and crude, but time and again progress has been made by scientists adopting a reductionist strategy of the most extreme form. Only when Mendelian geneticists divorced themelves from embryology were they able to make any headway in understanding hereditary phenomena. Only now, 80 years later, are biologists beginning to understand how genomes produce phenomes, and this progress would have been impossible without the advances made by Mendelian geneticists. As simplistic as treating evolution as nothing but changes in allelic frequencies may be, this was the simplifying assumption that opened up population genetics. Not all intellectual Philistines make seminal contributions to science, but at times it seems as if only Philistines ever succeed. When scientists get too sophisticated, they become immobilized.

One of the main messages of dialectical materialism is that the world *can* be changed. Like Marx, Levins and Lewontin are not content merely to interpret the world. Several of the chapters in their book deal with agricultural practices and policies, especially in underdeveloped nations. Levins and Lewontin decry the turning of the products of scientists into commodities. Agricultural policies in capitalistic countries are directed primarily at making a profit and only incidentally with feeding the hungry, while socialists tend to institute agricultural policies before the farmers who must implement them have been sufficiently "revolutionized". The wholesale collectivization of Russian agriculture after the revolution is one case in point. The Lysenko debacle is another. The situation seems hopeless — farmers in the Third World are caught between those who simply import agricultural practices that have proved successful in the West, even when the local conditions are totally unconducive, and Maoist ideologues who insist that Lysenko was a "great upholder of materialist method of investigation" (p.189). I sympathize with those who would like to alleviate the suffering in the world, but I find it difficult to see how the downtrodden can survive much more help.

Dialectical materialists object to viewing the world in terms of ideal types, yet they themselves exhibit a strong tendency to treat both Marxism and capitalism as reified abstractions. Perhaps an ideal Marxist state would be Heaven on Earth, but the ideal Marxist state is no more likely to be realized here on Earth than is the ideal capitalist state. Like it or not, we live in the real, not ideal world. Regardless of the terms that their defenders use to characterize them, both sorts of social structures in the real world are a mish-mash of elements and have persistent problems. Those nations that are nearer the capitalist, "free trade" end of the spectrum find it impossible to eliminate the grinding poverty of so many of their citizens, while people's republics tend to be drearily repressive. Perhaps scientists working in the "free world" are unconsciously being influenced by the character of their societies, but I for one prefer unconscious constraints to the explicit sort imposed by totalitarian states of all sorts. So do Levins and Lewontin, but they seem to think that the negative features of capitalist countries are inherent to them while the equally negative features of those societies that are trying to realize the Marxist ideal are only accidental and can be eliminated. I have my doubts.

Science developed in the West, and many of its characteristics may be merely remnants of its genesis. Levins and Lewontin sketch at least the general features of an alternative view of science. I happen to share many of their preferences but not their view of the historical contingencies that gave rise to them. □

David L. Hull is Professor in the Department of Philosophy, Northwestern University, Brentano Hall, Evanston, Illinois 60201, USA.

Geological history of the deep south

Jean-Claude Duplessy

South Atlantic Paleoceanography. Edited by K.J. Hsü and H.J. Weissert. *Cambridge University Press: 1985. Pp.350. £40, $69.50.*

In September, 1925, the Royal Research Ship *Discovery*, famous as Scott's first Antarctic vessel, sailed again for the South. Her purpose was not to explore new lands, but to make hydrological and biological observations in the South Atlantic by using "the same methods as those which have been already productive of valuable results in the North Atlantic". Fifty five years later, *Glomar Challenger* sailed to the South Atlantic and geologists might have used the same phrase in their proposal to study this basin. The geological history of the South Atlantic is still much more poorly known than that of the North Atlantic, which is the first to be studied by the most recent methods of geophysics and geochemistry.

It is not surprising, therefore, that the first drill cores obtained with *Glomar Challenger's* hydraulic piston corer during five cruises in the South Atlantic in 1980 have provided new details on the evolution of climatic conditions and ocean circulation and chemistry during the past 70 million years. These findings are summarized in *South Atlantic Paleoceanography*, which is based on 15 papers (including one extended abstract) presented at the First International Conference on Paleoceanography held in Zürich in July 1983. The papers themselves have been edited thoroughly, and the text is clearly presented and illustrated. The overall structure, however, is a patchwork of individual studies dealing with one site or, at best, with the set of sites drilled during one leg, and no attempt has been made to compare results on the scale of the South Atlantic as a whole.

More than one-third of the book is devoted to sedimentological studies, which rely mainly on the carbonate, opal and organic carbon contents of the sediments. The carbonate content is a complex function of at least three parameters: carbonate production by plankton living in the surface waters; dissolution of carbonate shells during their fall to the sediment, or at the sediment–water interface; and the dilution of the remaining carbonate shells by detrital particles originating from the continents. The relative importance of these factors depends on the distance from the nearest continent, on the availability of nutrients supplied either by rivers or by upwelling, and on the global chemistry of the ocean. Nevertheless, geologists have demonstrated that there have been periods of intense calcite dissolution across the entire South Atlantic, a finding which constitutes a challenge for the modelling of the CO_2 cycle.

During the Cenozoic, the global cooling trend recognized in the oxygen isotope record is still dominant, but detailed analysis of some core sections of shorter duration shows a great deal of variability in the record, which re-opens the debate on the relative importance of the two dominant factors in this record, continental ice volume and sea water temperature. The occurrence of large carbon isotope shifts points to important changes in deep-water circulation, besides those affecting the carbon cycle, so that the interpretation of the oxygen isotope record might be a more complex matter than generally thought.

The last three chapters mainly discuss the non-isotopic evidence of deep-water variability, such as hiatuses, and sedimentological and micropalaeontological observations. They include various scenarios to explain the inception of the cold, deep-water realm about 40 million years ago and to account for the changes in deep-water circulation during the Neogene.

This book will be useful to marine geologists who want an up-to-date summary of some of the recent findings to emerge from the cruises of *Glomar Challenger* without having to search within those heavy blue books, the *Initial Reports of the Deep Sea Drilling Project.* □

Jean-Claude Duplessy is Director of the Centre des Faibles Radioactivités, Laboratoire Mixte CNRS – CEA, Parc du CNRS, 91190 Gif sur Yvette, France.