tute, followed by a response from Dr. R. S. Poor, Birmingham-Southern College. Dr. and Mrs. Duncan tendered the guests a reception in the president's mansion after the banquet.

On Saturday morning a geological and archeological field trip was conducted by Walter B. Jones, state geologist, to sites in the vicinity of the new Chewacla State Park. Later the members visited the Tuskegee Institute.

The Alabama Junior Academy of Science held its fourth annual meeting at the same place at this time. Fifteen high schools from all parts of the state were represented.

The officers elected for 1936–1937 are as follows:

President: Dr. Walter B. Jones, state geologist, University of Alabama, Tuscaloosa (president-elect for the past year).

President-elect: Dr. Roger Allen, Alabama Polytechnic Institute, Auburn.

Vice-Presidents (chairmen of sections):

Dr. C. M. Farmer, State Teachers College, Troy (re-elected), Section I.

Dr. Herman D. Jones, Alabama Polytechnic Institute, Auburn, Section II.

Dr. J. R. Cudworth, director of the State Bureau of Mines Experiment Station, University of Alabama, Tuscaloosa, Section III.

Mr. Fred B. Riggan, Stockham Pipe and Fitting Company, Birmingham, Section IV.

The following officers were reelected:

Secretary: Dr. Septima Smith, University of Alabama (for one year).

Treasurer: Dr. B. F. Clark, Birmingham-Southern College (for two years).

Editor of the Journal: Dr. E. V. Jones, Birmingham-Southern College (for three years).

Councilor to the American Association for the Advancement of Science: P. H. Yancey, Spring Hill College, Mobile.

The next meeting of the academy will be held at the University of Alabama, Tuscaloosa, some time in March, 1937.

SEPTIMA C. SMITH,
Secretary

REPORTS

RESEARCH AT MELLON INSTITUTE DURING 1935–36

MELLON INSTITUTE celebrated this year the twenty-fifth anniversary of the establishment of its industrial fellowship system at the University of Pittsburgh. Since 1911 the institute has had 1,085 industrial fellowships on 268 different subjects of technology, on which 935 scientists and engineers have been employed. Over 500 new or improved processes and products and nearly 2,000 contributions to the literature of pure and applied science have come from these researches. During the past quarter century 363 fellows and 414 fellowship assistants of the institute, having completed their services in the institution, have entered the domains of manufacturing, commerce and education. These trained additions to the forces of industry and teaching constitute the institute's most valuable gift to humanity.

The activities of the institute during the fiscal year, March 1, 1935, to March 1, 1936, are described in the annual report of the director, Dr. E. R. Weidlein, to the board of trustees, just off the press. There was an expansion of the institute's industrial fellowship work in this period, as is shown by the funds received from donors to defray the cost of scientific investigations being conducted for these companies and associations. This money amounted to $632,547, an increase of $35,609 over the preceding year. The sum contributed by donors during the last twenty-five years totals $10,662,091.

At the close of the fiscal year 59 industrial fellowships (17 multiple and 42 individual fellowships), three more than the year before, were in operation. Each of these industrial fellowships was concerned with a major problem of technology, different in subject from the others. These industrial fellowships required the services of 86 fellows and 28 assistants. Thirty-one industrial fellowships have been at work for five years or more, and of these fellowships 13 have concluded 10 years of research, 10 have been operating for 15 years or more, and 4 fellowships are 20 years of age or older. The multiple industrial fellowship on petroleum refining has served its donor 25 years. It is clear from these data that the donors of the industrial fellowships alluded to recognize the need for and value of long-range basic production and merchandising researches. Throughout the fiscal year 1935–36, 66 industrial fellowships (19 multiple and 47 individual fellowships) were active, and 102 fellows and 69 assistants held posts thereon during all or part of the year. During the calendar year 1935 the contributions to the literature by members of the institute included 10 bulletins, 22 research reports, and 58 other papers. Thirty-four U. S. patents and 78 foreign patents were issued to fellows.

The year 1935–36 was characterized by many noteworthy advances through industrial fellowship researches, chiefly a number of new products of commercial promise. Releasable facts relating to this investigational progress will now be summarized.

