or the visitor might move on, as though to seek a more friendly "bed fellow."

During most of the day the beetles were in shadow, but toward evening streaks of sunlight fell upon them, causing them to shift their position, so that the configuration of the group was materially changed. Whether light or heat or both were the disturbing factors I can not say.

At 6:10 P. M. or about 5 minutes before the sun sank behind a nearby mountain, the beetles started to ascend the trees. But while the general movement was up a few of the beetles would reverse their direction and move down for a time. At 6:20, after the sun had disappeared, there was a great pilgrimage upward, but a few laggards were still "asleep." By 7:10 all but one had ascended the particular tree which I was observing, and by 7:30 all had gone up.

The following morning was partly cloudy and still. Most of the insects had moved to other trees in the vicinity, but a few were in the same location as on the two preceding days. At 9:15 A. M., or more than two hours after the sun had reached the top of the alders, a few of the beetles had come down the trunks or were wandering aimlessly up and down, while others were still in the tree tops. At 11 A. M. I noted several groups of from 10 to 20 beetles on the trunks of several trees, but many were still resting quietly on the leaves or flying from leaf to leaf, but apparently not feeding.

Further observations on the "sleep" behavior of insects and the rôle of various environmental and physiological factors in its control are desirable.

R. T. YOUNG

LA JOLLA, CALIF.

NOTES ON THE COMMON SHRIMP

FOR about a year I have had in my aquarium a number of the common fresh-water shrimp—*Palaemonetes exilipes*. In general these specimens were fed on bread crumbs and bits of scrambled egg. One morning during the latter part of September, I introduced quite a number of mosquito larvae—(*Culex* sp.) into the aquarium. The shrimp at once began to chase the larvae. Even among the plants and grasses of the aquarium the larvae were easily captured. The shrimp held the larvae in their pinchers, introduced the still struggling larvae into the mouth and gradually consumed them.

This does not present proof that in its natural environment *Palaemonetes exilipes* eats the larvae of the mosquito. However, since it positively occurs in an aquarium, it seems probable that such is the case in the natural habitat of these shrimp. Such feeding habits make Palaemonetes very valuable economically.

G. ROBERT LUNZ, JR.

CHARLESTON MUSEUM

REPORTS

RESEARCH AT MELLON INSTITUTE DURING 1934-35

THE steady advancement of Mellon Institute during the past twenty-four years is frequently cited as an illustration of the esteem in which industrial research is held by American manufacturers. The institution was one of the first organizations in the United States founded expressly for investigating the problems of the industries, and its industrial fellowships, which have now passed the one-thousand mark, have served scientifically 3,600 companies, either as individuals or as members of industrial associations. In ten instances the inventions of fellowships have created new industries and as the results of research accomplishments of other fellowships many new branches have been added to existing manufactures. The triple function of the institute as an industrial experiment station, as a training school for industrial scientists and as a center for investigation in pure as well as applied chemistry is seen in the numerous discoveries, the successful processes and products, achieved under its auspices and in the regiment of keen research men who have here acquired specialized knowledge and experience that they are now applying productively in other fields.

In his twenty-second annual report to the institute's board of trustees, just issued, Dr. E. R. Weidlein, director, has summarized the progress during the fiscal year ended February 28, 1935. That there was a growth of the institute's activities in this period is shown by the funds contributed by the industries for the support of research, which amounted to $596,937.68, an increase of 11 per cent. over the preceding year. The money appropriated by companies and associations to the institute during the past twenty-four years amounts to $10,029,544.

At the close of the fiscal year, 56 industrial research programs, each relating to a major problem of technology, different in subject from the others, were being pursued, 16 by multiple industrial fellowships and 40 by individual industrial fellowships. Eighty-seven fellows and 29 assistants held positions thereon. Twenty-eight fellowships, or half the total number, have been in operation for five years or more, and of these fellowships 14 have concluded ten years of research, eight have been at work for 15 years or more,

and three fellowships are 20 years of age or older. These data demonstrate that there is a growing realization by industrialists that long-range basic research is profitable. Throughout the fiscal year (March 1, 1934, to March 1, 1935) 62 industrial fellowships—17 multiple and 45 individual fellowships—were active; and these different investigations required the services of 97 fellows and 48 assistants during all or part of the year. During the calendar year 1934, publications by members of the institute included 11 bulletins, 19 research reports and 41 other papers. Fifty-two United States patents and 49 foreign patents were issued to fellows.

