cological procedures should be developed and used to a maxima extent.

(3) Food materials and all chemicals and processes at present in use for the preparation and distribution of food should be subjected to adequate examination to ensure minimum risk in use, if this has not already been done, or unless previous knowledge indicates that this is unnecessary.

(4) All chemicals or processes proposed in the future should be subjected to adequate examination to minimize risk before being accepted for use.

(5) The presence of carcinogenic substances in food might be a significant factor in the occurrence of what is considered to be spontaneous cancer in man and animals.

(6) Since dose–response relationships have been demonstrated in the case of carcinogenic agents, the reduction of carcinogenic substances in food to the lowest practicable level may be one of the effective measures towards cancer prevention.

(7) Many factors may influence dose–response in carcinogenesis. Their complexities are such that it is agreed that no assuredly safe level for carcinogens in human food can be determined from experimental findings at the present time.

(8) The elimination, or at least the reduction to a minimum, of all proved carcinogenic substances in the diet of man and of animals used as human food is a worth-while objective.

In recent years a number of food additives or food contaminants have been suspected of being carcinogenic. As a practical approach to the problems arising in this field, the Committee has reviewed the evidence available and the action taken with regard to a number of these substances. Many points of interest were revealed, of which the most important are:

(*a*) The apparent lack of information on the toxicity or potential carcinogenity of many food additives.

(*b*) The inadequacy of the design, execution and interpretation of some experiments or of reported information in some of the publications in this field and the frequent lack of corroborative evidence.

(*c*) The need for detailed pathological evaluation of any lesion observed in experimental studies.

(*d*) The difficulties arising in interpretation of local sarcoma formation at the site of the injection.

(*e*) The difficulty of completely excluding, at the present time, carcinogenic contaminants from food, from processes used in the preparation of food, and from substances coming into contact with food.

(*f*) The possibility that some natural constituents of the diet or even an essential nutrient, such as selenium, may constitute a carcinogenic risk. Clearly, these substances cannot be completely excluded from the diet.

(*g*) The difficulty of carrying out and interpreting epidemiological studies.

(*h*) The wide variety of food colours, many of which do not appear to have been adequately tested, including the 'permitted' lists of different countries.

(*i*) The necessity for separate assessment of the carcinogenic risk for each individual substance.

EARLY FOSSIL RODENTS AND THEIR EVOLUTION

THE literature of science overflows with immature works, but at rare intervals a *magnum opus*, the seasoned fruit of many years patient study, is offered for our digestion. Such is *The Early Tertiary Rodents of the Family Paramyidae*, by Albert E. Wood, published in the *Trans. Amer. Phil. Soc.* (New Series, 52, part 1. Pp. 261. Philadelphia: American Philosophical Society, 1962. 6 dollars). Behind the innocuous title nestles a major contribution to the study of fossil rodents, a veritable landmark in mammalian palæontology, and a wealth of detailed anatomical, taxonomic and stratigraphic observations for the student of evolution.

The paramyids comprise the earliest known rodents of the Upper Palæocene and Eocene. When last reviewed by W. D. Matthew in 1910 [1] he was able to deal exhaustively with the group in thirty pages. The size of the present work is a measure of the vast quantity of additional material available for study half a century later. Wood begins with a review of the history of the classification of the paramyids, discussing the views of earlier writers on the importance of the paramyids in the evolution of rodents.

All but 30 pages of this great work are devoted to a systematic treatise of the family paramyidae. Wood states he has examined approximately a thousand specimens, referred to 22 genera and 78 species, ranging from the Upper Palæocene to Upper Oligocene, mainly from North America but including European forms. In several instances nearly complete skeletons were available. Where material in a sample was adequate he has made variation studies; incisor teeth have been carefully examined and found to be of considerable systematic value. Each species is monographed, its probable affinities discussed and where possible the functional interpretation of its characteristics are suggested. These details enabled Wood, for example, to reconstruct *Paramys delicatus* as a rat-like animal, rather than the squirrel-like reconstruction of Matthew. In two species Wood has been able to recognize a series of sub-species—material for so detailed a study of gens or *rassenkreis* rarely obtains in mammalian palæontology. The illustrations are admirable, clearly drawn and well printed: it is unfortunate that the phylogenetic tree could not have been three-dimensional.

Following the systematic treatise, Wood discusses the interrelationships of paramyids, evolutionary trends within the family, relationships to later rodents, rodents subordinal classification, evolutionary rates in paramyids and the origin of rodents. Several of the opinions and interpretations set out here have already appeared in print in earlier writings of the author; nevertheless the summary accompanying the monograph is useful in restating Wood's case alongside his evidence.

In discussing evolutionary trends Wood distinguishes three series. First, those that can be followed in all or nearly all lines within the family, representing results of selective pressures for increased rodent adaptation; these include continuously growing incisors and reduction of pre-molar dentition. Secondly, those which represent divergent trends characteristic of one or more sub-families as a result

of its adaptive radiation; these affect shape of incisors, crest pattern on molars and degree of reduction of last molar. Finally, those which show no significant pattern as in the erratic evolution of the third upper pre-molars. Wood has calculated the rates of evolutionary change which at generic level within the paramyids he found to be similar to those of horses, but in some lines much faster.

