Amateur Scientist: Science as a Hobby." The foreword is by Dr. Conklin. A certain number of copies have been distributed to various educational and scientific institutions by the Carnegie Corporation. The eight chapters of the book deal with Science and Ourselves, Science as a Hobby, Who is the Amateur Scientist?, The Amateur Scientist and the Community, Organizations of Amateur Scientists, Research and the Amateur Scientist, Sample Programs for Amateur Research, The Amateur Scientist and the Future.

The book sets forth the aims, methods and results, of a two and one-half years survey of amateur science in the Philadelphia region and the broader conclusions to be drawn from it—especially the great importance of encouraging people to be "scientifically-minded" when confronted with social, political and international problems, as well as with the problems of science. "Plainly," says the author, "the scientist is either indifferent to his relationship to the public or else he shies away from interpreting his findings to the layman for fear of being misunderstood."

The first chapter sets forth briefly how our daily lives are affected by modern science and notes how wide-spread is the amateur interest as indicated by studies made by the American Association of Adult Education. The second chapter discusses why laymen so often adopt one of the sciences as a recreational pursuit. The educational importance is stressed of having a program of public education that equips one not only for a vocation, but to spend his spare time with profit and interest—to live as well as to make a living.

One who might be inclined to question the value to science of encouraging the interest of amateurs, says the author, need only be reminded that Isaac Newton was a public official, Leewenhoek a Dutch merchant, Benjamin Franklin a printer, Sir William Herschel an organist, Priestley a preacher, Darwin a country gentleman, Mendel a monk, Fabre a village school teacher (p. 40). The situation in Philadelphia and vicinity is presented as a sample of what has been and is being done, but the book has a broad outlook and range, and is full of helpful suggestions for promoting and organizing the layman's interest in science. The Philadelphia program is worthy of careful study and imitation (with variations of course as to detail, etc.), and the book is to be commended to the careful attention of every one who is interested, not only in science, but in public education and public welfare.

C. STUART GAGER

BROOKLYN BOTANIC GARDEN

REPORTS

AUSTRALIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH[1]

THE fifteenth annual report of the Council for Scientific and Industrial Research, Commonwealth of Australia, covers the year ended June 30, 1941, and includes the financial statement as well as lists of publications of the council and of the personnel of the council and its committees and the committees concerning work in which the council is cooperating.

A large part of the council's activities is now devoted to the solution of problems arising out of the war, and to assistance and advice to various government departments and other institutions and organizations which are concerned with that effort. This applies particularly to the National Standards Laboratory, the Aeronautical Research Laboratory, the Forest Products Laboratory and the Division of Industrial Chemistry. The reference to these activities is limited to brief general statements or omitted entirely.

Plant investigations have been concerned with native or naturalized plants as alternative sources of fiber, particularly as a substitute for jute, and investigations aimed at ascertaining the difference between the fiber from various Linum (flax) strains of good type or being continued. A survey is in progress to ascertain the position with regard to domestic supplies of vegetable and farm crop seed and methods of maintaining them. Weed investigations have shown that the St. John's wort can be virtually eliminated wherever subterranean clover can be grown successfully, but spraying with chemicals has failed to control an infestation of blackberry, and the work on both nutgrass (*Cyperus rotundus*) and mintweed (*Salvia reflexa*) has indicated that chemical sprays are of no value in controlling either plant. Field experiments on the control of take-all and the root-rot of wheat have continued at three sub-stations.

The work on the chemistry of tobacco at the University of Sydney was discontinued, as well as the study of disease resistance by the section of genetics. Work on the yellow dwarf disease, however, has continued actively, as well as investigations on smoking quality and physiological investigations. Fruit investigations have included an extension of the experiments on wax coatings for apples, and a reorganization to coordinate the wider attack on this problem organized by the division of food preservation. A re-examination and summary of the results of the work carried out in Tasmania on the brown-heart

[1] From *Nature*.

problem during the last five years has been made. Extended cooperation with the Tasmanian Department of Agriculture in experiments, particularly in relation to the effect of different stocks and pruning technique on the keeping quality of apples, has also been a feature of the season.