The income of the institute from industrial fellowship donors is expended in carrying on scientific researches of concern to these companies and associations. The institution also has funds that enable it to sustain a department of research in pure chemistry and to support certain investigations of general importance to public welfare, such as, for example, the broad study of air hygiene by H. B. Meller and his coworkers, in progress since 1928. Through its department of research in pure chemistry the institute is according constantly increasing attention to the encouragement of thoroughgoing investigations of fundamental chemical problems. This attitude is the result of altruistic motives and of the realization that such studies are essential as a background and stimulus for industrial research. Since this department was founded in 1927, it has contributed much to the literature of pure organic chemistry. During recent months its studies have been concentrated on cinchona alkaloids, in following lines which might lead to compounds of value therapeutically in pneumonia. So far 59 different preparations have been tested for toxicity, protection against lethal doses of pneumococci in animals and pneumococcocidal power in vitro. Many biological and clinical data are being gathered by the department's medical collaborators, Drs. W. W. G. Maclachlan, H. H. Permar, John M. Johnston, Joseph R. Kenny and H. B. Burchell, at Mercy Hospital, Pittsburgh. To date the most interesting compounds studied, from the medical point of view, have been hydroxyethylhydrocupreine, apoquinine, ethylapoquinine, and hydroxyethylapoquinine. The experimental findings and clinical observations are being published at the conclusion of definite stages of progress in this large investigation. The department's staff is now constituted of Dr. L. H. Cretcher, head, Dr. C. L. Butler, Miss Alice G. Renfrew, Dr. B. L. Souther and Miss Mary Hosler.

The cooperative work with the Institute of Pathology of the Western Pennsylvania Hospital, made through arrangements with Dr. C. B. Schildecker, is being continued. These studies, which are being conducted by twelve scientists under the direction of Dr. R. R. Mellon, also pertain to pneumonia and allied pulmonary diseases. Considerable advancement has been made in an anti-pneumococcic serum and an anti-streptococcic serum.

Mellon Institute has taken an active part, during the past five years, in the preparation of the eleventh revision of the "United States Pharmacopoeia." Dr. G. D. Beal, assistant director of the institute, is a member of several of the committees, and, aided by C. R. Szalkowski, has completed a comprehensive series of studies in the five-year period. Six researches have been published and as many more will appear soon.

Information concerning the subject-matter and progress of many of the industrial fellowships is not releasable, but the institute is privileged to describe some of the developments during the fiscal year, as follows: The carbon black fellowship, whose incumbent is Dr. C. W. Sweitzer, has made a basic investigation of the dispersion properties of carbon blacks that has led to the development of a method for colloidally dispersing carbon black pigments in lacquer vehicles, this colloidal dispersion resulting in markedly improved properties for the black lacquer. The fellowship on ceramic chemicals has given attention to several aspects of enameling procedure, and W. J. Baldwin, the incumbent, has carried into the plant stage of development an improved enameling process. A research creation of the multiple fellowship on protected metals, "Tile-Faced Robertson Protected Metal," developed by D. S. Hubbell, has been shown to have an immediate, broad market in the building material field, because of the combination of an attractive ceramic surface upon a core of asphalt-asbestos protected metal. The multiple fellowship on refractories, headed by S. M. Phelps, has continued research on new test methods for evaluating progress in developmental work and for the control of commercial products while being manufactured, and has evolved the panel spalling test and two improved analytical methods. The same fellowship has also investigated the effect of furnace gas pressure on the behavior of refractories in industrial furnaces. During the past two years Dr. B. H. Gilmore, on the calgonizing fellowship, has carried out comprehensive research on the rôle of sodium hexametaphosphate in sequestering calcium and magnesium ions as they affect detergent operations in which soap is used or formed. By removing these ions from solution without precipitation, the curdling effect of hard water upon soap is completely inhibited and the soap used in washing operations is held in solution to exercise its full detergent action. Sodium hexametaphosphate, in consequence, is being employed extensively in laundering and in mechanical dishwashing; it is also useful for cleaning the foliage of evergreen shrubbery and for