Regarding classification, relationships and origin of rodents in general and of paramyids in particular, Wood gives a very fair summary of the views of Stehlin and Schaub[2], his chief rivals, though it becomes patently clear to the reader that the two schools are still very distinct. On the evidence made available in this monograph, together with his interpretation of cusp homologies and the significance of parallelisms, Wood's thesis that "the Paramyidae are ancestral to all other known rodents" seems rather more probable than Schaub's view, based on a different interpretation of cusp homologies, which places the ancestry of the rodents farther back in the Palæocene with the paramyids as specialized descendants and the Oligocene squirrels as structurally the most primitive known rodents. Both views and their consequent implications are plausible analyses of the present evidence; only new evidence can produce an approximation nearer the truth. Wood's monograph enables us to ask more questions about rodent evolution; this is the surest way of unravelling the enigma.

R. J. G. SAVAGE

[1] Matthew, W. D., *Bull. Amer. Mus. Nat. Hist.*, **28**, 43 (1910).
[2] Stehlin, H. G., and Schaub, S., *Schweiz. palaont. Abh.*, **67**, 1 (1951).

A SUGGESTED RECONSTRUCTION OF THE LAND MASSES OF THE EARTH AS A COMPLETE CRUST

WEGENER'S theory of continental drift is by no means universally accepted by geophysicists[1]. However, as Carey[2] has pointed out, the degree of congruence between Africa and South America, compared at the 2,000-m. isobath, is so great that pure chance can scarcely be the explanation for the fit. Moreover, this theory satisfactorily accounts for the fact that the Earth's granite is collected in the continents, the remaining three-quarters of the Earth's surface, forming the ocean bed, almost certainly consisting of basalt.

An alternative hypothesis is that the Earth was formerly much smaller and was covered by a complete crust of granite, subsequent expansion causing the splitting of the crust and the filling of the cracks by upward movement of the underlying molten basalt. If this hypothesis were valid it would be possible to fit together the outlines of the continents on a small globe, thus representing the Earth in its early state. I attempted to do so before becoming aware of the evidence adduced by Egyed[3] and Heezen[4] that this type of expansion may in fact have occurred, and the outcome provides collateral evidence in support of their views.

It was estimated that the representation of the continents, together with the continental shelf extending to the 1,000-fathom isobath, on a globe $4\frac{1}{2}$ in. in diameter, had a total area which corresponded to somewhat less than the surface area of a 3-in. sphere. The outline of each continent was transferred from such a globe to thin sheets of rubber and cut out. The separate pieces of rubber were then placed on a wooden ball 3 in. in diameter and their outlines marked on the wood, to represent the appearance of the Earth soon after the hypothetical splitting of the crust. Despite the crude method used, the land masses fitted together reasonably well, though there was some distortion of certain regions and there was a triangular gap in the North Atlantic ocean (Fig. 1). It is to be noted that post-palæozoic geology need not be identical in masses which would appear to have been adjacent, as the movements envisaged possibly originated at a much earlier phase. It is difficult to

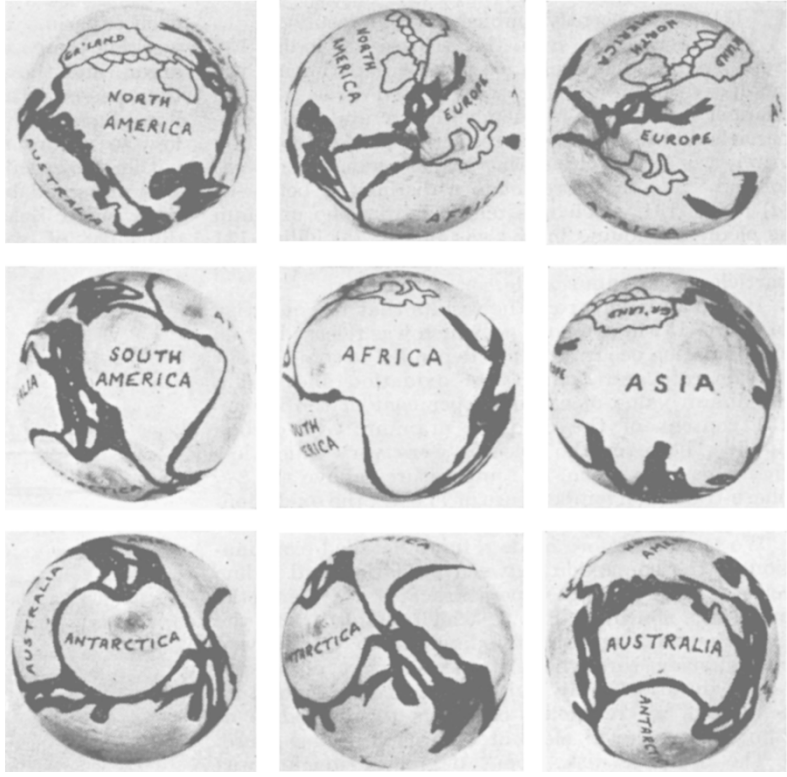

Fig. 1. Nine photographs of the wooden sphere representing the suggested pattern of the continents soon after splitting of the crust