A. Brouwer 1967. General palaeontology. Edinburgh and London: Oliver and Boyd. 215 pp., 4 pls., 72 text-figs. 35s.

Palaeontology is frequently discounted by outsiders, and even by geologists with other interests, as being not a science, but a system of cataloguing with a certain element of litigation thrown in; palaeontologists are caricatured as "geological stamp-collectors" concerned only with amassing, arranging and labelling specimens. Many amateurs are initially attracted to the subject, only to be repelled by the mass of new names and new terms they encounter. They come up against textbooks arranged on severely classificatory principles, with burdensome lists of names of genera and of groups and subdivisions of genera and with each definition of a genus couched in terms they do not understand. They encounter whole volumes and series of journals devoted to statements of apparently arbitrary rules governing the naming of species and to weighty arguments concerning the niceties of interpretation of these rules. Quite often they become bemused and depressed and retire from the struggle, their original interest washed away by the flood of names and words.

It is good, therefore, to have available a book which emphasises those other aspects of palaeontology (so often concealed from view within the rigid strait-jacket of a taxonomic format), which are the real heart and fascination of the subject. Although, inevitably, some fossil names and descriptive terms have to be used at times, they are kept to a minimum in this work: it can be read and enjoyed on the basis of a quite slender knowledge of biology or palaeontology, as a means of enlarging one's scientific horizons or simply for pleasure. It can equally well act as a supplement to (and as a sort of mental pick-me-up after) reading of classical palaeontological texts during coursework. Its main effect is to make one endeavour to interpret, as well as merely to collect; to make one think, then look again .....

The author defines "general palaeontology" as including "stratigraphical palaeontology which is concerned with the vertical distribution of fossils, palaeoecology which is the study of fossils in relation to their environments, and palaeobiogeography, the study of the geographical distribution of fossils" (p. 2). By implication, therefore, it is concerned also with elucidating the root causes, the processes and the effects of evolution: and the concluding section of the book is devoted to this latter topic.

It is shown that a considerable volume of information can be got, firstly, from the morphology of the fossil itself; secondly, from the orientation of groups of fossils or of individuals when found and from the association or dissociation of their component parts; thirdly, from the traces of their activities during life; and fourthly, from study of the character of the surrounding sediments. The influences governing the relative probability of fossilisation in various groups or organisms are assessed and the degrees of knowledge of living and fossil species are compared. The environmental conditions required by the major groups of aquatic organisms are summarised: and a comparison is made with the inferred environments of fossil forms. The effects of geography on animal populations are then discussed briefly; it is shown how a knowledge of the distributions of fossils can help in determining the geography of the past and, conversely, how geography can account for apparent anomalies in distribution. The next section treats with the stratigraphic ranges of organisms and with the principles and difficulties of correlation by fossils. The final section begins with a useful summary of the studies of fossil sequences in which the process of evolution has been demonstrated in detail: such studies are surprisingly few in number even yet, in part because of the relative rarity of uninterrupted sedimentary sequences consistently yielding the same types of fossils, in part because palaeontologists are very generally content to examine details, without attempting to assemble their information into a larger picture. A consideration of the tempo of evolution and of the incidence of directional trends follows; and a brief summary of conclusions on biological and geological evolution (which might, with advantage, have been longer and fuller) concludes the work.

In a work of such considerable scope, it is inevitable that there should be a number of points meriting alteration or modification; these are listed here, in the hope that they may be corrected in subsequent editions of what deserves to become a frequently-reprinted work. First of all, in a number of instances the author falls into the familiar trap of using, without explanation, names familiar to him but not necessarily to his readership. A certain number of species names are introduced without any explanation of what animal group they belong to (e.g. those of Mytilus edulis and Cardium edule, p. 11 - both lamellibranchs): and, although the author generally provides definitions for most terms unfamiliar to the general reader, a few have slipped by undefined (e.g. euxinic basins, p. 51: Tethys, p. 98 et seq.; erastems, p. 129). The abbreviation of what are likely to be unfamiliar names of fossil groups in Fig. 59 will cause difficulties: the early Triassic gliding reptiles should be included in this figure.

