

The bees go marching one by one

Ants or termites marching in a line may be an unnerving sight, though not an unusual one. But Amazonian bumblebees (*Bombus transversalis*) trekking along tiny forest trails leading from their nest into the woods surprised entomologists. They had thought that among ground-dwelling social insects, only ants and termites participate in such pedestrian activities.

The nest-building bumblebees in the Tambopata Nature Reserve in southeastern Peru clear trails about 2 meters long and 9 to 10 centimeters wide, according to Sydney A. Cameron and James B. Whitfield of the University of Arkansas at Fayetteville.

Although the bees can fly, they walk along the trails to piles of leaves, which they carry home for use as construction material, the team reports in the Jan. 11 NATURE. The bees keep their trails tidy, quickly pushing off leaf and twig fragments that the researchers dropped.

The scientists observed the bee trails on two occasions. At first, two trails extended on opposite sides of the nest. Six weeks later, the bees had cleared three more trails at either 90° or 45° angles from the first two. They also increased the thickness and width of the roof over their nest by 10 cm during that time.



Other types of bees mark their nests with a pheromone to ensure that they can locate it later. Cameron and Whitfield plan to investigate

whether the Amazonian bumblebees also mark their trails with a scent, Cameron says.

Three bees heading out on the trail and one returning to the nest.

whether the Amazonian bumblebees also mark their trails with a scent, Cameron says.

Tracking down insects' molting hormones

During each of the many stages an insect larva passes through before becoming an adult, it must shed its outer shell, or cuticle. Scientists know that a brain peptide called eclosion hormone initiates the events that culminate in this molting, or ecdysis.

Now, a study of the tobacco hornworm (*Manduca sexta*) suggests that the hormone works by setting off another peptide, which actually triggers ecdysis. Dušan Žitňan and his colleagues injected a synthetic version of the peptide into larvae, pupae, and adult insects. The early stages of ecdysis began within 2 to 10 minutes, they report in the Jan. 5 SCIENCE. Žitňan, now at the Slovak Academy of Sciences in Bratislava, Slovakia, and his coworkers conducted the research at the University of California, Riverside.

"The new report . . . indicates that the long-held view that [eclosion hormone] is the sole mediator of ecdysial behavior and physiology is too simplistic," asserts James W. Truman in an accompanying comment. Researchers now need to define how eclosion hormone and the newly discovered peptide work together, adds Truman, a zoologist at the University of Washington in Seattle.

During their research on molting, Žitňan and his colleagues found that certain glands expand just before ecdysis and shrink once ecdysis has begun. They discovered in those glands cells that produce a peptide and release it into the insects' bloodlike fluid, called hemolymph, immediately before ecdysis starts. They named the peptide *M. sexta* ecdysis-triggering hormone.

Letters continued from p. 67

ed upwelling of deep water, a process that sustains one of the world's most important fisheries. We should expect no less dramatic and beneficial effects from artificial ocean fertilization.

Hence, I must also disagree with MacCracken's view of the multibillion-dollar expense of marine fertilization as "sort of money down the drain." The world's fisheries, already seriously depleted by human activity, make up only a tiny fraction of the world's oceans precisely because of simple elemental deficiency.

The human populations these fisheries serve would profit immensely from the unprecedented abundance that ocean fertilization would bring, as well as from the correction of the manmade greenhouse gas imbalance.

Joel Brind
Professor of Biology
City University of New York
New York, N.Y.

The National Science Foundation (NSF) was not the only or even the lead agency in support of the iron-seeding experiment.

In February 1991, after the American Society of Limnology and Oceanography's special symposium on the subject had identified the possible hazards and necessary safeguards for an experiment, Martin came to the Office of Naval Research (ONR) and NSF with a joint proposal to do the field study.

Martin knew that the NSF peer review system is uncomfortable with controversy and that ONR would have a difficult time finding the resources to move a major oceanographic research vessel to the preferred area of study south of the Galapagos Islands. So he broke his proposal into two parts, the safe study of phytoplankton abundance in the lee of the islands and the controversial iron seeding in a barren region of the Pacific near the equator.

It played out exactly as he had planned: NSF funded the safe part and ONR the iron seeding, sharing the ship transit cost with NSF.

While ONR was the lead agency in this remarkable experiment, it should also be mentioned that in addition to NSF support, funding was provided by NASA and the Environmental Protection Agency.

As Monastersky reports, Martin did not live quite long enough to see the results of his masterful planning, but all of us associated with the effort, even at the bureaucratic level, felt his guidance.

Edward J. Green
Office of Naval Research
Arlington, Va.

Martin "suggested that with half a shipload of Fe [iron] . . . I could give you an ice age." There is a class of meteors made of iron. Evidence suggests that a large impact preceded the extinction of the dinosaurs. Could the impact of an iron meteor, group of

meteors, or the debris from a large meteor impact have caused the ice age by depositing iron over the ocean?

Paul Tidwell
Blacksburg, Va.

Across the spectrum on OTA

The last sentence of the article "OTA dies, but its analyses will live on" (SN: 10/7/95, p. 228) was obviously written from a liberal bias. To point out that "By January, all 23 years' worth of OTA reports will be available from the federal government on CD-ROM" would seem to emphasize the quantity, not the quality, of the efforts of OTA.

By the way, who paid for the "lousy" T-shirts?

Marvin Blickenstaff
Myersville, Md.

The OTA staff designed and paid for their shirts.

— J. Raloff

Those who mourn the loss of OTA don't realize that its demise is due to the high quality of its nonpartisan reports.

PACs (political action committees) pay a great deal of money to make sure their version of the facts is used when legislation is crafted. OTA will be missed only if our congressional leaders decide to make laws for the good of the country rather than the highest bidder.

Mike Mahar
San Jose, Calif.