the first evidence that social insects use pheromones to advertise their territories and deter invasion by members of other colonies.

The colonies of weaver ants, including queens, were collected in Kenya and transported to Harvard University laboratories. There the worker ants wove their characteristic nests of larval silk and leaves on potted grapefruit and fig trees. The ants weave by holding small larvae in their mouthparts and moving them back and forth, like shuttles.

When the researchers extended the area available to a colony, ants deposited large drops of rectal fluids randomly over the new territory. Since other ant species fastidiously discard fecal material in a restricted garbage pile outside the nest, the researchers suspected that weaver ants were posting a specific scent.

To test their suspicion, Hölldobler and Wilson watched ants explore territory marked by members of a different colony. Even if no alien ants have been in the area for the previous 12 hours, the intruding ants display great caution and frequent aggressive posturing, opening their mandibles and lifting their abdomens vertically, as shown in the photograph. The exploring ants also stop often to inspect the marked spots.

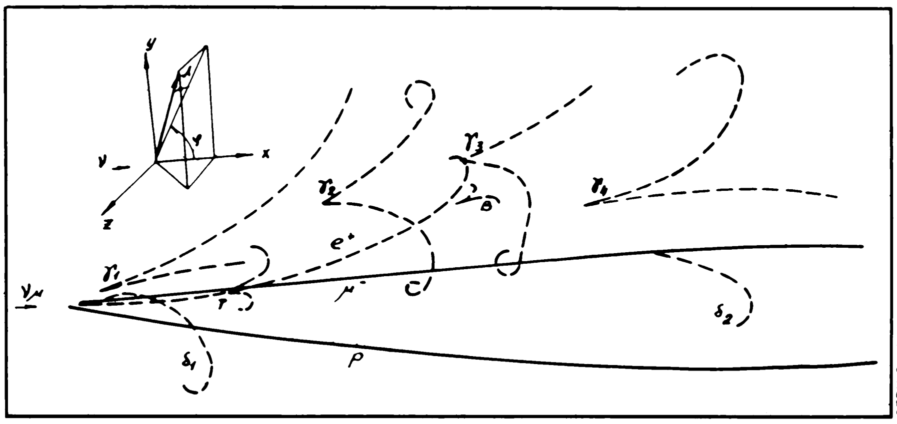
The researchers observed fierce territorial battles when they allowed members of two colonies to enter simultaneously an area previously marked by members of one colony. Although in nature battles rage for hours or even days, the researchers interrupted the laboratory match after 30 minutes. At the interruption the investigators determined which side was ahead by the number of ants present from each colony and where the battle lines were drawn.

"That initial outcome is not necessarily the final outcome. We haven't followed these battles all the way through with our colonies because they're too valuable," Wilson says. "The ants look identical. The only way you can identify them is by watching where they're coming and going, the columns streaming back and forth." In all cases the initial victor was the colony that had marked the floor papers with pheromone.

The researchers determined that the territorial pheromone at least partly originates in an ant's rectal sac. They are now beginning an investigation of the chemical nature of the substance. Exactly how ants produce and recognize chemicals unique to members of a colony is one of the most intriguing problems in the study of social insects, Wilson says. He predicts the answer will include genetic factors, as well as differences in diet and even in the materials of the nest.

The question remains whether the territorial pheromone will be found in other insects or whether it is a peculiar adaptation of the exceptionally aggressive weaver ants. □

Possible heavy lepton in Russia



CERN Courier

Diagram of Serpukhov event has proton, positron (e+), and negative muon tracks.

Heavy leptons are among the most sought-after objects in particle physics. The existence of such particles, heavier relatives of the electron and the muon, is postulated by the new unified theories that have particle physicists very excited, and a final proof of the existence of heavy leptons would be a strong point in favor of the theory. Evidence for the apparent existence of heavy leptons has recently come from laboratories in the United States and West Germany (SN: 5/21/77, p. 325; 5/28/77, p. 341). Now there is an apparent heavy-lepton event reported from the other side of the world, Serpukhov in Russia.

Serpukhov is the site of the Institute for High Energy Physics, which has a 70-billion-electron-volt proton synchrotron that was once the most energetic accelerator in the world. One of the experiments now running there uses the proton beam to make a beam of high-energy neutrinos. The neutrinos are fed into a bubble chamber full of a heavy liquid to see if and how they interact with neutrons or protons in the atomic nuclei in the liquid. The first runs of the experiment yielded about 25,000 pictures. Scanning of half of these has produced 500 that show neutrino interactions taking place. One of those 500 can be interpreted as showing the production of a heavy lepton in the neutrino-nucleus collision.

The chief reason for suspecting the formation of a heavy lepton is the appearance of a negatively charged muon and a positron, which theoretically would be the heavy lepton's decay products, among the particles coming out of the interaction. The heavy lepton suspected in this case would be electrically neutral and so would not make a track in the bubble chamber even if it lived long enough to travel a measurable distance.

The favored interpretation of the event is that the neutrino-nucleus collision produces the heavy lepton (designated M^0) and a proton plus two neutral pi mesons. The heavy lepton then decays into a muon, a positron and another neutrino. The mass of the heavy lepton would be something between 1.4 and 2.1 billion electron-volts. Its lifetime would be about 6×10^{-12} seconds.

There is another possible interpretation of the Serpukhov event, which would be equally interesting to particle physicists. That is that the neutral particle produced in the neutrino-nucleus collision is a neutral charmonium meson (called D^0). (There is also American evidence for the D^0.) Any other interpretation of the Serpukhov event is judged to have a very low probability. □

New measurement of muon magnetism

Somewhere in physicsland the value of the intrinsic magnetism of the muon, the muon's magnetic moment, should be etched in stone. The number is, as the May CERN COURIER puts it, "an acid test" of the accuracy of quantum physics calculations, that is, the use of the basic dynamical theory of subatomic physics as a predictor of measurable physical quantities. The long history of experiments to measure this number has also been a strong test of experimenters' ability to devise ever more precise measuring techniques as theorists keep refining their calculations.

Over the years, one series of muon-magnetic-moment experiments has been done at the CERN laboratory in Geneva. The results of the latest one are now in, and they represent an improvement in accuracy by a factor of 38 over previous experiments. This brings the precision to a point where the effects of some very fine-scale and touchy corrections of the total number must be taken into account.

According to the simplest ideas about the electromagnetic behavior of subatomic particles, the muon's magnetic moment, usually designated by the letter *g* because its other name is gyromagnetic factor,