

stand that damage at settlement sites in Central and South America may be the result of earthquakes rather than post-abandonment decay, but the discussion of archaeological sites and earthquake evidence in Chapters 5, 6, 7, and 8 is uneven and somewhat cursory. Some students would find the material interesting, but it is unlikely that the book will be used in many university courses because it is such a niche product.

Professor Kovach argues that earthquakes played a role in the evolution of early cultures in quake-prone regions in the Americas. Few would dispute this statement, because, as the author shows, the myths and legends of early people include animistic references to earthquakes. Further, it is not surprising that ancient Zapotecan, Mayan, Incan, and other ruins show evidence of earthquake damage, as the areas in which these people lived are seismically active. In my view, a more interesting question is “How did early people in the Americas adapt to the strong earthquakes they must have experienced?” These peoples were very familiar with earthquakes and they must have adjusted their lives to limit the damage that quakes caused. Scientists have argued that large earthquakes and volcanic eruptions ended ancient civilizations. I find such arguments unconvincing as they assume that early peoples were unable to adapt to natural disasters. As Professor Kovach points out, ancient civilizations can fall due to many causes, including climate change, epidemics, foreign and civil wars, cultural and social decay, and agricultural and economic collapse. Earthquakes, at most, are the *coup de grace* of a civilization in terminal decline.

Professor Kovach argues that archaeology can play an important role in extending the historical record of seismicity. I agree, but the book does not demonstrate that this has been, or can be, done in the Americas. The New World record falls far short of that in the Middle East, especially Israel and Jordan, where surface rupture and other earthquake effects can be related to precisely dated events dating back more than 2000 years. Fault offsets and other damage to archaeological sites in the Jordan River valley, for example, has been used to determine the magnitude of biblically important quakes.

The organization and presentation suffer from the book’s lack of clearly defined audience and purpose.

Chapter 2, on seismo-tectonics of the Americas, is only 11 pages and too general to be useful. Furthermore, some of its content is repeated in the regional earthquake chapters. The regional chapters (5-11) seem somewhat forced, with arbitrary geographic boundaries. Why, for example, separate earthquakes in California from those in the North American Cordillera, especially as the chapter on North American Cordillera includes a section on earthquakes in Death Valley, California? California, of course, is part of the North American Cordillera.

Archaeological sites in quake-prone regions are reviewed in several chapters, but the actual evidence for earthquake damage is not discussed in the detail that I would have liked. Earthquake myths, legends, and damage to famous archaeological sites are included in the chapters dealing with Mexico, the Mayan empire, and Peru and Chile, but are scarcely mentioned in the other regional chapters.

The illustrative material, as a whole, will do little to sell the book. Seventy five of the 135 figures in the book are simple black-and-white maps showing earthquake epicentres, faults, and localities mentioned in the text. Some of the maps could have been combined or better annotated. Thirty six of the remaining figures are photographs; some are very good but others show little and could have been deleted.

Here, then, are my summary and recommendation:

**Strong points:**

- Earthquake tables
- Description of effects of earthquakes on archaeological sites
- Discussion of relation between earthquake intensity and magnitude
- Reference list

**Weak points:**

- Lack of clear focus
- Structure
- Figures
- Cost (US\$90 is a hefty price for a 268-page book)

**Recommendation.** Unless you are a real earthquake junkie, I would pass on this book.

## Understanding Environmental Pollution, A Primer (2<sup>nd</sup> Edition)

By Marquita K. Hill

Cambridge University Press, 2004,

ISBN 0-52182-024-3

\$110.00, hardcover, 484 p.

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Understanding Environmental Pollution is rich in general information about most forms of pollution at the household, local, and global level. It is written for the non-scientist and non-science student, but is also good reading for those who want generic environmental information beyond their level of expertise. The book’s 18 chapters discuss methodically, pollution concepts; major pollutants in air, water and soil; pollution sources; climate change; toxicity and risk assessment, and concepts and efforts to reduce pollution. The concept of pollution is not presented in isolation but rather as a consequence of the integrated actions of society. It is, in this sense, that energy generation and use and its relationship to pollution are presented.

