many honors, among them the degree of LL.D. from the universities of Mississippi, Michigan, Columbia and California; the Liebig gold medal from Munich, and others from the expositions of Paris, Rio de Janeiro and St. Louis, as well as the offer of Assistant Secretary of Agriculture from President Harrison.

Although much reduced in vitality during the last three years of his life as the result of an injury, his interest and desire for service in the cause of agriculture were keen and virile, and his great regret, daily expressed to the last, lay in his inability to further pursue his studies of soil and other problems.

R. H. LOUGHRIDGE
UNIVERSITY OF CALIFORNIA

THE INDUSTRIAL FELLOWSHIPS OF THE MELLON INSTITUTE

SOME of the important recent events in connection with the operation of the practical system of cooperation between science and industry at the Mellon Institute of Industrial Research of the University of Pittsburgh, have been reported during the past year in this journal. I allude especially to the dedication of the permanent building of the institute,[1] the establishment of a school of chemistry at the University of Pittsburgh,[2] and the inauguration of Professor M. A. Rosanoff as head of the department of research in pure chemistry of the Mellon Institute.[3] In addition, there has been occasion to communicate elsewhere accounts of the graduate school of specific industries of the Mellon Institute[4] and a discussion of the principles involved in the administration of endowed industrial research laboratories.[5] However, almost two years have elapsed since the last report was made to SCIENCE[6] on the status of the system of industrial fellowships initiated by the late Dr. Robert Kennedy Duncan at the University of Kansas and later, on September 1, 1911, transferred to the University of Pittsburgh.

The progressive growth in both the number of industrial fellowships in operation and in the amounts subscribed for their maintenance, is shown in the following table.

Academic Year	Number of Fellowships in Operation	Number of Fellows	Amounts Subscribed for the Maintenance of Fellowships
1911–12.....	11	23	$39,700
1912–13.....	16	30	53,500
1913–14..	15	29	59,100
1914–15.....	24	42	74,350

It is of interest to note that when the industrial fellowship system passed out of its experimental stage—when the Mellon Institute moved into its permanent home in February, 1915—twenty-three fellowships were in operation. At the present time (March 1, 1916) there are thirty-six fellowships and two additional ones have recently been arranged for, to begin later in the year. Sixty-three industrial fellows are engaged on the fellowships now in operation. The growth of the institute has about reached the stage where we shall be obliged to decline further industrial investigations for the present, since our laboratories are almost filled up to capacity.

A LIST OF THE INDUSTRIAL FELLOWSHIPS IN OPERATION AT THE MELLON INSTITUTE ON JANUARY 1, 1916

No. 19: Aluminum.—$5,000 a year for two years; $5,000 a year for the third year. Bonus: $10,000. Fellows: Lester A. Pratt, Ph.D. (University of Pittsburgh); Hugh Clark, Ph.D. (University of Pittsburgh); F. D. Shumaker, B.S. (University of Pittsburgh). (June 1, 1913.)

No. 28: Fertilizer.—$2,500 a year for three years. Bonus: $5,000. Fellow: Earl S. Bishop, M.A. (University of Nebraska). (January 5, 1914.)

[1] Hamor, SCIENCE, N. S., 41 (1915), 418. See also Hamor, *J. Ind. Eng. Chem.*, 7, 326; *Met. Chem. Eng.*, 13, 266, and *Eng. Min. J.*, 99, 480.

[2] SCIENCE, N. S., 42 (1915), 491. See also *Met. Chem. Eng.*, 13, 782; *J. Ind. Eng. Chem.*, 7, 1,002, and *Univ. Pgh. Bull.*, 11, No. 23.

[3] Hamor, SCIENCE, N. S., 42 (1915), 636. See also Bogert, *ibid.*, 737.

[4] Bacon, *J. Ind. Eng. Chem.*, 7, 343; *J. Frank. Inst.*, November, 1914, 624.

[5] *J. Soc. Chem. Ind.*, 35 (1916), 18–27.

[6] Duncan, SCIENCE, 39 (1914), 672.

