

PUBLIC HEALTH

War Against Insects

Our grandchildren may never see a cockroach, a Japanese beetle or a corn earworm. The pests may all be wiped out by new scientific weapons, deadly to insects, safe for humans.

See Front Cover

► MAN IS PLOTTING to abolish some of his ancient insect enemies from the face of the earth. Insect experts, called entomologists, are fighting a research war on six fronts. Only one front uses the insecticides that have come under so much fire recently.

These are the fronts:

1. Sterilization—mass application of chemicals or radioactive materials can make insects incapable of having offspring.

2. Traps—insect traps will be baited with food or female "perfume" to lure thousands of unsuspecting insects, some that would be killed and others that would be chemically treated, then released to carry sterility and disease.

3. Predators—hordes of creatures, harmless to man, are being sought by scientists and released in infested areas to prey on and destroy harmful pests.

4. Disease—plagues will wipe out huge "cities" of harmful insects as diseases are mass produced and sprayed over large areas.

5. Starvation—insect food supplies will be cut off by planting crops that are immune to insects, taste bad to them, or grow at the wrong time of year for them to eat.

6. Poisons—new chemical poisons will be used in different ways.

Scientists are studying life histories and habits of many insects in a plan to combine these six fronts in a united effort to wipe out pests. The standard housefly like the one seen on this week's front cover, are being bred on milk by entomologists at the U.S. Department of Agriculture's Agricultural Research Center, Beltsville, Md., in experimental tests for making better insecticides.

Insecticides are only part of the answer to the insect problem. At present, these poisons remain the farmers' best protection, but they cost him about \$500 million each year, and must be reapplied year after year in increasing doses.

The chemical poisons that remain on foods threaten man. They kill birds, wildlife and the fish in streams. They also kill useful insects that normally eat vast numbers of pesty insects. Moreover, 70 types of pests have now developed an immunity to insecticides.

Enforced Birth Control

New methods launched by the U.S. Department of Agriculture to check hordes of harmful insects include the sterilization of large numbers of the pests. If insects can bear no offspring, their species will die out.

Mosquitoes, boll weevils, cockroaches, as well as caterpillars, flies, aphids and beetles are now being sterilized experimentally.

The screwworm fly in Florida was controlled by sterilization. This shiny blue-green blowfly lays its eggs in wounds on cattle. The eggs hatch into maggots which burrow into the flesh, often killing the animal.

Agricultural experts raised thousands of captive screwworms on a diet of hamburger and blood. The males were sterilized with radioactive cobalt-60 and released. So many sterile males mated with females throughout the Florida area that most eggs laid that season did not hatch.

On the island of Rota in the Pacific Ocean, two types of fruitflies were eradicated this year by sprays and sterilization methods.

Certain chemicals can make insects impotent. The housefly, for instance, can be lured to feed on a sugar solution loaded with chemo-sterilants. The eggs its mates lay will never hatch.

In the laboratories at the USDA's Agricultural Research Center, Beltsville, Md., entomologists are meddling with the love life of the cockroach. They found that each female insect produces a "perfume" which lures the males to her. Just a whiff of this potent chemical will bring male roaches scurrying to her from all over a building.

These "perfume" chemicals are now being identified, extracted and manufactured. Scientists will use them to bait traps in which insects will be killed or chemically sterilized and released. Lights can also be used in traps at night to attract moths and other night-flying and night-crawling insects.

