

of particular, limited sections or communities. With the liberating power inherent in science as a spiritual force, clashes and tensions arise which may limit our freedom of choice and action, and this gives the greater strength to the contention here, as in the Reith Lectures, that not merely the coming of automation but the whole tendency of the age challenges us to a primary and determined effort of broad education in human values at every level.

EVOLUTION ILLUSTRATED

Atlas of Evolution

By Sir Gavin de Beer. Pp. 202 + 16 plates. (Edinburgh: Thomas Nelson and Sons, Ltd., 1964.) 90s.

THIS large copiously illustrated book, beautifully designed and printed in Holland, may suffer the same fate as some of its recent biological congeners and be treated by trade and public alike as a 'coffee-table' offering. But modern syntheses of wide biological subjects, to be effective scientifically, educationally and as general stimuli to further reading and enjoyment, must almost invariably come to resemble 'still' television programmes. The best ones nearly all do; and Sir Gavin de Beer's *Atlas*, unique, pithy, lucid and scholarly, is almost straight from Channel Two and just the sort of performance which gets (or entirely merits) a late-hour repeat on Channel One. It is a *tour de force*, in fact, of adult education; and should (indeed must) also become prescribed sixth-form-level reading for all schools who can afford it, or whose education authorities encourage adventures with books outside mainstream text-books. It is a pattern, indeed, for the text-book of the future.

In the century of the acceptance and refinement of Darwin's law of the process of evolution by natural selection few could have brought so much to a synthesis from about seven spheres of authority as de Beer. Ever since his presidency of the fifteenth, Darwin centennial, International Congress of Zoology, Sir Gavin has obviously belonged to the exclusive kennel of Darwin's pedigree prophet-bulldogs, with the Huxleys, Sir Ronald Fisher, Simpson, Mayr and a very few others. A polymath of evolution, he has distilled for us its philosophical history, and the understandings of its process which derive from ecology, systematics, palaeontology, genetics, biochemistry and embryology. The book is arranged under the severe logic of: What is the situation? How does it work? What do we learn from it?; and culminates in a beautifully balanced and up-to-date account of the evolution of man and his mind.

More than two-thirds of de Beer's *Atlas* is occupied by the atlas part; that is to say, pictures, maps and captions. The planning and integration of such work, two of the most difficult tasks in the world of serious communication, have been magnificently done, and reflect what was obviously a very close and fruitful relationship between the writer and his designer, Mr. J. van den Bos. The frequent and effective use of dramatic images and presentations has never been allowed to loosen the book's discipline. Some of the atlas material, however (and its captions), show less precision than the text: I guess that some pictures and maps were commissioned, together with the research behind them, from outside sources—not very up to date.

The choice of basic map-projection, though highly ingenious, is not the most suitable one. I can find no explanation in the text of its source or system, though it appears to be an equal-area projection. It rends the region at present occupied by the holartic fauna untimely between Greenland and Iceland—not even down the middle of Greenland, which is the natural boundary of the present nearctic and palearctic sub-faunas. South

America ends up practically as far away from Africa and Australia as it could be: this never should be if the present, or indeed Tertiary, distributions are to be understood at a glance. Zoologists have quite enough problems with continental drift without adding to it. Better would have been (for example) a Fawcett equal-area map based on a London-centred hemisphere with the land masses of the opposite hemisphere in petals—already widely and usefully adopted for global distribution plots of terrestrial taxa.

As an atlas merits unusual care in the selection of projections to fit its material, I offer this as a serious adverse criticism, and at the same time my respects to de Beer for the fact that it is the only one I can make of an otherwise almost perfect work of science and art, hand in hand. Other criticisms are minor, and may refer partly to material of which de Beer may not have had full control. In maps of relict distributions all fossil localities should surely have been spotted and not, as many are, indicated as largish hatched areas. On p. 130 the ratite map misses many opportunities of clarity and accuracy. The tapir map could have been made much less sketchy; it evidently pinpoints but a small sample of fossil sites of the genus *Tapirus* (some shown as Pliocene are surely referable to early Pleistocene) and would have been much more exciting and informative had it also shown known localities of bones which have been referred to the genus in, for example, Borneo (prehistoric); Florida, Missouri, South California, Oklahoma, Arizona, Buenos Aires, Argentina, Holland, Italy and Sumatra (Pleistocene); California, Argentina, Poland, Italy, Yugoslavia and Szechuan (Pliocene); Germany (Miocene); and France, Germany and Switzerland (Oligocene). There is also a Tertiary fossil tapir site in Bolivia.

Although it does not exactly say so in the caption, the puffin distribution and variation map which demonstrates Bergmann's ecological rule (Plate 10, near p. 120) gives the impression of a breeding distribution which, if so, is false. The figures (p. 109) appear to derive from a text-book published nearly half a century ago. Far better and more up-to-date maps and discussions were offered by Salomonsen (including an account of an important 'dwarf-mutation' in some populations) in 1944 and by Lockley in 1953. On the same page opportunities are missed, through over-simplification and range distortion, of demonstrating that the gull-chain of *Larus argentatus* and its allies has probably given rise to not two but five valid species since the retreat of the last Pleistocene glaciation—a situation, incidentally, picked up in fine detail on the same scale, by another 'coffee-table' book lately published.

This review is written by an ornithologist, and all specialists can pick on special points in the most careful books of wide scholarship. In such books it is probably wise to follow the consensus of established opinion, to which Sir Gavin de Beer himself has contributed so much and so wisely. However, I find a little disappointment in his uncritical quotation of "the cave-paintings of Lascaux, dated by carbon-14 analysis as 15,000 years old" (against a caption on the same page "painted about 20,000 years ago"). In fact, what was dated (Chicago University test 406, 15,516 ± 900 years B.P., see Libby in 1963) was charcoal taken from an occupation-level in the cave by Breuil and Blanc in 1949. The paintings are of no fauna which could have lived in that part of France then, though only the late F. E. Zeuner (and, following him much later, myself) seem to have suggested that it (and therefore its painters) may have lived in an interstadial period, perhaps as much as 100,000 years B.P.

Doubtless some map projections and presentations, and some facts and opinions, will be re-assessed in future editions of this work of scholarship and thoughtful synthesis. It is bound to become prescribed reading, in its succeeding editions, for more than a generation of rising biologists.

JAMES FISHER