the urine was definitely less than that occurring from such secondary injections in the animals of Group I. The reduction in the elimination by the kidney of phenolsulphonephthalein was not so great, the reserve alkali of the blood was usually undisturbed, there was no retention of creatinine, and the retention of both urea and non-protein nitrogen was slight or failed to occur. In six dogs with a partial restoration in renal function from an initial uranium injection, the amount of uranium has been increased from the primary dose of 2 mgs per kilogram to 8 mgs and in each instance the same type of modified nephrotoxic action has been obtained.

The morphological basis for this resistance on the part of the kidney to uranium has been associated with the type of epithelial repair to the convoluted tubules and the extent to which this repair has taken place. Those animals with a chronic nephritis in which the epithelial replacement has been very largely effected by a relining of the tubules with a flattened, non-specialized type of cell, have shown functionally the highest tissue resistance against repeated intoxications by uranium. This type of cell is resistant to the toxic action of the poison. It fails under its influence to become edematous and necrotic.

These experiments would not indicate the acquisition on the part of the animals of an immunity to uranium, but the substitution in the kidney, as a result of a process of repair, of a type of epithelial tissue atypical for the convoluted tubules, which either fails to secrete uranium and subject itself to an injury from the substance, or an epithelium which is resistant to it during secretion. Such changes in cell types in the kidney may be looked upon as a morphological defense mechanism giving to the organ an acquired tissue resistance which varies in degree for subsequent injuries from the same chemical substance.

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A NEW FACTOR IN THE TRANSPORTATION AND DISTRIBUTION OF MARINE SEDIMENTS

ONE of the well-known facts concerning the distribution of marine sediments on the continental shelves is that there is a progressive gradation from coarse to fine-grained material away from the shore. The mechanism of the sorting power of the sea and its ability to transport material still remain an unsolved problem of the sedimentationist. Many explanations have been put forward as to the action of currents in the sea produced by tides, winds and differences in density, but no observational data have been accumulated to give us any definite knowledge of the method by which grains of sand and silt are actually transported. With the object of making an investigation of this subject, Mr. Stetson devised a trap which could be placed on the sea bottom in such a way as to catch particles which were traveling in suspension within a few inches of the sea floor. The traps are boxes of heavy galvanized sheet iron 1 foot 2 inches square in ground plan, with the sides bent in and sloping up to a central opening 8 inches square. In some cases the trap was constructed with the lip 1 inch from the bottom, in other instances 6 inches. The deeper traps seem on the whole to be the more satisfactory. Two half doors hinged in the middle were fitted to the opening, which could be tightly closed by a messenger dropped from the surface before the apparatus was hauled up. It is planned to place a series of these traps along a profile on the continental shelf, with the hope of obtaining from them some knowledge of when, and possibly how, the grains travel.

Among the first results of the preliminary work with the traps has been to find, on hauling the first of them after it had been a week on the bottom in about eight fathoms of water, approximately a half mile east of the sandy bluff known at Fourth Cliff, Scituate, that it contained a layer 2 inches deep of a jelly-like substance concerning which little or nothing seems to be known. This jelly is practically colorless, and, when examined under the microscope, also structureless. In it are found grains of sand and silt, fragments of eel grass and fucus, much macerated particles of various algae, shells of diatoms and foraminifera, and small spicules of various sorts. The origin and composition of the jelly are a subject for investigations which are now being carried out. The late C. G. Joh. Petersen investigated the organic matter in the waters off Denmark, and found at the bottom a layer from one to three mm in thickness, composed largely of organic matter, which on account of its color he called the brown layer. He also found in certain localities what he spoke of as mud which quivered like jelly. The material he found seems to have been very much like the jelly in our trap. Petersen's studies, summarized in the report of the Danish Biological Station, Vol. XX, 1911, led him to the conclusion that the material with which he was dealing was made up principally of decomposed vegetable matter, the chief contributor being eel grass. Another suggestion is that the material might be sewage, but it is seemingly too abundant and too widely distributed to be so explained.

