation from present and predicted short-term meteorology, its focus is really on the use of dispersion models and their limitations. A strong meteorological message which emerges, however, is that despite all the research effort which has gone into improving model simulations of diffusion and turbulence, surprisingly little effort has gone into reliable methods of predicting wind direction on the small

mesoscale. And yet wind direction is a key factor in determining which areas will be exposed to an accidental release of hazardous material on this distance scale.

The second paper is solidly meteorological in content, dealing with meteorological data acquisition and their use in models. The mesoscale processes important in dispersion in emergency response situations, e.g. land and sea-breezes, the urban heat island, anabatic and katabatic flows, and the use of Pasquill stability categories, are all covered in a clear and succinct manner. Useful recommendations on equipment design, exposure and network density are presented, and the necessity for data quality assurance is strongly emphasised.

In the third paper the Chernobyl accident is used as a case study for the requirements of predictive meteorological systems for emergency response modelling. The impact of the release of radioactive material from Chernobyl is assessed on three distance scales, the release zone (up to 200 km radius), the mesozone (200 to 2000 km) and the macrozone (beyond 2000 km). The meteorological factors affecting the position, path and dispersion change from one zone to another, and the consequences in terms of population exposed and the level of exposure, are discussed. The use of a wind field model in predicting the trajectory and dispersion of the radioactive plume in the macrozone is described, and the model's good performance over the first 48 to 96 hours is noted. A predictive model simulation on the mesoscale is presented for a squall line, showing a reasonable qualitative performance in representing the features of the squall line, but poor quantitative performance in predicting precipitation. A brief but informative discussion on nowcasting is also presented.

The fourth paper deals fairly briefly with the application of a predictive dispersion model to quantitatively simulate the Chernobyl release. The model was actually used operationally just after the release and, in hindsight, performed rather well. The model's limitations in parametrisation of the deposition and wet scavenging processes are discussed in some detail.

The final paper is a very lengthy review of the methods of evaluating the performance of dispersion models for emergency response use. Much of the material in this paper has already been published by the USEPA, amongst others. The paper covers the issues in the debate over the use of statistical criteria for assessing model performance, and provides examples of the various methods. The models evaluated are various versions of MATHEW/ADPIC, well known to specialists in the emergency response area, and comparisons between model simulations and data from eight field experiments are presented. The paper recommends a further workshop to establish performance criteria for emergency response models, leading, no doubt, to a further publication on the subject.

This book provides some useful insights into one application of plume dispersion modelling. The field of dispersion modelling is well established and employs proven techniques. Dispersion models are regarded as accurate if they simulate the key features of a real situation and give quantitative estimates within a factor of two to four of observed values. Meteorology is at the core of dispersion modelling, and it is the accuracy in parametrisation of turbulence, diffusion and deposition which determines the performance of the model. Accuracies of factors of two or four are hardly an appropriate basis for making major decisions such as evacuation of a district, but, as the papers presented in the book make clear, they are the only basis currently available from the present models.

This book will probably find its largest readership among the meteorologically literate industrial plant and emergency response managers, and their staffs who use the models. It would have some appeal as useful background material to meteorologists who routinely provide nowcasts or short-term forecasts. For the specialists in emergency response and complex dispersion modelling, the material presented would be quite familiar.

At US$40, the book is fair value for money. Presumably it will be best ordered direct from the American Meteorological Society.

Phil Morgan

Phil Morgan works with the Victorian Environment Protection Authority. Originally a meteorologist, he now manages EPA's air and water research programs.

The Hurricane by Roger A. Pielke (Routledge, Chapman & Hall Ltd, 1990) ISBN 0 415 03705 0. Pp. xi + 228, £50.00.

This book is written for the scientifically oriented reader. It generally succeeds in its stated aim which is, to quote the jacket flap, '... to give a detailed, descriptive discussion of tropical cyclones in a non-mathematical framework'. The author is a Professor of Atmospheric Science at Colorado State University, an institution well-known for its tropical meteorology activity. Although it discusses tropical cyclones generally, the book is slanted toward the north Atlantic and USA. It is divided into two main sections: five chapters of text (augmented by 45 figures comprising over 200 graphs, charts and photographs) and two appendixes.

