sian characters, that are uncommon to most bibliographic enterprises.

Bibliographies as thorough and as well appointed as this one are definite milestones in the progress of research, in no matter what field. With the bewildering increment of literature in all branches of science, the great need for bibliographies is scarcely to be disputed. The most serious problem these days is to find funds for bibliographic publication after the necessary work of compilation has been done. In the present case the assiduity of the compilers and the interest and generosity of the sponsors, including one anonymous contributor, are especially gratifying. Botanists and plant scientists of at least three continents are the beneficiaries.

PAUL H. OEHSER

U. S. NATIONAL MUSEUM

GRIGORE ANTIPA

Grigore Antipa. Hommage à son oeuvre. 10 décembre, 1867—10 décembre, 1937. Bucharest, Imprimeria Natzională, 1938. (Published under the auspices of the Roumanian Society of Sciences.) Pp. 727; numerous plates and illustrations.

THIS noble volume, admirably printed and illustrated, is a tribute to one of the wisest and kindliest of modern biologists—Director Antipa, of the Bucharest Natural History Museum, Haeckel's assistant for many years at Jena, ex-minister of agriculture and world-renowned leader in fresh-water fishery development. Tendered to him on his seventieth birthday by pupils and friends, it contains a bibliography of his writings, accounts of his work as scientist, sociologist, economist and museum director; but its main bulk consists of valuable scientific papers in French, German, Italian and English (very few in Roumanian). These touch almost every phase of scientific interest, from the weathering rate of sedimentary rocks in Switzerland and the Pliocene fauna of Roumania, to sardine fisheries on the Chilian coast and an article by our own Henry Baldwin Ward on "Environmental Stimuli and Salmon Migration"; we even have an article by Netzhammer on Christian martyrs in the Danube basin and one on the development of forensic medicine in Zurich. It is interesting to discover that American "pumpkinseeds" and "bullheads" have made their way into the Danube system; there are specially valuable articles on wheat rust, on vitamin D from Black Sea sharks' livers, on the science of museum display, where Antipa was a pathfinder; but perhaps the most important have to do with pisciculture, in which we recognized Antipa's leadership some years ago by inviting him to investigate and make recommendations for the Mississippi Valley fisheries. Space limits prevent listing of the 52 articles; suffice it to say that this volume should adorn every large biological reference library, and the separate articles should go into the bibliographies. And all of us who have enjoyed the hospitality of Dr. Antipa and his charming wife will rejoice in the worthy quality of this hearty tribute—headed by King Carol himself—to a gentleman and a scholar of the highest rank and a patriot who showed his mettle under the trying conditions of the German occupation of Roumania; and we may take courage for the future of scholarship in the proof it affords of his stimulating influence on the younger generation.

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REPORTS

PURE AND APPLIED SCIENCE RESEARCH AT MELLON INSTITUTE

EIGHTY-SIX industrial fellowships, of which 30 are multiple and 56 individual, have been in operation in Mellon Institute during its fiscal year, March 1, 1938, to March 1, 1939. These investigations have employed 161 fellows and 96 fellowship assistants. During this fiscal year the institute has spent $1,104,405 in carrying on these research programs and its broad studies in pure science, which have been becoming more and more important, according to the twenty-sixth Annual Report of the director, Dr. E. R. Weidlein, to the trustees of the institution.

Of outstanding interest in this report is the account of the investigations on the chemotherapy of pneumonia under way in the institute's department of research in pure chemistry. Several active compounds have been discovered, but none appears to be as generally suitable as hydroxyethylapocupreine. The conclusions of the medical collaborators, Drs. W. W. G. Maclachlan, J. M. Johnston, M. M. Bracken and G. E. Crum, following three years of clinical experience with this drug, demonstrate that the mortality figure in pneumococcic pneumonia in adults during the past year has been greatly reduced in those cases which received hydroxyethylapocupreine. In comparing the mortality figures of the chemically treated cases, which were of course smaller in number, with the serum-treated cases in Pittsburgh, for the same types of pneumonia during the same period of time, almost identical results were observed by these specialists. Hydroxyethylapocupreine, which has shown no evidence of disturbing vision, can be used effectively in all types of pneumonia. Clinical studies of the drug in cities other than Pittsburgh have been arranged for. Experiments

have revealed that, in identical doses within the effective ranges, hydroxyethylapocupreine will protect against pneumococcal septicemia in mice better than sulfanilamide and fully as well as sulfapyridine. These comparative studies are being continued.