pet-washing. Drs. W. W. Duecker and C. R. Payne on the multiple fellowship on sulfur have found that acid-resistant cements, made by combining sulfur with an aggregate, can be improved by the addition of certain olefine polysulfides, and that such modified cements are valuable bonding agents and protective coatings in structures subjected to acids or corrosive solutions. On the shaving fellowship E. J. Casselman has been studying safety-razor guard-bar design and razor-blade quality; he has developed a procedure that has resulted in the advancement of the technique of controlling factory methods for sharpening blades as well as enabling the manufacturer to specify the correct quality of blade steel. The multiple fellowship on organic synthesis (Dr. E. W. Reid, senior fellow) has been remarkably successful in preparing new, commercially valuable compounds for a wide variety of uses: glycol ethers, novel plasticizers, new types of vinyl resins, triethylene tetramine, and morpholine derivatives. Two new strained foods (a cereal and apricots) have been developed by the food varieties fellowship, and E. R. Harding, the senior fellow, and Miss Helen B. Wigman have continued their study of vitamin C. On the sugar fellowship Dr. G. J. Cox and Miss Mary L. Dodds attained in 1934 results that suggest the existence of a factor which, if present in the diet during a critical period of tooth formation, will aid in the construction of teeth resistant to decay. The useful chemicals that this fellowship demonstrated could be produced from sugar, such as sucrose octa-acetate, calcium levulinate and the ethers of levulinic acid, are now being manufactured by an industrial organization.

Seven new fellowships began operation during the fiscal year—starch, stone, closure, zymology, demulcent, laboratory and thread. Another fellowship, on soya bean, started work on March 1, 1935. The following fellowships concluded their research programs during the year: cleaning, velvet, vanadium, sugar, phosphates and paper finishing.

It is announced that the new building of the institute will be gradually occupied during 1935. The chemical engineering quarters are practically finished and many of the new laboratories will be ready for occupancy within the next few months. It is planned to have the building completed by the end of 1935. The first use of the edifice was to house the Science Exhibition held in connection with the Pittsburgh meeting of the American Association for the Advancement of Science. More than 25,000 persons visited this exhibition, which was open from December 27 to 30, 1934.

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MELLON INSTITUTE OF INDUSTRIAL RESEARCH

SCIENTIFIC APPARATUS AND LABORATORY METHODS

PARADICHLOROBENZENE, AN EFFECTIVE HERBARIUM INSECTICIDE[1]

THE plants in an herbarium must be kept free from pests. This is commonly done by periodic fumigation with hydrogen cyanide or carbon bisulfide. Such methods require either an airtight case in which to carry on fumigation or the general herbarium cases sufficiently airtight to retain the fumes within the case. Both methods may have serious after-effects if the substances are not adequately cleared out of the air. In our case with neither a fumigating case and far from airtight herbarium cases, neither of these methods could be used. Routine poisoning of new specimens checked the introduction of new pests but did not free the old plants.

Taking a tip from the entomologists, we decided to try out paradichlorobenzene. We have found it an immense success. In practice a small unsealed envelope with about a heaping teaspoonful of paradichlorobenzene is put somewhere in the herbarium case. In our practice one such envelope is put at the bottom of the case and does for two columns of 17 pigeonholes each. The chemical volatilizes in the course of two or three weeks. The fumes penetrate the compartments and in a few days diffuse out around the doors. We have done this for our whole herbarium towards the close of the school year for the past two years. In the first fall following this treatment, we were able to find living pests in a bulky specimen of Asclepias, a few pupae in other Asclepiases and in one legume. Thousands of dead larvae and pupae scattered through the herbarium were mute testimony to the action of the paradichlorobenzene. Following the second year of such treatment, we have been able to discover no living pests anywhere in the herbarium.

The same substance may be employed in fumigating duplicates or in recent accessions which have not yet been mounted. The simple practice is to put a small amount in an envelope in the ordinary pasteboard boxes that plants are stored in and allow it to remain until one is ready to use the plants. No effort is made to keep these boxes airtight, but they are usually tied up. In thus treating one group of plants

[1] Contribution No. 346 from the Department of Botany and Plant Pathology, Kansas State College of Agriculture and Applied Science, Manhattan, Kansas.