The introduction begins rather dramatically with a bulletin from the US National Hurricane Center issued during the disastrous hurricane *Camille* event of 1969, one of the most severe in America's history. Pielke goes on to define some basic terms, then introduces the Saffir-Simpson Damage-Potential Scale, unfortunately without any elaboration.

Chapter 1 uses maps to give details of the origin of tropical cyclones and their tracks. The drafting quality of these and other maps varies from the appealing to the appalling. Those of cyclone tracks, for instance, while clear enough within the limitations of a 'spaghetti' of overlapping paths, are based on operational synoptic charts and no attempt has been made to 'clean up' the backgrounds. They also purport to show 1968–77 tracks but are cited as coming from a 1975 source. In order to fit tropical cyclone occurrence into a global perspective, there follows a description of the general circulation. Though a good summary, a few additional schematics would have made some points clearer. By enunciating various development criteria, the origins and tracks of tropical cyclones are then related to the general circulation.

The next two chapters deal respectively with tropical cyclone formation and intensification mechanisms, and controls on their movement. These areas are potentially difficult without recourse to mathematics; genesis and development are handled well. Athough the notion of steering current and the nature of the cyclone's interaction with its external environment are explained adequately, internal influences on movement are only touched upon. Some readers may be left wondering why some cyclones move very erratically and others fairly predictably. Unfortunately, satellite pictures used in these chapters for illustrative purposes are not particularly good examples of their respective subject matter, and suffer from noise effects.

Oceanic and land impacts are discussed next. A highlight of this book is a series of 33 aerial photographs of the sea surface in cyclone winds of varying strength, combined with the expanded Beaufort wind scale. Land-based impacts mentioned include those due to storm surge, wind, rainfall and tornadoes. Pielke emphasises that some of these impacts may occur some time after, and at considerable distances from, a cyclone's landfall.

The final chapter is largely about the forecasting of tropical cyclones. The reader is briefly introduced to some of the computer models now available, as well as to forecasting strategies using the decision tree approach. Seasonal forecasting of tropical cyclone occurrence is touched upon. The chapter concludes with a short mention of attempts at cyclone modification. This chapter gives the impression of being rushed through, particularly the section on computer models.

The remaining 128 pages are occupied by two appendixes. Appendix 1 shows detailed annual maps of reanalysed north Atlantic tropical storm tracks from 1871 to 1989. From 1886 onward, hurricanes are distinguished from lesser storms; progressively more detail of storm intensities is shown after 1898. These charts will provide a valuable resource for those interested in the climatology of tropical cyclones in this region, though the appeal for an Australian readership is obviously limited. Appendix 2 is a northwest Atlantic cyclone tracking map.

Criticisms are mainly related to quality control and presentation. Some figures, particularly maps, suffer from a poor standard of drafting quality. While the quality of printing is generally excellent, several pages show some smudging. It is felt that Pielke could have made better choices of satellite pictures for illustrations; for example, the dust jacket photograph shows a hurricane's eye much more clearly than does the relevant figure. The list of references contains a number which are not cited in the text and several whose year of publication does not match that cited. Grammatical and spelling errors are few. An unusual feature is the use of English spelling in an obviously American production, perhaps because this edition was published in London.

This is a good introductory work, presenting its topic in generally clear, non-mathematical terms. Some physical science background is assumed however. The book should find acceptance among students and teachers of meteorology, climatology and geography.

Peter Bate

Peter Bate is a meteorologist now engaged in real-time climate monitoring in the Bureau of Meteorology's Darwin office, after a 20-year tropical forecasting career.

Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere edited by A. O'Neill (Kluwer Academic Publishers, 1990) ISBN 0792309774. Dfl 145.00.

