fessor James Perrin Smith has remarked to the writer, "A new species is a new species, no matter where it is found."

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THE PRICE OF HONOR

"Ph.D." 's letter in SCIENCE for April 16 moves me to quote a letter written me on May 28, 1925, from this same Professor Fritz Holm, G.D.G., LL.D., D.C.L., D.Lit., Chamberlain to His Royal Highness the Count of Caserta (Prince Alphonse of Bourbon-Sicily, Head of the Royal House of Naples).

On that occasion His Excellency's secretary informed me that His Excellency (then residing in Paris) had "read with interest and admiration of your Science League to combat silly attitudes by lawgivers and others towards questions of evolution, etc. His Excellency wishes me to inform you, that you may use his name in the literature of your league in capacity of honorary vice-president or simply vice-president."

I replied that the officers of the Science League of America were elected, that only members were eligible to office, and that membership was $3 a year. No reply was vouchsafed me. Evidently the "dollars (or bills)" are all supposed to flow in one direction!

MAYNARD SHIPLEY,
President, Science League of America

QUOTATIONS

CHEMISTRY AND DISEASE

DR. CHARLES H. HERTY recently pointed out that we spent annually $1,015,000,000 to keep our 115,000,000 bodies in repair, as follows:

Drugs, including patent medicines	$ 500,000,000
Doctors' services (estimated on basis of average income per doctor per year of $1,500)	220,000,000
5% interest on the $624,000,000 of hospital investments in lands, buildings and furnishings	31,000,000
Hospital maintenance	264,000,000
	$1,015,000,000

In commenting on this, Senator Ransdell, of Louisiana, in a speech supporting a bill providing for the appropriation of $20,000,000 for the study of the cause, prevention and cure of disease, asked whether it would not be worth while to spend a few millions a year in order to determine whether this vast bill of a billion could not be reduced. Much has been done privately, notably by the Rockefeller Institute for Medical Research, the Carnegie Institution of Washington and other institutes and laboratories. But in most of these institutions comparatively little time is allowed for concentrated work on problems of major importance, or opportunity given for cooperative effort of the chemist, the biologist, the pharmacologist, the therapeutist and the physiologist.

Senator Ransdell's bill, which he "hopes will be favorably acted upon at the next session of Congress," contemplates the enlargement of the Hygienic Laboratory of the Public Health Service into a chemo-medical research laboratory. Specifically, it provides for an appropriation of $2,000,000 a year for five years for this enlargement, and in addition $10,000,000 to establish an academy of health in the District of Columbia or its vicinity. In such an institution a joint attack may be made on fundamental problems of medicine by leaders in chemistry, physics, biology, pharmacology and medicine, just as, out in California, physicist, astronomer and chemist have brigaded their efforts in an attack upon the forces of the atom. A similar coordination of effort was made by scientists in search for poisonous gas during the war.

Research service in conservation of the health of the nation should not be left entirely to private interest, however generous, zealous and intelligent. Particularly is it desirable that chemistry should be brought back, in its highest development as a science, to the aid of the physician in the prevention of disease and the alleviation of suffering. It has turned its attention in recent decades mainly to the production of wealth in the industries. It has a higher ministry before it if it can be brought to cope with disease in time of peace, as its aid was invoked by the government for destruction during the war. We have gone further in our federal departments in concern for the health of the lower animals, and even of trees and plants, than we have for that of human beings.—The New York *Times*.

SCIENTIFIC BOOKS

A History of British Earthquakes. By CHARLES DAVISON. Cambridge, at the University Press, 1924.

THE authentic history of British earthquakes begins, according to the author of this accurate chronicle, with the year 974 A. D. Earlier occurrences, whose reality can hardly be doubted, but whose dates and places are not identifiable and whose character may be open to suspicion, are classed as legendary. We have here the keynote to Dr. Davison's work. It is scrupulously precise. Possibly mistaken or spurious records are rigidly excluded from his accounts, which nevertheless include 1,191 shocks in 950 years, 974 to 1924.

Geographical limitations are equally definite. The

scene does not cover the platform of the British Isles, which might be considered a geologic unit, but is restricted to the lands of England and Scotland. For this area there is a list, in which each one of the 1,191 shocks is given an arbitrary, sequential number and is cited by date, hour, center, intensity when known and area of disturbance. Ireland, the Channel Islands and the Shetland Islands are treated in a separate chapter under the heading "Extra-British Earthquakes." This also includes a description of the effects of the Lisbon earthquake so far as they were recorded in England.

