Malthusian problem, in so far as this problem depends on the ability of the soil to produce food. How this great new law of nature bears on the question of when the earth will become saturated with population is more extensively discussed by the writer in another place.

(*h*) *A theory of the perultimate limit to plant growth.* The existence of a common perultimate limit to the effect of growth factors and to the growth power of all plants is a circumstance striking enough to warrant an attempt to picture the underlying reason. At the present time explanation can be little more than surmise and hypothesis, but certain facts are known which furnish hints.

One likely hypothesis is suggested by the work of Stoklasa, who has apparently found that the growth power of plants is increased (*i.e.,* their pressures of satiation lowered) by exposing them to radiations from low grade Joachimsthal ores. These radioactive materials evidently create a field of force or of influence about the growing plants which acts to intensify their vital activities. But Stoklasa's field may very well be regarded as a secondary or supplemental field superposed on an original primary field of the same general kind; this primary field may be supposed to be due to a particular category of radiations which reach the earth from outer space, or they may come from the interior of the earth itself. The facts of plant growth indicate that this primary field has a certain finite intensity and thus does not supply energy or stimulus beyond a certain limit, this limit determining the perultimate limit to the amount of active protoplasm which may be formed or activated in a unit of space, or, as we may now say, in a unit field of influence. When, however, the primary field is reinforced by congruent radiations, as appears to be the case in Stoklasa's experiments, the total strength of the field is increased and the original perultimate limit on growth power is correspondingly displaced.

So much for the suppositive prime factor in the limitation on plant growth; the mechanism of the action of this prime factor remains to be accounted for. Certain hints in this direction are found in the work of the Java sugar-cane breeders whose spectacular achievements have so greatly upset the contemporary sugar trade. When a superior new variety of sugar-cane is created by cross-breeding it is found that the individual cells of the more vigorous variety are larger than corresponding cells of the less vigorous strains from which the newcomer was derived (Bremer). This will explain the existence of differences in the satiation pressures of varieties of the same species which differ in growth powers, for obviously at equal osmotic pressures a certain number of large cells may contain a greater aggregate quantity of dissolved substances than the same number of small cells of the same kind, *i.e.,* the former are able to draw more extensively than the latter on a given supply of soil nutrients without increasing the normal concentration of their cell liquids. Satiation pressure is, therefore, to some extent at least, an inverse function of cell size. The same relative lowering of the satiation pressures of the more productive new varieties would also occur if the size of the cells remained the same but their number increased relatively to the number of cells in the less productive; or increases in both number and size of cells might occur simultaneously.

The Java cane breeders have also noted that valuable new varieties are obtained from combinations which result in certain definite changes in the number of the chromosomes of the new variety. Growth power of varieties within a species is therefore also a function or an accompaniment of a particular sort of chromosome complex.

From these materials we may construct the following tentative hypothesis to account for the creation of more vigorously growing new varieties: The crossing of two different strains (particularly if the species is originally highly bastardized, like the sugar-cane) results in a certain new combination of chromosomes. There are reasons for supposing that chromosomes are intimately concerned in vital processes, and they may be supposed to constitute or to characterize a system which "tunes in" more or less accurately with the primary field or fields of influence which we have already supposed to supply the governing stimulus to plant growth. If the tuning in is perfect, then the size of the cells or their number, or both size and number, are adjusted to conform to the perultimate limit on growth, and the new variety is perultra. If the tuning in is imperfect, the full strength of the field can not be utilized and the new variety is subultra.

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RIDGEWOOD, NEW JERSEY

SCIENTIFIC EVENTS

A BIOLOGICAL STUDY OF NERITIC WATERS IN THE GULF OF MAINE

OVER a period of more than ten years oceanological investigations have been carried on in the Gulf of Maine and adjacent waters by Dr. H. B. Bigelow and the combined results have been published in three comprehensive monographs. These excellent reports cover very well the adult fish fauna of the gulf and the general biological and physical conditions in the offshore waters.