This book presents the proceedings of a NATO advanced research workshop held in San Franciso, California, USA in April 1989. Speakers at the workshop have each prepared their own typewitten text, and the various contributions have then been merged and bound to form the book. This leads to some degree of non-uniformity in presentation style between successive

chapters, but no doubt allowed a faster preparation of the book, and thereby more rapid dissemination of its contents. There do not seem to be a large number of typographical errors; the few I noted are not really worthy of mention, except perhaps the one in the title listing just prior to the table of contents, where 'Southern' is spelt 'Soutern'. Grammatically the papers read pretty well.

The workshop was held during a period when interest in the Antarctic ozone hole was significant and so, not surprisingly, the conference seems to have been dominated by papers concerning the ozone hole. Indeed, of the 18 papers which appear, 9 directly concern this phenomenon and at least a couple of others make some reference to it. Thus for any potential reader interested in quite recent developments about the ozone hole, this is a useful reference. The other papers deal with various aspects of the general circulation of the southern hemisphere, highlighting differences and similarities between the northern and southern hemisphere circulations.

It is the differences between the two hemispheres which make the publication most useful, and was one of the main motivations for the conference. The different fractions of land surface in the two hemispheres result in quite markedly different levels of planetary and gravity wave orographic forcing. As a result the mean flow in the southern hemisphere stratosphere shows much less activity on scales of a few weeks than occurs at corresponding altitudes in the northern hemisphere. It is precisely this feature which allows the development of the very intense vortex over the Antarctic continent in winter and therefore allows conditions to develop which lead to the famed 'Antarctic ozone hole'. The lack of orographic forcing in the southern part of the globe also leads to quite different behaviour of the gravity wave spectrum.

The book is not really designed for the 'beginner'. Terms like 'Ertel's potential vorticity', 'Eliassen-Palm flux and divergence', 'Universal Gravity Wave spectrum', 'Vorticity area integrals' etc. are not generally defined; it is assumed that the readers have some familiarity with all these concepts. However, given the fact that the conference was designed as an *advanced* study group, this is not unreasonable.

The book presents a moderately good mix of experimental, modelling and theoretical work. However, in addition to the previously mentioned bias towards papers concerning the ozone hole, there is a concentration on planetary wave and mean flow motions, with only three papers concerning gravity waves and only one which even touches on smaller scale motions. There is also a strong concentration on the stratospheric regime, with only a limited number of papers discussing the mesosphere. The papers concerning chemistry also concentrated almost exclusively on the stratosphere, and again on the ozone hole in particular. In view of the book's title, I personally found this concentration on the stratosphere a little disappointing. Along the same lines, most of the 'experimental data' presented were recorded by satellites, and data recorded with ground-based instrumentation were less frequently discussed. Nevertheless, these omissions do not detract from the quality of the book; rather, they simply suggest that the title claims to be a little broader than it really should.

To finish this review, I would like to consider in slightly more detail a couple of the papers which I personally found of interest. Naturally these will be biased by my own special interests.

The first chapter, by Michael McIntyre, aims at a broad overview of those current problems of middle atmospheric dynamics which he sees to be as yet unanswered. He offers three major challenges for middle atmospheric work in the future, all intimately related to the way in which we tend to represent turbulence in the atmosphere. Whilst I can agree with his general thrust — namely that the intermittent nature of turbulence conflicts with the frequently used but simplified assumptions of homogeneity and stationarity — I believe his criticisms are too strong. In particular, in Section 3.6 of his chapter he notes that the use of an 'eddy diffusivity' is not justified when one is considering scales of transport smaller than the 'outer scale' of the turbulence; he has done a grave injustice to workers in the field of turbulence to even imply that they believe this to be true. It has been known for at least 30 years that one cannot do this! Nevertheless I think the paper is designed to be thought-provoking, and generally I think he has been successful.

