of the crust to bear vertical stresses, distributed in alternating belts of positive and negative load. Daly selects peninsular India as the continental region of greatest demonstrated departure from isostasy and therefore the region best adapted to give a measure of strength in the continental crust. He estimates from the anomalies a maximum stress-difference in India of 400 kilograms per square centimeter. Similar estimates for Hawaii and the Mindanao Deep indicate considerably larger stress-differences in the Pacific floor, and lead to agreement with Barrell that the sub-Pacific part of the lithosphere is much stronger than the continental part.

An estimate of the order of strength in the asthenosphere is furnished by Fennoscandia. In the area of maximum uplift there is a defect of mass equal to a plate of granite about 200 meters thick; this value is deduced from the anomalies, and also from the measured rates of uplift since the ice disappeared. Using a stress diagram prepared by Timoshenko, Daly estimates that at a depth of 100 kilometers under the center of the Fennoscandian tract the stress-difference can not exceed 4 kilograms per square centimeter. Thus the degree of strength indicated for the asthenosphere is at least two orders of magnitude smaller than the estimates of Barrell and Jeffreys.

The hypothesis of a thin, strong lithosphere resting on a subcrust devoid of strength accords with evidence that orogeny is accompanied by horizontal shearing of a superficial shell over its foundation. Daly finds that the concept serves also to clarify some of the larger facts of igneous geology. However, an asthenosphere of unlimited depth is not compatible with Heiskanen's triaxial spheroid as the preferred figure of reference in gravity reductions. The major axis of this assumed figure emerges at 25° west longitude and 155° east longitude; the minor axis, at 115° west longitude and 65° east longitude. In Daly's view, the chief groups of regional one-sign anomaly are explained most logically in reference to the triaxial figure. In an attempt to harmonize the two concepts—a strengthless asthenosphere and a triaxial earth—Daly suggests that the asthenospheric shell is thin, and that it rests on a thick *mesospheric* shell which is strong enough to bear the stresses implied by the triaxial form. The suggested shells are, therefore, from the surface downward: (1) the lithosphere, 60 to 80 kilometers thick; (2) the asthenosphere, with a maximum thickness of about 400 kilometers and possibly much less; (3) the mesosphere, nearly 2,500 kilometers thick and resting on the central core. Daly recognizes that this hypothesis excludes the concept of deep-seated convection as a mechanism to explain crustal deformation. The two hypotheses must compete with each other.

To the reviewer the concept of a thin shell devoid of strength between shells of high strength seems artificial and open to grave doubt. Could such an arrangement be stable, even if it could be brought about? The question of stability arises also in connection with triaxiality supposed to be maintained in the mesosphere. If the assumed small asymmetry produces a figure of disequilibrium in the mesosphere, would not the lack of strength in the surrounding asthenosphere permit compensating adjustments, thus erasing the asymmetry for the earth as a whole? The problem is very difficult, but in a "naturalistic" analysis this criticism seems warranted. Readers will appreciate, of course, that Professor Daly is "going all out" in an attempt to grapple with a stupendous problem. As he says, "To make any progress with the present question, we can not avoid pyramiding speculative ideas."

In this discussion of major issues, one critical comment on terminology may be permitted. Daly adopts Gutenberg's suggested term *mantle* for the entire composite shell of the earth outside the central core. Introduction of this usage into the literature seems unfortunate, because the term *mantle rock,* commonly shortened to *mantle,* has long been in use with another meaning. Even without this objection the appropriateness of the term as Gutenberg uses it may be challenged, since a mantle suggests a superficial covering, whereas the feature in question comprises five sixths of the volume of the earth. The reviewer realizes the need of a short term to designate the entire unit surrounding the central core, but protests the adoption of "mantle" for the purpose.

We are indebted to Professor Daly for a highly useful study, involving much labor on his part and designed to make the way easier and more profitable for future students. In spite of the difficult character of the subject-matter, the book has the pleasing literary quality that characterizes Daly's writings generally. Whatever may be the reactions to interpretations and hypotheses proposed by the author, the book has no rival as a comprehensive guide to a subject of increasing importance in geology.

