

# SCIENCE

Vol. LXX

FRIDAY, DECEMBER 20, 1929

No. 1825

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## ZONES OF WEAKNESS IN THE EARTH'S CRUST

By Dr. WILLIAM BOWIE

U. S. COAST AND GEODETIC SURVEY

THE advocates of the theory that the great deformations in the earth's crust have been caused by a cooling of the interior of the earth and the collapse of the crust to fit the reduced area of the surface of the nucleus have, in general, accepted isostasy as a scientific principle. They, however, seem to need zones of weakness within which uplift occurs in order to permit the crust to fit the shrinking nucleus. They also are of the opinion that the Airy idea of isostasy is the true one.

I am writing this paper in order to call attention to the idea that the areas which have been receiving vast amounts of sediments, possibly to depths of five or more miles, should not be the zones of greatest weakness in the earth's crust.

The heavy beds of sediments are laid down, in general, along margins of oceans or inland seas. At least this is the generally expressed opinion of the leading writers of geological literature. It has been

shown in "Isostasy"<sup>1</sup> and in a number of publications of the Coast and Geodetic Survey that areas of heavy sedimentation are not out of equilibrium. It is evident, therefore, that the weight of the sediments pushes down the crust beneath. The lower part of the crust necessarily enters subcrustal space and there is a horizontal movement of the displaced subcrustal material in a direction towards the area from which the sediments were derived. The volume of subcrustal material displaced will not be as great as the volume of the sediments. This is because the upper part of the subcrustal material must be of greater density than that of the sediments. Of course, the unconsolidated sediments have very light density, probably not more than 2.4. It may be that the density is 2.2. When these sediments are consolidated, the density will probably rise somewhat over

<sup>1</sup> E. P. Dutton and Co., New York, 1927. Spec. Pubs. 40, 99, and Serial 366, U. S. Coast and Geodetic Survey.

# Science

**70 (1825)**

*Science* **70** (1825), x-618.

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