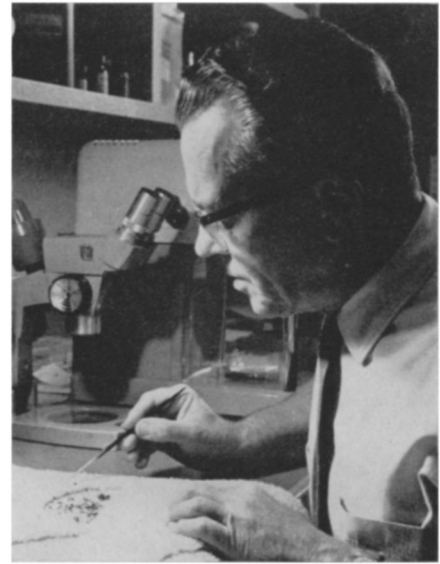
Potent 'Perfumes' Seduce Males

Projects are underway to identify and extract this sex attractant from many insects. The scent is present in such minute quantities that chemists estimate they must grind up hundreds of female insects in order to extract enough lure to be effective.

For instance, to extract the "perfume" from 500,000 female moths, researchers must raise a million moths, since only about half will be female. The moths are scientifically raised in "nurseries," where they are carefully tended during several phases of their metamorphic life, from the caterpillar stage which is the young wormlike larva stage, to the pupa which is the resting stage surrounded by a cocoon, to the adult stage of the winged moth itself.

In one caterpillar "nursery," ten tons of tobacco hornworms are being raised to produce this precious scent. Here, fat green four-inch hornworms are carefully tended, with truckloads of fresh tobacco leaves bringing them their food, and truckloads hauling away the waste products.

Insects are part of a complex balance of



University of California

FABRIC PROTECTION—A University of California at Los Angeles entomologist, Roy Pence, tests his new non-toxic substance developed for protecting fabrics from moths and beetles. The chemical prevents insects from using essential nutrients they find in fabric contaminants and also from using their own nutrients, thus causing death from acute malnutrition.

nature that includes other animals, many of them predatory insects. Those creatures that feed upon others are known as natural enemies. Among the insect enemies are birds and other insects that catch and gobble them up, and the many tiny parasites which live in or on the living body of their hosts.

Some of our insect pests did not originate in the United States, but were imported by way of suitcases, paper-bag lunches, or potted plants. Scientists are traveling to insect "homelands" to search for natural enemies. At the same time they are hunting for new enemies to devour pests native to the United States.

Once scientists can locate and transport a natural enemy into an infested area, it is often difficult for that insect to establish itself in the land which is foreign to it. After it does become established, the insect seldom occurs in large enough numbers to devour insects which are harming crops and fruits.

As the new predators eat up their hosts, they run out of food. As the food supply drops, so do their numbers. As their numbers drop, the hosts multiply again.

In importing an insect to destroy another, scientists face the problems of insect travel and migration. Lady bugs brought into a garden to eat the aphids simply fly away to greener pastures. Entomologists try to

solve this situation by releasing greater numbers of them over a wider area. This means that a lady bug flying out of one garden would be replaced by another lady bug flying in from the neighbor's.

Researchers also plan to set plagues upon harmful insects. Already milky disease spores can be bought at garden supply stores to infest and destroy the grubs of young Japanese beetles.

USDA researchers are trying to produce these disease spores in the vast quantities needed to exterminate the Japanese beetles completely.

Diseases for Insects Only

Low-flying airplanes are spreading a special chemical disease, *Bacillus thuringiensis*, over areas infected with gypsy moths. With the first mouthful the insects stop chewing, for the disease paralyzes their jaws, and soon they shrivel and drop from the leaves. The *Bacillus* disease produces a crystal which is toxic to the caterpillars of the gypsy moths, cabbage moths and many other moths—yet it is harmless to man and other animals.

Airplanes are also spraying a hormone on certain forest insects that can prevent caterpillars from reaching maturity. The wormlike larvae may grow larger and larger until they pop, but will never reach sexual maturity and lay eggs.

Several viruses can kill sawflies on forest trees, cabbage loopers on cabbage leaves, and other pests. These viruses leave no residue on the plants and are not toxic to man. The virus is obtained by grinding up infected caterpillars, mixing the resulting mash with a solution and spraying it over the land. Only five to ten infected caterpillars are necessary per acre, and the application need be repeated only once each season.