The chapter by Susan Solomon presents a fairly clear and up-to-date review of ozone chemistry associated with the ozone hole, and I found the discussion about the processes of denitrification of the Antarctic stratosphere of some interest. But perhaps more interesting was the paper by Grose et al. which discussed the possibility of the ozone depletion over the South Pole causing a subsequent depletion of ozone throughout the entire southern hemisphere by allowing ozone-poor air from the polar vortex to mix into the surrounding regions during the period of break-up of the vortex. It seems that the recovery time for ozone to return to 'normal' concentrations in the lower latitudes is longer than a year, so this dilution effect may be having a cumulative effect on the total ozone at all latitudes. This must be a serious concern to all Australians.

The paper by David Andrews also caught my eye. He considers the manner in which experimentalists and modellers interact and draw from each other's expertise, and whilst nothing he says is really new, it does neatly define a quite reason-

able mode of interaction between the disciplines. It reminds us all to occasionally go 'back to basics', question exactly what we are doing, and query how valid are the assumptions which we often 'take for granted'.

It would be remiss of me not to make one final observation. Despite the fact that the book concerns the southern hemisphere, it is noteworthy that only two of the authors are from that region of the globe. They are both from Australian institutions, which I suppose is good, but one cannot help but wonder whether funding for atmospheric studies in Australia is at an adequate level — surely we should be a world leader in studies of our own atmosphere, rather than watching the Americans, Japanese and Europeans take the principal role.

W. Hocking

Dr Hocking is a senior lecturer at the University of Adelaide. He specialises in studies of atmospheric dynamics of the middle atmosphere.

Meteorology of Air Pollution by R.S. Scorer (Prentice Hall, 1990) ISBN 135772303. $78.50.

Professor Scorer's latest book *Meteorology of Air Pollution* continues the long tradition of meteorological texts by this well known British meteorologist. It contains the qualities we have come to expect from Scorer. The sound and comprehensive understanding of his subject, the carefully selected and very powerful illustrations and, of course, his commitment to humankind and social responsibility.

The book is divided into two parts, 'Local and National' and 'Global and Climatic'. These are essentially, as they imply, the two conventional scales of interest to air pollution meteorologists. The first part concentrates on micro and mesoscale meteorology, and the related air quality processes; the second discusses the global issues such as ozone, greenhouse and acid rain.

Although the first part is not explicitly about the British situation, and most of the phenomena and mechanisms described will occur in other parts of the world, it is still very clearly mainly drawn from the British perspective. The great bulk of the photographs are from Britain yet, despite their parochialism, in most cases they illustrate their subjects beautifully. The Australian reader will, however, find some slight unusualness in a few places. For instance most of the aerological work is done on the tephigram. I am not sure whether it is simply through familiarity with the skew T-log P, but to me the tephigram seems harder to come to grips with. As is common with many British texts, this one does not come to terms with SI units. As a result one becomes very frustrated with the inconsistencies of a meteorological text published in 1990 that has millibars and centimetres, 'T is the temperature in kelvins' or even reference to inches. This may seem to be trivial criticism, but the book is, in the author's own words, 'based on lectures given to engineering students at University College'. It probably seeks to take its place as a text for students but, without a rigorous approach to such details, must fall short of that ideal.

The initial few chapters of the first part cover, in a fairly conventional way, the essential meteorology of the boundary layer. They introduce all the key processes in air pollution meteorology, such as the mechanisms of development of the thermal structure of the layer, roles of condensation and evaporation, interactions with the cloud layer, radiative heat exchanges and the diurnal changes of the boundary layer. Discussions on katabatic winds, the sub-cloud inversion and the mixing layer are also included. All this is done in a quite concise way, with all the essential nuances captured.

Then follow a couple of chapters on the mechanisms of plume behaviour and approaches to modelling it. All scales from single stacks affecting a local environment to international transport are covered. The strengths and weaknesses of models are covered very well. By the time the book reaches the chapter on deposition at large distances, the last in Part I, the scene has been set to address some of the other 'political' issues associated with contemporary air pollution meteorology. This chapter is a most interesting one. It uses the Chernobyl disaster as an illustration of large distance transportation. In particular it emphasises the uniqueness of most situations. In the Chernobyl instance Scorer points out that the track of the radioactive waste 'bore no relation to the climatologically most likely track.' Finally, the power of satellite imagery is shown. Scorer presents over a dozen satellite images of various pollution or dispersion phenomena. These are uniformly excellent and the reader can spend an interesting period studying them.