A survey of the distribution of this material has been carried on, using a scraper dredge. Several lines of stations were run, beginning at the beach and going off shore about ten miles, with bottom samples taken about every mile. The places selected were the south shore of Massachusetts Bay from Marshfield to Cohasset, and the southern half of Ipswich Bay north of Cape Ann, because in both these regions the profile of equilibrium appears to be well developed. The jelly was found in every haul and on every sort of bottom. In the shoal water near shore, 20–150 feet deep, much fresh material is present, that is, the plant fragments are still identifiable. The entangled sand grains here range as high as fine beach sizes. The mud zone on the Massachusetts coast begins at a depth of about 225–300 feet. From a depth of 200 feet outward, the jelly was a homogeneous mass in which the organic detritus can not be identified. Some of the fresher material taken near shore was allowed to stand about four months in sealed jars. At the end of that time, the plant fragments had rotted down so that the jelly resembled that found in the mud zone. The sediment collected at 350 feet of depth, which was the deepest taken, ranges from clay and silt sizes to very fine sand. A bottom core, five feet long, taken at this depth in Ipswich Bay, shows about 10 per cent. fine white sand, and the rest clay and silt. It is homogeneous in composition for its whole length.

As might be expected, there seems to be a definite relationship between rough and calm weather and the condition of the jelly. During periods of calm the very top of the jelly layer flocculates and collects in light feathery masses. After a period of rough weather the entire layer is churned up and samples taken at such a time present on settling a much more uniform and compact appearance. Further settling of the very fine particles again produces the flocculent appearance of the top layer. This condition may be duplicated by violent agitation in a jar in the laboratory.

The transporting power of this jelly is further illustrated by the fact that during and after every storm it may be taken, with its entangled sand, from surface water. The roiling, so noticeable in coastal waters after every storm, is probably due in a large measure to this jelly and not to free sediment. The day after a 60-mile easterly gale, three gallons of surface water were taken off the entrance to Cohasset harbor in 25 feet of water. This position is protected from the full sweep of the seas by a string of ledges a mile or more off shore. After filtering and washing with fresh water, the sample was ignited to remove the organic material. .2604 gram of actual sand and silt remained. The largest sizes are included in Wentworth's "very fine sand" class with sizes ranging from 1/8–1/16 mm. These grains are largely quartz. It is obvious that if this amount of sediment was in suspension at the surface, greater quantities would be encountered near the bottom. The total carrying capacity must be enormous. This may explain in a large measure the rapid silting of harbors and estuaries; it enables sediment to travel along the bottom and in suspension in a current the velocity of which would otherwise be powerless to move it. On the day in question the flood tide entering Cohasset harbor was so muddy with jelly that an object two feet below the surface was invisible. The ebb was noticeably clearer.

The main significance of this material, whatever may be its origin, lies in its obvious importance as an agent in the transportation of sand grains. Samples of the material dried and weighed after the combustion of the organic matter shows that about 85 per cent. by weight consists of grains of various sizes, from fine sand to silt. Since only the slightest amount of current is necessary to transport this jelly, it could be widely and easily distributed without evoking the aid of any strong currents near the sea bottom.

If Petersen is correct in his contention that most of the organic matter in the coastal waters is decomposed eel grass, then there is a periodicity in transportation. Eel grass being a deciduous plant, the new supply of vegetation is an annual product, the decay beginning with the shedding of the leaves in the fall. The thin brown layer which Petersen found in large areas of the sea bottom around Denmark is believed to be decomposed eel grass which had come to rest below the wave base. It is, therefore, possible that since heavy storms are likewise seasonal, the jelly may have another significance in that it may possibly form parting planes, and in some places at least may happen to be buried and produce the appearance of varves, which is not infrequently observed in marine strata. It seems more probable that eel grass is only one of its constituents and that algae probably play a large part. The chemical analysis is now being carried out, and next summer a survey of its distribution will be made in the Gulf of Maine and adjacent waters.

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