In the chemotherapeutic research the institute is supporting at the Western Pennsylvania Hospital in Pittsburgh, Dr. R. R. Mellon and a staff of eight have made extended comparisons of effective dosage and protective values, using large numbers of rats and mice and numerous aromatic sulfur compounds, with pneumococci and streptococci as infecting agents. Investigation of the mode of action of sulfanilamide indicates that the compound likely permits the overproduction of metabolic products by the infecting pneumococcus or streptococcus, which results in an alteration of the growth rate or growth character of the latter. Fundamental research in bacterial variation, using streptococci and tubercle bacilli, has supplied additional evidence that transformations do occur within the present accepted classifications. These findings are being applied both diagnostically and therapeutically as opportunity offers.

The pure research fellowship sustained in the institute by The Buhl Foundation, on the relation of nutrition to various phases of dental caries, has disclosed some new relationships of food to tooth decay and has improved certain necessary techniques. Investigation of the beneficent effects of fluorides in the formation of teeth resistant to caries has not been entirely conclusive. In an attempt to determine what factors in meat confer caries resistance to rat teeth, Dr. G. J. Cox and his coworkers on this fellowship have fed to rats a series of diets varying in protein content. No difference in caries susceptibility was noted from diets ranging by 5 per cent. steps from 10 to 55 per cent. protein. A similar study of varied calcium to phosphorus ratio showed that in the rat the mother during pregnancy and lactation can provide calcium and phosphorus for good teeth over a wide range of ratios of calcium to phosphorus. On the low ratios, however, mothers and young displayed detrimental effects of the diets so far as body weight was concerned. Some preliminary experiments have indicated that suppression of saliva leads to promotion of decay.

Under a Federal Government grant, the fellowship on air pollution control has been cooperating with the department of public health of the city of Pittsburgh in a thorough study of municipal air contamination. There are 100 stations for the collection of precipitated solids and 50 field men who make direct observations of smoking chimneys. There are about 5,000 stacks in the classes regulated by the city's anti-smoke ordinance; and there are 154,000 dwelling units, 119,000 of which burn coal for fuel, and none of them is subject to smoke regulation. Indications are that the dwelling units are the greatest source of air pollution in Pittsburgh during the winter months. At several points the air is being sampled for the purpose of measuring suspended solids. The study of autopsy material is being carried on at the Singer Memorial Laboratory in the effort to determine possible effects of air pollution as noted in Pittsburgh in causing or aggravating respiratory diseases. Answers to 100,000 questionnaires on the effects of smog have been tabulated and will be appraised by medical specialists.

Air Hygiene Foundation of America, a non-profit, science organization with headquarters and a multiple fellowship (Dr. H. B. Meller, senior incumbent) at Mellon Institute, represents a collective effort by 250 industrial employers in behalf of the health of approximately a million workmen. The foundation, in addition to its pure, basic research in industrial hygiene, furnishes company members with practical plant applications to prevent industrial illness and to foster industrial health. During the year the foundation's preventive engineering committee prepared and issued eight bulletins on measures for safeguarding occupational health. Under grants from the foundation scientific investigations progressed at Harvard University, the University of Pennsylvania, The Saranac Laboratory, and Mellon Institute. Two graduate fellowships were established at Harvard to train men in industrial hygiene under Professor Philip Drinker. Research in roentgenography at the University of Pennsylvania seeks to improve x-ray techniques for industrial purposes, as in large-scale medical examinations of groups of workmen. At The Saranac Laboratory Dr. L. U. Gardner, the director, has experimental data to support the thesis that various minerals associated with silica tend to inhibit its action upon the body. The foundation is collaborating in the work of various states and of federal agencies in the field and makes every reasonable effort to fulfill public needs for facts on industrial health subjects.

The report includes descriptions of accomplishments of many industrial fellowships during 1938–39. The multiple fellowship on anthracite showed how completely automatic heat can be readily obtained with Pennsylvania anthracite without the necessity of any attention for weeks at a time. The multiple fellowship on calgonizing found "Calgonite" advantageously useful in cleaning dairy equipment. The multiple fellowship on tire and industrial chains described a number of successful welding electrode coating compositions. Another multiple fellowship, the one on commodity standards, continued productively its studies of major problems in retail merchandising.

