canoe County Historical Association, Lafayette, Ind., the Board of County Commissioners receives in trust for the association the Wetherill home, with its contents and a trust fund of $100,000 for the erection of a museum, or museum rooms and auditorium on the property. If the entire amount of the fund is not required for the construction, the remainder may be used for improvements or as a maintenance fund. The will provides also for a $5,000 trust fund to be added to Dr. Wetherill's previous gifts to the association.

A COUNCIL of eleven members has been named to conduct the newly established University Research Institute of the University of Texas, which will cover the field of research in business, city government, engineering, economic geology, industrial chemistry and the social sciences. It has been granted an initial budget of $25,000 annually. Members of the council include Drs. J. T. Patterson, R. L. Moore, E. H. Sellards, R. J. Williams, E. C. Barker, F. C. Ayer, J. C. Dolley and Theodore Hornberger. Dr. A. P. Brogan, dean of the Graduate School, has been made chairman. W. R. Woolrich, dean of engineering, and Dr. W. E. Gettys, director of social science research, have been named ex-officio councilmen. Dean Brogan explained that the new program will provide for the first time university money to match grants from educational and scientific foundations which have fallen heretofore outside established university studies.

A REPORT of the British Home Office relating to experiments on living animals shows, according to a summary in the London *Times*, that the total number of experiments performed during 1938 was 958,761, or 39,801 more than in 1937. The number of experiments performed with anesthetics was 49,915, being 9,596 more than in 1937. The number of experiments comprising inoculations, hypodermic injections and other proceedings performed without anesthetics was 908,846, 30,205 more than in 1937. Of the 49,915 experiments performed with anesthetics, comprising all the cases in which a serious operation was involved, 14,797 were performed under license alone or under certificate C, and therefore came under the provision of the act that the animal must be kept under an anesthetic during the whole of the experiment. The experiments performed without anesthetics—908,846 in number—were mostly inoculations and feeding experiments. In addition, a certain number consisted of oral administrations, inhalations, external applications and the abstraction of body fluids. A large number of experiments, almost wholly simple inoculations and similar proceedings, were performed either on behalf of official bodies, with a view to the preservation of the public health or directly for the diagnosis and treatment of disease. Over 183,000 experiments were reported by 365 licensees as having been performed for Government Departments, the Medical Research Council, county councils, municipal corporations or other public health authorities.

DISCUSSION

A POSSIBLE EXPLANATION OF DEEP-FOCUS QUAKES

IN view of the interest shown at the Washington meeting of the International Union of Geodesy and Geophysics in the explanation of deep-focus quakes, it seems appropriate to air a suggested explanation of such quakes advanced informally at a meeting of the Geological Society of America by the writer—an explanation which time has so far prevented his testing properly.

Seismological evidence indicates that some quakes have their origin as far down in the earth as 500 miles or more. From the large amplitude of the shear waves in these quakes we must conclude that considerable shear energy is released. This implies that at a depth of 500 miles in the earth we have a region where resistance to distortion is possible and shear energy can be stored up—quite contrary to geologists' notions of conditions at such a depth. In view of this implication, Jeffreys and others are prepared to attribute finite strength in the earth to this required depth of 500 miles. At the international meeting mentioned, Jeffreys seemed even willing to throw overboard the theory of isostasy. Before thus rejecting orthodox geological views of the earth's interior, the present note suggests another possibility, namely, that in the so-called deep-focus quakes, the quake or fracture actually occurs comparatively near the surface but that a real image of it is formed some hundreds of miles down and it is from this focal point that the seismologist's waves start. The first question that arises on such a hypothesis is—does the seismologist then receive waves both from the quake and from its image or only from its image?

Clearly waves must be emitted from such a near surface fracture, but there are two reasons why perhaps they are not recorded. It is not at all uncommon for the first impulse of a compressional wave on a seismograph record to be preceded some ten or twelve seconds by an emergence. As its name implies, an emergence is a gradual beginning. If we can actually identify such emergences ten or twelve seconds before an impulse, it may well be that some emergences too faint to be identified arrive many seconds earlier still;

hence, the first possibility is that at the quake itself the energy is spread over such a wide area that the waves emitted, unless brought to a focus, possess too little energy to make a perceptible record.