In the first chapter of Part II Scorer indulges in some political philosophy. After a conventional description of the roles of radiative gases in the global atmosphere, he then addresses the current greenhouse debate. I leave it to the reader to enjoy his controversial approach, but he does not have much time for modellers, and puts much emphasis on the role of water vapour. He also makes the point that greenhouse is not the problem, but rather it is the rapidly growing human population that we should be concerned about. His implacable anti-nuclear credentials are invoked to

strengthen his credibility. He points out that although the nuclear winter hypothesis was an ally to the anti-nuclear cause he could not support it because be believed it was scientifically wrong. The Gaia ideas are also introduced and given a degree of support here. (Look also in this chapter for the hoary old idea of flooding Lake Eyre!)

In the next chapter Scorer continues the approach, but this time concentrating on ozone. He begins with an introduction to atmospheric chemistry, both tropospheric and stratospheric, and this seems to me to be a good, brief presentation. He then addresses the issues of the day. These are done with a degree of cynicism, particularly with respect to concerns about ozone depletion. He more or less ignores the evidence that there are real measured depletions of ozone at all latitudes. Ozone depletion is really a very important issue, and while cautious scepticism is necessary, I am not sure that Scorer's cavalier approach is particularly helpful to one of the major atmospheric debates at present facing Australia.

Then the third of the big three in global pollution, acid rain, is addressed. This chapter is thin on meteorology, concentrating mainly on the effects of acid rain, and its sources. His message is that the concept of acid rain damage, particularly as it effects the biosphere, is by no means well understood. However the public and the media look for a simple villain to blame and so the simple concept of acid rain is used. In fact there are many processes which cause the damage to forests, fauna, lakes etc. and it is important to understand the holistic nature of the problem if it is to be solved.

The final chapter presents a philosophical overview of Scorer's ideas about the role of air pollution on the future of the earth. He begins this with a dozen or so 'brief statements' that might have been uttered by various people. These include, for example, ones by Jeremiah (also hellfire religions, and some econuts), the Club of Rome, Malthus, Adam Smith, Economists, Canute and so on. Then follows Scorer's views, particularly on the prospects for the earth. 'The essential fundamentalism is the recognition that humanity has become a plague on Earth'. He believes that the ability of the biosphere-atmosphere system to maintain a stable ecosystem is no longer possible if we continue in the way we are going. The impacts of human activities require drastic changes by us. He warns that 'where control is not exercised by consent it will be maintained by ruthless suppression, which is fundamentalist in character'. He expresses his concerns about where the scientists are going and if they are helping or hindering the solution to the clearly identified pollution problems. In particular, Scorer does not have very great faith in the ability of numerical models to address climate issues and believes that the chaos theories, currently in vogue, contribute little, if anything, to our knowledge of the responses of atmospheric systems.

So, in summary, we have a volume on meteorology which does not fit a conventional mould. As a text book it is not really adequate. Nevertheless it addresses the essential elements of air pollution meteorology in a conventional way, although it does require more than a basic understanding of the fundamentals of meteorology. As a philosophical treatise it is rather too full of Scorer's personal views. But these are well presented and thought provoking, even if somewhere off the mainstream.

It would be difficult to recommend this book for the personal collection of any but the most avid hoarder of meteorological literature. In any case as the book is in excess of $70, for a rather thin (160 pages) volume, most would consider it overpriced. But it is well worth a read. So my recommendation is borrow it from your library, and if they don't have it ask them to add it to their collection.

Bob Brook

Bob Brook's background is forecasting and research with a special interest in boundary-layer meteorology. He is head of the Bureau's Observations and Engineering Branch.