The diseases of plants, vines, and trees have been studied, and remedies sought, and the station has tried to introduce new crops in sections of the State hitherto comparatively barren. The sorghum experiments for this purpose have attracted attention throughout the whole country. It is safe to say, that, in the scientific and practical value of its work, this station is equalled by extremely few of the European stations.

The station had been steadily growing in the favor of the farmers and general public of the State, and is now regarded as an educating agency of the first importance. Farmers depend upon its work, manufacturers of fertilizers are made careful, dealers in seeds and implements seek its approval. The progress of agriculture in New Jersey is marked by larger staple crops; higher enrichment of the soil; extended cultivation of market-garden products, peaches, and small-fruit; and a great increase in dairying. Even from year to year the progress is plainly marked. That the station contributes much to this progress, there is no room for doubt.

Louisiana has three stations, the first of which was established in October, 1885, by an association of sugar-planters; and the last, in April, 1888. These stations have already accomplished much useful work, including investigations of the manurial requirements of various staple crops of the State; analyses and classification of the soils of the State; analyses of all the commercial fertilizers sold in the State; experiments with forty-two varieties of cotton to determine the relative yield of lint, length of staple, and strength of fibre; and the introduction, with the aid of the United States commissioner of agriculture, of more than seventy varieties of sugar-cane, forty-eight of which are now cultivated in the State. Each station is the headquarters for a large agricultural association, which holds monthly meetings on the station grounds. At the North Louisiana Station, at Calhoun, the farmers have raised by subscription the means to build a hall for these meetings, which are frequently attended by several hundred farmers. During the season for sugar-making, the sugar experiment station, which has quite recently been moved from Kenner to Audubon Park, New Orleans, is visited by planters from all parts of the world. The average number of visitors at this station during the past season was about one hundred a day.

The influence of the Wisconsin Station within the State has been very marked. Its experiments on pig-feeding are favorably known throughout the whole country. The following extract from a letter from Director Henry indicates some of the other good things which the station has done and is doing: "Years ago the station, then called the Experimental Farm, sent out the Mansury barley, which has been worth a very considerable sum to our people. Last spring, after a year's patient work, our first assistant chemist announced the completion of a method by which an ordinary dairyman, with a reasonable amount of care, can determine the percentage of fat in milk or cream with about as much accuracy as the chemist by the gravimetric method. This method of determining fat is being brought into general use by dairymen and others. Last summer our chief chemist, Dr. Babcock, announced the discovery of fibrine in milk, and stated that this new compound played an important part in the raising of cream. Work at the station yet to be announced shows that this discovery is of considerable importance to dairymen, and in it we have an explanation of many of the phenomena of milk and cream."

Similarly favorable reports might be given from stations from Maine to California, and from Alabama to Michigan, wherever the experimenting has been carried on long enough to give a fair test of its value.

Americans have the credit of dropping enterprises which do not pay. It is a significant fact, therefore, that no State which has once established a station has ever abandoned it. On the other hand, the revenues which the stations derive from the States, apart from those which they receive from the National Government, have steadily risen from $2,800, with which the first station began, to more than $125,000 in the present year.

Even if some of the newer stations have as yet brought but little fruit and some that is not well matured, we may confidently expect before many years to have institutions in all the States which will be of the highest service to American agriculture.

One most favorable indication is the earnest desire of the managers of the stations to do the best possible work. This has been particularly manifest at the conventions of the Association of American Agricultural Colleges and Experiment Stations, in which matters of station policy have formed the principal theme of discussion. The underlying thought has uniformly been to learn to do what will best serve the interests for which the stations are established.

The experiment-station enterprise is now equipped for its great work. From its small beginning, fourteen years ago, it has grown out to the farthest limits of our land, has enlisted the best colleges and universities and the ablest investigators of the country, and secured both State and National resources for its service. It has the favor not only of leading minds in science and education, but also of a great army of practical farmers, to whom it has already brought substantial benefits. As the first secretary of agriculture has justly said, "Of all the scientific enterprises which the government has undertaken, scarcely any other has impressed its value upon the people and their representatives in the State and National legislatures so speedily and so strongly as this. The rapid growth of an enterprise for elevating agriculture by the aid of science, its espousal by the United States Government, its development to its present dimensions in so short a period, and, finally, the favor with which it is received by the public at large, are a striking illustration of the appreciation, on the part of the American people, of the wisdom and the usefulness of calling the highest science to the aid of the arts and industries of life. The present is an auspicious time for this undertaking. 'In the history of no nation before have there been such a thirst for knowledge on the part of the great masses of the people, such high and just appreciation of its value, and such wide-reaching, successful, and popular schemes for self-education; no other nation has so large a body of farmers of high intelligence; never before has the great agricultural public been so willing, and indeed so anxious, to receive with respect and use with intelligence the information which science offers; never before has science had so much to give.' The prospects, then, for this, the largest scientific enterprise in behalf of agriculture that any government has undertaken, are full of promise."

