This little gem of a book is a must read for anyone interested in the evolution of plants and how they have affected the earth's biological and geological history. The ecological role that plants have played in the broad evolutionary play (sensu Hutchinson) is clearly laid out for the reader, and no prior experience in either paleoecology or geology is required to understand the main themes of this book.

Each chapter conveniently starts off with a short synopsis, which puts each chapter into perspective. The writing style is purposively casual, and not, as Francis Crick once wrote, in the "tedious style" of the typical scientific paper. Beerling's prose is exemplary for its clarity and style, making this a thoroughly enjoyable read. The incorporation of numerous biographical vignettes, interspersed throughout the book, gives the science a human perspective that is often lacking in other similar works. As Beerling states, his goal here was "...highlighting the brilliant achievements of the generations of scientific pioneers and adventurers who have shaped scientific thought." He has definitely achieved that goal.

The book chapters fall into four major groups: Chapters 4 and 5 show how fossil plants can yield new information about past climates and selection pressures; Chapters 2, 3, 7 and 8 document the power of plants themselves to change the global environment; Chapters 6 and 8 focus on specific vegetation types and their environmental influences, while the last group (Chapters 5, 6 and 7) provides warnings about current impacts of humans on their environment based on past history.

Chapter 1 outlines the broad themes of this book: that "plants exquisitely record previously hidden features of Earth history, and second, that plants are a geological force of nature...." But there is another theme: that while past may be prologue, modern scientific techniques, such as molecular biology and isotopic analysis, can be used to test ideas about plant evolution and early Earth history; that in fact, one can derive testable hypotheses about events that happened millions of years ago. This theme is carried throughout each of the chapters.

The evolution of leaves is the concern of Chapter 2. Using energy balance theory, Beerling argues that the earliest plants had no leaves because CO$_2$ levels, and thus temperatures, were high, and such structures could not have adequately dissipated enough heat through transpirational cooling to be functionally viable. When CO$_2$ concentrations dropped, such restrictions were lifted, and leaves appeared. The evolution of leaves proved functionally advantageous, because it provided large surface areas with which to exchange gases. This in turn led to faster growth rates and more competition that eventually led to an increase in both the size and complexity of plants.

In a unique juxtaposition of the new and the old, Beerling uses developments in modern molecular biology to propose an actual mechanism by which leaves first arose. He suggests that down-regulation of the knotted homeobox (KNOX) genes was a first step towards producing leaf lamina. When this gene is active it suppresses lateral outgrowths on stems. Somehow, when CO$_2$ concentrations dropped below a certain point, these genes were turned off, allowing new stem outgrowths to be produced and which, after further modifications, developed into modern leaves. Scientists are currently studying what additional steps may have been required, such as coordinating the development of the upper and lower leaf surfaces.

Beerling then switches gears from CO$_2$ to O$_2$ in Chapter 3. Here he shows how plants and natural mineral weathering over geologic timescales altered the past O$_2$ content of the atmosphere. The production of O$_2$ by photosynthesis is mostly balanced by the decomposition of organic material which returns CO$_2$ back to the atmosphere. But in the geologic past, a small fraction of organic material was immobilized, leading to small incremental increases in O$_2$. In addition, natural sulfur cycling contributed to higher atmospheric O$_2$. These small increments in O$_2$ over long time periods led to large increases in atmospheric O$_2$, peaking at 35% around 300 mya in the Carboniferous period. It was during this brief spike that the world saw the evolution of gigantism, such as 40 m tall relatives...