The citations which constitute the greater part of the work are arranged by localities and proceed from Scotland through Wales and the Midland counties to southern and southeastern England. Of the space allotted to the descriptions of shocks, two thirds are occupied by those of Scotland and Wales, an indication of the greater seismic activity of those regions as compared with England proper. It is also a fact that the northern country is more rugged and of more complex geologic structure, more distinctly faulted.

The geographic extent of British earthquakes is usually small. The author has defined the disturbed area, wherever possible, meaning thereby the area within which the shock was even slightly perceptible. The facts are determinable, as a rule, only for shocks of the last sixty years and not for a large proportion of them; but the figures are sufficiently numerous to indicate that those which have even slightly disturbed as much as fifty thousand square miles are few. It may be inferred that the depths of the foci are comparatively moderate and the intensities not very high.

The chapter headings indicate the centers of greatest activity: Inverness, near the Great Glenn fault; Comrie and Menstrie, near the Highland Border fault; north Wales and south Wales; and many districts scattered throughout England are all distinguished. The author links each grouping of successive shocks with a known or supposititious fault. He thus suggests that the British Isles, like California, are traversed by active dislocations, although no visible displacements have been observed at the surface. To one who knows both countries the differences in topographic expression and geologic history appear so marked that they raise a doubt as to whether the mechanics of the earthquakes are necessarily similar.

Destructive earthquakes have been few in Britain. The writer enumerates eleven in England, five in Scotland, and two in Wales. Most of them, however, did little more than throw down chimneys. The most severe disturbances did damage massive stone structures, whose great weight rendered them liable in spite of the thickness of the walls. We quote:

1180, about September 29, an earthquake fatal to many great buildings in England, especially to Lincoln church. (Mallet)

On the mondaie in the weeke before Easter, chanced a sore earthquake through all parts of this land, such a one as the like had not beene heard of sithens the beginning of the world. For stones that laie couched in the earth, were remoued out of their places, stone, houses were overthrowne, and the great church of Lincoln was rent from the top downwards. (Holinshed)

1580, April 6. A very great earthquake in London and almost generally throughout England. Stukely says that no houses were thrown down. A piece of Temple Church, however, fell, also some stones from St. Pauls Church, a stone fell from the top of Christ Church, which killed an apprentice, and various chimneys were thrown down. At Dover, a part of the cliff fell into the sea with a portion of the castle wall. A small part of Saltwood Castle and of Sutton Church (both in Kent) also fell down. At these places, and also in East Kent, three shocks were felt—at 6 p. m., 9 p. m., and 11 p. m. The shock of 6 p. m. was also felt in France and Belgium.

1816, August 13. This is the strongest known earthquake felt, not only in the Inverness district, but in all Scotland. In Inverness the injury to property was considerable. Chimney-tops were thrown down or damaged in every quarter of the town; many slates and tiles fell from roofs; and several walls were cracked. In the Mason Lodge ——— one of the coping stones (of the chimney) estimated to weigh 50 or 60 pounds, fell on the other side of the street, a distance of not less than 20 yards. The octagonal spire of the county jail was broken through about 5 or 6 feet from the top, and the upper part was twisted round so that the angles of the octagon were turned nearly to the middle of the flat sides below.

After describing the shocks which occurred in Wales between 1690 and 1841 the writer says:

Only one of these early shocks [1832] was comparable in strength with the remarkable earthquakes of Pembroke in 1892, Carmarthen in 1893, and Swansea in 1906. All three were twin earthquakes of the second class. They belong to the front rank of British earthquakes—their intensities were 7, 7, and 8 respectively [on the Davison, modified Rossi-Forel scale, on which 8 is apparently about equivalent to the VIII of that scale as usually interpreted] while the areas included within the isoseismal 4 were 44,860, 35,900 and 37,800 square miles.

In weighing these accounts one should bear in mind the character of British architecture; while of great strength, the structures are excessively heavy and their massiveness renders them peculiarly liable to damage by their own weight. The inference is justified that Great Britain has not experienced a shock of major violence since some historically very re-

mote, though perhaps geologically not distant epoch, if ever.