The other possibility is that the seismologists receive waves only from the real image of the hypocenter and not even feeble ones from the hypocenter itself. In this case we should have to postulate that the waves from the hypocenter were screened from the observing stations. The nature of this screening brings us to the question of how such a real image could be formed.

If we adopt Airy's view of mountain roots, it is easy to picture the roots as forming a vast parabolic basin which would act as a mirror with the reflecting surface the denser material in which the mountains may be considered as floating. If we take the Himalayas or the Hindu Kush Mountains where the quakes which occur are consistently of the same depth of focus, about 200 kms, the mountain roots would have to form a parabolic mirror extending this depth into the isostatic level and in length and width extending roughly the length and width of the mountain range.

Such a parabolic mirror, formed by sufficiently deep roots of a mountain range such as the Himalayas, could conceivably account for a real image of a surface fracture such as we have pictured, but the mountain roots would have to be deeper than previously imagined. For land quakes such as those occurring in the Hindu Kush Mountains, the fracture might occur above sea level, and hence only those rays brought to a focus below would be recorded. Those traveling direct from the fracture would strike the side of the mountain and give rise to but very feeble surface waves. For sea quakes, *i.e.*, quakes with their origin in sub-oceanic areas, we should have to postulate a screening effect by internal reflection from the sides of the parabolic mirror.

In conclusion, it must be emphasized that there is no evidence so far adduced to show that such image foci actually exist, but on the other hand there seems to be no evidence to show that they can not exist. Their existence is suggested as a possible alternative to overthrowing the existing geological picture of an earth with a rigid outer structure extending only some sixty or seventy miles. One step toward testing the theory is being made. Records of deep-focus quakes are being carefully scanned for evidence of phases earlier than the regular P phases. Naturally, one would not expect perfect screening of waves from an extended fracture and if there are two such hypocenters, a real one and its image, one should expect at least occasionally to pick up waves from each.

JOSEPH LYNCH, S.J.

FORDHAM UNIVERSITY

RESISTANCE TO SULFANILYL DERIVATIVES IN VITRO AND IN VIVO

DURING the past year and a half, we have characterized the growth of bacteria in broth by two constants, the time T required to reach a slight but definite turbidity,[1] and the slope K of the logarithmic increase thereafter. Organisms grown in the presence of sulfanilamide, sulfapyridine, or sulfamethylthiazole can show a marked increase in T accompanied by a much smaller change in K, indicating the development of resistance after a period of inhibition.

This resistance is partly temporary, and partly "permanent" (*i.e.*, appears in subcultures). The "permanent" resistance may be intensified by continued subculture in the presence of the drug, as shown by others for Pneumococcus[2] and Gonococcus.[3] We have found that eventually both T and K of the resistant strain grown in the presence of the drug approximate those of the parent strain tested in the absence of the drug.

The development of such resistance appears to be a general phenomenon. It also occurs *in vivo* during a course of therapy, as reported for Pneumococcus against sulfapyridine,[4] and as we have found in Staphylococcus aureus against sulfamethylthiazole.

The question arises whether organisms made resistant to one drug also are resistant to related drugs. We have found that two types exist, A, those in which resistance induced by one drug (*e.g.*, sulfanilamide) is carried over, and B those in which it is not. The metabolically versatile E. coli and Staphylococcus aureus belong to type A, whereas the fastidious Hemophilus parainfluenzae belongs to type B.

The implications of the foregoing for the theory of drug action and the control of therapy are obvious.

JEROME S. HARRIS
HENRY I. KOHN

DUKE UNIVERSITY SCHOOL OF MEDICINE

COLLECTING SUBTROPICAL PLANTS AND ANIMALS IN NORTHERN OHIO

CONCERNING the spread of animals and plants throughout the United States, it is of interest to consider the probable roles played by the various aquatic plant nurseries, such as the William Tricker Company in Independence, Ohio, which import plants from many tropical and subtropical areas throughout the world, and, in turn, ship them to places all over the country.

During the entire year, the pools of this company serve as a reliable source of extremely interesting

[1] The optical density determined in the Evelyn photoelectric colorimeter is directly proportional to the number of organisms.

[2] C. M. MacLeod and G. Daddi, *Proc. Soc. Exper. Biol. and Med.*, 41: 69, 1939.

[3] L. Westphal, R. L. Charles and C. M. Carpenter, *Jour. Bact.*, 39: 47, 1940.

[4] R. W. Ross, *Lancet*, 1: 1207, 1939.