broadly on the lines of the British book export schemes which were established during the War and in the immediate post-War period.

(ii) To promote the production of low-priced editions of a range of British books for sale in certain countries where there is a large unsatisfied demand for such books. This will call for substantial Government expenditure.

(iii) To authorize a further expansion of the British Council's library services in several centres and of the Council's resources for presentations of books and periodicals abroad on which the Council this year expects to spend in all about £650,000.

(iv) To assist, through the British Council, in the development of library systems in some Colonial territories, including the establishment of central libraries, regional branches, book vans and book boxes.

(v) To co-operate with publishers in measures to enable them to increase their circulations in some of the more difficult markets overseas.

Parliamentary approval for the expenditure involved will be sought at the earliest convenient opportunity and it will be necessary to proceed in consultation with the Governments of the Commonwealth and foreign countries concerned, and Dr. Hill promised to inform Parliament as soon as agreements had been concluded. In reply to a further question Dr. Hill said that the increase in the British Council's resources would be concentrated on scientific and technical books, but the schemes to be negotiated with countries where import restrictions prevent the flow would cover a wide range of books. He hoped that in the next year it would be possible to reach up to 2 million copies of low-priced books. This would be done in association with the publishers who own the copyright of the books concerned and would involve Government aid to narrow the gap between the economic price and what could be paid in the countries of reception. Replying to specific questions, Dr. Hill said that British book exports in 1958 to India were recorded in the Trade and Navigation Accounts as £424,427, to Pakistan £39,950, to Ceylon £15,732 and to Israel £9,473. Dr. Hill estimated the increased expenditure as about £500,000 next year.

FORESTRY IN NEW ZEALAND

THE annual report of the director of forestry of New Zealand for the year ending March 31, 1958, is of more than usual interest in that it includes a general historical review of both departmental activities and general land use and administration, covering the past forty years. The need for such a review had been particularly stressed by the Minister of Forests (Mr. Tirikatene) and was prompted also by the meeting of the British Commonwealth Forestry Conference which had been held in the country during September–October 1957. The Minister himself (a Maori) contributes a prologue recognizing that the great forestry effort involved in creating a very large acreage of exotic softwood plantations, mainly of *Pinus radiata* from California, by the quick production of an alternative supply of essential timber, has saved a large remnant of the native forest: at the same time he calls for much greater attention to the maintenance of this forest, especially for its value in protecting soil and conserving water. The disastrous consequences of the denudation of the hillsides in the form of soil erosion and then extensive floods are all too widespread and serious to be ignored any longer. Quoting two specific examples, he suggests that the Urewera indigenous forests in North Island, largely in Maori ownership, might in the national interest have to be managed primarily for soil stabilization and water retention, not timber, while in the hills behind Canterbury, all land more than 3,000 ft. high might have to be taken out of pastoral use; even the city itself is now threatened by flood devastation. It must be encouraging to the Forest Service to have this official backing, which is combined with full recognition of the essential need of stable finance for the necessary research work and for remedial measures.

The visit of the Commonwealth Conference stimulated the preparation of a number of research papers covering many of the lines of activity which have called for special attention of recent years. Some of the topics dealt with are also currently prominent elsewhere, especially where softwood plantations play an important part; such are problems in genetics, and the relation between sylvicultural treatment and market requirements in respect of both dimensions and quality (whether for timber or pulp). There are also problems of the later management and regeneration of the plantations, as in the United Kingdom. During recent years, a good deal of thought has been given to the management and regeneration of the native forests, both those with important softwoods, notably kauri (*Agathis australis*) and the various species of *Podocarpus*, and the 'beech' forests (*Nothofagus* spp.). Encouraging progress is being made but rates of development are, of course, very slow compared with those of the introduced conifers, and, as already noted, these forests have other functions to fill as well as timber production.

The Commonwealth Conference appointed a special committee to report on New Zealand forestry. In the report, as Resolution 6 of the Conference, alarm is expressed at the poor condition of the remaining indigenous forest as a result of past exploitation, and expansion of research programmes is urged; the publication of Volume 1 of the "National Forest Survey of New Zealand" for these forests in 1953 is commended, as is also the extension of the survey to protection forests.

It may be noted that damage to the native forests by introduced animals, above all red deer and opossums but also wild goats and pigs, is still a really serious problem, so much so that there is a special division to deal with 'noxious animals'. To reinforce shooting operations in the natural forests, bounties are paid for animals killed outside. The numbers killed in the year in what do not claim to be more than 'holding' operations are striking, namely, 55,000 deer, 28,000 goats, 4,000 pigs and 4,000 chamois by the State alone. The opossums are mostly killed outside the reserves, 900,000 in the year (after more than a million in 1956).

The control of noxious animals was only taken over by the Forest Service two years ago and there is a strong case for a similar taking over of soil conservation and river control, so that the troubles can be dealt with at their source instead of trying to remedy them after the damage has already been done, as is currently happening.

There is still a big exotic planting programme, 8,744 acres having been added in the past year. The major features are the clearing and replanting of former failures, notably those with *Pinus scopulorum*, a mistaken choice, and the extension of the work on to the coastal sands of the North Island which are unsuitable for agriculture, where the plantations will not only be productive in themselves but will also protect the fields from sand encroachment.