The Office of Experiment Stations of the Department of Agriculture.

The number and diversity of problems to be solved in the widely separated sections of our country, the need of linking the stations together, of helping to co-ordinate their efforts, of bringing to them the fruits of accumulated experience, of assisting them in research, and of collating their products and making them available to the public whom they serve, and the evident propriety that the Department of Agriculture should aid the enterprise in these respects, — all these considerations evince the wisdom of Congress in providing for a central office, as a branch of this department, to meet the need.

The stations themselves, through the Association of American Agricultural Colleges and Experiment Stations, were the prime movers in securing the establishment of this office, and have given to it their cordial sympathy and support.

ENEMIES OF THE PLANT-LOUSE.

THE importance of parasitic and predaceous insects in overcoming our insect pests has long been recognized by the practical entomologist. He sees the destroyers swept off as by a flood, and sees in these prolific friends the easy solution of the problem of insect years. He knows, that, were it not for these friends, the destroying hosts would make our earth a desert, and replace plenty with famine. He knows that adversity among these tiny helpers means success to the swarms of insects that devour the crops, and so is rejoiced when he sees these little helpers active and numerous.

The present season has furnished a vivid illustration of this important and interesting fact. On June 30 the heads of wheat in Michigan were crowded with hungry *Aphides*, or plant-lice. These myriad lice, often five or six around a single kernel of wheat, and two hundred on a single head, were sucking the sap and very vi-

tality from the forming kernels. They were rapidly blighting the grain; and, unless some friendly hand were raised against them, the wheat-crop would be utterly ruined. Even then, when the lice were countless in numbers, and when the winged forms were rapidly spreading to the oat-fields, the hand of deliverance was easily discerned in the comparatively few but wondrously prolific enemies of the lice, which had already sounded a halt in the march of destruction. A week later, and the enemies of the lice were in the ascendency; and to-day the lice are nearly exterminated, and the wheat-crop is rescued and the oat-crop saved. Close observation easily demonstrates these truths. Even the careless eye can see the savage insects dining on the lice, or the fatal egg laid which dooms the louse which receives it.

The fact that farmers are noticing these insects friends, and have now an object-lesson which should be rightly understood and carefully studied, leads Professor A. J. Cook, the Michigan State entomologist, to send out a bulletin on the subject of the enemies of the plant-lice. Some weeks ago he was receiving scores of letters asking about the lice: to-day he is receiving as numerous inquiries regarding these friends. That instruction is opportune is evident from such questions as this: "Are these insects going to complete the destruction so actively begun by the lice?"

There are two groups of these insect friends, — predaceous and parasitic insects, — both of which are well illustrated on the heads of wheat of Michigan fields to-day. Predaceous insects are such as devour their prey, much as the cat or weasel devours the mouse. Parasitic insects are those that lay their eggs on or in their victims. When these eggs hatch, the larval parasite proceeds to feast on its host, which thus serves it for both home and food. In the case before us, as soon as the parasite has devoured the viscera of the louse, it uses the skin or crust as a sort of cocoon. These gray, circular cocoons are now thick among the kernels of every head of wheat, and must have been noticed by every observer who has taken pains to examine. A tiny black fly is by far the most important of these little friends that have come to the farmers' rescue, and saved the wheat, barley, and oat crops.

The lice that are the victims of these eager parasities are easily distinguished. They are short, rounded, and gray in color. After the larva disembowels the lice, it uses the dry, thick skin as a cocoon, in which it changes to a pupa. Very soon the mature insect comes forth from a small round hole in the upper, hinder part of the abdomen, and very soon mates, and commences to lay its many eggs in new victims. Of course, these parasitic larvæ fairly swim in the rich nutritious blood of the lice, and so are rapidly developed. Thus we see how it is that the parasites are too much for the lice. Prolific as are the lice, and rapid as they are in development, yet the parasites are even more so, and thus it is that in ten days the parasites have so outnumbered the lice that the latter have been routed and driven from the field. The little flies are just about one-tenth of an inch in length; but, tiny as they are, they will save millions of dollars to the farmers of Michigan and adjacent States during this single year.