The moderate intensity of British earthquakes may, perhaps, afford a reason for the special scale of intensities employed by the author. He describes it as a modified Rossi-Forel scale. It is not apparent what has been gained by the modification, which seems to consist in the adoption of one test only for each degree of the Davison scale; thus: "5. The observer's seat perceptibly raised or moved. 6. Chandeliers, pictures, etc., made to swing. 7. Ornaments, vases, etc., overthrown. 8. Chimneys thrown down and cracks made in the walls of some, but not many, houses in one place." 9. The same, but "cracks made in the walls of about one half the houses." It would seem that a shock which would perceptibly move an observer's seat, even John Bull's, would cause a chandelier to swing and might well overthrow a more or less delicately balanced vase. Or considering the criterion for intensity 5; how could it be applied during those hours when people generally were in bed? Yet the author lists as of intensity 5 a number of shocks which occurred during the wee, small hours. It is regrettable that in seeking precision he should have added to the already grave confusion.

With reference to the mechanics of earthquakes the author accepts the generally recognized theory of elastic rebound as the explanation of all British shocks. The theory was clearly established by the California earthquake of April, 1906, where obvious displacements of blocks of the earth's crust were observed. Similar displacements have not been recognized in Britain. The faults which have been identified there are ancient, even geologically, and the inactivity of the Atlantic basin as contrasted with the activity of the Pacific marks a contrast in degree if not in kind. It is not impossible that there are other mechanisms in the earth's crust besides faults which may give rise to elastic waves and it would be wise not to push assumptions too far. Where faults are known to occur in the vicinity of earthquake foci, as is the case with the Great Glen and Highland Border faults, the evidence favors the theory; elsewhere the reader may be pardoned if he retains an open-minded doubt.

The work contains a few closing pages in which the author describes the phenomena of twin earthquakes and seeks to explain their origin: discusses the conditions of pressure that produce folds in the earth's crust; and analyzes the relations of folds to earthquake faults. Shearing, the mechanical effect which was first recognized by Reid as the condition of development of the California faults when he applied the rebound theory, is not considered by the author as a cause of British faults. Yet shearing is the one mechanical effect which can produce planes of displacement at right angles to each other, that is, in the relative positions in which the trends of twin earthquakes lie with reference to each other, according to the author, in England. It is in fact impossible that folds should develop at the depths which are assigned to the foci of twin earthquakes, since at those depths the character of the rocks and the loads they bear combine to make bending more difficult than shearing. It is also true according to the principles of mechanics that two forces acting simultaneously upon a given body must produce a single resultant. One can not produce an effect independently of the other. This elementary principle appears to have been overlooked by the author who refers to "compression in two directions" and to folds which constitute a "double system of corrugations." To quote: "If we may assume that the earthquake faults are approximately at right angles to the folds to the growth of which the earthquakes are due, it would seem that the crust at a depth of a few miles below the counties of Stafford, Derby, and Leicester is corrugated in two systems of perpendicular folds." It is in assuming folds that the seismologist has gone astray. Had he assumed shearing, due to compression along a diagonal of the nearly rectangular system of the two series of faults, the explanation would have been in accord with mechanics as well as with observation. His mistake is the more natural since many geologists write of folding the earth's crust without the least consideration of the mechanics of the process and its limitations, but it vitiates the theoretical concept of a structure in which folds are assumed to play the dominant rôle.

As an authentic history of British earthquakes, which assembles the data in a most carefully considered statement of facts and covers a thousand years, Professor Davison's work is a most timely contribution to the study of seismology on both sides of the Atlantic. The geologic histories of Great Britain and the eastern United States have run parallel with such nicety during so many ages that the subterranean forces, which have acted and are acting to disturb the landmasses, may well be assigned to a common dynamic source, namely, energy set free in the rocks beneath the Atlantic basin. The earthquake record of the New England-St. Lawrence province during the last three hundred years has resembled that of Great Britain, except that the shocks which have been experienced appear to have affected far larger areas and may have been somewhat more violent. Even so, Great Britain's record of a thousand or more years without an earthquake of the first magnitude is reassuring for her sons across the water.

BAILEY WILLIS

WASHINGTON, D. C.