

A tiny wasp  
whose larvae feed  
on eggs of the face  
and horn fly may be one  
of man's mighty  
allies in

## BATTLING BAD BUGS

By David Fortney

When the president of Japan's Entomological Society came to the United States last year, he made a bee-line for the University of Missouri's Columbia campus. Like many scientists worldwide, he knows where the U. S. entomological action is.

In man's battle against bad bugs, the University has built up an international reputation and an enviable armada for insect control. Here top entomologists from the University and the United States Department of Agriculture pool their efforts to check the population growth of insect pests.

Their task is important, especially in a world already facing a population pinch and food problems.

Of approximately one million species known to exist, only a few hundred kinds of insects are harmful, but they are a real threat. British scientists estimated in a scientific journal last winter that pests are destroying from 10 to 25 per cent of man's food and fiber each year.

The insect offensive comes on many different fronts. To cattle, for instance, the screw-worm fly is a hazard, especially in the South. A female of the species can lay eggs in an open wound on any warm-blooded animal; once hatched, the larvae feed on the beast's flesh and can kill a full-grown steer in less than two weeks. Until science

found a way to combat them these insects were causing U. S. livestock losses of an estimated \$40 million annually. Crops also suffer, falling to such insects as grasshoppers, corn borers and weevils. Man suffers from flies, fleas and mosquitoes, pests which transmit disease while feeding on humans and animals. Nor do man's goods escape becoming table fare for moths, termites and silverfish. Even the tiny midge can add to the harassment and decrease property value. Ask anyone who has painted a new home only to have to scrape off the paint and add another coat because a swarm of midges used his house as a landing field.

Against these insects, chemicals (some developed here) have helped, but they also have caused considerable damage to wildlife and man. Child deaths have been attributed to accidental doses of the chemical killers. An insecticide also was blamed for the millions of dead fish found floating along a 185-mile stretch of the Rhine River this summer. And chemical agents have been charged with upsetting nature's balance and contributing to our environment's pollution.

Entomologists at Columbia are trying to devise new ways of managing insect populations without mismanaging the environment. One project that shows promise is plant-breeding, the transmutation of a plant's genetic make-up to give it more resistance to insect pests. Dr. Mahlon Fairchild, a University entomologist, is working on such long-range experiments with USDA scientists.

"The object is to select and breed plants to cultivate certain traits which better resist insects," Dr. Fairchild explains. "What we eventually hope to do is develop plants the pests won't harm."

The scientists are conducting this study in a three-stage cycle. Fairchild seeks plants with a high resistance to certain insects; another man analyzes them for chemical content; and a third tries to incorporate the traits into a new hybrid. Then the plant returns to Fairchild for testing.

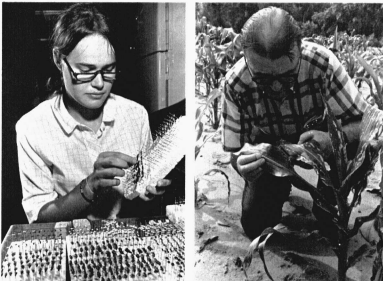
Another approach to controlling bugs without chemicals is through the use of natural enemies — primarily parasites, predators and pathogens that attack our enemy insects. Most of these studies take place in the Biological Control of Insects Research Laboratory southwest of Memorial Stadium in Research Park. There on 10 acres scientists have access to a main control lab, greenhouse, insectary, irrigation pond and a few acres of land.

The lab, operated by USDA Agricultural Research Service's Entomology Research Division, is this country's only federal laboratory to do basic research in biological insect control. Standing guard over the Midwest, some of the world's richest farmland, it also has branches in California, New Jersey and overseas near Paris and Rome. The central lab here operates in cooperation with the University and the Missouri Agricultural Experiment Station.

Director of the biological control lab is Professor Francis R. Lawson. When fully staffed his team will consist of 15 senior research scientists, a crew of professional technicians, engineers, insect-rearing specialists, a horticulturist, librarian and temporary student help.

Lawson feels that in many cases biological controls offer a cheaper and more effective means of checking insect populations than do insecticides, and they do so without the fear of environmental contamination from poisonous residues left on crops.

