time-effect. The matrix-element (perturbation-energy) which gives the transition-probability between the nuclear spin and electron-spin is quite small for paramagnetic salts. Perhaps the interaction with electrons in metals would be sufficient to cut down the relaxation-time considerably.

The theory of superconductivity was briefly discussed by Professor F. London. It must be emphasized that the magnetic behavior is as important as the superconduction. The microscopic picture is not yet clear. From the behavior of liquid helium and that of diamagnetism in solids it is probable that superconductivity is a cooperative phenomenon causing very low level-densities for low energies.

C. F. SQUIRE
UNIVERSITY OF PENNSYLVANIA
F. G. BRICKWEDDE
NATIONAL BUREAU OF STANDARDS
E. TELLER
GEORGE WASHINGTON UNIVERSITY
M. A. TUVE
CARNEGIE INSTITUTION OF WASHINGTON

REPORTS

THE BANTING RESEARCH FOUNDATION

THE annual report for 1937–38 of the Banting Research Foundation reveals that its income was, as usual, disbursed in two ways. A substantial part of it was placed at the disposal of Sir Frederick Banting to employ research workers in the Department of Medical Research, University of Toronto, to pursue research work of his election. This is allowing the investigation of twenty-one different problems in the department which Sir Frederick heads. The second, and slightly larger portion of the foundation's income, was widely distributed throughout Canada to twenty-four applicants who submitted problems to the foundation which met with the trustees' approval. These problems are being worked out in various hospitals and university laboratories scattered throughout the country. Analysis of the applications showed that they were granted to provide financial assistance for four different purposes: (1) salaries for full-time work, (2) salaries for part-time work, (3) salaries for helpers or assistants and (4) money for equipment and materials only. Following is a list of these workers whose applications were granted during the past year, the place where the work is being carried out and the general topic with which each problem is concerned.

B. F. Crocker, department of biochemistry, University of Toronto, is making an experimental study of digestion. E. W. McHenry, school of hygiene, University of Toronto, is studying the physiological action of vitamin C. R. W. Begg, department of pathology, Dalhousie University, Halifax, is making an extensive study of the sedimentation of erythrocytes. E. M. Boyd, department of pharmacology, Queen's University, Kingston, is pursuing further studies on the water-balance hormone of the pituitary. Maria Sergeyeva, department of physiology, McGill University, is investigating the nervous and hormone effects on the structure of islet cells. B. Rose, University Medical Clinic, Royal Victoria Hospital, Montreal, is studying the effect of cortin and histaminase on the disappearance of histamine in the adrenalectomized rat. M. J. Miller, University of Saskatchewan, is determining the distribution of human parasites in midwestern Canada. G. L. Bateman, department of physiology, Queen's University, is investigating the occurrence and function of acetylcholine in the placentae of animals. E. A. Ryan, department of biochemistry, University of Toronto, is investigating the physiological significance and chemical structure of a new compound, probably related to the sterols, which is excreted by normal humans. A. D. Odell, department of biochemistry, University of Toronto, is attempting to synthesize the progestational hormone or a possible substitute for it by the chemical degradation of an easily procurable bile acid. C. H. Walton, faculty of medicine, University of Manitoba, is, with Dr. M. Dudley's help, making a thorough pollen survey of Manitoba. K. W. Baldwin, department of anatomy, University of Toronto, is studying with A. W. Ham the fate of alveolar epithelium as the lung passes through various stages of embryonic development. D. W. G. Murray, department of surgery, University of Toronto, is continuing clinical studies regarding the effects of heparin on patients. H. T. Malloy, Royal Victoria Hospital, Montreal, is studying congenital haemolytic jaundice in the rat and man. H. B. Collier, department of biochemistry, University of Toronto, is pursuing researches on the enzymatic synthesis of protein. W. J. Auger, Hospital for Sick Children, Toronto, having devised a superior method for obtaining sputum from children, is studying type I pneumonia. D. L. Selby and R. W. I. Urquhart, both of the department of pathological chemistry, University of Toronto, are continuing their studies of experimental nephrosis, using an ingenious technique which they have recently described. E. E. Kuitunen, school of hygiene, University of Toronto, is making a survey of the distribution and type of intestinal parasites in Toronto children. D. G. MacDonald, school of hygiene, University of Toronto, is studying, in cooperation with Dr. A. A. Fletcher, the action of the B vitamins on intestinal tonus and also the cause of bradycardia, which occurs in B_1 deficiency. B. Schachter, department of biochemistry, University of Toronto, is investigating the nature of a compound in pregnant mare's urine to see if it is an oestrogen derivative. M. M. Hoffman, Dalhousie University, Halifax, is determining the physiological properties of an unidentified ketone in

pregnant mare's urine. P. G. Weil, University Clinic, Royal Victoria Hospital, Montreal, is pursuing biochemical studies on the metabolism of progesterone, investigating the sterol metabolism in the toxemias of pregnancy, and studying a new sterol, with reference to the adrenal cortex.