The importance of air conditioning induced the multiple industrial fellowship on heat insulation (R. H. Heilman, senior fellow, and R. W. Ortmiller) to investigate the various insulating materials used in the low-temperature field. The results of this research indicate that the conductivity of some low-temperature insulations is increased by more than 50 per cent. for an increase in temperature of only 100° F. In the high-temperature field, in studying refractory materials, the fellowship has found the emissivities of refractories of a number of different colors, concluding that the emissivity of light-colored refractories decreases rapidly with increase in temperature, the decrease starting at a temperature of about 400° F.

The industrial fellowship on illuminating glass, whose incumbent is Dr. R. R. McGregor, has devised novel methods for purifying glass-making materials and has carried forward work on two new types of opal glass for light-diffusing purposes.

R. C. Briant on the stone fellowship has evolved "Jetmar," an improved, interfused black marble, and has cooperated in the development of "Lumar," a scientifically selected, specially cut, translucent marble.

The principal activity of Dr. A. P. Thompson on the abrasives fellowship has been to serve in a liaison capacity between the donor's research laboratory and the industries in developing a series of novel refractories, named generically "Monofrax."

The industrial fellowship on natural gas, held by Dr. J. B. Garner, has been determining the utility of liquid normal butane as an industrial solvent and has also been studying the compressibility of natural gas.

The multiple industrial fellowship on organic synthesis, headed by Dr. E. W. Reid, has continued researches on the derivatives of ethylene diamine, morpholine, and piperazine. Applications have been found for propylene diamine and phenyl morpholine. A new resin, "Vinylite X," has been created for use in safety glass, and the resulting product has been proved to be quite superior in every respect to any other type of safety glass.

The incumbent of the industrial fellowship on paper, Dr. P. B. Davidson, learned that sucrose octa-acetate imparts to certain papers a mellow translucency that has suggested its use in specialty papers.

A new alloy steel particularly suitable for razor blades has been invented by E. J. Casselman on the shaving fellowship.

On the steel fellowship Dr. S. A. Braley has been carrying on with valuable results basic investigations in wire technology; he has also been largely responsible for the installation of a specification department in the donor's plant, to define all details of processing procedure for each and every wire requirement of customers.

Dr. R. N. Wenzel of the textile finishing fellowship conducted studies that have led to the manufacture of several new waterproofing agents for open fabrics.

In collaboration with the smoke abatement fellowship, the air pollution fellowship, whose incumbent is H. B. Meller, has made a preliminary research, using experimental animals, to determine the effects of mixtures of air with flue gases and accompanying solids. No definite conclusions have been reached, but there is evidence of the harmfulness of some of the air-diluted products of combustion of certain fuels, and a more scopeful investigation is being planned. These two fellowships have also made a comprehensive study of the effects of smoke on aviation.

Ten new industrial fellowships were put in operation during the fiscal year—soybean, glazing, meat merchandising, bone black, lead, protective coatings, air hygiene, food container, yeast and bone products. Another industrial fellowship, on household utilities, began work on March 2, 1936; and two other new industrial fellowships, on the utilization of silicate wastes and on problems in plate-glass technology, will have early inception. The following industrial fellowships concluded their research programs during the year: tire bead, starch, yeast production, petroleum production, food merchandising, zymology, and nitrogenous resins.

The year 1936 marks the decennial of the formation of the institute's department of research in pure chemistry, which is headed by Dr. L. H. Cretcher, aided by Dr. C. L. Butler, senior fellow. Throughout the year 1935–36 studies in the province of the cinchona alkaloids have been continued with the main object of securing compounds of therapeutic value in pneumonia. So far sixty-six preparations have been tested biologically by Drs. W. W. G. Maclachlan, H. H. Permar, J. M. Johnston, H. H. Burchell, and J. R. Kenny, the medical collaborators at Mercy Hospital, Pittsburgh. On the basis of favorable preliminary results, clinical studies have been carried out with apocupreine, ethylapocupreine and hydroxyethylapocupreine. The last-mentioned compound is the most promising drug that has been found to date. It has been tested in twenty-six clinical cases, and the findings have demonstrated a very high tolerance in the human to the drug, absence of any visual effects, and a high proportion of recoveries from severe pneumococcic infections of all types. Because of the great interest in hydroxyethylapocupreine and the difficulties involved in preparing it, considerable attention has been devoted during the year to the

investigation of this substance. Drs. B. L. Souther and Alice G. Renfrew and also Misses Mary Hostler and Mary A. Clapp have been active in this work.

