

PREFACE

It is a truism to state that we are all subject to the environment within which we live. From it we derive the food and water that sustains life, the material and energy resources that makes that life more comfortable, and consign to it our waste products. Until very recently, these things were taken for granted. The resources seemed inexhaustible, while inexorable technological advances promised ever more comfortable lifestyles. Gradually, these perceptions have been changing under the irrefutable evidence of climate change.

The first intimations that all was not well came from the unexpected discovery of ozone depletion and the dramatic ‘hole’ over Antarctica. It soon became apparent that this was a direct result of human activity — the planet is not necessarily able to absorb all our waste. It is now widely appreciated that resources are indeed limited and that consumption, particularly in the developed world, might need to be reined in if others less fortunate are to be able to enjoy some of the benefits. However, it is the consequences of climate change that have engaged the news media the most and set political agendas, at least in Europe. While few among the scientific community dispute the twin observations of steadily increasing temperatures and rising levels of carbon dioxide, the actions required to reverse the trends are necessarily political and economic. Science alone cannot do this; it can name the dangers and even suggest possible solutions, but ultimately there are some decisions that are not within its province.

This book is a somewhat expanded version of a course on Environmental Science given by the author to second and third year Physics honours undergraduate students at Durham University. The course was intended to provide a bridge between the different individual specialisms that make up the general field of environmental science — one that would be accessible to the average student at this level of his or her degree programme. Too brief in many aspects to be in any sense comprehensive, the course did set out to introduce students to the diversity of the subject. The approach was meant to be rigorous and therefore to some degree mathematical, though with the hope that the physics would not be obscured by the mathematical ‘trees’. The same philosophy has been adopted in ‘Physics of the Environment’ and the mathematical content has been kept to a minimum that is commensurate with a proper understanding of the subject.

There is in reality a dearth of physics textbooks that cover the breadth of material at a level appropriate for undergraduate students of physics.^a Specialist texts are by definition ‘specialist’, focusing in depth on the particular field in question and are usually more suitable for postgraduate study. Often texts on environmental science are primarily concerned with ecological matters and on the whole do not address themselves to the physical sciences, or if they do, it is only at a superficial level. Some have clear polemic agendas.

With the exception of the final chapter, the rationale behind this book has been to develop the science and technology of the subject. That is not to say that there is an absence of material that some might deem controversial e.g. the inclusion of a section on nuclear power, a critique of the shortfalls of renewable energy, the so-called hydrogen economy all being cases in point. As part of the current and possible future environmental science landscape, such topics should not be ignored, but the intention has been to discuss the science in as neutral and unbiased manner as possible.

Finally, the book is by now long overdue and it would be unjust not to acknowledge the patience and forbearance of the editor, Katie Lydon, on this project.

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^aEnvironmental Physics, 2nd edn by Egbert Boeker and Rienk van Grondelle, Wiley (1999) being an honourable exception — it was also the course text.