The trustees were pleased to note that medical literature of last year contained over thirty reports of research carried out with the assistance of the Banting Research Foundation. The indication many of these reports gave to the effect that medical science is slowly making inroads upon some of man's most stubborn ills, should, in the opinion of the trustees, be a source of satisfaction to those who showed their appreciation of Sir Frederick Banting's researches by endowing a foundation to allow him and others to continue to advance the state of medical knowledge.

V. E. HENDERSON,
A. W. HAM,
Honorary Secretaries

SPECIAL ARTICLES

THE OCCURRENCE OF GAMMA TOCOPHEROL IN CORN EMBRYO OIL[1]

OLCOTT and Emerson[2] showed that the tocopherols have strong antioxidant powers, and concluded that they represent at least a large part of the antioxidants in wheat-germ and cotton-seed oils. There seems to be no relation between the vitamin and antioxidant activities of these substances, since alpha, which is the most potent as the vitamin, is the weakest antioxidant. Gamma, which is approximately equal in vitamin potency to beta, is definitely a more powerful antioxidant.

It seemed interesting to determine if the antioxidant properties of other vegetable oils might be due to the presence of tocopherols, and those oils with less vitamin potency might contain the less vitamin-potent beta or gamma. Accordingly we investigated corn oil, since Mattill and Crawford[3] had shown it to be rich in antioxidants.

Freshly pressed, unrefined corn oil[4] was assayed for vitamin E. A single dose of 4 gm enabled all four test rats to cast good litters, but at 2 gm only resorptions resulted. Three kilograms of the oil was saponified, the non-saponifiable fraction distributed between high boiling petroleum ether and 92 per cent. methanol, and then dry methanol, and the methanol solution was concentrated, chilled to free it as much as possible of sterols, and finally the oily residue distilled in a molecular still, as previously described for palm oil[5]. The fraction distilling between 120–140°, which contained the bulk of the vitamin, weighed 5.65 gm. Fed at a level of 15 mg, three resorptions and one litter resulted, but at 45 mg all four rats fed had litters. Karrer and Keller[6] measured by titration with gold chloride the tocopherol content of a non-saponifiable fraction of corn oil, freed from most of the sterols, and found it to be 0.2 per cent. Assuming the critical level of gamma tocopherol to be 6 mg, Karrer and Keller's measurement would appear to be in reasonable agreement with the results of our feeding tests.

The concentrate was treated with cyanic acid in benzene, as previously described. The only tocopherol which could be isolated was gamma, whose allophanate, mp. 137–140°, gave no depression on admixture with gamma tocopheryl allophanate previously obtained from cotton-seed oil. The yield was about 700 mg.

The allophanate was saponified, and the free tocopherol fed at levels of 3 to 6 mg. Of four rats fed 3 mg one had a litter and three resorbed, while of five rats receiving 6 mg, two had litters and three resorbed.

The gamma allophanate, on admixture with beta allophanate, mp 143–6°, melted at 130–5°. This, together with the complete difference in the habit and appearance of the two allophanates, would seem to leave little reason to doubt their non-identity. On the other hand, the admixture of alpha tocopheryl allophanate mp 158–60° lowers the melting point of gamma only two or three degrees, which makes it very difficult to be certain that a preparation of gamma is not contaminated with alpha. However, the absence of any considerable amounts of alpha from corn oil greatly facilitates the preparation of gamma in a comparatively pure form.

OLIVER H. EMERSON
GLADYS A. EMERSON
HERBERT M. EVANS
INSTITUTE OF EXPERIMENTAL BIOLOGY,
UNIVERSITY OF CALIFORNIA, BERKELEY

[1] Aided by grants from the Department of Agriculture, University of California and by Merck and Company, Inc., Rahway, N. J. Assistance was rendered by the Works Progress Administration, Project No. 10482 A-5.

[2] H. S. Olcott and O. H. Emerson, *Jour. Am. Chem. Soc.*, 59: 1008, 1937.

[3] H. A. Mattill and Blanche Crawford, *Jour. Ind. Eng. Chem.*, 22: 341, 1930.

[4] The corn oil was kindly supplied by the Miner Millard Milling Co., Wilkes-Barre, Pa.

[5] O. H. Emerson, G. A. Emerson, Ali Mohammad and H. M. Evans, *Jour. Biol. Chem.*, 122: 99, 1937.

THE QUANTITATIVE DETERMINATION OF VITAMIN C IN MILK

RECENT studies[1, 2, 3, 4] have shown that there are a number of important factors which may influence the

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[1] P. F. Sharp, *Jour. Dairy Science*, 21: 85, 1938.

[2] S. K. Kon and M. B. Watson, *Jour. Soc. Chem. Ind.*, 55: 508, 1936.