BOOK REVIEWS

MASTER MIND

The Essential Writings of Erasmus Darwin

Chosen and edited with a linking commentary by Desmond King-Hele. Pp. 223+16 photographs. (MacGibbon and Kee: London, 1968.) 45*s*.

In recent times, Erasmus Darwin has been known chiefly as the grandfather of Charles Darwin, rather than as a major figure in his own right. He was, however, one of the most influential men of the eighteenth century, both in science and literature. It is well known that he outlined a theory of biological evolution, but it is not so well known that at the end of the eighteenth century, he was the most famous living English poet, and was described by Coleridge as "the first *literary* character in Europe, and the most original-minded Man". By the middle of the nineteenth century he had been almost forgotten, and when remembered, was thought of as a comic character, the exemplar of the bad scientist, who threw out ideas without bothering to prove them, in contrast with that exemplar of a good scientist, his grandson, who spent a lifetime on establishing one idea.

Dr King-Hele in his new and beautifully illustrated book has shown that Erasmus Darwin was a pioneer, through advancing new and correct ideas, inventions or techniques, in at least seventy-five important topics. These include the formation of clouds by adiabatic expansion, and the conception of warm and cold fronts. He deduced that hydrogen would be the main constituent of the outermost atmosphere, and estimated that at a height of 35 miles the air is 3,000 times rarer than at sea-level. He recognized that the aurora occurred at about this height. His views were unheeded, and a century later the measurements of the aurora planned for the International Polar Year of 1882 failed because they were based on the assumption that it occurs at a height of five miles.

Darwin correctly explained artesian wells and sank one near his house in Derby. He forecast the building of skyscrapers and the crowding of towns with cars, and he prophesied in verse the construction of the Sydney Harbour bridge. He was the first British author to recognize the role of phosphorus and nitrogen in fertilizers, and proposed the construction of sewage farms to conserve nutrients. He immediately accepted the new French chemistry, and challenged his British friends Watt and Priestley to explain the contradictions of the phlogiston theory. Dr King-Hele has reproduced drawings of what appear to be an oxygen-and-hydrogen rocket, and an expansion turbine.

In his comprehensive theory of evolution, Darwin conceived the spontaneous generation of life from chemical constituents in primeval seas. He regarded life as having evolved from filament "molecules" not too unlike molecules of DNA. He described sexual reproduction as "the chef d'oeuvre, the masterpiece of nature", because it provided variation. He recognized the notion of the struggle for existence, and the survival of the fittest.

Besides having enormous range and penetration, Darwin put a large part of his scientific thought accurately and succinctly into verse. Dr King-Hele shows that Wordsworth, Coleridge and Shelley were deeply influenced by him, and even when they began to write in another style, the impress of his ideas remained.

Then, in the nineteenth century, his fame was almost extinguished. How is this to be explained? Dr King-Hele suggests that one cause was reaction against his sympathy for the French Revolution and the advanced ideas that accompanied it. One may think, too, that the Romantic reaction against industrialism, with which Erasmus Darwin was intimately associated, also contributed. He was Matthew Boulton's doctor, and a founder of the Lunar Society, the most influential medium of interaction between science and industry at the beginning of the Industrial Revolution.

Today it is being realized that men such as Erasmus Darwin had a human range greater than our own. They may be the kind of man we shall have to produce, if we are to escape from the present rise of narrow-minded professionalism.

Dr King-Hele's book is a fascinating illustration of the value of combined accomplishment in both science and literature, and it is to be hoped that HM Department of Education and Science will draw on it for inspiration on the problems of the attitude of the arts student to science, and that arts departments in universities will look to it for insight on science and its relations with literature.

J. G. Crowther

RESTLESS EARTH

The Heart of the Earth

By O. M. Phillips. Pp. 236. (Freeman: San Francisco, 1968.) $4.50.

It is always interesting to have an account from an expert in one field or another. In this book Professor Phillips, fluid dynamicist and oceanographer, writes simply about the interior of the earth, the domain of the geologist and "solid earth" geophysicist. From the title of the book, one wonders if the author is making a topical allusion to recent medical advance and correctly suggesting that drastic surgery has been applied to the geophysicist's model of the earth.

For a revolution—it is not too strong a word to use—has occurred in this field in the past ten or twenty years and Dr Phillips's book must be judged according to whether he has adequately conveyed the radical change of outlook and the wealth of new techniques, data and imaginative thinking which have caused it. The classical geophysicist's idea of the earth was a simple one—the continent was a thin crust on a rigid mantle of ferromagnesian silicates surrounding a fluid iron core. The chemical separation implied by the sharp boundaries of these layers occurred very soon after the earth's origin and its physical evolution was minimal thereafter.

But the record of earth history so arduously wrung from the rocks by the geologists did not fit easily with the geophysicists' earth. The geophysicist had produced a static earth where the source of energy (radioactivity) had been entirely concentrated within a few kilometres of the surface, a wholly rigid mantle and physical properties (density, temperature, pressure) which varied only with depth and not with latitude and longitude. The geologist had produced a "restless earth" in which movements, originating at depth, had continually uplifted and folded strata into mountain belts, and had broken the crust along great fault lines. These movements suggest a mantle in which great physical processes were occurring. Even the distribution of the recently active mountain belts and of the antipodal positioning of continents and oceans suggested a variation of physical properties within the mantle—not the radially symmetrical mantle of the geophysicist.

The geologist really couldn't quite see how the geophysicist's earth explained his observations; but the geophysicist found the geologists descriptions of what had happened in earth history unsatisfyingly qualitative. No