Nature of Dental Caries

IN a recent paper on the cause and nature of dental caries, J. J. Enright, H. E. Friesell and M. O. Trescher describe experiments designed to elucidate the part played by local factors in the etiology of this disease (*J. Dental Res.*, **12**, 759; 1932). The authors first discuss the two chief theories of causation and point out that Miller's bacterio-chemical theory does not explain all the facts. For example, carious areas produced artificially by acid have not simulated natural caries in certain particulars; the carious process may halt for indefinite periods and, finally, dirty mouths are frequently free from caries. After a review of the relation of diet to dental caries, the authors conclude that improper diet is at least an important predisposing factor in the causation of tooth decay, since diets rich in vitamins A, C and D and yielding an alkaline ash, when utilised systematically during the period of development, produce teeth less liable to decay. After eruption, the structure of the enamel cannot be changed by factors acting from the pulp, because there is no circulation in this structure. Moreover, the ameloblasts, the enamel-forming cells, are lost at the time of eruption.

Clinical observation shows that caries begins at the surface of the tooth and only at certain parts of the surface, namely, in pits and fissures, and on the buccal, labial and proximal surfaces near the gum. It does not commence in areas which are scoured by the food during mastication.

In their first experiments, the authors investigated the action of lactic and citric acids at different *p*H values upon the enamel of isolated teeth *in vitro*. They found that artificial caries might simulate natural caries exactly, that all solutions between *p*H 4 and 8 etched enamel and that different enamels varied in their susceptibility to the action of the acids. Further experiments were carried out with the same solutions to which tricalcium phosphate had been added to saturation, since saliva is supersaturated with regard to this salt. It was then found that etching of enamel only occurred in solutions more acid than *p*H 5. It was also noticed that incipient carious areas were insoluble in acid, apparently because they contained an increased amount of organic material: it is suggested that this explains why the natural process often comes to a stop, even when acid-producing bacteria are contiguous to the lesion.

In the authors' second series of experiments, cultures were taken from carious areas and from similar regions in the mouths of persons immune to caries and grown on blood agar and acid galactose-whey broth. Another examination of the same mouths was made 3–9 months after the first: a close correlation was found between the presence of lactobacilli on the first occasion and the advance or development of caries in the interval. The strains of lactobacilli obtained could be divided into two chief groups: Group 1 usually produces a smooth colony and acid without gas in glucose, galactose, levulose, maltose, lactose, sucrose, mannitol, sorbitol, dextrin and salicin, but no acid or gas in raffinose, arabinose, xylose or inulin. Organisms of this group grow at 15° C. and are agglutinated by a Group 1 rabbit antiserum. Group 2 usually produces a rough, fuzzy type of colony, and acid in glucose, galactose, levulose, maltose, lactose, sucrose and raffinose. This type may or may not produce acid in dextrin; it usually does not produce acid or gas in arabinose, xylose, mannitol, sorbitol, salicin or inulin. Strains of this type do not grow at 15° C. and are not agglutinated by Group 1 antiserum. Lactobacilli of intestinal origin can also be divided into two similar groups. The strains of Group 1 were the most commonly found in the mouth.

The evidence adduced in this paper confirms the view that caries is directly due to the growth of lactobacilli in the mouth, the acid produced decalcifying the enamel. Growth of the organisms and close contact of the acid with the teeth are favoured by the presence of food débris in their pits and fissures and between them. The authors state that tests on the results of reducing the number of organisms in the mouth are now in progress and will be reported later.

Fishery Research in Newfoundland

FOLLOWING upon a preliminary survey of the Newfoundland fishing situation and a report on it to the Empire Marketing Board and to the Newfoundland Government, a scheme providing for a five-year period of fishery research in Newfoundland was drawn up. Half the cost of installation and subsequent maintenance of the Laboratory is, by agreement, borne by each of these two bodies. The objects of the scheme are the investigation of the life-histories of the principal commercial fishes with the view of gaining a clearer understanding of their movements and natural fluctuations, and the improvement of some or all of the existing methods of processing and marketing of the fish and fish products. By-products and their possible utilisation also come within the scope of the investigations.

The Laboratory is situated in the outport of Bay Bulls, some 18 miles south of St. John's. It is housed in part of certain spacious fishery premises which, fortunately, were available for this purpose. The buildings are fronted by wharves standing in water up to 20 ft. deep, so that steam trawlers can berth hard by the laboratory premises. Thus situated, right by the water's edge in an active fishing centre, and in the closest juxtaposition with a commercial concern, the Bay Bulls Laboratory appears to enjoy unique facilities for prosecuting fishery research—opportunities which it shows every indication of utilising to the full.

The scheme came into operation on April 1, 1931, and a report* upon the Laboratory's first full year's work has now been published, the main object of which is to indicate the general trend and progress of the various researches already under way.

In accordance with the scheme, the work of the Laboratory follows two main lines which may for convenience be termed (*a*) biological and (*b*) applied.

* Reports of the Newfoundland Fishery Research Commission. Vol. 1, No. 4: Annual Report for 1931. (St. John's, Newfoundland: Newfoundland Fishery Research Commission, 1932.) 1 dollar.

