DEEP-FOCUS EARTHQUAKES AND ISOSTASY

IN a recent discussion[1] Professor W. T. Thom, Jr., wrote: "Pending proof that the deep-focus earthquakes *are* due to ordinary faulting, and are not due to instantaneous rupture produced by deep-seated 'explosions,' it would seem to be in order to consider that their bearing on the problems of tectonics and of isostasy remains indeterminate."

Since the writer had early referred[2] to the possible significance of deep-focus earthquakes for isostasy and has recently been quoted[3] to that effect, a brief statement may here be made.

The mere occurrence of earthquakes at great depths does not in itself prove, as Professor Thom rightly points out, faulting at those depths. It is indeed difficult to imagine faulting at a depth of 500 kilometers, though the question might be raised whether it is essentially more difficult than to imagine it at a depth of, say, 50 kilometers. Perhaps the main reason for greater difficulty in the first case is that we are accustomed to think of high temperatures and zero strength for the rocks at great depths. But is such low or zero strength a demonstrated fact?

The writer is far from assigning "ordinary faulting" as the cause of the deep-seated shocks and looks rather to the high-pressure experiments of Professor Bridgman as pointing to a solution. There is, however, one feature of the seismographic records of at least some of the deep-focus earthquakes that may again be referred to here. In a study of the earthquake of March 29, 1928, it was stated: "The apparent predominance of shear waves must be taken into account in any hypothesis that one might put forward in regard to the mode of origin of a shock at so great a depth as 410 kilometers. The records would seem to preclude anything in the way of a mere explosive activity."[2] The same prominence of the shear waves is found in a study now being made of the shock of June 29, 1934. This is the deepest earthquake reported thus far, having a focal depth of nearly 700 kilometers.

Again, if the source were an "explosion," one might expect the direction of motion of the first impulse to be generally the same. However, no such consistency appears. Thus, of 101 shocks in the interval from April, 1932, to April, 1934, qualified in the Bulletin of the Seismological Laboratory at Pasadena as "deep," 61 showed the first impulse as a compression and 40 as a dilatation.

The apparently limited geographical distribution of deep-focus earthquakes—though perhaps we still know too little on this point—would seem to indicate a lack of spherical homogeneity in the earth at rather great depths. It may be asked whether such homogeneity at depths of several hundred kilometers, while probably not essential, has not been at least implicit in the isostatic picture of the earth's interior.

While, then, it may be said that, for the time being, the bearing of deep-focus earthquakes on "the problems of tectonics and isostasy remains indeterminate," it may also be urged that deep earthquakes must find a place in any complete theory of the earth's interior, of its structure, constitution and development.

V. C. STECHSCHULTE
XAVIER UNIVERSITY, CINCINNATI

THE NEW ERGOT ALKALOID

DURING the first half of the year 1935 communications appeared from four different laboratories, in three different countries, each describing the discovery and isolation of a new alkaloid from ergot, very different in its properties from those previously known. These communications dealt with researches which had been proceeding concurrently and independently, and in each case the authors gave a name to the alkaloid which they had obtained, so that four new names were put forward—Ergometrine,[1] Ergotocin,[2] Ergobasine[3] and Ergostetrine.[4] There was an obvious general resemblance between the substances thus variously named, but preliminary analytical indications and certain minor discrepancies in the earlier published physical constants and chemical properties left some doubt as to whether the four were really identical or only closely related alkaloids. Later and more detailed publications have removed most of these discrepancies. It appeared to us, however, that the question of identity ought to be settled finally by an exchange of specimens, a careful comparison of them in the laboratories concerned and, if possible, an agreed statement of the resulting conclusion. This exchange and comparison have now been carried out by the undersigned, of whom H. King has acted in the place of the late H. W. Dudley (who died on

1 SCIENCE, 83: 2141, 32, January 10, 1936.
2 *Bull. Seis. Soc. Amer.*, 22: 2, 81–137, June, 1932.
3 J. S. De Lury, *Jour. Geol.*, 43: 7, 763, October-November, 1935.

