been developed has proven successful for obtaining diatoms in quantities large enough for chemical analysis (*i.e.,* by the kilogram),[3] but since the maximum rate at which the diatom sludge could be accumulated during periods of abundant flowering was a liter in about six hours and since the work involved the services of three men and a forty-foot power boat, the method obviously would not be practical for obtaining a food supply for man.

Zooplankton can be procured much more readily because its larger size makes possible the use of coarser nets which, due to their stronger mesh, can have larger filtering surfaces and can be towed at faster speeds. The abundance of zooplankton is extremely variable both in time and in place. But even in the relatively rich Atlantic coastal area between Cape Cod and Chesapeake Bay catches greater than 2 liters in volume (per 20 minute haul at 1.2 knots with net 1 m in diameter) were rarely encountered in a four-year survey reported by Bigelow and Sears.[4] These authors concluded that the average concentration of zooplankton in this area during the season of maximum production was about 0.5–0.8 cc per cubic meter of sea water. Plankton was much scarcer during the winter. Comparison with other investigations showed that the plankton of European waters was little, if any, richer. Since plankton is at least 90 per cent. water, we may take as an outside figure a value of 0.1 g dry weight of plankton per m^3 of sea water. Even though the plankton may actually be richer, this figure gives the order of magnitude of the amount *which can be caught* using the most efficient methods yet devised.

Since the foregoing data are available one is tempted to make a rough calculation of the amount of ocean which would be required to sustain a man. Assuming an energy yield of 9 cal/g for fat, and 4 cal/g for protein and carbohydrate, we find that the combustion of 1 gram of dried plankton would yield about 4 cal. If a value of 3,000 cal per individual be taken as the average daily requirement of the population,[5] about 750 g of plankton would be needed per man per day, *assuming all the organic matter in the plankton to be assimilable.* On the basis of 0.1 g plankton/m^3 each member of the population would require all the zooplankton from *at least* 7,500 m^3 each day (approximately equal to the volume of a football field filled 1.5 m deep). Using the largest net generally found practical (2 m in diameter)[6] at a fast towing speed (2 knots) and assuming a 20 per cent. straining efficiency for a coarse net,[7] a period of 2½ hours would be necessary to filter this volume of water. If several nets were used simultaneously, more men and larger boats entailing greater operating costs would be required.[8] Even though plankton be considered only as a subsidiary food source, it must be obtained economically in order to form an efficient part of the whole dietary scheme. We are forced to conclude, therefore, that if the marketing of plankton on a commercial scale is to become a practical reality, either areas of greatly increased richness must be located or some method must be found for making the above rate of procuring plankton economically feasible.

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IMMUNITY TO FUSARIUM WILT IN THE TOMATO

GREENHOUSE and field tests of the resistance of several wilt-resistant tomato varieties to *Fusarium lycopersici* Sacc. (F. *bulbigenum* var. *lycopersici* Woll.) showed that infection was almost universal when environmental conditions were very favorable for the development of the disease. The resistant varieties survived for longer periods than susceptible varieties, but usually died before the growing season ended.

In a search for more effective resistance to *Fusarium lycopersici* in a plant cross-fertile with the tomato, numerous accessions of Lycopersicum and related genera were exposed to infection by virulent isolates of the parasite. All accessions of species in genera other than Lycopersicum proved immune. A few attempts to produce intergeneric hybrids were not successful. Accessions of *L. esculentum* Mill. exhibited various degrees of resistance and development of external symptoms, but all were susceptible to infection. Accessions of *L. pimpinellifolium* Mill. from several sources varied greatly in reaction to *F. lycopersici;* one proved very susceptible; several were somewhat resistant; one, Accession 160, remained free from infection and apparently possessed immunity.

The immune accession of *L. pimpinellifolium* was received from Dr. W. S. Porte, U. S. Department of Agriculture, Washington, D. C., who wrote of it, ". . . our No. 2116 was obtained by F. P. I. from Dr. Wolcott, who picked it up near Trujillo, Peru."

In contrast to the resistance or tolerance of commercial varieties of tomatoes to *Fusarium lycopersici,* immunity in Accession 160 was effective under con-

[3] G. L. Clarke, SCIENCE, 86: 593, 1937.

[4] Memoirs of the Museum of Comparative Zoology, 1939 (in press).

[5] G. Lusk, "The Elements of the Science of Nutrition." Philadelphia, 1928.

