

## Cockroaches on a treadmill

The cockroach scooting across the kitchen counter is just as energetically economical as a pedestrian land crab, a mouse, a ground squirrel or even a human. Scientists at the State University of New York in Buffalo constructed a miniature treadmill for cockroaches and enclosed it in an airtight device to measure oxygen consumption. Ten insects were exercised once a day for 20 minutes at treadmill velocities of up to 0.12 kilometers per hour (7 feet per minute), which is approximately the fastest pace a cockroach can sustain. The cockroaches displayed a rapid increase in oxygen consumption at the start of exercising, similar to that in vertebrates and decidedly different from that observed in crabs and snails. The minimum cost of transport, the amount of energy required to move 1 gram of animal 1 kilometer, is approximately the same as that for quadrupedal and bipedal vertebrates, report Clyde F. Herreid II, David A. Prawel and Robert J. Full. In the April 17 *SCIENCE* they conclude, "... it appears that the energetic economy of pedestrian locomotion may be similar among animals of the same size regardless of the number of legs involved or the nature of the circulatory or respiratory system used to supply the aerobic requirements."

## Seeds of plant genetic engineering

Methods of moving genes at a scientist's whim have been slower to develop in plants than in bacteria. But two recent advances now indicate that these techniques will soon blossom. In Reston, Va., at the Batelle Memorial Institute conference on genetic engineering Michael W. Bevan reported that a yeast gene moved into a plant tumor is operational. And at a recent conference in Brussels, Marc Van Montagu announced that foreign DNA incorporated into tobacco plants breeds true in future generations.

The bacteria that cause crown gall tumors provide the vehicles that Bevan and others use to carry genes into plants (SN: 7/15/78, p.45). The ability to synthesize and metabolize rare amino acids and the ability to produce tumors are carried on a plasmid, an independent ring of bacterial DNA. The entire plasmid, called Ti, has more than 200 separate genes. But Bevan finds only a segment of 12 genes is maintained in the plants. Bevan, working with Mary-Dell Chilton at Washington University in St. Louis, has infected plants with a version of the plasmid containing the gene for the yeast enzyme alcohol dehydrogenase and a gene conferring resistance to an antibiotic. When the investigators recently extracted protein from the resultant tumors and identified it with antibodies, they found the yeast enzyme. "This result shows that one can genetically engineer plants," Bevan says. Other scientists at the conference, John Kemp and Timothy Hall of the University of Wisconsin, described work in progress that is using this method to transplant a gene for a nutritionally important protein of beans.

Growing a normal plant from a tumor is essential for practical applications of this technique. Van Montagu in Brussels and Jeff Schell in Cologne observed that some tumor cells give rise to shoots that can develop into complete plants. But these plants failed to produce descendants with the transplanted genes. The April 9 *NEW SCIENTIST* reports that Van Montagu now has modified the crown gall bacterial plasmid so that it inserts into a plant's own chromosomes and persists there without causing abnormal growth. He has hundreds of plants that have flowered and produced healthy progeny carrying such transplanted genes as those for rabbit globin, human fibroblast interferon and a soybean protein that plays a key role in nitrogen fixation. This progress now must be complemented by advances in basic plant genetics to allow construction of crops with improved combinations of nutritional, economical and survival properties.

## Appealing microwave injury

Having found "a direct causal relationship" between Samuel Yannon's occupational exposure to microwaves and his death (SN: 3/14/81, p. 166), the New York State workers' compensation board awarded his widow \$29,000 in back payments and \$45 a week for life (or until remarriage). The case, now being appealed in the Appellate Court of New York by Yannon's former employer, New York Telephone Co., is being watched closely by a host of attorneys handling similar cases in which the jury is still out.

More than 20 separate lawsuits charging microwave-induced injury — from burns among microwave-oven users to cataracts, pancreatic cancer and endocrine disorders among radar technicians — are logged in the April issue of *MICROWAVE NEWS*. According to the newsletter, attorney James Lyons is trying to form an association of lawyers representing radar and microwave injury cases. The publication identifies 18 such attorneys (addresses and phone numbers) and cases they're handling or have settled.

## Blood disease and microwaves

Army pathologist Hylar Friedman reports signs of a possible link between chronic exposure to microwaves and polycythemia — a rare blood disease characterized by an excess of red-blood cells — in the Feb. 5 *NEW ENGLAND JOURNAL OF MEDICINE*.

What first roused Friedman's curiosity was the high proportion of polycythemic patients referred to him (for potential therapeutic phlebotomies) who mentioned having had work assignments involving radar. Friedman searched through records at the William Beaumont Army Medical Center and eventually identified 14 men referred to his hospital for therapeutic phlebotomies. Each was tracked down by phone and questioned on work experiences, especially in the military. Half received chronic exposure to microwaves for between three and 23 years.

Adjusting for the size of the El Paso, Tex., population from which these workers came, Friedman reports an incidence of polycythemia of 18.7 per 100,000 men. That's many times higher than the 1.5 to 5.6 cases per 100,000 reported for men within the same age group in an earlier Mayo Clinic study.

According to the March *MICROWAVE NEWS*, Friedman's report "took the microwave research community by surprise." No prior connection between microwaves and the disease had been reported. In fact, though many researchers are looking for blood-microwave interreactions, most focus on white-blood cells.

The newsletter also notes that Friedman had trouble getting his research published. "The military was quite concerned," he said; the army claimed a lack of supporting data in radar epidemiology justified withholding these preliminary findings. However, tipped off by the *NEW ENGLAND JOURNAL* letter, the Food and Drug Administration's Bureau of Radiological Health will be following up this lead.

## Microwaves and exploratory behavior

Exposure to low levels of microwaves — comparable to current safety-guideline levels — suppresses exploratory activity in rats, according to research by University of Texas physiologist Robert Lebovitz. Rats caged in individual irradiation chambers were exposed three hours daily to microwaves while they "worked" — tapped a bar a requisite number of times to get food after first being signaled with a visual light cue. Exploratory activity was also scheduled, but using the bar in these uncued sessions failed to deliver the rat its manna. Both groups proved equally likely to work for food, but compared with a matched group of nonirradiated rats, irradiated animals proved "significantly" less active during the unrewarded exploratory periods.