The multiple fellowship of the Cotton Research Foundation, an organization of philanthropic business men, expanded its personnel and work in trying to improve the cotton economy of the United States. New

knowledge resulted from studies of hull bran, cottonseed proteins, nutritional properties of cottonseed meal, cotton line, and linters. Through the agency of the institute the foundation established research fellowships at the University of Texas, Texas Technological College, and the University of Tennessee, besides sustaining an investigation at the University of North Carolina and a fellowship on cellulose economics at the University of Pittsburgh.

The multiple fellowship on food varieties reached the full technological development of a line of special foods for the feeding of children beyond the strained foods age. The technical glassware fellowship developed methods and apparatus to evaluate "surface hardness" of glass. The heat insulation fellowship assisted in acquiring technical information on fireproof constructional materials and on all-asbestos insulating air ducts. "Kemite" and "Karcite," laboratory constructional materials, were further studied by another fellowship, with special attention to new raw materials, development of additional properties, and novel applications.

The industrial fellowship on meat merchandising, after three and a half years of research, attained the development to commercial status of a new process making an improvement in the palatability of beef through increase in tenderness and juiciness. The natural gas fellowship studied major problems pertaining to conditions of the distribution and utilization of this fuel. The multiple fellowship on organic synthesis entered its twenty-fifth year of continuous, creative activity. On the multiple fellowship on petroleum refining several new devices were evolved for quick and accurate measurements of physical constants of oil hydrocarbons. The pressing machinery fellowship announced a new, safer and purer type of petroleum naphtha and also improvements in filters and stills for purifying the liquids used in the dry-cleaning industry. The multiple fellowship on protective coatings progressed in investigations of the fundamental structure and properties of organic resin films on metals and other surfaces.

Twenty-two years of age, the multiple fellowship on refractories solved the riddle of "mottled" silica brick. The mineral products fellowship designed and supervised the erection of a large plant for manufacturing "Garspar," a new ceramic raw material, and developed two other silica products, "Garbond" and "Gartex." The multiple fellowship on steel applied the principles of carbon wire technology to the manufacture of stainless steel wire with beneficial results and devoted much study to problems of manufacturing seamless tubing. Some new uses for sulfur came from the researches of another fellowship.

Seventeen industrial fellowships began work during the year, and four other fellowships have been accepted and will soon start operation. Eight industrial fellowships concluded their investigations during 1938–39. Among the new fellowships the programs on acid recovery (prevention of stream pollution by waste pickle liquors), air filters, gypsum products, plastics in meter construction, criteria of excellence of pearls, and watch lubrication have already advanced by the acquirement of useful results.

During the calendar year 1938, 17 bulletins, 27 research reports and 43 other papers were published. Twenty-four United States patents and 30 foreign patents on fellowship inventions came to issue. The total publications for the 28 years ended December 31, 1938, have been 20 books, 174 bulletins, 803 research reports and 1,225 miscellaneous articles; 714 United States patents were granted during the same period.

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SPECIAL ARTICLES

DISINTEGRATION OF TOBACCO MOSAIC VIRUS IN UREA SOLUTIONS

CHANGES are known to occur in the structure of proteins when they are dissolved in concentrated solutions of urea. In the case of egg albumin, the alteration is quite marked,[1] whereas in the case of hemoglobin and of pepsin, the degree of the change is much less, for, although hemoglobin is split into half-molecules,[2] there appears to be no change in the special properties of these proteins. Recently it was reported[3] that solution of tobacco mosaic virus in 6 M urea and 0.1 M phosphate buffer caused a 100-fold increase in the diffusion constant of the material with no change in the virus activity. Since this would indicate a decrease in molecular weight from one of the order of several millions to one of about 100,000, and, since in many previous attempts[4] it had not proved possible to demonstrate the existence of low molecular weight material possessing virus activity, it seemed desirable to reinvestigate the effect of concentrated urea solution on tobacco mosaic virus.

[1] F. G. Hopkins, *Nature*, 126: 328, 383, 1930; M. L. Anson and A. E. Mirsky, *Jour. Gen. Physiol.*, 13: 121, 1929; H. Wu and E. F. Yang, *Chinese Jour. Physiol.*, 5: 301, 1931.

[2] N. F. Burk and D. M. Greenberg, *Jour. Biol. Chem.*, 87: 197, 1930; J. Steinhardt, *Jour. Biol. Chem.*, 123: 543, 1938.

[3] V. L. Frampton and A. M. Saum, SCIENCE, 89: 84, 1939.

[4] W. M. Stanley, in *Handbuch der Virusforschung*, Springer, Wien, 1938.