Other investigations have been concerned with storage disorders and with fruit physiology in relation to keeping quality and seasonal climate. Work on pre-storage treatments to increase the cool- and common-storage capacity has now been greatly expanded. A survey is also in progress in coastal Queensland areas to locate indigenous or naturalized plants, which may be sources of certain drugs such as caffeine, ephedrine, cocaine, quinine substitutes and substances such as derris. Attention has also been given to potato virus diseases, particularly to virus X, and trials have been made on fungicidal dusts for the treatment of maize seed. The dusts had no perceptible effect on germination or vigor of early growth, except at Canberra, and then only when inferior or diseased seed was used.

Laboratory work of the division of economic entomology on weevil control has been concentrated chiefly on a study of mineral dusts, and gratifying results have been obtained with one or two effective non-silicious dusts readily available in Australia. Milling tests with treated wheat indicated that the dust is removed in the ordinary mill treating process, although the dust treatment has certain disadvantages such as its effect on the appearance and free-running properties of the grain. Although the division does not possess the special equipment required for accurate assessment of the relative toxicity of fumigants, a series of experiments with simple apparatus has been carried out to determine the susceptibility to fumigants of Calandra and *Rhizopertha dominica* to such fumigants as di-β-chloroethyl ether, chloropicrin, ethyl formate, *o*-dichlorobenzene, carbon disulfide, ethylene dichloride and carbon tetrachloride. Results indicate that Rhizopertha is more susceptible to all these fumigants than either of the Calandra species. Practical fumigation tests of infested wheat in concrete silos have been carried out with ethyl bromide and with Cyanogas G, the latter appearing to give almost complete control of *Rhizopertha dominica*. The sterilization of stack sites and sheds with petroleum oil and tar oil emulsions indicates that only those emulsions containing *o*-dichlorobenzene and di-β-chloroethyl ether or their mixtures with creosote and oil have given consistently good results for killing the developmental stages of *C. granaria, C. oryzae* and *R. dominica,* and good results have been obtained with emulsions of carbon disulfide or *o*-dichlorobenzene with crude naphthalene in the treatment of wheat shed floors when these are of loose earth in which infested grain may be buried.

In investigations on sheep blowfly, considerable progress has been made in compounding two useful dressings, the study of repellants and in an investigation of the breeding-ground of *Lucilia cuprina,* which is responsible for 90 per cent. or more of strikes in Canberra. Toxicity studies using the contact toxicity technique indicate that 0.4 per cent. of arsenious oxide is completely non-toxic to prepupae when immersed for 30 minutes at 23° C., and αα-dipyrridyl is almost as high in toxicity as nicotine, dinitro-*o*-cyclohexyl-phenol and proflavine being only slightly toxic. Other entomological investigations have been concerned with the eradication of cattle ticks, insecticides for the control of wheat weevil and on the oriental peach moth. Animal health and nutrition investigations have covered pleuro-pneumonia of cattle, mastitis in dairy cattle, studies on phenothiazine as an anthelmintic and blowfly problems and coast disease of sheep.

The division of forest products investigation has extended its work in the field of defense, including the examination of numerous specifications for all kinds of defense and munition needs, the submission of advice on substitutes when necessary, and recommendations in regard to modified manufacturing methods or procedures; its work is claimed to have resulted in savings in imports, in the amount of timber used and in the use of timber of lower quality. Flax investigations have been enlarged and both chemical and engineering research in this field are now centered in the division. The promising work on chemical retting is being revived and problems of scutching, tow treatment, drying of retted straw and control of dew retting are also being studied.

Food preservation investigations have covered problems in the preparation and transport of boneless frozen meat, chiefly for the use of fighting services overseas, canning problems, the use of *o*-phenyl-phenol in fillers to restrict bacterial waste in stored eggs, the storage of whole egg powder, the handling, treatment and storage of fruit, etc., investigations which will in future be coordinated by a special committee representing all bodies carrying out work in this field. Protective skin coatings for fruit have been investigated, particularly the preparation of colloidal wax emulsions that leave clear bright films on drying. Chemical treatments for the control of mold wastage in stored grains have also been investigated. Fisheries investigations have covered smoking of fish, fish liver oil production and investigations on Australian tunas, pilchards, mullets, etc.

