Rectal temperature was monitored throughout the experiment and was kept in the normal range by a heating pad placed beneath the animal. The hypothalamic temperature was measured with a thermocouple, or estimated indirectly from measurements of the thermode temperature. Respiratory movements were picked up by a thermopile placed in the tracheal cannula and recorded on the face of an oscilloscope simultaneously with the neuron discharge.

The frequency of spontaneous unit discharges in the anterior hypothalamus ranged from 3.7 to 27 per second. The discharge of a particular cell was rather stable, firing at an almost constant rate for several minutes. Some units changed their discharge interval with the rhythm of respiration. Numerous units which did not respond to local heating were found in the anterior hypothalamus. Regardless of an increase in respiration rate at hypothalamic temperatures of even more than 40°C, the discharge frequencies of these units remained fairly constant. The existence of a unit which does not respond with increased frequency to heating serves as a good control for heat-sensitive units. A few units have been found in the anterior hypothalamus which respond to local heating with a slight decrease in frequency. Occasionally the amplitude of the discharge decreased or increased with heating and returned to the normal 1 or 2 min after cessation of heating without any change in frequency. This change of amplitude is thought to be brought about by tissue movement with respect to the electrode.

Units which increase their discharge frequencies during local heating have so far been found stereotaxically in a region 13.5 to 15.5 mm rostral from the stereotaxic zero point, within 2 mm of the mid-line, and between 0.5 to 3 mm from the bottom of the brain tissue. The increase of frequency always occurred prior to the onset of polypnea, and even in an anesthetized cat an elevation of less than 1°C in the hypothalamic temperature was enough to increase significantly the discharge frequency. In an experiment in which the hypothalamic temperature was changed slowly by the circulation of warm water, the discharge frequency per second was 7.2, 15, and 21.2 at hypothalamic temperatures of 36.8°, 38°, and 38.7°C, respectively. The discharge rate remained fairly constant and showed little adaptation at a given hypothalamic temperature so long as the intensity of heating was moderate. These thermally sensitive units did not stop firing but showed a minor decrease in frequency when the hypothalamic temperature was lowered to 32°C. One unit, however, had a minimum frequency at 35.4°C, and increased its frequency with either cooling or heating.

The relation between hypothalamic temperature, unit discharge, and respiration is illustrated in Fig. 1. With radio-frequency heating the hypothalamic temperature went up gradually and the discharge began to increase in frequency. The discharge reached its maximum frequency 80 sec after the beginning of heating and maintained a fairly constant frequency at this level. Coincident with the fall of hypothalamic temperature, the frequency of discharge decreased without showing any afterdischarge. Close inspection of this figure, however, reveals that the frequency decreased a little while the hypothalamic temperature was still rising. Such a tendency of decrease is more conspicuous at higher hypothalamic temperatures, and in this type of response the frequency usually decreased markedly in the recovery phase after cessation of heating and then returned to the starting level. During the first minute or so of the heating period the respiration rate remained fairly constant or, more frequently, decreased slightly, as shown in Fig. 1.

In another series of experiments, rapid heating was employed, that is, the hypothalamic temperature was raised 6.5°C in 24 sec, from 38°C to 44.5°C, in an attempt to see whether any phasic response could be evoked. The discharge rate, 9.5 per second at normal temperature, decreased suddenly to 6 per second 3 seconds after the beginning of temperature elevation and then increased and reached the maximum frequency of 28 per second in 31 sec. Other units which showed no initial inhibition responded to a rapid heating with a minor increase in frequency.

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2 May 1961

Authigenic Dolomite in Modern Carbonate Sediments along the Southern Coast of Florida

Abstract. Crystalline authigenic dolomite in shallow-water marine sediments from the margins of the North American continent is described for the first time. Dolomite is probably forming at the water-sediment interface in Florida Bay because of an interaction between organic material and hypersaline sea water.

Dolomite crystals occur in carbonate sediments now accumulating in shallow sea water along the southern coast of Florida (latitude, 25° 05′ 50″ N; longitude, 80° 53′ 58″ W). Examination of sediment cores shows that dolomite is most abundant near the sediment-water interface. These dolomite crystals are associated with calcareous shell fragments that have accumulated to form carbonate mud banks which overlie the consolidated Miami oolite of Pleistocene age. Along the western margin of Florida Bay, where dolomite appears to be concentrated, the unconsolidated mud is approximately 1.5 m thick. During periods of low water the mud is exposed to the atmosphere.

The dolomite crystals are characterstically euhedral rhombohedrons, ranging in size from less than 1 μ to approximately 60 μ; they commonly contain dark internal rhombohedrons that appear to be intergrowths of dolomite and dark material, possibly organic (Fig. 1). Clusters of interpenetrating rhombohedrons, in rare specimens, appear to be in the process of growth.

Unconsolidated carbonate sediment was leached with distilled water to remove all interstitial dissolved solids, filtered with Pasteur filter candles, passed wet through a screen with 62-μ openings, and suspended in a 2.5M solu-

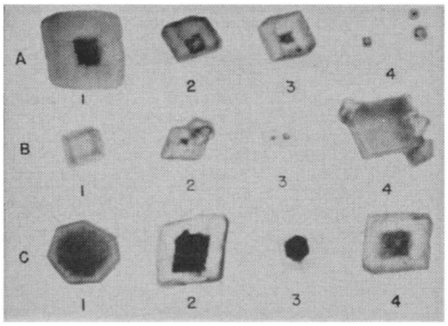

Fig. 1. Photomicrographs of typical dolomite crystals that occur in modern unconsolidated marine carbonate muds along the southern coast of Florida. Crystals range in size from about 16 to 62 μ, although the degree of enlargement varies from photograph to photograph. *A-1*, *A-2*, and *A-3*: euhedral crystals with dark organic material inside. *A-4*: three crystals contrasting lack of etching (lower two) with high degree of etching and loss of crystal faces (upper one). *B-1*: euhedral crystals lacking an inclusion. *B-2*, *B-3*, and *B-4*: interpenetrating euhedral crystals. *C-1*: seven-sided crystal that appears to be in initial growth stage. *C-2*, *C-3*, and *C-4*: euhedral crystals with rhombohedral-shaped dark inclusions.