Upsetting the living conditions of insects by starving them or taking away their homes is a promising method of getting rid of them. Wheat can be grown resistant to the ravages of the Hessian fly. Corn varieties can be grown resistant to the European corn borer, the corn earworm and other corn-loving insects.

By cutting and plowing under the tobacco stalks after the leaves have been picked, farmers can destroy the housing in which tobacco hornworms live through the winter, ready to attack the young tobacco shoots in the spring.

New Insect Poisons

New insect poisons are used in cooperation with the different attacks on insects. Chemical poisons can be spread in the soil where they are absorbed by plant roots and spread throughout the plant where they kill insects feeding upon the plants. This year three new chemical poisons will be on the market, combining a high level of safety for humans with an increased effectiveness against insect pests.

The all-out war using sterilization methods, disease, predators or poisons must be waged against the insects when they are the most vulnerable. Careful studies of the enemies' weak points reveal that insects are most susceptible at the time of year when the young are exposed or the population numbers are low.

• Science News Letter, 86:74 August 1, 1964

AGRICULTURE

Green Light Means Stop For Pesty Insects

► FLASHES of green light lasting less than one-thousandth of a second can upset an insect so much that he perishes.

By flashing lights at night on cabbage-worms, entomologists of the U.S. Department of Agriculture Research Service have forced the insects to bypass a certain dormant stage of their life cycle and develop into adults "ahead of schedule."

If insects in their natural environment could be subjected to this interruption of their lives, the entomologists believe they would be so badly out of step with nature that they would perish.

Many insects go through four stages during their life cycle: the egg; the larva, when the insect can be most destructive to crops with its voracious appetite; the pupa or dormant stage, and the adult stage.

The successful stopping of insects' life cycle in the laboratory does not necessarily mean the same method can be used for insects in the field, the researchers pointed out. However, commercial Xenon and mercury lamps could furnish enough illumination, and perhaps mobile lights mounted on airplanes, could eventually control insect population in the field.

Light treatments that alter insect development have little or no effect on plant development, the scientists added. Red light is most effective for altering plant growth, and green light is most effective on insects.

• Science News Letter, 86:75 August 1, 1964

Nature Note

Onions in Egypt

► It is written in the tombs: in the days of the Pharaohs, before the shifting sands of the desert covered the great civilization of ancient Egypt, high among the pleasures of the people was—the onion.

Pictures in tombs portraying laborers eating onions date back over 5,000 years to the First Dynasty. As early as the Third and Fourth Dynasties, in the beginning of the Age of Pyramids (2780 to 2100 B.C.), onions are shown on the banquet tables of great feasts.

Onions were among the offerings to the gods of ancient Egypt; priests are often pictured on the walls of pyramids covering altars with their leaves and roots.

Mummies have frequently been found with onions affixed to the pelvic regions of the body, in the thorax, flattened against the ears, and in front of the collapsed eyes. Flowering onions have been found on the chest, and onions have been found attached to the soles of the feet and along the legs.

One of the most important testimonials to the use of onions as a food in ancient Egypt comes from the Bible, Numbers xi, 5. The Israelites, complaining about their hardships while being led by Moses from Egypt to the land of Canaan, said, "We remember the fish which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions . . ."

• Science News Letter, 86:75 August 1, 1964

SCIENCE BARGAINS

Order by Stock No.—Send Check or M.O. Shipment same day received—Satisfaction or money back.

