ENVIRONMENT

The mosquito killer

Mosquitos beware. William A. Ramoska is out to get you with some "incredibly impressive stuff." Just back from field trials in malaria-ridden Chinadeda, Nicaragua, the Kansas State University insect pathologist found that his bacteria, *Bacillus sphaericus,* brought a swift end to the previously pesticide-resistant mosquito larvae.

Insect pathologists at Ohio State University were sent sick Indonesian mosquitos by the World Health Organization in 1971. They found an unknown bacterium to blame, and Western Illinois University's Sam Singer later identified it. Successful field tests of the pathogen by Ramoska in Florida during 1975 motivated WHO to send Singer and Ramoska to Nicaragua in July.

Ramoska told SCIENCE NEWS that they detected three live larvae per ladle of water at the field site when they applied the bacterial spores. Returning 18 hours later, they found only two live larvae in 30 dips; those larvae, also doomed, were only one hour old.

The bacterium, which could become provisionally available in the U.S. as early as 1981, affects only mosquitos. Ramoska says it appears to be the best mosquito killer known and should be cost competitive with chemical pesticides.

A swamp of value

A cypress-typelo swamp in southern Illinois performs functions that would cost $18,500 and require 415 barrels of oil annually if done by humans, report William J. Mitsch and colleagues at the Illinois Institute of Technology in Chicago. The 75-acre Heron Pond Swamp stored water in wet seasons and slowly released it in dry ones, offering effective flood control. It also retained 11 times more phosphorus, dumped by flooding rivers, than it discharged during the year; too much can lead to eutrophication (SN: 7/1/78, p. 8). Mitsch says wetlands were once regarded as wastelands. Now only half their original acreage remains, and we lose about another one percent each year, he says.

Beeing on top of pollution

Environmentalists are recruiting honeybees to monitor air quality. Bees "show considerable potential" for determining the distribution and magnitude of pollutants, according to entomologist Jerry Bromenshenk of the University of Montana in Missoula. "If we use honeybees correctly, we are practically assured of an early warning of pollutant levels, perhaps in time to avoid harm," he writes in the July-August THE SCIENCES.

Because bees concentrate pollutants, chemical analyses of their bodies are "good indicators of extremely low concentrations of pollutants," Bromenshenk says. Studies he and colleagues are making of biota in an 80-kilometer-square area of southeastern Montana provide data on biological effects of pollution before damage occurs.

Two coal-fired powerplants have been built in the region since the studies began. Already fluoride levels in bees have increased (8 to 16 parts per million) up to 15 kilometers downwind of the plants. The levels do not appear dangerous, but Bromenshenk cautions they may change if the 30 coal and coal-gasification plants, planned for this and adjacent regions, are built.

Studies show bees accumulate radioactive substances leaking from waste-disposal sites and from atmospheric fallout. Bees have also been used to map and measure more than 40 elements, including lead, cadmium and sulfur — some in trace amounts. But don't give up honey yet. Bromenshenk says a natural filter in the bees' abdomens extracts most pollutants so that their levels in honey "are usually quite low."

TECHNOLOGY

Good things come in small bursts

Some very important processes — including photosynthesis and nuclear fusion — involve reaction times of about a picosecond (a trillionth of a second). The possibility of illuminating such processes by using similarly transient bursts of light has made the search for sub-picosecond laser pulses one of the hottest fields around, and the record has just been improved by nearly a factor of two: Physicists at the University of Southern California have produced a pulse of red light 0.17 ps long.

To accomplish this, the USC team, headed by Jean-Claude Diels, uses at one end of their laser a mirror that preferentially reflects light of one color. A common dye, Rhodamine-6A, is then irradiated with continuous laser light until it begins to lase in bursts. The extent of each pulse is determined by the reflecting properties of the mirror and a light-absorbing material mixed in with the dye.

Actually measuring the duration of such short-lived pulses is one of the several problems encountered by researchers in this business. At present this measurement is commonly made by first splitting a pulse into two portions, one of which is delayed with respect to the first and then recombined in a particular way. The specific character of this recombined pulse reveals, remarkably, the temporal extent of the original one. The USC team is attempting to improve this technique, however, because their newest laser appears to be straining the limits of its reliability.

Three, not four, is music to the ears

For a certain engineer at Ohio State University, at least, more of a good thing is definitely not better. Robert B. Lackey recently developed a three-channel sound system that he claims is superior in several ways to the four-channel quadrophonic process, recently introduced as a (debatable) improvement over traditional stereo.

For one thing, his triphonic system is apparently less complicated electronically. The prototype devices essential to its operation contain "four operational amplifiers [tiny solid-state devices], a handful of resistors and a few inches of wire." The cost was about five dollars and "except for packaging, manufacturing and marketing," Lackey asserted, the new system is ready to go with no further research or development work needed.

And what about the audible results of his brainchild? According to Lackey, the three-speaker approach cuts in half the electronic interference between channels (crosstalk) that's inherent in quadrophonic systems and which manifests itself as a disagreeable distortion of the reproduced sound. In one test of the triphonic apparatus, Lackey arranged three speakers at each end of and above a piano keyboard. Recorded this way, music played back made a listener feel as if he "were sitting on top of the piano." Although he and co-inventors John Hull and Henry D. Colson are seeking a patent for the system, there are no formal plans yet for its mass production.

Superconductors are made to give in

A major reason most superconducting materials are not more widely applied is their extreme brittleness, which makes fabricating them into useful shapes very difficult. Now Chang C. Tsuei of the IBM Research Center in Yorktown, N.Y., has improved this situation by discovering that certain popular superconducting alloys, including niobium-germanium, can be formed as ductile films on thin backing materials. After being shaped, the films are annealed and thus regain most of the favorable properties of the superconductor made conventionally. Tsuei's full results are reported in a recent APPLIED PHYSICS LETTERS (33:262).