1 H. W. Dudley and C. Moir (Ergometrine), *Brit. Med. Jour.*, i: 520, 1935; SCIENCE, 81: 559, 1935. H. W. Dudley (Ergometrine), *Proc. Roy. Soc. London*, B. 810, 116; 478, 1935.
2 M. S. Kharasch and R. R. Legault (Ergotocin), SCIENCE, 1935, 81: 388 and 614; *Jour. Am. Chem. Soc.*, 57: 956 and 1140, 1935; M. E. Davis, F. L. Adair, G. Rogers, M. S. Kharasch and R. R. Legault, *Am. Jour. Obstet. and Gynec.*, 29: 155, 1935.
3 A. Stoll and E. Burckhardt (Ergobasine), *C.r. Ac. Sc.*, 200: 1680, 1935; *Bull. Sci. Pharmacol.*, 42: 257, 1935.
4 M. R. Thompson (Ergostetrine), *Jour. Am. Pharm. Assoc.*, 24: 24 and 185, 1935; SCIENCE, 81: 636, 1935.

October 3, 1935). Our comparisons of the melting points and mixed melting-points of the four alkaloids and of certain of their salts, and of their optical activities in different solvents in cases where sufficient material was available, leave us in no doubt that the alkaloid obtained in the four different laboratories was the same substance, and that the four names given to it are synonyms. Having reached that conclusion, we are content to leave to the world of science the choice of one of these names, for adoption into scientific literature as the recognized name of the one alkaloid.

M. S. KHARASCH
H. KING
A. STOLL
MARVIN R. THOMPSON

SCIENTIFIC BOOKS

INSECT ENEMIES OF SHADE TREES

Insect Enemies of Shade Trees. By GLENN W. HERRICK. Pages i–viii, 1–417, 350 text illustrations. Comstock Publishing Company, Ithaca, New York. 1935.

THIS latest addition to our knowledge of the insects of shade trees is by one who has added materially to our knowledge of this large group. The book is an attractive, moderate-sized volume containing brief practical accounts of the more injurious insect pests affecting trees and shrubs. It also lists many others which are not deemed of sufficient importance to warrant a paragraph, though for most of these there is no clue as to where information concerning them may be found.

There is first of all a discussion of the value of shade trees and general methods of protection from insect attack, followed by a chapter devoted to a consideration of the materials and apparatus for the control of tree and shrub insects and a third is concerned with suggestions for treatment of weakened trees. This last is important, since it is becoming increasingly evident that the vigorous tree is less likely to suffer from insect pests and in not a few cases it is able to resist attack. This is particularly true of the deadly enemies of the cambium, such as the bronze birch borer, the two-lined chestnut borer, the hickory bark beetle and the hemlock borer. It is the belief of the reviewer that the intimate relation existing between repeated defoliation, poor growing conditions, sudden changes in the supply of moisture, including drought, can not be emphasized and re-emphasized too much since they are fundamental to any system which would keep trees vigorous. This is recognized by the author, though hardly emphasized sufficiently. It is gratifying to note that both in this volume and in large scale control work on shade tree insects by governmental and state agencies, tree sanitation is becoming more generally recognized as an important method of tree conservation. Another matter which might have been brought out is the difficult growing conditions for trees on lawns, due to the fact that there is comparatively little enrichment of the lower soil layers and the reduced humus incident to repeated mowing, both greatly favoring drought extremes.

The larger portion of the volume is devoted to a discussion of the insect enemies of the more important trees, such as the ash, beech, birch, buckeye and horse-chestnut, catalpa, elm, ginkgo, hackberry and so on down the list to the willow. The apple and cherry, both of value as ornamentals as well as for fruit, are conspicuous by their absence. An interesting innovation is a preliminary consideration of the characteristic qualities of each of the shade trees discussed in the various chapters.

There is a separate chapter dealing with the insect enemies of smaller trees and shrubs, another devoted to evergreens other than pines and a final one restricted to miscellaneous enemies of trees and shrubs. It appears to the reviewer that it would have been more logical to have included the accounts in these last three in chapters devoted to the other trees, even if the divisions were relatively short. An informative book of this character is successful in proportion to the accessibility of the information to the average reader. He knows little and usually cares less about taxonomic relationships. This, however, is more or less a matter of opinion.

Greater familiarity on the part of the author with recent literature would have made possible a definite statement as to the wintering habits of the hickory gall aphid, an appreciation of the fact that the elm lace bug rarely attacks valuable trees, since these latter are seldom surrounded by the bushy or woody growth necessary to the hibernation of this insect and there is therefore little real need of suggesting a spray for this insect, that injury by the Pales weevil to the roots of good-sized Scotch pines may greatly outweigh the earlier recognized damage to seedlings and that methods of controlling the two more common hackberry psyllids of the north are already known. We question the need or efficacy of the measures recommended for the control of the pigeon horn-tail. The treatments commonly advised for injurious borers are far from satisfactory, due in large measure to inherent diffi-