In the biological investigations the aim has been, during the first year, to make a rapid survey of the marine fauna and its inter-relationships in the waters supporting or directly connected with the fishing activities of Newfoundland. Much work has already been accomplished, and great strides are being made in piecing together the life-histories of the caplin, salmon, Newfoundland herring, haddock, cod, lobster, shrimps and prawns. Particular attention has been given to the short-finned squid (*Illex illecebrosa*), a highly important animal commercially in that it is the staple bait for the fall cod fishery. If it does not arrive in very large numbers, this fishery is a failure and up to one-third of the year's catch is lost. In 1930 and 1931, for example, Newfoundland was bereft of much of its fall fishery owing to shortage of this squid for bait.

In addition to the above, extensive hydrographical observations have also been carried out, the results of which already show that the Newfoundland area is one where contrasting, as well as rapidly changing, physical conditions of sea-water have a profound influence on the fauna.

On the processing or applied side, investigations are being carried out on the properties of Newfoundland cod liver oil from the point of view of marketing possibilities. The processing of dried codfish, bacterial infection of fish products, and preparation of fish meals, fish glue, and soaps from many sources are also receiving attention.

The report closes with some conclusions and recommendations which might well be adopted by the various firms and departments concerned in the improvement of the Newfoundland fisheries; and in an appendix there is published a very useful "First List of Fishes in the Newfoundland Fishing Area".

Judging from the contents of this report and some technical papers already issued, there can be little doubt that the Director and staff of the Bay Bulls Laboratory are attacking with great vigour and remarkable success the numerous problems with which they are confronted.

South-Eastern Union of Scientific Societies

THE thirty-eighth annual congress of the South-Eastern Union of Scientific Societies was held at Norwich on June 7–10 under the presidency of Prof. E. J. Salisbury, Quain professor of botany at University College, London. The occasion was the first time that the Union has met for its congress in the extreme north of its area, and the attendance was well up to the average.

Prof. Salisbury's presidential address on "The Influence of Man on Vegetation" showed that there are two sides to man's interference with the native flora, elimination and introduction. The relative biological isolation of the British Isles ceased when human intercourse between Great Britain and the Continent began. The idea is prevalent that the chalk downs of the south-east were grassland from time immemorial, but the grounds for this assumption appear quite inadequate. Chalk hills are not unsuited for tree-growth. Neolithic man cultivated even the crests of the hills, and the chalk may have been the nursery of English agriculture. Stress was laid on man as an unconscious agent in dispersal. The rôle of man in this respect has been neglected. Dispersal by birds seems a legitimate subject for examination, but the seeds of plants carried by man in the mud of his feet and his clothes have not received sufficient attention.

After the depauperisation of the British flora during the Glacial period, neolithic man must have brought seeds of weeds with his flax and corn in the absence of all modern screening methods. Calculations show that of the 288,857 cwt. of clover and grass seed imported in 1912, 2–6 billion weed-seeds from abroad were sown in Great Britain. The unconscious carrying of seeds by man was strikingly illustrated by an experiment on the dust collected in sweeping out the pews of two selected churches. Samples of the dust were sown, each sample being about four ounces in weight. The germinating plants in any one sample varied from one to fourteen, about 90 per cent being grasses. Possibly clothed in skins, neolithic man may have carried seeds for considerable distances, even as now Prof. Salisbury finds that man is carrying about viable seeds in his turned-up trousers after a walk on Chesil Beach or on a Hertfordshire common. In the latter case, a walk produced 110 grasses and three dicotyledons.

In a paper by Mr. Hugh Ramage on "Applications of the Spectroscope to Biology" some of the results of research by this means were given. Strontium was detected in the genital duct of the edible snail and manganese was a prominent element in its liver. It was found that, on examining 146 specimens, copper and iron were always present. The highest concentration of silver was found in the liver and kidney of *Pinna pectinata*. Silver was present in every liver of crabs and lobsters examined. Cæsium was always found in the liver of the common scallop. Examination of sea-water always revealed 0·004–0·005 per cent of strontium, which appears to place strontium as the ninth element in order of abundance. Copper was found in all human tissues and occurs in greatest concentration in fœtal tissues and fœtal livers. Rubidium occurs in the heart and striated muscles. Silver appears to be a normal constituent of the thyroid and the tonsil. The edible mushroom yielded copper and silver. Some fungi contain rubidium. The highest percentage of rubidium (dry weight) was found in *Cantharellus cibarius*, namely, 0·21; and of silver, 0·20 in the skin of a specimen of *Psaliota campestris*.

Investigations as regards insect immigration have been carried out since the inauguration of the special committee of the South-Eastern Union in 1932, and there are now thirty light-vessels and light-houses with their observers engaged in the work, with some hundreds of inland observers. Useful records have reached Capt. T. Dannreuther and Dr. C. B. Williams, who are responsible for the collating of such records. The Large White butterfly has been observed by L. G. Sharman, of the East Dudgeon light-vessel, for some years. He has seen a stream of these butterflies every year about the middle of June. In 1931 about thirty an hour were seen passing over the ship from east to west. Near Alston, G. Bolam observed a passing band of Small Garden Whites on June 25, 1932. They were steadily pursuing a northerly course at the rate of about a dozen a minute. These are cited as showing the records that it is hoped observers will send in from all parts of