lows were elected as follows: Section on Mathematics, 1; Section on Psychology, 8; Section on Social and Economic Sciences, 5; Section on Medical Sciences, 1.

Dr. E. G. Conklin was elected as representative of the association on the board of trustees of Science Service in place of Dr. B. E. Livingston, who had resigned.

The Psychometric Society was accepted as an affiliated society. This organization has a total membership of 159. Of this number 74 are members of the association, 58 of these being fellows. The society is entitled to one representative in the council.

The American Philosophical Association expressed its acceptance of the invitation to change its status from that of an associated society to an affiliated society.

It was voted to hold the 1940–41 winter meeting in Philadelphia and to authorize publication of this decision.

It was voted to hold the 1939 summer meeting in Milwaukee and to authorize publication of this decision.

It was voted to appropriate to *Biological Abstracts* $150 from the treasurer's funds for general purposes, the officers of the journal to be notified that this is the final grant from the association for this purpose.

The chairman appointed the president and the permanent secretary representatives of the association for the meeting of the British Association for the Advancement of Science, to be held at Nottingham, from September 1 to 8.

Dr. Atherton Seidell was selected as delegate from the association to the Dix-septième Congrès de Chimie industrielle, Paris, from September 26 to October 2.

The committee adjourned at 3:45 P.M., to meet in Denver in June. (The usual program calls for the executive committee to meet on Sunday afternoon and evening prior to the opening of the meeting on Monday, June 21.)

HENRY B. WARD

REPORTS

ACTIVITIES OF MELLON INSTITUTE DURING THE PAST YEAR

THE major event during the past fiscal year of Mellon Institute was the transfer of almost all the organization's activities to its new building, completed after a construction period of six years, and dedicated May 5 to 9 to science and humanity in honor of the institution's founders, Andrew W. Mellon and Richard B. Mellon.

The fiscal year just closed marks the twenty-sixth anniversary of the establishment of the Institute's fellowship system. The expansion of activities made possible by the new building is reflected by the increase in the total sum contributed to the institution by industrial fellowship donors. This sum amounted to $816,315 for the fiscal year, March 1, 1936, to March 1, 1937, bringing the total for the past twenty-six years to $11,478,406.

Sixty-nine industrial fellowships—30 multiple and 39 individual fellowships—were in operation throughout the fiscal year, requiring the services of 125 fellows and 52 fellowship assistants. In operation at the close of the year were 64 industrial fellowships—27 multiple and 37 individual fellowships—on which 114 fellows and 41 assistants held positions. Thirty-three fellowships have been in continuous operation for five years or more, and of this number 15 have been active for 10 years, 11 have concluded 15 years or more of research, and 7 fellowships are 20 years of age or older.

During the calendar year 1936, 1 book, 13 bulletins, 17 research papers and 31 other articles were contributed to scientific and technical literature by Institute members. Fifty United States patents and 14 foreign patents on fellowship inventions came to issue. Since 1911, the total number of publications includes 19 books, 143 bulletins, 744 papers and 1,117 miscellaneous articles. During the same period, 668 United States patents were granted. Bibliographic bulletin 4, to be issued later this year, will cover the Institute's patents and contributions to literature from 1911 to 1936.

Eleven fellowships began operation during 1936–37 on the following subjects: household utilities, plate glass, mineral products, pasteurization, drying, air pollution survey, chain, raolin, surgical supplies, chromium and cork. Investigational programs were concluded by five fellowships: smoke abatement, cosmetics, closure, can and shoes. Three recently accepted fellowships will start work this spring.

The activities of the Institute are described in the annual report of the director, E. R. Weidlein. Releasable facts relating to the institution's investigational progress are here summarized:

Fundamental studies of anthracite fuel beds and heat-transfer methods were made by the anthracite fellowship under H. J. Rose. Through the researches of E. P. Barrett, a process has been commercialized for the removal of taste- and odor-producing substances from protective coating materials for food containers. R. R. Fulton's fellowship has developed a hydraulic pressure transmitting fluid for the brake systems of automobiles and airplanes. A comprehensive study recently completed by the fellowship headed by C. W. Sweitzer on the dispersion behavior of carbon blacks in oil- and varnish-type vehicles will assist

greatly in the more satisfactory and wide-spread use of these pigments.