The list of organisms composed of organic compounds (p. 17) is incomplete: it should include the Chitinozoa and a variety of groups of phytoplankton. On p. 23, the author states that the trunks of elephants produce no reflection in the skeleton: in fact, the skull does show considerable modifications, and the presence of similar modifications in the skulls of South American ungulates has enabled the deduction that they too had trunks. On p. 29, the author discusses two "living fossils", the primitive mollusc Neopilina and the coelacanth, Latimeria, and he states that they have survived in the protective environment of the ocean depths: this is misleading, for current knowledge indicates that Latimeria lives in very much shallower waters than Neopilina. In the section on "Taxonomy and nomenclature" (pp. 30-35), the existence of a separate and different code for botanical nomenclature is nowhere referred to. On p. 33, it is stated that "With the same ease which the neontologist can observe variation in a geographical sense, the palaeontologist can observe evolution in a chronological sense": this is somehwat misleading, for in fact continuous lineages in a constant sedimentological environment are (regrettably) rare in the geological column. Fig. 16 is inverted and the caption therefore does not make sense. On p. 50 a digit has been omitted: the bathyal zone extends down to 1000 metres. The definition of plankton on this page is poor: most planktonic organisms by no means "float or drift passively", but instead undertake a vertical migration daily (sometimes of many hundreds of feet) in response to varying light conditions, as well as being capable of moving around within the particular layer they inhabit. The discussion of lithostratigraphical units (p. 120) is rendered less comprehensible to English readers because the word "bed" is nowhere used. Arkell's mis-statement that Oppel nowhere defined the term "zone" is repeated on p. 121: in 1858 Oppel stated that "A zone is characterised as a definite palaeontological horizon by the constant occurrence in it of certain species which do not occur in the adjacent preceding and succeeding zones" (Transl. in Zittel, 1901 "History of geology and palaeontology", p. 501). On p. 128, it is stated that Arkell discovered 100 synonymous stage names used for the Western European Jurassic; since these were not, in fact, defined by the same boundaries as the 11 stages Arkell accepted, they are not synonyms, merely alternatives. No mention is made in this section of the work of the First and Second International Colloquia (Luxembourg 1963 and 1967) on the standardisation of Jurassic stage nomenclature. The author comments (p. 132) that "the upper boundary of the Cretaceous has .... no significance from the point of view of ammonite palaeontology"; this is only true if the Danian stage is included in the Cretaceous, a matter on which there is no international agreement -----many stratigraphers, in part for this very reason, allocate it to the Palaeocene.

The publishers are to be congratulated on the clean and attractive presentation of text and text-figures: it is unfortunate, however, that the book cover is made of a poor-quality glossy-surfaced paper --- the reviewer's copy is already dog-eared and marked and is likely soon to disintegrate. Surely a more durable backing material could have been used for this quite high-priced book?

On the whole, reading this book has proved a refreshing and stimulating experience. The author is to be congratulated on providing an excellent synthesis of information on aspects of palaeontology all too often lost from view.

William A.S. Sarjeant

N. Kirkham and T. D. Ford. The Ecton Copper Mines, Staffordshire. Peak District Mines Historical Society, Special Publication No. 1 (Second Edition). 26 pp., 3 pls., 9 plans. 5s. Available from Mrs. P.E. Lunn, Hon. Sec., Peak District Mines Historical Society, 28 Kenbourne Road, Sheffield. Postal code S7 1 HP.

This work contains what are effectively a group of papers of variable length, treating with the geology and history of the Ecton copper mines. These are workings of great historical importance, situated on the eastern flanks of the Manifold Valley --- physically a part of Derbyshire, but consigned (by the vagaries of county boundaries) to Staffordshire.

The history of the Ecton mines is a long and interesting one. It seems probable that the earliest working was during the early seventeenth century: the earliest published mention is by Robert Plot (1680) and by that time working had already been long abandoned. The mines were reopened about 1740 and the mines achieved peak production in the late eighteenth and early nineteenth century. The Duke of Devonshire, who was responsible for their workings at this time, is said to have built the Crescent at Buxton out of the profits from the Ecton mines: Ford (p. 23) estimates the profit from the mines to have been somewhere between £6,000 and £11,000 per annum between 1776 and 1817, an enormous sum at this period. The ores worked were primarily chalcopyrite and erubescite (bornite), with malachite and azurite most important amongst a considerable group of minor ores present: Ford estimates (p. 25) that the copper content of ore plus waste was 7½% --- thus, as he comments, a rich ore by modern standards.