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SOCIETIES AND MEETINGS

THE ANNUAL MEETING OF THE SOUTHWESTERN DIVISION

THE twenty-first annual meeting of the Southwestern Division of the American Association for the Advancement of Science will be held at Lubbock, Texas, on April 28, 29, 30 and May 1, 1941. This

will be the second meeting of the division in this city, the previous one having been held here in 1934. Lubbock is located in the center of the South Plains area of Northwest Texas. It is approximately one hundred miles east of the New Mexico border, three hundred miles west of Fort Worth, and one hundred twenty-five miles south of Amarillo. The city is easily accessible by rail over the main line and several branch lines of the Santa Fe, and over a branch line of the Fort Worth and Denver. Well-paved highways, including U. S. 84 and 87, lead out radially from Lubbock in many directions, a fact which is responsible for its often being designated as the "hub of the Plains."

The host institution, the Texas Technological College, was founded in 1925 and now has a regular student body of about 4,300 in the nine-month session. Many changes will be evident to members of the association who have not visited Lubbock and the campus of Texas Tech since the 1934 meeting. A number of new buildings, including four large dormitories, a library building and a press building of an aggregate cost of about two million dollars have been erected on the campus since that time. The city itself has grown from a population of 20,000 to approximately 35,000, exclusive of college students.

Among the organizations meeting with the Southwestern Division may be mentioned the Clearing House for Southwestern Museums, the Council of Texas Archeologists, the Mathematical Association of America, Southwestern Division, the Texas Academy of Science, West Texas Division and the West Texas Museum Association.

In addition to papers presented in the sections devoted to Biological Sciences, Mathematics, Physical Sciences and Social Sciences, the program will include the annual Powell Lecture, to be given this year on Tuesday evening by Dr. Bernadotte Everly Schmitt, Andrew MacLeish distinguished service professor at the University of Chicago, and Pulitzer Prize winner in 1931. The selection of Dr. Schmitt seems rather timely, since he is an authority on European history and was awarded the Pulitzer prize for his work, "The Coming of the War 1914," published in 1930. On Wednesday evening, immediately following the annual banquet, Dr. C. V. Newsom, of the Department of Mathematics of the University of New Mexico, will give his address as retiring president of the division on the subject, "Mathematics and Science."

Members attending the meeting are promised a variety of entertainment and recreation, starting with a reception given on Monday afternoon by President and Mrs. Clifford B. Jones of the college at their home on the campus. Field trips will emphasize the archeology, biology, geology and horticulture of the high plains and their canyons. Points of interest include the State Experiment Station, Blanco Canyon and Yellow House Canyon. In addition, visits may be either en route or by special arrangement to the vertebrate fossil beds near Dickens (east of Lubbock), the gas and oil fields and the helium plant of the United States Bureau of Mines near Amarillo, the archeological sites of the Canadian River Valley and the Palo Duro State Park. Points of interest for those coming from greater distances include the newly dedicated McDonald Observatory in the Davis Mountains near Alpine, Texas, the Carlsbad Caverns and the salt mines near Carlsbad, New Mexico. The recent development at Carlsbad of a gigantic potash industry by the United States Potash Company, the Potash Company of America and the Union Potash and Chemical Company should be of especial interest to chemists and geologists. Short trips of not over a half day will be featured in Lubbock and the immediate vicinity. Longer trips, going farther afield, will be arranged if there is sufficient demand.

Dr. Wm. M. Craig, of the Department of Chemistry of the Texas Technological College, is in charge of a large local committee arranging for the meeting. Officers of the various sections are as follows:

Biological Sciences: Chairman, Harold M. Hefley, Lubbock; *Secretary,* Alvin R. Grove, Albuquerque.

Mathematics: Chairman, E. J. Purcell, Tucson; *Vice-Chairman,* Roy MacKay, Portales; *Secretary,* Harold D. Larsen, Albuquerque.

Physical Sciences: Chairman, Franklin E. Roach, Tucson; *Secretary,* Oscar B. Muench, Las Vegas.

Social Sciences: Chairman, W. C. Holden, Lubbock; *Secretary,* William M. Pearce, Lubbock.

The presentation of scientific papers under the several sections of the division is invited, and for participation neither membership in the association nor residence within the boundaries of the division is required. Persons desiring to present papers are requested to submit abstracts suitable for the press, not exceeding two hundred words, to the chairmen listed above so as to reach them not later than March 28.

Complete programs will be mailed to all members of the division as well as to others presenting papers. In order that these programs may be in the hands of persons contemplating attending the meeting by April 21, it is requested that the deadline of March 28 be carefully adhered to by those planning to present papers. Special requests for programs should be sent to the secretary of the division.

FRANK E. E. GERMANN,
Secretary

UNIVERSITY OF COLORADO