"there are several unrealistic features of Maynard Smith's model". Fair enough. But he does not mention that the figure of 4×10^9 nucleotide pairs in the mammalian genome, which he used to estimate the number of genes and hence of substitutions, even if reasonable at the time, is a substantial over-estimate of the coding DNA, and hence leads to an over-estimate of the load.

There are other occasions on which he overstates his case, but it really does not matter. He is the founder and principal architect of the neutral theory. He is convinced that it explains more about molecular evolution than any alternative theory, and he tells us why. This he does with clarity and vigour. He writes English as if it was his native language, with an elegance that most of us can only envy. He may sometimes reject arguments that I would accept, but he does not ignore facts or arguments which might damage his position. The result is a book which will rank with *The Genetical Theory of Natural Selection* and *The Causes of Evolution* as a milestone in evolutionary biology. It may not be right on every point, but it expresses an original viewpoint which from now on will be part of the way we see the world. □

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Hazy atmosphere

W.L. Chameides

Atmospheric Chemistry.
Edited by E.D. Goldberg.
Springer-Verlag: 1983. Pp.384.
DM48, $20.70.

THE realization in the early 1970s that free radicals are a normal component of the Earth's lower atmosphere revolutionized our understanding of atmospheric chemistry and its role in the larger biogeochemical cycling of the elements. However, the advances made in this field over the past decade have yet to be comprehensively covered in a single book. Unfortunately, although informative and enjoyable, *Atmospheric Chemistry* falls short of filling this need.

The book arises from a Dahlem Workshop on the chemistry of the lower atmosphere. Four sub-disciplines were discussed at the meeting: aqueous atmospheric chemistry, historical records in atmospheric composition, biogenic sources of atmospheric constituents and gas-phase tropospheric photochemistry. The book has a section for each of these fields and, in addition, a general introduction by R.M. Garrels. In each section, there are three or four "background" chapters written by individual conference participants, followed by a Group Report summarizing the findings and recommendations of the participants as a whole.

The advantage of such a format is that the diversity of styles and approaches gives the reader a sense of the vitality and excitement of the conference itself. Many of the chapters are excellent. Garrels's description of global chemical cycles as a complex array of interlocking wheels in the introductory chapter is intriguing. The chapter on precipitation-scavenging, liberally laced with poetic quotations and thinly veiled barbs, is characteristic of George Slinn and quite entertaining. In Lovelock's chapter on anoxic environments the reader is treated to some fascinating bits of information on biota; we learn, for instance, why cockroaches secrete octane. In addition there are several very scholarly reviews such as Stuiver's on carbon isotopes and Penkett's on non-methane organics.

However, while the format makes for several very stimulating chapters it prevents the book from succeeding as a whole because it is not consistently organized. For example, in Garrels's introductory chapter it is proposed that atmospheric chemistry is best examined by a consideration of the time constants intrinsic to global chemical cycles. This theme is then dropped in the following chapter and is never brought up again.

Quite often the Group Report chapters would have served better as introductions to the subdisciplines rather than as summaries; for instance in the biospheric sources section two detailed "background" chapters on oxic and anoxic environments are followed by the summary chapter in which the rationale for conceptually dividing the biosphere in this manner is presented. In other cases, the same facts (e.g. the ionic composition of rain) are discussed repeatedly in chapter after chapter; expositions on the "history of atmospheric chemistry" are presented in no less than four chapters. Examples of using specialized terminology without defining the terms or defining them in subsequent chapters can also be cited. Finally there are several rather noticeable holes in the coverage; these include chemical mechanisms in aqueous chemistry and the secular trends in atmospheric trace constituents such as CH_4 and N_2O.

Overall, the book reads as the proceedings of a workshop on atmospheric chemistry rather than a comprehensive text on the subject. The lack of organization between the chapters renders the book of limited value as an introductory treatise for the novice. Furthermore, the rather restricted citation list presented in most chapters prevents its use as a serious reference text. However, the book can be an informative documentary of what must have been a very exciting meeting among some of the more talented scientists now working in this field. □

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The good, the bad and the ugly

David L. Hull

The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades around 1900.
By Peter J. Bowler.
Johns Hopkins University Press: 1983. Pp.291. £19.50, $25.

AS most historians portray it, science is a linear sequence of triumphant discoveries. Occasionally we hear of scientists who were mistaken, just so long as they were mistaken in big ways. But most scientists fail in the most literal sense of this term. They may publish a few papers, but these papers rapidly sink out of sight in the great ocean of scientific publications. In most cases, publishing a paper is equivalent to throwing it away. Historians of science complain that chronicling only highly visible scientists at the expense of their more obscure fellow labourers is as misleading as telling the story of biological evolution without mentioning the vast majority of species that become extinct. The trouble is that few people want to read about experiments that failed, research that led nowhere, and ideas that were so inconsequential that no one was interested. Historians have written occasional histories of nobodies, but no one seems willing to read them including the nobodies.

Histories of Darwinism inevitably begin with Darwin's roots in uniformitarian geology and natural history, through Darwin and his fellow Darwinians, the advances of August Weismann and the rise of Mendelian genetics, to the New Synthesis. In *The Eclipse of Darwinism*, Peter Bowler takes just the opposite tack. He traces the anti-Darwinians from the earliest theistic teleologists, through the neo-Lamarckians and orthogenecists to Hugo de Vries and his mutation theory. Bowler treats his readers to a fascinating panoply of largely unfamiliar entities and processes — entities such as archetypes, plastidules, the idioplasm, mnemes and hopeful monsters, and processes such as intracellular pangenesis, kinetogenesis, orthogenesis, aristogenesis and racial senility. The names of the scientists whom Bowler discusses are somewhat more familiar — Louis Agassiz, St George Jackson Mivart, Henri Bergson, Richard Semon, Paul Kammerer, Theodor Eimer, Henry Fairfield Osborn, Alpheus Hyatt, Edwin Drinker Cope, Hugo de Vries, William Bateson, Richard Goldschmidt and D'Arcy Thompson. Terming all these scientists "losers" in the same sense is hardly accurate. Many of them made important contributions to science, while others at least had their day in the sun of scientific acceptance. They do all have one