The presentation of material is clear and lively but perhaps, also controversial. Typically, each chapter begins with an appropriate quotation about the right direction forward. This sets the tone for the accuracy about the present situation, which is explained by first presenting the basic concepts about a pollutant e.g., acid deposition, and then by recounting the history of the research and critical debate that have led to our current understanding of the problem – including the skeptics point of view.

The review of each topic spices the reading by adding the human element to what can otherwise be dry material. Also, it goes a long way to explaining the culture of science to the uninformed. For example, in the section on ozone depletion, Hill says, “However, as happens with many environmental issues, there are skeptics. And often, as with ozone, researchers respond to skeptics by doing more research.”

Another effective feature of the book is its inset boxes. These appear as

context-relevant, self-contained “asides” throughout the book and are full of attention grabbing statistics, ideas, quotations, and scientific explanations.

Each section ends with a set of open-ended questions that forces a certain amount of understanding and analysis and allows the reader to evaluate the issues for themselves; this is very good for students and for initiating discussions. The questions range from very basic ones about the science behind pollution to ethical questions about human behaviour and pollution. The ethical questions are thoughtful and provocative. Geoscience educators might find the latter to be helpful in making their lectures more relevant to students.

On the negative side, the upbeat tone of the book sometimes leads to alarmist and melodramatic statements which diminish the otherwise good writing. An example from chapter 5 on air pollution: “disastrous fires and mammoth dust storms may appear from space as gigantic yellow blobs.”

The book claims to be more international than the first edition but remains highly US-centric. Partly, this is unavoidable, simply because so much research has been undertaken in the US, as compared to elsewhere. However, many of the examples provided in the book tend to reinforce the notion that it is in the developing world where the pollution problem lies, and hence the solution, although the contribution to pollution by developed societies and their higher level of consumerism and waste-generation is repeatedly discussed.

In some cases, the description of scientific principles in the introduction has been so oversimplified that it borders on being incorrect. For example, energy is described as something that cannot be created or destroyed, just “dissipated” – rather than converted from one form to another. And organic versus inorganic chemicals are defined based on whether or not they can be destroyed as follows: “Organic chemicals even those difficult to degrade can be destroyed when conditions are right. However, inorganic substances, although they can be converted into other compounds are not destroyed.” I suppose Hill was referring to the 92 elements, although it is not clear, as the box on inorganic chemicals that follows includes sodium bicarbonate and sea salts. This is

very misleading – particularly as it applies to geochemistry.

The geoscientist, generally, will find this book lacking in scientific rigour, particularly in how it addresses the issues in geoscience; nevertheless, the main attraction is its broad scope and effective teaching format. Most of the material that touches on the geosciences – climate change, metals in the environment, atmospheric chemistry, mining, oil and gas, others – just scrapes the surface and is not presented in a quantitative manner. For example, when the book discusses natural sources of metals in the environment, it borders on being negligent and dismissive. In the discussion on lead, there is actually a subtitle called “some lead is natural” which sounds promising, but the ensuing statement is not: “But remember that lead, like all metals, is a natural element. We cannot totally eliminate it.” There is another subtitle called “natural sources” that uses only two sentences to describe them: “Natural sources: these include volcanoes, forest fires, and sea-salt sprays. These are significant but it is human activities that are increasing the environmental load of metals”. No further information is provided. Newspaper articles generally give the subject more attention.

Scientists will find the book to be disappointing in its lack of discussion of the methods used to discover the information that is presented, and in its poor referencing. Many points are presented simply as known facts, and worse, these are not referenced. The only references given in the book are provided under the “further reading” section at the end of each chapter. This seems an unnecessary weakness considering the ease of modern citation software. It greatly limits the use of the book as a research tool.