One possibility is sterilization — using the insect's very life force to destroy it. At the lab here they're sterilizing male butterflies, then releasing them to compete with normal males to mate with mild females. Infertile eggs result, producing other egg parasites, and eventually the population dies out. Scientists had good results using these methods against the screw worm, a major pest of cattle in



Thousands of insects are labeled and pinned in the University's extensive insect museum. At right, Dr. Marcus Zuber, professor of agronomy, inspects bug-damaged corn.



Before insects can be controlled, scientists must learn their ecology. At left, the habits of laboratory-raised corn ear worms are studied.

the South. Sterilization eliminated the screw worm in the southwestern states and might have done so in the southwest except for the flies migrating periodically from Mexico.

Such pests from outside the country have long been a problem to the United States. The Hessian fly, for instance, came to this country's wheat fields with Hessian mercenaries fighting in the American Revolution. Actually, other countries have given the United States its most harmful insects—such things as the corn borer, boll weevil, horn fly, cabbage worm and green pea aphid. To battle these imports, scientists often have had to go to the insects' native land for the solution. When a white scale threatened to wipe out California's citrus orchards, USDA scientists went to the pest's Australian home and returned with a beetle which naturally fed on the scale. Within two years the beetle had the problem under control. A similar problem in Mexico was solved when authorities imported parasite bugs and whipped a black fly which was damaging their citrus crops. Now at the University scientists are studying imported parasites which feed on the eggs of cabbage worms. They hope to find that these can adjust to the Missouri climate.

This is the heart of biological control research—using nature's own checks to attack the cropkillers and pests. Lab scientists are seeking insects which will kill only harmful bugs. In greenhouses here scientists are raising such insects as beetles and ladybugs, avid eaters of mosquitoes, midges and plant-killing aphids. Entomologists want to find which insects control the pests best and what conditions are needed to rear and release the insect-eaters.

Of course the pests have to be studied, too, and the staff has developed ways to mass-produce the pests for test purposes. The number of cabbage worms raised here is the largest ever reared under artificial conditions on an artificial diet. To identify new finds in friend or foe, scientists here have access to Missouri's only public insect museum—thousands of specimens pinned and labeled in rows of trays in the Agriculture building. Directed since 1953 by Dr. Wilbur Tenny, professor of entomology, the museum has insects from around the world, especially beetles and moths.

Such facilities aid University scientists in their efforts to understand and control insects. They serve as classrooms for the students, enabling them to

spread the word when they leave school. They serve as a source of practical information for the people of this state and across the country. (Washington, alone, has processed more than 50,000 insects through the Missouri lab for identification.) A team of extension entomologists, headed by Dr. Wilfred Craig, channels the latest findings to the people in the state.

"When somebody thinks an insect is damaging his crops he just writes to us and sends a specimen for identification," says Craig, explaining the Extension Service's role. "Then we try to tell him what the insect is and send him the latest information on how to fight it."

Besides handling direct requests for service, the Extension Service works through its county agents, giving them periodic training in insect control and information on the latest chemicals and techniques—ranging from biological control to cultural methods such as plowing, planting at certain times and the rotation of crops. This year they've even added a scientific troubleshooter—an extension field testing specialist who tackles problems on the spot so other extension personnel are free to work on long-range projects.

But before the extension agents can channel information to the people, even before the theories are available for the students, comes basic research. And this is why Columbia is where the entomological action is. It was Missouri scientists who found that a harmless-looking brown spider had venom 10 times as deadly as that of a rattlesnake. Entomologists here also discovered that a virus can be used to control cabbage loopers. They also came up with ways to construct a sewer lagoon with minimum insect nuisance and health hazards.

Where do the scientists go from here? "Back to the labs," predicts Dr. Craig, "because there's a lot more to be done. A few weeks ago it was aphids in the sorghum crops. Now it looks like the corn borer might make a comeback. Tomorrow it might be something else." □

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*A graduate student in journalism, David Fortney last spring was named winner of the \$2500 Frank Luther Mott fellowship for magazine study. Before coming to Missouri, Fortney received writing experience as a reporter with the Kirksville (Mo.) Daily Express and with the Army in Vietnam.*