The cottonseed product fellowship in charge of A. W. Harvey has made an investigation of the causes and control of mold development in certain types of cakes. A broad study of plastic fats has established the fact that the shortening properties of these materials are functions of physical and chemical characteristics rather than of biological origin. The basic program of the department-store commodity standards fellowship, under the direction of Jules Labarthe, Jr., emphasized the pre-evaluation of merchandise, the selection of store supplies, the giving of miscellaneous technical aid to the store and its customers and the study of complex complaint cases.

A new strained beef and liver soup, which appeared on the market in 1936, was developed by the multiple fellowship on food varieties headed by E. R. Harding. Material for laboratory table tops, sinks and similar equipment, previously developed by S. M. Phelps of the Institute, has been improved and carried into commercial production by the laboratory fellowship held by E. E. Marbaker. This material has been used in the new Institute building. Under the leadership of H. F. Robertson, studies have been conducted on the synthesis of a number of organic compounds and the development of commercial applications that may follow when such preparations become available in larger quantities.

During the year the petroleum fellowship completed a quarter-century of continuous operation. The work of the fellowship has covered a wide range of problems, including almost all types of petroleum products and uses. W. A. Gruse has been the senior fellow since 1923. A multiple fellowship, held by F. W. Adams, was established during the year to undertake basic researches in plate glass, paints and certain heavy chemicals. Striking correlations have been established between adherence of dry-process porcelain enamels on cast iron and composition and fabrication procedure by the porcelain enamels fellowship under D. G. Bennett. Studies were made by J. H. Young, senior fellow of the multiple fellowship on protected metals, to determine the type of cellular floor unit that would be best suited to residence construction. Investigations of the protective coatings fellowship in charge of G. H. Young have been aimed at the elucidation of fundamental film structure and basic principles determining adhesion, flexibility and continuity of commercial synthetic resin coatings.

Practical production of the new alloy developed last year as an improved razor blade material has been perfected, but the steel has not yet been produced in quantity. E. J. Casselman holds the fellowship concerned. An important addition to sanitational progress in machine dishwashing has been made by the development of sodium hexametaphosphate for this purpose by a fellowship under B. H. Gilmore. Artificial methods to accelerate the weathering of stone up to a hundred-fold have been evolved by the fellowship under R. C. Briant. The procedures were necessary in fundamental studies of commercial marbles and their uses. The practical superiority of plasticized sulfur as a jointing material in brick highway construction has been demonstrated by severe road tests under adverse weather conditions conducted by W. W. Duecker's fellowship.

Research designed to combat silicosis and similar diseases was inaugurated during the year by a fellowship at Mellon Institute under the sponsorship of Air Hygiene Foundation of America, Inc. H. B. Meller is managing director of the foundation, which is now supported by approximately 150 firms in most of the "heavy" manufacturing and mining industries. It is immediately concerned with diseases arising from industrial air contaminants—dusts, fumes, gases and vapors. The purposes of the organization, as set forth in its code of regulations, follow: It shall conduct and stimulate research on problems in the field of air hygiene and gather and disseminate factual information relating thereto. It will cooperate with and assist other agencies active in this domain and will collaborate in the coordination of such investigations.

The program for 1936 involved the collection and evaluation of information available on the subject, and, roughly, its classification into that which is positively established as fact, that which is doubtful or unproved and that which remains to be learned in order to combat air-derived occupational diseases.

Investigations in the cinchona alkaloid field, especially of the chemotherapy of pneumonia, have been continued in the Institute's department of research in pure chemistry, of which L. H. Cretcher is the head and C. L. Butler is senior fellow. In view of the very promising experimental and preliminary clinical results reported last year by the medical collaborators, W. W. G. Maclachlan, H. H. Permar, John M. Johnson and H. H. Burchel, using hydroxyethylapocupreine, more intensive study of this substance has been pursued, and a new and more efficient method of preparing it and other hydroxyalkyl ethers of cinchona alkaloids has been devised. Preparation work has been carried on mainly by B. L. Souther, Mary Hostler and Mary Clapp.

The highly desirable properties of hydroxyethylapocupreine as an antipneumococcic drug, such as high bacteriostatic activity *in vitro*, high protective action *in vivo* (mice), very low toxicity and absence of eye damage, have been confirmed by the medical group. Further clinical tests on a larger number of patients

have been made. While it is fully realized that caution in interpreting clinical data is essential, the present indication from the proportion of recoveries in these treated cases is that the drug has a highly beneficial effect upon the course of pneumonia. The final decision as to its real effectiveness will come only after analysis of many more treated cases than are now available.