[6] A net 4½ m in diameter but with relatively coarse mesh was used by the *Discovery* (J. W. S. Marr, *Discovery Reports,* 18: 105, 1938).

[7] Reported by G. L. Clarke and D. J. Zinn (*Biol. Bull.,* 73: 464, 1937) and confirmed by tests with the plankton sampler—a recently developed device equipped with volume meter.

[8] There might be some possibility of operating economically a filtering plant in the tidal flow between suitably located islands or in the entrance of an estuary.

ditions very favorable to the development of the disease. In greenhouse and field experiments of 1935 to 1938, in which nearly all plants of commercial resistant varieties were infected, Accession 160 and its F_1 hybrids with susceptible varieties of *Lycopersicum esculentum* remained free from vascular discoloration. Injection of a suspension of a virulent isolate of the fungus into the stems failed to produce the disease in Accession 160 or in the F_1 hybrids, although plants of the Bonny Best variety used as controls were killed by the fungus within 28 days. Accession 160 was not infected on autoclaved soil infested with 39 isolates of *Fusarium lycopersici* from various regions of North America and other continents; several of these isolates killed all plants of Bonny Best and Marglobe checks within 45 days.

Tests of several thousand plants in various progenies from crosses between Accession 160 and several susceptible commercial varieties proved that immunity to *Fusarium lycopersici* in tomatoes is dependent on a single, dominant genetic factor. The factor for immunity was maintained in the heterozygous condition in a series of 4 back-crosses to susceptible varieties. Its potency was not decreased in the fourth back-crosses or their progenies.

Large fruit size and various other characters of commercial value were obtained in some plants of advanced generations and many of the plants could not be distinguished from large-fruited forms of *Lycopersicum esculentum.* Although they were heterozygous for a large number of factors affecting fruit and plant characters, preliminary tests indicated that some plants in progenies from self-pollinated flowers of selections derived through outcrossing immune selections to commercial varieties for four generations were homozygous for immunity.

Various lines are being tested and subjected to selection to obtain plants homozygous for the factor for immunity, and for factors for desirable fruit and plant characters. The linkage relations of the gene for immunity are being studied. The data will be reported in detail, elsewhere, at an early date.

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MAHOLI GALAGOS BREED IN CAPTIVITY

IN September, 1937, I received two Maholi galagos from South Africa. This is a well-known, dwarf variety of lemuroid with a body about six inches long and hind legs which are slightly longer than the body. Like all lemuroids, they are nocturnal, and this variety normally hops about in the tops of trees. In July, 1938, the female matured, but fertilization did not take place. On December 15, 1938, there was a second period of heat, and four months later, April 14, 1939, two galagos were born. So far as I have been able to determine, this is the first time that the Maholi galago has bred young in this country. There are many cases recorded of young having been born among the lemurs while in captivity in the various zoos abroad, and in some instances the period of gestation has been recorded. I am unable, however, to find any record of the period of gestation for the Maholi galago.

Just before the birth of the twins the expectant mother tore up quantities of paper in an effort to make a nest in a small box inside her cage. At birth the young were well covered with grayish fur and the eyes were partially open. They could cling to the perpendicular sides of the cardboard box in which they were born by means of their adhesive pads on both hands and feet. The mother, if disturbed, would clutch one of her offspring in her mouth, usually by the middle of its back or even by its ventral surface. She is able to jump as much as ten feet with her offspring dangling from her mouth.

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ZOOLOGY FOR PRE-MEDICAL STUDENTS

A QUESTION which is raised by practically every student preparing for the study of medicine is, "How much science work, and particularly how many and what courses in zoology, should I take?" The answer, which I believe most deans of medical schools ordinarily give, is, "Take only those courses which are required for entrance to medical school."

In many liberal arts colleges, however, students who are preparing for the study of medicine are advised to take as much work in zoology as they can possibly get in. The usual assumption which is the basis of such advice is that the additional science work will better prepare the student to carry the medical curriculum. This seems logical, but, we ask, "Do these extra science courses sufficiently enhance the average student's ability to profit by the medical course to justify his taking them to the exclusion of other studies which in all probability he will never again have an opportunity to pursue?"

To throw some light upon this particular question we have compared the medical school grades in certain courses earned by students who had had similar courses in departments of zoology with the grades of other students in the same classes who had had no such courses. Specifically, the comparisons were as follows: The grades in gross human anatomy of one hundred students who had had comparative anatomy were compared with the grades of one hundred students who had not had this course; likewise the grades of one hundred students in human embryology, one