The annual report of the New Zealand Forest Research Institute for the same year ending March 31 (Pp. 100. Wellington: Government Printers, 1958) amplifies many of the points referred to above, and it also looks back over its first decade of work, expressing the feeling that it is now well established as a fully co-ordinated research centre, with an advisory committee representing both industry and all related research organizations. The graduate staff now numbers nearly fifty with a comparable number of technicians, but the Commonwealth Conference thought that there is still need for an increase on both the forestry and forest products sides.

H. G. CHAMPION

UBIQUINONE AND VITAMIN E

By DR. THOMAS MOORE

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SOME time ago we noticed[1] the presence in the livers of rats of an alkali-labile substance with a sharp absorption band at 275 mμ. For the purpose of studying the distribution of vitamin E in the body the rats had been given diets which were only barely sufficient in vitamin A. This restriction was intended to eliminate the strong spectroscopic absorption of vitamin A at 328 mμ, and so allow the measurement of vitamin E by its weaker absorption[2] at 294 μm. In the body-fat of rats given wheat germ, rich in vitamin E, the presence of this vitamin was readily detected. In the liver, however, the detection of vitamin E was made difficult by the absorption at 275 mμ which has already been mentioned.

We were reminded[3] of these early observations by reports by Lowe, Morton and Harrison[4] of fractions from the livers of rats deficient in vitamin A which adsorbed at 275 mμ, with other maxima at 233, 283 and 332 mμ. These workers thought, at the time, that abnormal steroid products had been formed as the result of the avitaminosis. We confirmed the presence of a band near 275 mμ in liver extracts of rats deficient in vitamin A. Saponification of the liver-fat with hot alcoholic potash caused the band to disappear, but it survived the same treatment when applied to the liver tissues. Presumably the tissues protected an unstable substance against oxidation. The band disappeared from solutions which were treated with 85 per cent sulphuric acid, were aerated, or stored for 37 days at − 10° C.; it survived treatment with digitonin. Sterol-free extracts of unsaponifiable matter, made by the direct saponification of the tissues, were neither fluorescent under ultra-violet irradiation nor chromogenic in the antimony trichloride test. By paper chromatography evidence was obtained of the presence of two substances with absorption maxima at 275 mμ. One had a single sharp band at this position, but the other had also an inflexion at 330 mμ. Both substances were faintly yellow, but had no selective absorption in the visible. Bands at 272–275 mμ were also found in liver extracts from rats which had been cured of avitaminosis A, from normal sexually immature rats, and from a normal pig and guinea pig.

The existence of two substances, with their main absorption maxima at the positions observed by us[3], was also reported by Heaton, Lowe and Morton[5]. The names substance *A* and substance *C* were given. Both had their absorption maxima at 275 mμ, but *C* differed from *A* in having a sharper inflexion at 330 mμ; both substances *A* and *C* were found in the livers of normal animals, although the concentration of substance *C* in the liver of normal rats was much lower than in the livers of rats suffering from vitamin A deficiency. *A* and *C* were also found in various tissues other than liver, and in different species[5,6].

Further extensive investigations by the Liverpool school, reviewed by Morton[7], have led to the isolation of substance *A*. It is not a sterol product, as first expected, but a derivative of 1-methyl-5,6,dimethoxy *p*-benzoquinone. In view of its wide distribution the name ubiquinone was given. The striking feature of its structure is a long unsaturated side-chain, comprising 50 carbon atoms, attached at the 2 position. Similar conclusions as to the constitution of ubiquinone, otherwise known as *Q* 275 [8] or mitoquinone[9], have been reached in America[10]. According to Lester, Crane and Hatefi[11], ubiquinone is only one of a whole new series of quinones, which vary in the nature of the side-chain.

Some workers[12] consider that ubiquinone plays an important part in tissue oxidations. Others[13] have ascribed a similar role to vitamin E. The roles of both vitamin E and ubiquinone in heart muscle preparations have been reviewed by Slater[14], who has suggested that the question whether there is a chemical or functional relationship between the two substances deserves investigation.

Vitamin E and ubiquinone have common properties in being soluble in fats, in being capable of undergoing reversible oxidation or reduction, and in being unstable to alkaline saponification in the presence of oxygen. They differ in vitamin E being found in animal tissues mainly in the reduced state, whereas ubiquinone is mainly in the oxidized state. Regarding their distribution, ubiquinone has been found mainly in mitochondria, whereas vitamin E can be stored in the body-fat[1]. Since vitamin E is a potent antioxidant, it might possibly intervene in the metabolism of ubiquinone by protecting it against irreversible and destructive oxidation.

It was of interest, therefore, to inquire into the effect of vitamin E deficiency on the concentration of ubiquinone in the tissues. The preliminary evidence on this point[1] may now be re-examined on the basis of pure ubiquinone having E (1 per cent, 1 cm.)[15] at 272 mμ = 167. A rough estimate of the concentration of ubiquinone, without allowance for the possible presence of substantial amounts of substance *C*, may be calculated from the difference