7 x 50 MONOCULAR
Makes inexpensive, lightweight telephoto system for any camera. Optimum in optical performance. Field of view at 100 yards is 375 feet. Relative light efficiency is 75. Exit pupil measures 7 mm. Has socket to attach to photographic tripod. Includes telephoto adapter which fits monocular eyecup—accepts the Series V adapter ring so can be used with any camera, especially reflex. Precision, Japanese made. Approx. 16-oz.
Stock No. 70,635-Q \$17.50 postpaid
ADAPTER RING ONLY \$1.50 postpaid
any camera Stock No. 40,680-Q \$1.50 postpaid

ADJUSTABLE SPANNER WRENCH

Remove your Retaining Rings. Disassemble Lenses, Cameras, etc. Made for U.S. Air Force—available at a fraction of Government cost. A top grade, versatile tool that every instrument and camera repair man or just plain tinkerer should own. Adjustable for 1/2" to 1 1/2" diameter retaining rings. Complete with six different sets of points to fit all types of slots and holes. 3", 6", and 12" main bars. All steel and nicely plated. The finest tool we have ever come across for this type of retaining ring work AND a real bargain at our low price.
Stock No. 70,355-Q \$12.50 Postpaid

BUILD A SOLAR ENERGY FURNACE

A fascinating new field. Build your own Solar Furnace for experimentation—many practical uses. Easy! Inexpensive! Use scrapwood! We furnish instructions. This sun powered furnace will generate terrific heat—2000° to 3000°. Fuses enamel to metal. Sets paper aflame in seconds. Use our Fresnel Lens. 11" Sq. F.L. 19".
Stock No. 70,533-Q \$6.00 Postpaid

SCIENCE TREASURE CHESTS

For Boys—Girls—Adults!
Science Treasure Chest—Extra-powerful magnets, polarizing filters, compass, one-way-mirror film, prism, diffraction grating and lots of other items for hundreds of thrilling experiments, plus a Ten-Lens Kit for making telescopes, microscopes, etc. Full instructions included.
Stock No. 70,342-Q \$5.00 Postpaid
Science Treasure Chest Deluxe—Everything in Chest above plus exciting additional items for more advanced experiments, including crystal-growing kit, electric motor, molecular models sets, first-surface mirrors, and lots more.
Stock No. 70,343-Q \$10.00 Postpaid

WOODEN SOLID PUZZLES

12 Different puzzles that will stimulate your ability to think and reason. Here is a fascinating assortment of wood puzzles that will provide hours of pleasure. Twelve different puzzles, animals and geometric forms to take apart and reassemble, give a chance for all the family, young and old, to test skill, patience and, best of all, to stimulate ability to think and reason while having lots of fun. Order yours now.
Stock No. 70,205-Q \$3.00 Postpaid

CRYSTAL-GROWING KIT

Do a crystallography project illustrated with large beautiful crystals you grow yourself. Kit includes the book "Crystals and Crystal Growing" and a generous supply of the chemicals you need to grow large display crystals of potassium aluminum sulfate (clear), potassium sulfate (purple), potassium sodium tartrate (clear), nickel sulfate hexahydrate (blue-green) or heptahydrate (green), potassium ferricyanide (red), and copper acetate (blue-green).
Stock No. 70,336-Q \$9.50 Postpaid

MINIATURE WATER PUMP

Wonderful for experiments miniature waterfalls, fountains, HO gage railroad backdrops, etc.; Tiny (2 5/8" x 1 3/4") electric motor and pump, ideal for hobbyists, labs, schools. Pumps continuous flow of water at rate of one pint per minute at a 12" head. With 2 D Batteries in series will pump to 24" high. Runs 48 hrs. on battery. Works in either direction. Self-priming.
Stock No. 50,345-Q \$2.25 Postpaid



Be sure to visit the
EDMUND SCIENTIFIC EXHIBIT
HALL OF EDUCATION
NEW YORK WORLD'S FAIR

TEACHERS! Write for Educational Catalog Q-2
Edmund Scientific Co., Barrington, N. J.

MAIL COUPON for FREE CATALOG "Q"

Completely new & enlarged 148 pages. Nearly 4000 BARGAINS.
EDMUND SCIENTIFIC CO.
Barrington, New Jersey
Please Rush Free Catalog "Q"

Name
Address
City Zone . . . State . . .

