The use of charts of this plane, together with the two elementary curves mentioned above, enable the rapid graphical analysis of the behaviour of many circuits, also the synthesis of networks with desired frequency characteristics and the determination of equivalent circuits.

An accuracy to 5 per cent in frequency or impedance and 0·5 decibel in attenuation can readily be obtained. The method has been found both rapid and convenient in application to various aspects of radio receiver design.

Acknowledgment is due to Murphy Radio, Ltd., for permission to publish this information.

D. N. TRUSCOTT.

Murphy Radio, Ltd.,
Welwyn Garden City,
Herts.
March 28.

Structural Geology of the Bermuda Islands

IN conjunction with investigations for the development of a technique for deep-sea seismic measurements that will permit the obtaining of positive geological information on the structure of the ocean basins, we have investigated the structural geology of the Bermuda Islands.

Of especial interest is the fact that contours around the Bermuda area based upon recently published sounding data[1] and unpublished soundings secured by the ketch *Atlantis* of the Woods Hole Oceanographic Institute suggest that the islands consist of four main volcanic cones with several minor ones on the flanks of the main structures, and also that the island mass is surrounded by a series of concentric folds which die out in amplitude with distance from the islands. In order to verify this latter indication, we have arranged for several lines of continuous soundings to be made in the near future.

Two seismic refractions depth profiles made in the island area show the top of the volcanics to lie at depths of 273 feet and 243 feet below sea-level. These determinations are in excellent agreement with the depth reported for the top of the volcanics in a deep well in the islands, 245 feet below sea-level. The volcanics were characterized by a velocity of 16,000 ft./sec., whereas the overlying calcareous eolianite composing the visible portion of the islands had a velocity of 8,800 ft./sec.

An examination of existing magnetic data which comprise a fairly complete isogonic survey[2] and localized studies of the variation in the horizontal component of the earth's field[3] show that the islands are characterized by local areas of low magnetic susceptibility. Further, that the depths of the disturbance are all about the same and less than 1,200 feet in depth. To elaborate the magnetic indications further, we have made a series of observations on the vertical component of the earth's field and find very high local disturbances both positive and negative in character. This work is still too incomplete to permit any conclusions to be reached as to the nature of the disturbances. They are near surface, and it is believed cannot be attributed to artificial causes.

Of significance in this connexion is the discovery of a calcareous sandstone heavily impregnated along dark bands with magnetite, ilmenite and andradite garnet. There are no surface exposures of this rock, and it was brought up from twenty feet below water in constructing a bridge pier. Also believed of significance is a coarse limestone conglomerate cemented in a very dense calcite matrix which occurs at about the same depth in several localities. In this formation we have found a weathered volcanic pebble four inches in diameter, but so far only one.

From the evidence presented it is seen that various conflicting conclusions might be drawn, but it is hoped by extending the seismic measurements, the magnetic studies, and geological studies of the lower dense limestone formation to reach a structural interpretation that will satisfy all the observed conditions. The nature of the exposed surface geology, cross-bedded eolianites, makes orthodox methods of structural geological investigation of little use in this area.

GEORGE P. WOOLARD.
MAURICE EWING.

Bermuda Biological Station for Research,
St. George's, W.
Bermuda.
April 13.

[1] Admiralty Chart, No. 360 (1938).
[2] Cole, J. F., *Terr. Mag. Atom. Elec.*, **13**, 49 (1908).
[3] Fisk, H. W., Sp. Rpt. 339, Carng. Inst. Wash., pp. 353–357.

Microphonic Potentials from the Utricle

Stevens and Davis[1] have put forward the view that the generation of potential differences in the cochlea when sound is incident on the ear is due to the 'piezoelectric' properties of the hair-cells themselves.

The principal item of evidence for this view is the similarity of the threshold curves for the microphonic effect determined oscillographically in the guinea pig and for sound perception in man. By implication, therefore, the microphonic effect is an integral part of the receptive process. Their argument is supported by the work of Adrian, Craik and Sturdy[2], who have demonstrated microphonic potentials in the ears of lower vertebrates (eel, frog, tortoise), which, though they do not possess a cochlea, yet have hair-cells in the maculæ of the labyrinth closely resembling those of Corti's organ. These observations were confined to the inferior part of the labyrinth, in particular the sacculus, which in these animals has an auditory function. This evidence therefore tends to confirm the belief that such microphonic potentials might be intimately connected with the reception of sound.

I have obtained similar microphonic potentials from the labyrinth of perch, tench and roach in response both to loud air-borne sounds and to vibrations transmitted through the bench. By exploration with concentric electrodes, it was possible to show that they were derived not only from the sacculus (and perhaps the lagena) but also from the utriculus. Indeed they could be obtained equally well from the latter after complete bilateral extirpation of sacculus and lagena, which in these bony fishes are widely separated from the upper non-auditory part of the labyrinth. Von Frisch[3] has demonstrated that in fish, as in higher vertebrates, the utricle plays no part in hearing. It is clear therefore that the generation of microphonic potentials in a sense organ is not in itself a sufficient