There remains, however, the marginal region extending from the shore to a point where the immediate influence of the coast is lost and open ocean conditions appear. This shallow or neritic zone plays a most important part in the natural economy of the Gulf of Maine. It is in this area, where the fertility of the waters is increased by outwash from the land and the rivers, that some very important fishing grounds (particularly the herring) are located. To date the American portion of the region has never been investigated in a comprehensive manner and studies of the same nature as those carried on by Dr. Bigelow are badly needed to supplement his work.

Inasmuch as the conditions in different areas along the coast of the Gulf of Maine vary considerably structurally and in the amount of outwash from the land, there will be considerable variability physically, chemically and biologically. In order, therefore, to understand the various fishery problems of the region it will be necessary to determine, so far as possible, these conditions. It is proposed to start work this year in the area lying between Mount Desert and the Canadian border and enlist the cooperation of all available interested organizations. Later it is hoped that such combined support might result in an extensive survey of the whole gulf to continue over a period of years. Certainly the problem warrants such attention. The program this year will include Passamaquoddy Bay and the herring fishery grounds, the work being carried on jointly by the Mount Desert Island Biological Laboratory, the Buffalo Museum of Science and Brown University, with the cooperation of the U. S. Bureau of Fisheries and the Museum of Comparative Zoology of Harvard University.

It is proposed to start work about June 15 with a suitable boat covering the region between Mount Desert and Passamaquoddy Bay at least once and if possible twice during the summer. In addition, special work will be concentrated in areas found most desirable for study. General hydrographical observations (temperature and salinity), chemical analyses of the water (nitrates, phosphates, silicates, pH), qualitative and quantitative micro- and macroplankton analyses, distribution and abundance of larval and postlarval fish, food of young fish and general observations on fishery conditions—particularly the herring—will be made.

The preliminary work will be carried on this year by a relatively small staff of three men with the part-time assistance of Mrs. Fish (for identification of larval fish). The staff will consist of Dr. Charles J. Fish, plankton and general hydrography; Dr. H. W. Rakestraw, chemistry, and one scientific assistant for field work and part-time analysis of stomach contents of larval and postlarval fishes.

A supervising committee has been appointed consisting of Dr. H. B. Bigelow, Commissioner Henry O'Malley, of the U. S. Bureau of Fisheries, and representatives of the Mount Desert Island Biological Laboratory and the Buffalo Museum of Science, to work out details of the program for the present season and plans for future investigations.

Such a survey will have three objects in view: *First,* a determination of the physical, chemical and biological conditions in the neritic waters of the Gulf of Maine; *second,* general oceanography (lateral extension of the region covered by Dr. Bigelow to the coast line); *third,* immediate problems of the fishery.

WORK OF THE ROCKEFELLER FOUNDATION

A REVIEW of the work of the Rockefeller Foundation in 1928, written by its president, George E. Vincent, will be published in a few days. In addition to recounting the activities of the past year, the review tells of plans for extending the scope of the foundation's work under a new régime which went into effect at the beginning of the year 1929, and also summarizes briefly the achievements of the organization during the first sixteen years of its existence.

During 1928 the Rockefeller Foundation continued its regular program of activities consisting chiefly in (1) promoting the development of medical knowledge by aiding schools of medicine, nursing and hygiene in many parts of the world; (2) advancing the cause of public health by helping governments fight certain diseases and strengthen their local health services, and (3) carrying out an extensive fellowship program by which 800 men and women were enabled to pursue additional studies, chiefly in countries other than their own. In doing this work the foundation disbursed from income and capital $21,690,738, of which $12,000,000 constituted an endowment fund for the new China Medical Board, Incorporated.

During the year plans were completed for a reorganization embodying as its main features the merging of the Rockefeller Foundation and the Laura Spelman Rockefeller Memorial into a new corporation to be known as the Rockefeller Foundation, and the extension of the scope of the new foundation's activities to include work in the natural and social sciences and in the humanities. A China Medical Board with independent self-perpetuating trustees to receive the lands and buildings of the Peking Union Medical College together with an endowment fund and annual appropriations was also created.

Since May 22, 1913, the foundation has paid out from income and principal a total of $144,189,400. The emphasis has been on the training of doctors, health officers and nurses, the creation or strengthen-