The lady-bird beetles are also very active and most efficient aids in the work of ridding the grain-fields of the *Aphides*. Both as larvæ and as mature insects, they feed on the plant-lice, and rapidly deplete their ranks. The beautiful rounded beetles, usually dressed in yellow or orange, and often adorned with black dots and markings, are known and admired by all. Few insects do more good than do these lady-bird beetles. The larvæ of these are elongated, dark-colored insects, usually dotted with gray, yellow, or orange, according to the species. So the insect not only does well, but looks well. There are also four rows of black dots which extend longitudinally, which are easily seen without a glass. Other species of lady-beetle larvæ are duller in color, and so less conspicuous, yet equally active and voracious. If any doubt the good work of these insects, especially the larvæ, he has but to enclose them in a box with louse-infested wheat-heads, or with plant-lice from any plant. The rapid disappearance of the lice will quickly convince the most sceptical of the valuable service of these predaceous friends. These lady-bird beetles are hardly second to the parasite first described, in the work of ridding our grain-fields of the lice. Professor C. M. Weed believes they take a first place in Ohio in this important service.

By close watching in the wheat or oat fields, one may observe a large number of very rapid flying two-winged flies. Not only are these very quick, but many are lined with yellow bands, and are very beautiful. These flies, for food, only sip the sweets from flowers, but they lay their eggs on the plants among the lice, and the maggots that hatch from these are perfect tigers. These syrphus-maggots seem to be veritable gourmands, as the number of plant-lice that one will suck bloodless is surprisingly great. These maggots look some like leeches or blood-suckers. The posterior end is large and truncated, while the mouth end is pointed. The color of the young ones is olive green, while the older or more mature maggots are gray, brown, or purple. There are light-brown transverse bands on the back, and one longitudinal one on each side. These maggots creep along in a slug-like manner, ever reaching into every crevice for the lice. The energetic zigzag motion of the head is very interesting. When it first finds a louse, it stabs him with its sharp mouth-parts, and quickly sucks him bloodless. As the louse shrinks, the maggot swells up. No sooner is one louse victimized than another is seized, and thus these voracious maggots will often destroy a half-score of lice in quick succession. Students have often suggested that these maggots must have India-rubber stomachs. From their great numbers and ravenous appetites, we must conclude that these syrphus-maggots are little, if any, behind the Braconid fly and the lady-bird beetles in their good services in helping to save the grain-crops.

Then the chrysopa-flies, with their beautiful green lace wings and their brilliant golden eyes, are no mean factor in this warfare against plant-lice. The handsome flies do not feed on the lice, but the larvæ do; and, as they have insatiable appetites, they do excellent execution. These flies lay their minute white eggs on the ends of short hairs attached to wheat-stems, twigs of fruit-trees, in short, to any plant that is harboring plant-lice. The larvæ have strong, sharp jaws, and have well earned the name "aphis-lion," which has been aptly applied to them. These and the syrphus-fly maggots work in confinement, or while we are holding the aphis-infected plant in our hand. The Braconid fly and the lady-bird beetles, on the other hand, are more timid and quite easily disturbed; and so, to see them at work, we must approach them with care, and handle them without the least jar. Thus in these beneficial insects Professor Cook describes the little friends that have come to the aid of the farmers, and banished disaster.

BOOK-REVIEWS.

A Practical Guide to the Climates and Weather of India, Ceylon and Burmah and the Storms of the Indian Seas. By HENRY F. BLANFORD, F.R.S. London, Macmillan. 8°. $3.50.

THE leisure following Mr. Blanford's retirement from the meteorological department of the government of India, which was developed in his charge, has been employed in preparing a general account of the climates and weather of that vast empire; and students of meteorology the world over are to be congratulated on having such a work from so competent a hand.

The book is divided into several parts. Part I. treats of the elements of climate and weather, with particular reference to their Indian features, under such headings as "Temperature," "Barometric Pressure and Wind," "Dampness and Dryness," "Clouds, Rain, and Storms." Here we recognize the same simple directness of statement and rational physical explanation of processes that characterize the author's "Indian Meteorologists' Vade-Mecum." The second part treats of the climatic divisions of the peninsula, giving a brief description of the several areas, such as the hills, — under which respectable mountain-ridges of 5,000 to 7,000 feet are included, — the plains, the plateaus, and the coasts. This is followed by an account of the weather-maps issued daily from Simlá on the basis of nearly one hundred telegraphic reports, the storms of the Indian seas, and the relation of Indian rainfall to water-supply and drainage. Several appendices contain tabular climatic statistics for 92 stations, lists of storms in the Bay of Bengal, and rainfall at 114 stations.

It is difficult to select material for extracts where all is so perti-