No. 34: Fatty Oils.—$2,100 a year for two years. Fellow: Leonard M. Liddle, Ph.D. (Yale). (July 1, 1914.)

No. 43: Laundering.—$1,800 a year for one year. Fellow: Harvey G. Elledge, B.S. (University of Kansas). (February 15, 1915.)

No. 44: Land Development.—$1,000 a year for one year. Fellow: Will E. Vawter, B.S. (University of Kansas). (February 1, 1915.)

No. 45: Copper.—$2,000 a year for one year. Fellow: Albert S. Crossfield, B.S. (University of California). (April 19, 1915.)

No. 46: Organic Synthesis.—$6,000 a year for one year. Bonus: $5,000. Fellows: Harold Hibbert, D.Sc. (Victoria University), Senior Fellow; H. A. Morton, Ph.D. (University of Pittsburgh); H. J. Little, B.S. (Delaware College). (July 1, 1915.)

No. 47: Soda.—$3,000 a year for one year. Fellow: C. W. Clark, Ph.D. (University of Pittsburgh). (September 7, 1915.)

No. 48: Bread.—$6,500 a year for two years. Bonus: $10,000. Fellows: Henry A. Kohman, Ph.D. (University of Kansas), Senior Fellow; Truman M. Godfrey, B.S. (University of Kansas); Lauren H. Ashe, B.S. (University of Pittsburgh). (March 1, 1915.)

No. 49: Candy.—$1,800 a year for one year. Fellow: C. A. Neusbaum, A.B. (Wabash College). (July 1, 1915.)

No. 50: Paint.—$1,500 a year for one year. Fellow: J. V. Thompson, A.B. (Cornell University). (September 1, 1915.)

No. 51: Yeast.—$2,800 a year for two years. Fellow: Ruth Glasgow, M.S. (University of Illinois). Scholar: T. A. Frazier (University of Pittsburgh). (September 1, 1915.)

No. 52: Ores.—$5,400 a year for one year. Fellows: Harry P. Corliss, Ph.D. (University of Pittsburgh); C. L. Perkins, B.S. (New Hampshire College); C. L. Weirich, M.S. (University of Pittsburgh). (July 1, 1915.)

No. 53: Copper.—$3,600 a year for one year. Fellows: Charles O. Brown, A.M. (Cornell University); Ernest D. Wilson, Ph.D. (University of Chicago). (July 1, 1915.)

No. 54: Dental Supply Trade.—$2,300 a year for one year. Bonus: royalty. Fellow: C. C. Vogt, Ph.D. (Ohio State University). Adviser: H. E. Friesell, Dean, Dental School, University of Pittsburgh. (July 1, 1915.)

No. 55: Pharmaceutical Products.—$13,000 a year for one year. Fellows: J. R. Watson, B.Sc. (London University); R. A. Dunphy, Ph.D. (University of Pittsburgh); H. W. Huntley, M.A. (University of Wisconsin); J. B. Churchill, B.S. (Harvard); R. N. Mullikin, Ph.D. (Johns Hopkins); E. P. Wightman, Ph.D. (Johns Hopkins); R. W. Harris, M.S. (Ohio State University). (July 7, 1915.)

No. 56: Soap.—$2,000 a year for one year. Fellow: Ben H. Nicolet, Ph.D. (Yale). (June 26, 1915.)

No. 57: Glue.—$1,800 a year for one year. Fellow: Ralph C. Shuey, B.S. (University of Kansas). (July 1, 1915.)

No. 58: Industrial Engineering.—$2,000 a year for one year. Fellow: Rudolph McDermet, M.S.E.E. (University of Illinois). (September 1, 1915.)

No. 59: Milling.—$2,500 a year for one year. Fellow: H. C. Holden, M.S. (New Hampshire College). (September 1, 1915.)

No. 60: Collars.—$2,300 a year for one year. Fellow: H. D. Clayton, B.A. (Ohio State University.) (October 1, 1915.)

No. 61: Synthetic Inorganic Chemistry.—$6,000 a year for two years. Bonus: $3,500. Fellow: Charles S. Palmer, Ph.D. (Johns Hopkins). (October 15, 1915.)

