the tissues of the tooth. Nevertheless, the concentrations even in these deeper enamel layers were higher in teeth from high than from low fluoride areas. The lesser solubility of fluorapatite compared with hydroxyapatite suggested a possible mode of action in reducing the incidence of caries, and detailed investigations of solubility were described in which the outer surfaces of teeth from high and low fluoride areas were compared. The large variation tooth-to-tooth made valid comparison very difficult and the slightly lower solubility found for teeth from a 1 p.p.m. fluorine area, as compared with a zero fluorine area, was not statistically significant. At 2 p.p.m., however, a statistically significant lowering by 21 per cent in the solubility was recorded. The choice of analytical method was of importance in the solubility determinations; in some conditions different results were obtained, according to whether phosphorus or calcium was measured, and workers in the United States had investigated the problem by gravimetric determinations of solubility on powders ground from successive layers of the teeth. By this method, too, the teeth with highest fluoride content were also the most soluble. Experiments with radioactive fluoride revealed that the tooth took up fluoride more readily in the nieghbourhood of a caries blemish, and it had been found that the differences between the fluoride of enamel from areas of high and low intake of fluoride were greater when carious enamel was studied.

Other properties of the fluoride ion were discussed that might be related to its action in reducing dental decay. Since it favoured the precipitation of calcium phosphate from unstable and metastable solutions, such as saliva, it might intermittently reverse the removal of calcium salts in, and thus slow the development of, a dental cavity. The role of fluoride as an enzyme poison might also be related to its decay-inhibiting properties. Attempts were therefore being made to study the fluoride content of the 'dental plaque' (the muco-bacterial film on the tooth surface)—an analytical problem of some magnitude when it is realized that only about 10 mg of plaque can be obtained from one person. It had been shown to be significantly higher in subjects from 'high fluoride' areas. Partial release of the bound fluoride in plaque might occur if the *p*H became sufficiently acid, as it probably did after eating carbohydrate. It had been found with saliva that the addition of fluoride at a concentration similar to that of plaque was effective not merely in preventing the production of acid from carbohydrate by salivary bacteria but could actually bring about an increase in *p*H.

That fluoridation of public water supplies was a subject of great topical interest was evident from the lively discussion that followed each paper. The analyst, it was clear, had an important part to play by developing and applying sensitive methods that were essential not only to ensure its proper regulation and control but also to provide the basic tools for the study of the fundamental mechanism by which fluoride exerted its beneficial effect.

S. A. PRICE

GROWTH AND NUTRITION OF A WHOLE PLANT

ANYONE interested in the growth of the whole plant should find a recently published memoir interesting, for they will find it a refreshing revision course dealing with some theories of contemporary botany in a more stimulating way than is usually found in text-books*. Prepared by Prof. F. C. Steward and three colleagues it contains, in Parts 2–5, information about the anatomy, growth and development of mint grown with a wide range of nutrient-levels (some of which led to deficiency symptoms) and different light and temperature conditions. Parts 4–6 have details of many chemical analyses, involving chromatographical techniques, carried out on roots, stems and leaves of plants grown under a wide range of environmental conditions. The final section is a synthesis of the earlier parts.

Although the morphology of the plant does make it readily acceptable to sampling procedures, the decline in popularity of mint as an experimental plant (discussed in Part 1) must largely be due to the fact that large numbers of plants are usually needed for experiments associated with analysis of growth. Raising plants from seeds is more satisfactory from many points of view than from cuttings. There are no troubles in keeping stock plants alive, no labour-demanding jobs such as preparing cuttings, and less variation in initial size of plant. The rapid growth rate of mint is obviously valuable; but the fact that it produces much lateral growth and a large number of small leaves is a disadvantage when compared with plants producing a few large leaves from a main axis. The unbranched plant, particularly one the form of which is similar under a wide range of environmental conditions, will, unlike mint, have similar efficiencies of light utilization in, for example, long- and short-day conditions. Would the results of the many chemical analyses that are presented in Parts 4–6 of the memoir have been similar if a plant with a single main axis had been used?

These first seven parts contain a great deal of information about effects of length of day, night temperature and mineral nutrition on some cell constituents; some information in future parts on effects of amount of incident radiation, spectral composition of light and perhaps other environmental variables would obviously give a more complete picture. Finally, most botanists would agree that the chemical analyses which were done on mature tissues should be extended to the growing regions, not only to apical meristems, but also to all organs throughout periods of cell division, expansion and differentiation if a better understanding of organization of growth is to be obtained.

P. NEWTON

* Growth, Nutrition and Metabolism of *Mentha piperita* L. Parts 1–7. Memoir 379, Cornell University Agricultural Experimental Station, Ithaca, New York. August 1962, 144 pages.

THE CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE, MYSORE

IT is not uncommon to find that scholarly academic work is undertaken in underdeveloped countries while practical problems of vital interest to the economy of the State are neglected. Sometimes technological laboratories equipped with foreign capital do not function satisfactorily because of lack of suitable personnel. Some of these problems are no doubt due to the type of training given to students sent to Europe and elsewhere, but others to lack of proper incentives presented by the Governments concerned. None of these criticisms can, however, be applied to the Central Food Technological Research Institute at Mysore, which, under its director, Dr. V. Subrahmanyan, is rapidly building a reputation in South-East Asia. The report of its work during 1960–61 covers