

reviews

THIS book* gives an account of the famous encounter between Lord Kelvin and the geological establishment over the use of physical arguments to set limits to the age of the Earth. It was an epic struggle which continued for 50 years with great vehemence and some acrimony.

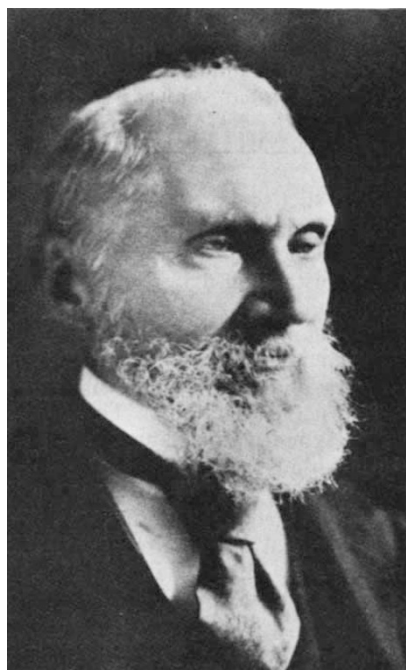
In their thoughts about time the geologists of the middle of the nineteenth century were not much inclined to arithmetic. They had inherited from Hutton and Lyell the idea that the Earth showed "no vestige of a beginning, no prospect of an end". This and the related ideas, that things have always been much as they are now, and that causes at present at work could, given enough time, account for all that has ever happened on earth, were the basis of their science and, in large degree, still are.

Very early in his career Kelvin became interested in the time scale of the Earth. His two principal methods of setting an upper limit were the calculation of the time for which the earth's original heat could supply the outward flow observed at the surface and a similar calculation for the sun. Both calculations required few and very plausible assumptions. Kelvin, and most physicists of the time, had great confidence in the results.

Kelvin's first estimate of 100–400 Myr did not greatly alarm the geologists. They no doubt knew that 100 Myr was a finite time, but it was so large a number that it seemed unnecessary to quarrel with it. Unfortunately, as he grew older, Kelvin grew more parsimonious of time and reduced his estimate to 20–30 Myr with threats of further restriction. This was too much, or rather too little; the few geologists who had disliked the 100 Myr limit were joined by the majority of their colleagues and a classic encounter occurred between two groups with almost no ideas in common. Kelvin had the prestige of physics, of Newton and of the divinely prescribed order of Nature behind him. Clearly he could not be wrong. The geologists had gut feelings that any specified length of time was inadequate, but little pos-

sibility of convincing others. Darwin, for example, estimated the time necessary to excavate the Weald of Kent as 400 Myr, but had no real basis for his statement, which he came greatly to regret.

Epic struggle with geological establishment



Edward Bullard

The story of the collision of two such disparate groups is admirably told in this book. Besides the main contestants all kinds of fascinating figures flit across the scene, including Lord Salisbury (the Prime Minister), Clarence King (the explorer of Colorado and Utah), T. J. J. See (the presumed author of that once celebrated work *The Life and Remarkable Discoveries of T. J. J. See*) and even, briefly, Frank Harris (the author provides a reference to his *Life and Loves*). The course of the dispute is

set out in detail and is of great interest to anyone concerned with the development of ideas about the Earth. Here the ideas of stratigraphy, evolution and physiography first met theoretical physics. The interest is, of course, enhanced by the fact that the biologists and geologists were right in saying that 30 Myr was not enough time, even though they had no way of providing convincing numerical estimates; how could one say how many years it took to convert *Eohippus* into a Derby winner?

The debacle induced by the discovery of radioactivity is well described; one of the oddest features is that no one seems to have been much concerned that, for the next 30 years, there was still no convincing account of the source of the Sun's heat.

In spite of the careful account of all these things some readers may feel a little deprived. An historian must study the past in its own terms. He must not ask 'What was Henry VIII's attitude to women's lib?'. This viewpoint has been adopted also by historians of science and, in some degree, is clearly necessary. But should one go the whole way? The author of this book consistently refrains from saying that anything is right or wrong, silly or unjustified. If Kelvin assumes that the Earth was initially at 1,500 °C, the author reports that he said it and that it was a more or less arbitrary choice, but he does not add that it matters very little what figure is taken. On the other hand no one would guess that Kelvin's assumption of the absence of convection within the Earth was crucial and that the attacks on it were well based. The history of science is different from other kinds of history; there is the additional fact that some things are correct and some wrong *sub specie aeternitatis*. The reasons for the beliefs are a function of the surrounding culture, but being right or wrong is not a thing of one age alone. In the study of the motions of the planets Descartes was wrong and Newton was right, and so it will always be. It is part of the function of the historian to say how and why. We and he lose a good deal if he backs away from the question. There were geniuses, inspired guessers, cranks, stick-in-the-muds and rash men in the past, just as there are today, and it is a pity to treat them all alike and leave the reader to decide which is which. □

**Lord Kelvin and the Age of the Earth*. By Joe D. Burchfield. Pp. xii+260. (Macmillan: London and Basingstoke, July 1975). £10.