No. 62: Gas.—$6,500 a year for one year. Fellows: James B. Garner, Ph.D. (University of Chicago), Senior Fellow; J. E. Underwood, M.A. (Wabash College); F. W. Padgett, M.S. (University of Pittsburgh). (September 15, 1915.)

No. 63: Peas.—$1,200 a year for one year. Fellow: E. H. Taylor, M.S. (University of Illinois). (November 1, 1915.)

No. 64: Petroleum.—$10,000 a year for one year. Bonus: $10,000. Fellows: B. T. Brooks, Ph.D. (University of Göttingen), Senior Fellow; I. W. Humphrey, B.S. (University of Kansas); Harry Essex, Ph.D. (University of Göttingen); D. F. Smith, M. S. (University of Wisconsin). (September 1, 1915.)

No. 65: Compound Fats.—$2,800 a year for one year. Fellow: Edmund O. Rhodes, M.S.

(University of Kansas). Scholar: R. Lee Wharton (University of Pittsburgh). (October 1, 1915.)

No. 66: Glycero-Phosphates.—$1,500 a year for one year. Bonus: 10 per cent. of profits. Fellow: Frank F. Rupert, Ph.D. (Mass. Inst. Tech.). (October 1, 1915.)

No. 67: Glass Bottles.—$2,100 a year for one year. Fellow: John F. W. Schulze, Ph.D. (Clark University). (December 1, 1915.)

No. 68: Illuminating Glass.—$900 a year for two years. Fellow: A. H. Stewart, A.B. (Washington & Jefferson). (October 1, 1915.)

No. 69: Linoleum.—$2,500 a year for one year. Fellow: Lester E. Cover, B.S. (Pennsylvania State College). (November 1, 1915.)

No. 70: Gum.—$2,500 a year for one year. Bonus: $6,000. Fellow: M. A. Gordon, B.S. (Cornell University). (November 15, 1915.)

No. 71: Stoves.—$2,300 a year for one year. Fellow: A. E. Blake, M.S. (University of Pittsburgh). (October 20, 1915.)

No. 72: Copper.—$6,500 a year for one year. Fellows: E. R. Weidlein, M.A. (University of Kansas); G. A. Bragg, B.S. (University of Kansas). (November 1, 1915.)

No. 73: Illumination.—$6,000 a year for one year. Bonus: $5,000. Fellows: George O. Curme, Ph.D. (University of Chicago), Senior Fellow; H. B. Heyn, B.S. (University of Wisconsin); Glen D. Bagley, M.S.E.E. (University of Illinois). (November 15, 1915.)

No. 76: Coal Tar Products.—$11,000 a year for one year. Fellows: R. R. Shively, Ph.D. (University of Pittsburgh); F. R. Peters, A.B. (Wabash College). (Three more Fellows to be appointed.) (December 1, 1915.)

Special Research Work.—R. P. Rose, M.S. (University of Kansas); R. W. Miller, M.S. (Kansas State College).

The conspicuous success which has attended the development of the system of service to industry founded by Dr. Duncan may be attributed to several factors. First among these, however, is the research strength of the Mellon Institute; this investigative power has resulted from the facilities for research and has been developed by the administrative staff. It has inspired an abiding confidence among industrialists and has eventuated in the consequent renewal, year after year, of industrial fellowships in fields which require constant inquiry, such as those represented by the fellowships numbered 19, 48, 51, 52, 53, 54, 57, 58, 64, 67, 68 and 72.

Several of the multiple fellowships—ones which have the intensive services of two or more researchers under the direction of a senior fellow—established at the Mellon Institute have been effectively at work since the foundation of that institution, and a number of investigations utilizing the services of one man—individual fellowships—have been promoted continuously for the past three years. Thus, although this must be regarded as a very short interval in the career of an institution whose history should be measured by decades, it has been long enough to afford opportunities for the development of ideas and ideals concerning the conduct of industrial research. The practical results of the research experience of the Mellon Institute are rich in applicable instruction and should be useful to the independent organizations which will probably enter the field of industrial research in the near future.

