

LETTER FROM FRANKFURT



Defending the dance of the bees

**A former student of Karl
von Frisch supports the
hypothesis that bee
dances are navigational**

by Thomas C. Lucey

Scientists interested in the behavior of, and communication between, honeybees had accepted for 30 years the interpretation put forth by Dr. Karl von Frisch of Germany that the dancing movements of foraging bees upon their return to the hive were precise cues about the direction and distance to newly discovered food. Bee dances were thus viewed as a recruitment device.

Then last year three United States scientists published findings suggesting that the foraging bees recruit and orient the food gatherers by olfactory means and that the dance does not appear to contribute to the search for food, although it might have other purposes in communication between bees (SN: 4/19/69, p. 383).

This argument is now countered by a former student and colleague of Dr. von Frisch. "There are some inaccuracies in the experiments of my American colleagues," says Dr. Martin Lindauer of Johann Wolfgang von Goethe University, Frankfurt.

Suggests Dr. Lindauer: Bees which have already been to a certain feeding site can be re-alerted to return to the site without the dance and presumably by odor; but bees which have never been there must be given directions by dancing forager bees. This view, he says, was well elucidated by Dr. von Frisch in the *ZOOLOGISCHEN JAHRBUCHER* in 1923.

"In any case, the critique of the American colleagues has encouraged us to go again into the experiments and to think of the communication method. It's understandable that some people will not believe that such a complicated communication system (as the dancing) has evolved."

(Three other researchers, again in the United States, were stimulated to repeat the experiments, with elaborate control of variables. Their conclusions, reported in the August 7 *SCIENCE*, agree with the von Frisch hypothesis that the dances are important cues, although the researchers say that in some cases odor cues alone may suffice. The work was done by James L. Gould and Michael Henerey of the California Institute of Technology and Michael C. MacLeod of the University of Oregon.)

The United States researchers who last year questioned Dr. von Frisch's conclusions were Drs. Adrian N. Wenner of the University of California at Santa Barbara, Patrick H. Wells of Occidental College and Dennis L. Johnson of the Air Force Academy. Their theory was that forager bees bring back to the hive an accumulation of odors

that triggers an involuntary recruitment among the workers.

In their experiments, Dr. Wenner and his group placed the hive at the apex of a triangle, with food sites at the base angles and a control site midway between the two. The two sites at the base angles of the triangle were scented for the first part of the experiment. Then later the control site was also scented, and no foragers were allowed to visit it. Nonetheless, new bees came to this third site. The group concluded that because no foragers were able to return from the control site to the hive, no dance information could be given. The bees must therefore have been guided by olfactory means, they reasoned. Other variables were controlled.

Dr. Lindauer has a unique explanation for the visits to the third site: Bees can integrate information, he says. Because the bees from the two other sites in the Wenner experiments performed their dances simultaneously in the same comb, recruits received dance information from both, he suggests. Dr. Lindauer thinks that the recruits then combined the information from the two dances so as to be oriented to the third, in-between, site.

The evidence that bees can integrate information came in an experiment by Dr. von Frisch in 1950, according to Dr. Lindauer, who participated. First, the bees were trained to go around a high rock to reach a food supply, "and to do so by going first in one direction and then reversing themselves on the other side," he says. "We wanted to see what direction the dancing bees would tell the workers in the hive to go. They indicated the direct route to the goal, integrating the two different directions they had flown. The novices that got the information by the dance went to the food supply directly, in a straight line."

A recent experiment by a student of Dr. Lindauer entirely excluded odor, he says. Nonetheless, bees were able to find their way to a food source after being alerted by foragers.

"The results," says Dr. Lindauer, "were favorable to the von Frisch theory."

Dr. Lindauer says the Wenner group overlooked not only the directional experiment, but other von Frisch experiments. "Even in 1923," he says, "von Frisch already had found that experienced collectors that start again to collect at a scented feeding goal can alert bees of the old collecting group without dances. Naive bees, however, will arrive at the goal only after being informed by dances."