impacts by asteroids of reasonable size. He makes his calculations on the basis of conservation of energy in the impact whereas the correct balance to use is conservation of momentum (see the discussion of impulsive forces and Carnot's theorem in J. S. Ames and F. D. Murnaghan, *Theoretical Mechanics*, Dover Publications, New York, 201 and 278, 1958). The former method is not valid but probably gives answers approximately correct.

Gallant discusses next the possibility of slip of the Earth's crust over the underlying mantle by virtue of meteoritic impact, producing continental drift. Since most suggested mechanisms of creating the drift are inadequate (except possibly thermal convection), he postulates sliding of major land masses over the asthenosphere (interpreted as plastic) consequent to meteoritic impact. In later chapters, he invokes this process to interpret the data on palaeontology, palaeoclimatology, and palaeomagnetism that Wegener's hypothesis is frequently called on to explain. In this connexion, he stresses the apparently sudden extinction of various species (such as the dinosaurs at the end of the Cretaceous) as evidence of catastrophism.

However, a rule of thumb exists in the field of the weapon effects of craters from nuclear explosions on the ground, implying that a heavily reinforced concrete structure underground and only narrowly outside the crater formed by the explosion will survive, at least in large part. The important point is the very high rate of attenuation of a shock wave to seismic amplitude in the ground outside of the crater. Thus, it is extremely doubtful that Gallant's mechanism to produce slip of the Earth's crust can be operative.

Gallant refers with examples to the frequently suggested possibility that many of the large and roughly circular features on the Earth are meteoritic in origin. In this connexion, he mentions the theory which I have put forward (*Nature*, **190**, 1048; 1961) that the terrestrial ocean basins were formed in this manner, far back in the Pre-Cambrian. However, he does not fall into the absurdity of claiming that all such roughly circular features are meteoritic in origin.

Some errors of fact were noted. On p. 79, meteor velocities for hyperbolic orbits are quoted—now known to be rare or non-existent. The temperature 10^8 °C given on p. 180 for impact of a large meteorite is far higher than the actual figure of approximately 10^5 °C. The latter value is large enough to produce thermal ionization and thus an intense flash of light in the impact, but not enough to excite nuclear reactions, as stated on p. 181.

An unfortunate aspect of the argument of *Bombarded Earth* is the suggested correlation of impacts of large meteorites with events in the historical records of ancient peoples. Moreover, the discussion in many cases contains a rather larger measure of unverifiable speculation than most specialists would be willing to accept.

J. J. Gilvarry

INDEX OF CRYSTALS

The Barker Index of Crystals

Vol. 3. Crystals of the Anorthic System, Part 1: Introduction and Tables. Pp. vi+94. Part 2: Crystal Descriptions A.1 to A.831; Atlas of Configurations. Pp. vii+text. Edited by M. W. Porter and L. W. Codd. (Cambridge: W. Heffer and Sons, Ltd., 1964.) 240*s*. per two parts.

THE *Barker Index* facilitates the speedy non destructive identification of crystalline materials. Volumes 1 (*Nature*, **169**, 851 (1952)) and 2 (*Nature*, **180**, 821 (1957)) covered some 6,500 substances, and this final volume, listing some 800 triclinic (anorthic) crystals, brings a monumental undertaking to a praiseworthy conclusion.

Given any crystal in a standard setting and orientation, a systematic description becomes possible in terms of particular interfacial angles. This principle, conceived by Federov and rendered workable by Barker (whose *Systematic Crystallography* was published in 1930), faces its most searching test when applied to crystals of the triclinic system. Here, Barker's rule of simplest indices sometimes fails to resolve ambiguities of setting, and much of the credit for overcoming this difficulty, mainly by means of topological and projective relationships, must go to Prof. Terpstra and his colleagues in Groningen. Because of this unavoidable complexity, Volume 3 has nearly double the average number of pages per crystal compared with the previous volumes, while matrix methods of checking angles have involved the use of a computer. Is it, perhaps, a little optimistic of Dr. Perdok to suggest that "the chemist with merely a basic crystallographic knowledge" would be able to use this volume of the Index?

The basic pattern remains similar to that of Volumes 1 and 2. In Part 1, after an explanatory introduction (including worked examples) by Dr. Hey, Mr. Codd gives an account of the use of the bond matrix for calculating crystal angles, and Dr. Perdok surveys the work done in Groningen. Then follows a table of multiple tangents (for the third time !), the main determinative table of classification angles, and more limited auxiliary tables of refractive indices, densities and melting points for confirmatory purposes. Two new features now appear: first a 48-page table, constructed from the output of the Oxford University computer, lists the bond matrix and its inverse for nearly all the crystals; then a 94-page table of configurations is given to facilitate selection of correct crystal setting and orientation. Part 1 concludes with the customary threefold list of substances, although it is to be regretted that some names, for example, A.760, are less informative than they would be had they followed the nomenclature recommendations of the International Union of Pure and Applied Chemistry.

The crystal descriptions, which make up the greater part of Part 2, are not only valuable in their own right, they are a useful supplement to the American Society for Testing Materials (A.S.T.M.) powder index, for there are only 13 substances in common. Part 2 concludes with a colourful 30-page atlas of configurations, provided as an alternative means of crystal setting by reference to standard zonograms.

It is a credit to both editors and printers that accuracy continues high and errors are few—a power missing on p. 42, and a mis-spelt word on p. 49; a formula error in A.269, while A.88 is assigned six A.S.T.M. index lines instead of three. Economy in cross-reference and space might have been achieved by listing the bond matrix immediately after the crystal description, and clarity in the introductory chapter might have been better served by distinguishing figures occurring in the text from those so usefully collected at the end of this section. But the omission of anorthic minerals from the present volume is deliberate. While we applaud the vision of the Barker committee, the workmanship of an international team and the devotion of the joint editors, they promise us a mineral supplement for good measure.

R. Hulme

A SYSTEMATIC REFERENCE TO PALAEARCTIC BIRDS

The Birds of the Palearctic Fauna

A Systematic Reference. Non-passeriformes. Vol. 2. By C. Vaurie. Pp. xx+763. (London : H. F. and G. Witherby, Ltd., 1965.) 147*s*.

DR. VAURIE'S first volume, covering the Passeriformes, was published in 1959 (*Nature*, **184**, 666; 1959); this second volume deals with all the non-passerine species, 559 in number. The complete work provides a new base-line for the taxonomic and geographic study of the species and sub-species of birds native to Greenland Europe, North Africa, and the northern part of Asia,

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