Introduction

The phrases CLIMATE CHANGE and GLOBAL WARMING and more recently GLOBAL COOLING are now part of our lives and rarely does a day go by without a mention in the press or on the radio of the possible causes of climate change and its consequences. Climate change has come upon us in a relatively short space of time and is accelerating with alarming speed. It is perhaps the most serious problem that the civilized world has had to face. It is the subject of major international co-operation through the Intergovernmental Panel on Climate Change (IPCC) which was set up in 1988 by the World Meteorological Organization and the United Nations Environment Programme. The IPCC has reported its findings in 1990, 1996, 2001 and 2007. The intention of this book is not to compete with the IPCC reports but to offer support through a different approach. This book does not focus on predicting the outcomes of climate change but presents both the facts relating to the possible causes of climate change and the evidence that climate and global changes are taking place.

In spite of all the publicity and coverage and indeed in the face of real evidence, there are many dissenting voices who either do not accept that climate change is taking place or that anthropogenic gases and compounds, such as carbon dioxide, are responsible for the major effect. One of the aims of this book is to counteract these comments and to present the evidence for climate change, in an unemotional, non-political, readable and scientific manner.

The book is divided into 25 chapters, each one written by an expert in the field. Five chapters have been devoted to answering the questions surrounding possible causes of climate change and the role being played by anthropogenic gases, compounds and particles. The five include solar effects, space weather, volcanic activity, variations in the earth's orbit, the role of cosmic radiation and the effect of changes in atmospheric carbon dioxide, nitrogen oxides, water vapour and man made gases such as freons.

To put climate change into perspective, there is a chapter on the geological history of the earth's climate. There is evidence of slow changes in climate, taking place over millions of years, and also of abrupt reorientations of the Earth's climate, the latter perhaps foreshadowing the way climate is responding to the present human activity.

If there ever was doubt about whether global and climate changes are taking place or not, then the last section of nineteen chapters should put pay to such thinking. These chapters give expert interpretations of the changes taking place in diverse areas such as weather patterns; bird, mammal and insect ecology; sea life and marine biodiversity; the inter-tidal zone; impacts on food

supply; sea level rising; sea temperature rising; ocean current and ocean acidification; glacial and polar cap melting; plants, lichen, and plant pathogens and coastline degradation.

Little or no attempt has been made to present climate models or to predict climate changes in the future. This book focuses more on the experimental observational and presents the reader with the likelihood, through statistically significant evidence, of a climate changing future.

An aim of the book is to have all the scientific details of possible causes and scientific evidence for climate change written by experts in a language accessible by all, brought together in one volume. In this way comparisons can be made and issues put into perspective. The book will benefit both the non-specialist and the serious student. Each chapter begins with an Introduction and finishes with a Conclusion, written in lay-person's language and each chapter contains references to all the relevant and latest scientific publications. In this way the book will be of great benefit to students and researchers in each of the topics as well as making an excellent source and textbook for University and College courses in 'Climate Change'.

The International Union of Pure and Applied Chemistry supports the book, through its 'Chemistry and the Environmental' Division, and the IUPAC logo appears on the front cover. The IUPAC's adherence to the International System of Quantities is reflected in the book with the use of SI units where ever possible. One will, for example, notice that the symbols for 'hour', 'day' and 'year' are 'h', 'd' and 'a' respectively.

In spite of its title, the book does include indicators of global change such as 'ocean acidification' which, like climate change, is a result of excess carbon dioxide in the atmosphere.

The book is a scientific presentation of the facts surrounding climate change and no attempt has been made to offer solutions to climate change although the basic nature of the problem is obvious: the burning of oil, coal and gas is causing a significant rise in atmospheric carbon dioxide, water vapour, nitrogen oxides and also particulate matter. In this respect, climate change and our future energy are closely intertwined and this book will, I am sure, have a strong influence on deciding our future energy options.

"CLIMATE CHANGE: observed impacts on Planet Earth" is written not only for students and researchers and their professors, but for decision makers in government and in industry, journalists and editors, corporate leaders and all interested people who wish for a balanced, scientific and honest look at this major problem facing us in the 21st century.

I wish to thank all the authors for contributing chapters and for their many suggestions and discussions – all of which have helped to improve the book and its format. Special thanks must go to Professor Martin Attrill and to Dr Carol Turley for their suggestions, confidence and advice and to my wife, Dr. Valerie Letcher, for her help and support.

Trevor M Letcher
Stratton on the Fosse
1 November 2008