Working effectively ended around 1891: the cause seems to have been a combination of the steadily falling world prices of copper, as a result of the opening-up of new and immensely rich mining fields in various parts of the world, and the increasing depth and difficulty of mining, possibly combined with a diminution in richness of the ore. It is unlikely that the deposit was exhausted: and it remains possible that future working here might prove economically worth while. However, since the mines are now scheduled as a Site of Special Scientific Interest and the area is under the charge of the Peak Park Planning Board, it is improbable that this will ever be undertaken.

The two principal papers are both by Nellie Kirkham: "Ecton Mines", originally published in the "Journal of the Derbyshire Archaeological and Natural History Society", 1947, and "Dale Lead Mine, Ecton", originally published in "Peakland Archaeological Society Newsletter" no. 4, 1948. The two papers were republished together as a booklet by Dalesman Publishing Co., Clapham, Yorks. in 1949 (a point not noted in this edition). They were again reprinted together to form the first "Special Publication" of the Peak District Mines Historical Society, published in 1961 and long since sold out. The publication here reviewed is a greatly enlarged Second Edition with a number of very valuable additions: these include three notes by T. D. Ford ("The Ecton Mine surveys"; "The ore minerals"; and "Just how rich was Ecton?"), a group of mine plans and sections (some of these are reproduced from 19th Century sources, others are original, resulting from surveys by the Leicester University Speleological Society), and a group of excellent plates. The photographs composing the plates were in part taken over thirty years ago by the late Mr. J.C. Ferguson, in part more recently by the Society's Chairman, Harry M. Parker.

Miss Kirkham's accounts of the mines are fascinating but discursive: the inclusion of an index, in any future edition, would be of assistance to the reader seeking information on specific points. A few minor errors were noted: the "Acknowledgements" refer to "The author" and not "The authors", and (on p. 21) the zinc sulphide ore is listed under the name "sphalerite", yet referred to in the text by the more familiar Derbyshire name of "blende" on the following page, a juxtaposition which may confuse readers unaware that these are synonyms. The format is attractive and the price inexpensive: all geologists interested in the mines, the history or the mineralogy of the Peak District will find this a very worth-while purchase.

William A.S. Sarjeant

Wren's Nest National Nature Reserve: A guide to the geology and economic history of the Wren's Nest Nature Reserve including the Nature Trails. Nature Conservancy 1967. 31 pp., 6 pls., 1 map. 3s. 6d. (4/- post free), obtainable from The Geological Section, The Nature Conservancy, Oak Cottage, Hyde End Lane, Brimpton, Reading, Berks.

Wren's Nest and Mons Hill, Dudley, became a National Nature Reserve in 1956. The Geological Nature Trails were then planned and set up. Now, with the publication of this guidebook, the educational value of the Reserve is greatly increased.

After the introduction, there is a brief account of the geology by Dr. I. Strachan. This is followed by a rather longer section on economic history by Dr. G.T. Warwick, giving information on output, prices, wages, methods of working, transport and the history of the individual limestone mines. The final section, in which Mr. A.E. Stubbs describes the Nature Trails, is preceded by some timely advice to visitors on personal safety and dangerous rock faces and old workings.

The two Nature Trails, one elementary and one advanced, are laid out in relation to eleven bollards, each "a concrete cylinder about eighteen inches in diameter and projecting about a foot above the ground." These are not nearly as prominent as one might suppose. They are older than the newly published guidebook, and have suffered many attacks from hammer-happy visitors. Following the Nature Trails for the first time is like a modified version of a well known party game - 'hunt-the-bollard'. In fine weather, the combined use of the aerial photograph on the cover and the map in the middle should make the Trails easy enough to follow (I visited the area with a party of students just after the guidebook was published; torrential rain made use of the guidebook very difficult!).

Nine genera of fossils from the area are illustrated in three of the photographic plates. The photographs are good, but lack any indication of scale. Most are about natural size, but the enrolled Calymene (p. 7) and the Atrypa (p. 10) are either abnormally large individuals or shown at about twice natural size. This could be very confusing to the beginner. A visit to Dudley Museum, as recommended in the guidebook, will facilitate the identification of any fossils likely to be found in the area. It is also worth noting that, of the 68 species of Wenlock fossils illustrated in the British Museum's book on British Palaeozoic Fossils, 50 are from Dudley.

This booklet is strongly recommended for a "do-it-yourself" excursion to a classic Silurian locality within easy reach of members of the East Midlands Geological Society. As you follow the Trail, guidebook in hand, you are supplied with all the information normally provided by the leader of the party.

W.A. Cummins