tion of Na_2CO_3. The suspensions were decanted to effect a sizing based on settling velocity and particle size. Dolomite was suspected when rhombohedrons were found with an electron microscope in the size fraction of less than 1 μ. Many preparations, ranging in size between 62 and 16 μ, were acidified in very dilute (1:30) HCl to remove the more soluble (in dilute acid) aragonite, calcite, and magnesian calcite that constitute more than 95 percent of the total carbonate. The insoluble residue was studied by x-ray diffraction on a Norelco high-angle Geiger-Mueller counter goniometer. As shown by Fig. 2, the insoluble residue consists of dolomite and quartz.

The origin of the dolomite is incompletely known. The presence of complex clusters of these crystals suggests that it has not been transported. The apparent concentration of dolomite near the top of the sediment cores suggests that dolomite is forming at the sediment-water interface rather than after burial in some diagenetic process. If exposure of the mud bank coincides with a time of high evaporation, concentration of the dissolved solids in the surface film of water will rise markedly. The presence of organic material and a high concentration of dissolved salts may possibly be the conditions necessary to initiate growth of the original dolomite crystal on which later crystals may grow.

Fairbridge (*1*) has reviewed the problem of the origin of dolomite. In brief, dolomite is an important constituent in ancient calcareous rocks, but is not known to be forming in modern carbonate sediments whose depositional environment is considered to be typical of ancient deposits. As shown by the present study, however, dolomite is forming along the western margin of Florida Bay. Further geochemical study of this occurrence should help to clarify the origin of some ancient dolomites (*2*).

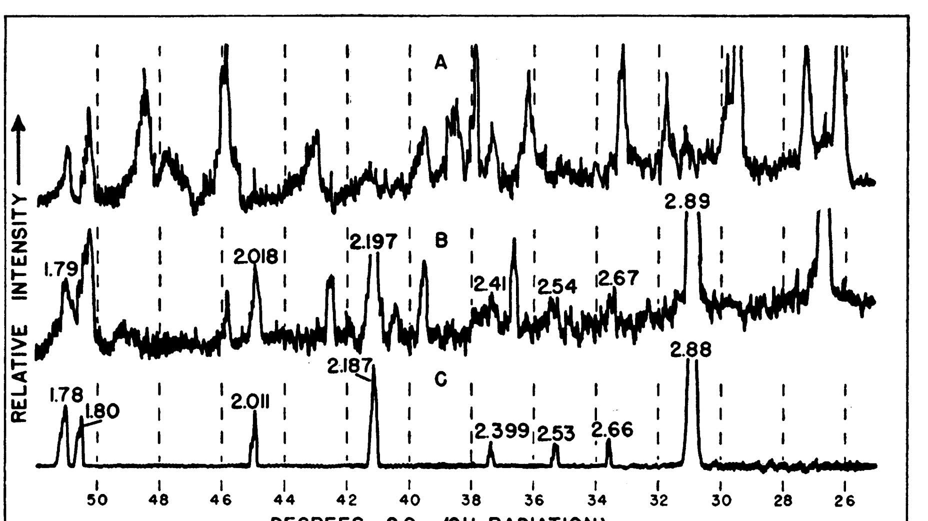

Fig. 2. Comparision of three x-ray diffraction patterns that confirm presence of dolomite in Florida carbonate muds. (*A*) Diffraction pattern of untreated carbonate mud. Note that no dolomite peak appears at 31°. (*B*) Diffraction pattern of residue of sample *A* after calcite, aragonite, and magnesian calcite have been leached away with dilute HCl. Note presence of strong dolomite peak at 31°. Also note that d_{hkl} values for dolomite peaks are listed; other peaks are quartz which also occurs in the residue. (*C*) Diffraction pattern of U.S. Bureau of Standards No. 88 standard dolomite shows dolomite peaks comparable to those in *B*.

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Mass Culture of Phytoplankton as Foods for Metazoans

Abstract. An apparatus for mass culture of photosynthetic microorganisms has been developed to grow algae for use as foods for larval and juvenile mollusks in studies of their physiological requirements. The apparatus consists of a series of 5-gal growth chambers, and the system can be enlarged to yield any desired volume of algae by replication of basic units. Approximately 50 lit. of algal suspension, averaging about 0.5 ml of packed wet cells per liter, are produced daily.

In developing a standard technique for rearing lamellibranch larvae, one of the requirements was to provide an adequate quantity of food. To be ingested by early-swimming larvae of the American oyster, *Crassostrea virginica*, food particles must be in suspension and must not be larger than about 7 μ in size.

Photosynthetic nannoplankton appeared to be the most promising natural food. It was found, however, that various species of microorganisms not only differ in food value, but that some are not utilized at all, while others are actually toxic (*1*, *2*). Some produce toxins that appear to be intracellular but, more commonly, toxins occur as external metabolites. Certain bacteria also produce toxins (*3*). In low concentrations these toxins only retard the growth of bivalve larvae, but sometimes concentrations are sufficient to prevent development of eggs, or kill larvae (*4*).

To provide food for the daily feeding of the larval and juvenile mollusks at this laboratory, from 20 to 60 lit./day of a relatively dense culture of food organisms in unialgal and,