Brief reference is made to the work of the National Standards Laboratory, to aeronautical investigations

at the aeronautical laboratory, which has now been given the status of a division, and to investigations in industrial chemistry, including that on unshrinkable wool, on wool wax, utilization of minerals and on producer gas investigations, particularly the suitability of Australian hardwoods for the production of charcoal. Substantial progress has been made in building up a research organization and the development of research methods for dealing with lubrication, bearing and wear problems in Australia. The work is undertaken as cooperative research with the University of Melbourne and housed in the new chemistry school. The work of the Dairy Research Section has included a survey of the properties of Australian butter and the storage and transport of butter fat without refrigeration.

SPECIAL ARTICLES

SUBCLINICAL VITAMIN DEFICIENCY[1]

I. TISSUE ANALYSES

INDIVIDUALS subsisting upon inadequate diets generally experience a more or less prolonged period of ill-health before unequivocal symptoms of deficiency make their appearance. Recognition of their deficiency in this subclinical stage is difficult because of the vagueness and generality of their complaints. Speculation on the extent to which the general population may be affected has led therefore to a program designed to decrease the incidence of latent deficiency by increasing considerably the consumption of vitamins.

Definition of "normal vitamin requirements" has proved, however, to be a complicated problem. The suggestion that our civilized diet is not normal has made impossible the customary identification of "usual" with "normal." The essentially intracellular character of the enzymes derived from vitamins,[2] and the poorly understood equilibria between these enzymes and the body fluids, have made difficult the interpretation of vitamin analyses of blood, urine and stools. Before these indirect measurements of nutritional status can be used critically, a primary knowledge of the tissue concentrations which they reflect must be obtained.

The type of information required can be illustrated by Fig. 1. A classical curve of enzyme action is used to represent the probable relationship between tissue thiamin concentrations and the tissue functions dependent upon thiamin enzymes. The problem is to identify the position of points M, m and S, and to determine the thiamin intake necessary to maintain the concentration of enzyme at or near M under varying conditions of energy output, environmental temperature and metabolic mixture. Solution is complicated by the existence of different relationships in different tissues and in different age groups, Tables I and II.

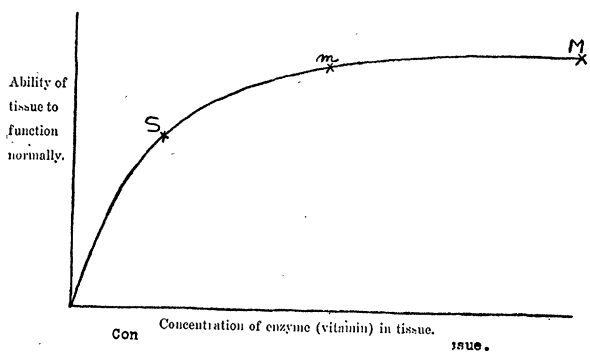

FIG. 1. Scheme of the relationship between tissue thiamin concentrations and the ability of tissues to carry on their normal functions. M = Maximum concentration of enzyme obtainable in tissues. m = Minimum concentration of enzyme compatible with normal function. S = Concentration of enzyme at which symptoms of deficiency appear.

TABLE I

SKELETAL MUSCLE THIAMIN IN DIFFERENT AGE GROUPS OF PRESUMABLY SIMILAR NUTRITIONAL STATUS

Age	Micrograms of thiamin per gram of muscle
6 month fetus	1.4
8 month fetus	1.5
Term infant	1.3
1 year	1.6
5 years	1.0
10 years	1.2
30 years	0.4
37 years	0.4
48 years	0.5
51 years	0.4

Tissues from both post-mortem and biopsy tables are available for vitamin assays. Post-mortem material permits analysis of the relationships between changes in vitamin concentrations in different tissues. Its assay is therefore a necessary preliminary to the evaluation of observations made on single tissues. Biopsy specimens are usually restricted to one tissue but are free from the unspecific effects of terminal illness and have the advantage of permitting repeated observations on ambulatory subjects. From studies of biopsy and post-mortem material a fair composite picture of the relationship between changes in vitamin

[1] Aided by grants from the R. R. Williams and R. E. Waterman Fund for the Investigation of Nutritional Disease, Research Corporation, New York City. Part II—"Micro Muscle Biopsies" and Part III—"The Thiamin Content of Micro Muscle Biopsies" were aided by a grant from the National Research Council, Washington, D. C.

[2] E. A. Evans, Jr., "The Biological Action of the Vitamins." The University of Chicago Press, Chicago, 1942.