The Institute participated in the compilation of the Eleventh Decennial Revision of the United States Pharmacopoeia, which was issued on January 1, 1936, and became official on June 1. In conformity with the policy of the U. S. Pharmacopoeial Convention, the work of revision has continued in order to keep abreast of commercial trends and therapeutic developments and to make available to all users the latest scientific information on the standardization of medicinal agents. The findings of the Revision Committee will be published from time to time as supplements to the Pharmacopoeia and will have official standing from those dates. Study of the official organic chemicals is continuing under the chairmanship of G. D. Beal with the aid of a grant from the Pharmacopoeial Convention. M. W. Green has been appointed as assistant in the Institute's department of research in pure chemistry under this grant.

Research on dental caries has been continued by the fellowship of the Buhl Foundation, which is headed by G. J. Cox with W. E. Walker and Sara F. Dixon as assistants. The study has centered upon the two fundamental aspects of nutritional control of dental caries, namely, (1) the formation of teeth immune to caries and (2) the arrest of decay in existing cavities. The nutritional factors which confer caries immunity may be, but are not necessarily, the same as those which arrest the progress of decay.

The bacteriological and serological investigations started several years ago at the suggestion of Dr. C. B. Schildecker have been continued on an enlarged scale during the year. This work, which is under the general supervision of Dr. R. R. Mellon, director of the Institute of Pathology of the Western Pennsylvania Hospital, is supported by Mellon Institute. The biochemical group (A. P. Locke, with the assistance of Rose B. Locke, Rhoda J. Bragdon and William Thompson) is concerned with the rôle of host factors in pneumococcic infections. The bacteriologists (P. B. Hadley, aided by Faith P. Hadley, F. B. Cooper, Paul Gross, Louise Peebles, L. R. Shinn and Marion L. Lewis) are investigating the development and dispensing of types I and II pneumonia serums and the mechanism of action of an antistreptococcus serum.

SPECIAL ARTICLES

PIMELIC ACID AS A GROWTH ACCESSORY FACTOR FOR A STRAIN OF THE DIPHTHERIA BACILLUS[1]

STUDIES on the nutritional requirements of certain strains of the diphtheria bacillus, which have been carried out during the last few years in this laboratory,[2,3,4,5] have served to indicate the general nature of the materials which must be supplied in order to obtain maximal growth of these organisms. In addition to suitable inorganic ions, these include (1) a readily available source of energy—*i.e.*, glycerol, ethyl alcohol, lactic acid, etc.; (2) certain amino acids, varying individually somewhat from one strain of the organism to another; and (3) one or more substances occurring in meat extract or in extractives from other tissues.

It has already been shown[4] that a boiling water extract of liver offers an adequate source of these latter growth-stimulating materials, a considerable proportion passing into the filtrate after vacuum concentration and precipitation with alcohol, and, further, that from such a solution, after removal of the alcohol in vacuo, the substances in question are readily adsorbed on charcoal and may be eluted from it with acid alcohol.[6]

This eluted material has been purified in a number of ways, keeping in mind always that more than one substance may well be involved. It was eventually found that a separation into two fractions could be accomplished, neither of which alone, in any concentration, would duplicate the effect of small amounts of the mixture with our test strain. This separation was brought about by repeatedly extracting the strongly acidified eluate with ether. The ethereal solution and the residual aqueous layer constituted the two fractions. Again, the possible multiplicity of active substances in one or both of these fractions has had to be kept in mind.

Recalling the work of Pappenheimer[7] in isolating

[1] From the Department of Bacteriology and Immunology, Harvard University Medical School, Boston.

[2] J. H. Mueller, K. S. Klise, E. F. Porter and A. Graybiel, *Jour. Bact.*, 25: 509, 1933.

[3] J. H. Mueller, *Jour. Bact.*, 29: 515, 1935.

[4] J. H. Mueller, *Jour. Bact.*, 30: 513, 1935.

[5] J. H. Mueller and I. Kapnick, *Jour. Bact.*, 30: 525, 1935.

[6] The writer is indebted to Dr. Y. Subba Row, of the Department of Biochemistry of the Harvard University Medical School, and to the Lederle Company, Pearl River, New York, for considerable quantities of liver extract concentrates used in this work; and to Dr. Subba Row, also, for a great deal of active assistance and advice.