In this department is a fellowship that is carrying on broad research on nutritional aspects of dental caries, under a grant from The Buhl Foundation of Pittsburgh. This extension of the study of the problem described last year is being conducted by Dr. G. J. Cox and two assistants. It is hoped that it will provide an answer to the interesting and important question, is there present in the diet during a critical period of tooth formation a factor that will aid in the construction of teeth resistant to decay?

For six years the institution has been supporting comprehensive research in the Institute of Pathology of the Western Pennsylvania Hospital in Pittsburgh, through arrangements made by Dr. C. B. Schildecker. This investigational work, which is being conducted by a group of scientists under the direction of Dr. R. R. Mellon, also relates in part to the treatment of pneumonia and allied pulmonary diseases and has resulted in the preparation of an apparently effective antipneumococcic serum. Late in 1935 members of this staff reported artificial breeding experiments with the tuberculosis bacillus that led to the discovery of a new form of this organism and shed new light on the disease. Then, too, progress has been made in an anti-streptococcic serum.

The new building of the institute, whose construction will soon be completed, is being gradually occupied. At present the department of research in pure chemistry and twelve industrial fellowships are located in this edifice.

W. A. HAMOR

MELLON INSTITUTE OF INDUSTRIAL RESEARCH

SPECIAL ARTICLES

INVASIVENESS OF SKIN INFECTIONS CAUSED BY PATHOGENIC FUNGI AND SUBSURFACE MYCELIUM[1]

THERE is little known with reference to the basic factors which determine chronicity and invasiveness of pathogenic fungi in skin infections. For this reason I have begun a study of the ability of pathogenic fungi to invade various solid mediums in an attempt to correlate these findings with what occurs in the body.

The invasiveness of pathogenic fungi for hair and skin has been amply demonstrated histologically. For this reason it seemed logical that a medium using as its source of nitrogen hydrolyzed hair and hydroylzed skin would be practicable. The Difco Laboratories prepared these products for me in the manner in which they prepare their peptone. The following mediums were used: 1 per cent. peptone, 4 per cent. dextrose, (Sabouraud's), 1½ per cent. agar; 1 per cent. hydrolyzed pig skin, 4 per cent. dextrose, 1½ per cent. agar; 1 per cent. hydrolyzed hair, 4 per cent. dextrose, 1½ per cent. agar. Plants were made using women's hydrolyzed hair, men's hydrolyzed hair and children's (before puberty) hydrolyzed hair. Children's hydrolyzed hair which was planted in duplicates was used for these descriptions. The pH was adjusted to 5.6. The tubes were incubated at room temperature in diffused light for a period of 30 days.

The following representative fungi and non-pathogenic fungus, *Scopulariopsis brevicaulis,* were planted in duplicate: *Achorion schoenleinii, Acladium castellani, Candida candida, Endodermophyton indicum, Endomyces capsulatus, E. dermatitidus, Epidermophyton cruris, E. inguinale, E. rubrum, Glenospora gammeli, Geotrichum bachmann, Indiella americana, Microsporon audouini, M. felineum, M. gypseum, Monosporum apiospermum, Monilia albicans, Oöspora humi, Sporotrichum schenkii, Trichophyton crateriforme, T. granulosum, T. gypseum, T. gypseum asteroides, T. gypseum lacticolor, T. interdigitale, T. louisiana, T. niveum, T. chophyton purpureum, T. sulfureum, Willia anomala.*

The following changes were noted. The growths in general became more subsurface on the skin medium and distinctly more subsurface on hair medium. In many instances there was complete loss of surface growth on hair medium. One could note the plate of growth (point of departure) successively deeper in skin and hair mediums. Coincidently the length and amount of surface mycelium and the roughness of the colony would become less or disappear. In most instances the plate of growth was distinct, but in a few this distinctness was lost so that the growth consisted only of mycelium, the breadth of which widened as the distance from the surface of the medium increased. The latter occurrence was noted only in hair medium.

The above findings suggested the possibility that cysteine might be a factor, since the amount of cysteine in hydrolyzed skin would be about one third to one fourth less than that in hydrolyzed hair. Cysteine hydrochloride was therefore substituted as the source of nitrogen, and it was found that the growths were very predominantly subsurface. This seemed surprising unless cysteine had to a considerable extent been

[1] Contribution No. 69 from the Department of Biology and Public Health, Massachusetts Institute of Technology, Cambridge, Mass.