Honey ant war games end in slavery

Slavery among ants was first reported by a Swiss naturalist, 50 years before the Emancipation Proclamation outlawed the practice among humans in the United States. Several ant species are now known to capture and domesticate other ants. Some, in fact, could not survive without these captive castes. Until now, however, no ant behavior analogous to human slavery—the slavery of one's own species—had been observed.

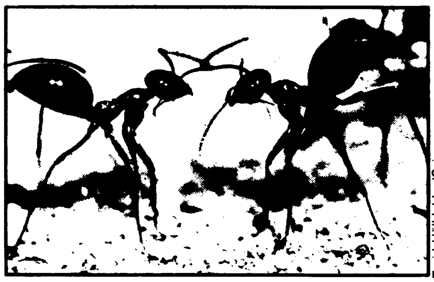
Harvard biologist Bert Hölldobler now reports "intraspecific slavery" by the desert honeypot ant *(Myrmecocystus mimicus)*. He also reports honeypot ant tournaments—the first example of ritualized aggression by an ant species—in the May 28 SCIENCE.

Honeypot ants are unusual enough insects to begin with: Within each colony, a special caste called "repletes" serve as living honey jars for the nectar gathered by workers. The repletes engorge honey, store it in their expandable abdomens, then hang from the ceilings in subterranean chambers like bulbous casks the size of grapes. During the off-season they regurgitate food for the rest of the colony.

These honey ants, like many other species of the world's dominant insect, are vulnerable to attack due to their thin cuticle, or outer covering. In honeypots, this thin cuticle is apparently an adaptation necessary for the honey-storing function. Considering this liability, and the common occurrence of ritualized aggression in other animal species, it was surprising, Hölldobler says, that tournaments and other *nonlethal* displays of territoriality had never been seen in ants. Hölldobler's careful observations of honeypot colonies near Portal, Ariz., however, disproved that rule.

Rather than seeing deadly wars between neighboring honeypot colonies, Hölldobler witnessed elaborate tournaments and ritualized displays on the flat, sandy soil. Workers are recruited to the tournament site (often a shared territorial border), he observed, by the agitated behavior of scout ants and by the trail of "orientation pheromone" they lay down by dragging their hindguts along the ground.

Hundreds of workers so alerted rush out from their respective colonies, follow the trails and approach each other. They can be seen, at this point, to walk on "stiltlegs"—the ant equivalent of tip-toes—to make themselves appear larger and more menacing. Then, rather than slashing each other to death, each ant turns sideways to an opponent, raises its gaster (abdomen) high in the air and begins to drum the opponent's raised gaster with its antennas. The only physical contact are the antennas drumming and a bit of sideways pushing. After 10 to 30 seconds, the weaker partner yields and both go off to display to new opponents.



Turid Hölldobler/Science

Worker ants approach on 'stiltlegs.'

Only if the colony whose territory has been invaded is too small to send large forces to the tournament, does the aggressive display end violently. Under these circumstances—5 of the 28 invasions Hölldobler observed—the invaders rush the colony and carry off larvae, pupae, workers and repletes as slaves for their own colony. "Since, to my knowledge, all cases of slave-making in ants involve two different species," Hölldobler states, "this is the first evidence for intraspecific slavery in ants."

This study was part of Hölldobler's general investigation of spacing and territorial strategies among desert ants—a life's work not nearly as arcane as it may at first sound. "I am studying this for a very simple reason," he says. "The desert is flat and there are very few natural boundaries or visual landmarks for neighboring animal colonies. It is a model place to watch territorial behavior and the ways animals partition space." Most territory research centers on ecological boundaries, he says, and not behavioral mechanisms.

Besides this, he says, ants are the most territorial and aggressive insects, and it is important, from an evolutionary standpoint, to see "how they reach gentleman's agreements and thus avoid lethal confrontations." □

Tree rings reveal past temperatures

They're used for dating earthquake faults, glaciation advances and pollution profiles, and now tree rings are being exploited to establish a temperature record of the past. The thermometer was invented in the late 17th century. In order to determine temperature profiles for earlier times, common practice has been to infer them from surrogate clues such as indications of past anomalous weather conditions and plant growth. A group of researchers from an American university and two German institutions report in the May 27 NATURE that variations in the trace abundances of deuterium and oxygen 18 found in individual sets of tree rings correlate with independently recorded temperature profiles from 1700 to the present.

The qualitative agreement between the isotopic variations and the known temperature profiles was demonstrated by matching Europe's three centuries of recorded temperatures with data from several very old trees. The isotopic data displayed fluctuations averaging about 10 parts per thousand during the last 300 years. Fourier transforms of the variations reveal the strongest periodicities are 95 and 153 years long. The report concludes from studies on thousand-year-old trees that there has been a systematic temperature decrease of about 1.5°C during the past 1,800 years, compared with the 10-degree drop during the last ice age. The scientists say that future plans include exploring the Fourier transforms for the well-known 21-year sunspot cycle and studying trees felled by the advancing ice sheet in Wisconsin 12,000 years ago. □

White House names 15 science medalists

Fifteen persons have been named winners of the National Medal of Science, the government's highest award for distinction in science and engineering. The awards are given "for outstanding contributions to knowledge in the physical, biological, mathematical or engineering sciences." In announcing the winners on June 4, President Ford said, "The records of discovery, contribution and service to the nation of these medalists demonstrate the diversity and strength of our nation's scientific and engineering endeavors."

The 15 winners are the highest number named in a single year. Last year there were 13 recipients. Since 1962, 102 persons have received the medal. The White House said this year's recipients were selected from among 617 nominees. The winners:

JOHN W. BACKUS, computer science, IBM San Jose Research Laboratory
MANSON BENEDICT, nuclear engineering, MIT
HANS A. BETHE, physics, Cornell
SHIING-SHEN CHERN, mathematics, University of California, Berkeley
GEORGE B. DANTZIG, operations research, Stanford
HALLOWELL DAVIS, auditory physiology, Washington University, St. Louis
PAUL GYORGY, biochemistry, infant nutrition, University of Pennsylvania School of Medicine (posthumous award)
STERLING HENDRICKS, chemistry, USDA Plant Industry Station
JOSEPH O. HIRSCHFELDER, theoretical chemistry, University of Wisconsin
WILLIAM H. PICKERING, engineering, physics, Jet Propulsion Laboratory
LEWIS H. SARETT, drug chemistry, Merck Sharp & Dohme Research Laboratories
FREDERICK E. TERMAN, electronics engineering, Stanford
ORVILLE A. VOGEL, agronomy, Washington State University
E. BRIGHT WILSON JR., chemistry, Harvard
CHIEN-SHIUNG WU, physics, Columbia University □