The proposal has been made to establish state industrial research bureaus, to be conducted along the same general administrative lines as the various agricultural experiment stations, and some progress has, in fact, been made in this direction, for the University of Kansas has, in its department of chemistry, a division of state chemical research. Then, too, the Royal Canadian Institute has lately inaugurated a bureau of scientific and industrial research, based upon the system in operation at the Mellon Institute, and several educational institutions are contemplating similar steps in England.[7] The experience of the industrial research institutions now in operation, which is certain to be drawn upon heavily in the movement to make the research work of the

[7] For English appreciations of the system of industrial research in operation at the Mellon Institute, see Sir William Ramsay and G. G. Henderson, *J. Soc. Chem. Ind.*, 34, 751 and 753; and Humberstone, *Quart. Rev.*, 224, Nos. 445, 521.

country national in both scope and effort, should be readily available for use by their prospective allies. Their entrance into this field should be warmly welcomed. No greater good fortune could come to the Mellon Institute, for example, than a division of labors with a number of similarly well-founded establishments.

In keeping with this attitude of welcome towards prospective industrial research organizations, it is important to add that with them no relations can be stable and helpful, but relations of reciprocity. Cooperation is just as essential among research laboratories as it is among the members of a research team. I may therefore be permitted to indicate one serious danger in connection with the establishment of industrial fellowships which is of concern to the Mellon Institute, and that is the danger that, in order to obtain fellowships, the heads of research departments will "let down the bars." In other words, that they will modify the conditions under which industrial fellowships are accepted at the Mellon Institute. This would be a very serious matter and might lead ultimately to the failure of the whole plan.

The administration of the Mellon Institute is now constituted as follows:

Raymond F. Bacon, Ph.D., director;
Samuel R. Scholes, Ph.D., assistant director;
E. Ward Tillotson, Jr., Ph.D., assistant director;
John J. O'Connor, Jr., M.A., assistant director;
William A. Hamor, M.A., assistant to the director;
Martin A. Rosanoff, Sc.D., head of the department of research in pure chemistry.

Raymond F. Bacon

THE NEW JERSEY MOSQUITO ASSOCIATION

This organization, which has for its object the elimination of the mosquito from the standpoint of human comfort and the attendant property values, held its third annual meeting on February 17 and 18. As might be expected from its purpose the membership is composed of business and professional men of all sorts. To become a member it is merely necessary to inform the proper persons that one wishes to become connected with the movement. No dues or assessments are levied upon the individual members and the necessary expenses are borne by the organizations which belong to it.

The program of this meeting included five speakers, who were professionally connected with the practical work; eleven who were identified with it as members of directing boards; two who were responsible for the state work and the correlation of the work of the county units; three who represented the taxpayers who received the benefits and pay the bills; one who represented the Interstate Anti-mosquito Committee; and one who represented the mosquito work of the country as a whole.

One member of the first group, Mr. James E. Brooks, showed that dikes, tide gates, and trenching drain shut-in areas of salt marsh, which the ordinary trenching will not protect, in such a fashion that no serious emergence of mosquitoes takes place. Another member, Mr. William Delaney, pointed out that pumps are necessary on certain enclosed marshes that have shrunken below the sea level, and that a twelve-inch, low-head, motor-driven, centrifugal pump with necessary trenching removed the water from 800 acres of bad breeding marsh in such a fashion that no serious emergence could occur.

Another member of this group, Mr. Harold I. Eaton, showed that the average acre cost of salt-marsh trenching for 12,000 acres drained in the last three years was $4.00, and that the price exclusive of administration expense had been reduced from $5.22 in 1913 to $2.75 in 1915. Another member, Mr. Russell W. Gies, showed that the average per capita cost of county-wide mosquito control work was about 12 cents. Another, Mr. John Dobbins, pointed out the methods, which four years' experience in the practical work had proved to be best for fresh water mosquito control.

The members of the second group, Dr. Wm. Edgar Darnall, Mr. E. B. Walden, Mr. Joseph Camp, Mr. Spencer Miller, Dr. H. H. Brinkerhoff, Mr. Chas. Deshler, Mr. Ira Barrows, Mr.