The charnockite series is represented by hypersthene granite, hypersthene tonalite, and members designated as norite and noritic charnockite, respectively. Contamination of some basic charnockites by granitic emanations provides a clue to the origin of the erratics, in which hypersthene may have been derived from the basic charnockites.

The mineralogical features of petrogenic significance are: (1) the paucity of water in the charnockites is indicated by mineral species, (2) an increase in the FeO/MgO ratio as evidenced by the character of the hypersthene in the more acid charnockite is in accord with the trend of crystallization in basic magmas, (3) strong development of microperthites and myrmekite, (4) garnet occurs in hypersthene granite, while augite is confined to noritic charnockites.

In view of the similarity of occurrence, mineralogy, chemical characters, and textural features of the Bunger Lake charnockites to those of other Antarctic charnockites, it appears that these rocks were originally a differentiated series of basic igneous intrusions and have been metamorphosed during granitization. The discovery of the charnockites in this area has added a fourth distinct province to Antarctica.

## MAPPING PLUTONIC ROCKS IN THE COAST RANGE OF BRITISH COLUMBIA, CANADA*

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In mapping 500 square miles of plutonic rocks in the southwest part of the Coast Range the authors separated rock types on the relative proportions of quartz, potash feldspar, plagioclase feldspar, and mafic minerals. Commonly used classifications, in which the separation depends on composition of plagioclase, in addition to relative proportion of essential minerals, were not practicable, as the plagioclase is highly variable in composition, is generally zoned (oscillatory), and is indeterminable in the field. Wherever average composition of plagioclase was determined specimens obviously from a homogeneous mass contained zoned plagioclases with varying average compositions, necessitating several rock names for this mass if the standardized classifications were used. In mapping, although separation into five generalized rock types (granite, granodiorite, quartz diorite, diorite, and gabbro) was easy, a further division on the relative proportion of hornblende to biotite conveyed a better picture of relation of rock types to one another and to older sedimentary and volcanic formations. The plutonic rocks fall into five facies divisions (hornblende or biotite rich, hornblende or biotite predominant, and hornblende and biotite in equal proportions). Mapping with this classification developed the following conclusions: (1) Plutonic rocks containing same mafic minerals are more closely associated than those containing same relative proportions of quartz and feldspar; that is, hornblende granite and hornblende diorite are associated, whereas hornblende granite and biotite granite are not. (2) Normally the ratio of hornblende to biotite increases near areas of older strata. (3) The general trend of various facies divisions roughly parallels that of preplutonic rocks. (4) All facies are gradational into one another.

## PRELIMINARY REPORT ON THE SEDIMENTS AND FORAMINIFERA FROM THE SALTON SEA, SOUTHERN CALIFORNIA

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The Salton Sea is a lake of interior drainage in a large graben separated from the Gulf of California by the Colorado River delta. After the last marine invasion of the region in late Miocene or lower Pliocene time, the present basin was formed and has, periodically, been filled to different elevations

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by flood waters of the Colorado River. This is witnessed by relatively recent fresh-water lake deposits on the borders of the basin.

Following the spectacular break of its levees in 1905, the river discharged again its entire flow for nearly two years into the Imperial Valley, thus creating the present Salton Sea. Since then, intense evaporation has caused a progressive increase in salinity.

Investigations show that:

(1) The chlorinity of the water ranges from 0.70‰ to 14.20‰.

(2) Extreme readings for water temperature were 12°C and 31.5°C.

(3) Away from the shore, grain size and pH of the sediments decrease rapidly, whereas the organic carbon content increases.

(4) The foraminiferal population is typically an *Elphidium-Streblus*-miliolid shallow-water assemblage.

(5) Foraminiferal numbers (number of Foraminifera per gram of sediment) are much higher close to shore than in the center of the lake.

(6) Arenaceous Foraminifera have been found at only one station near an estuary.

(7) No planktonic Foraminifera have been collected.

Foraminifera and other small marine organisms may have been introduced into the lake in several ways, among which are: birds, naval seaplanes, transplantation of marine fishes, and speed-boating.

## PARTICLE SIZES OF CLAY MINERALS BY SMALL-ANGLE X-RAY SCATTERING

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A review of the present methods of particle-size determination of clay minerals indicates that none is entirely adequate. Electron microscopy has provided the first reliable measure of clay sizes but gives poor results with montmorillonite and illite. This paper describes an investigation of small-angle x-ray scattering as a possible technique. The interpretation used is that of Shull and Roess involving a graphical comparison of experimental scattering curves with theoretical scattering curves. In theory, both the distribution of particle sizes and the shape of the particles should be obtainable, but in practice outside evidence of the shape is required.

A two-crystal spectrometer was used to collect data for 2 carbon black samples and 28 clay samples. The carbon blacks and most of the clays gave scattering curves from which particle-size information could be extracted. The scattering curves for the halloysites and attapulgites could not be interpreted, probably because of their fibrous or tubular character. Of five purified samples of illite and montmorillonite, four gave uninterpretable scattering curves, possibly owing to extreme orientation during treatment. Because of the scarcity of similar data in the literature it is difficult to verify the particle-size information derived. However, it is believed that the small-angle x-ray scattering technique will fill the need for a relatively simple method of determining clay sizes.

## SIGNIFICANCE OF CARBONATE STRATIFICATION IN PELAGIC DEPOSITS

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The carbonate stratification of Pleistocene and Recent pelagic deposits is of widely varying type. To evaluate the significance of the stratification it is necessary to check the relative importance of changes in (a) accumulation of detrital minerals, (b) accumulation of minerals formed inorganically in the ocean, (c) production of calcareous plankton, (d) production of noncalcareous plankton, (e) dissolution of skeletal remains of plankton. Where changes in (a) and (b) are minor, increased oceanic circulation as during the Ice Ages will result in increased carbonate content of the deposit if (c) dominates over (e). This is the case, *e.g.*, in the vicinity of the Equatorial Divergence in the Pacific