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Do Trees Communicate for Mutual Defense? Article #762

by Larry Gedney

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It promises to be another bad year for Alaska's aspen and birch trees. According to Richard "Skeeter" Werner, an entomologist with the U.S. Institute of Northern Forestry in Fairbanks, 1986 will be the third year in a row that the trees will have to cope with those pesky clouds of spear-marked black moths and large aspen tortrix. More precisely, it is we who will have to deal with the clouds of insects, while the trees try to survive the voracious attacks on their leaves by the larval or caterpillar stages. After two or three years of defoliation, says Werner, the tops of some trees will begin to die out, and some younger trees may even be killed.

According to an article by Jeanne McDermott in the December 1984 issue of *Smithsonian Magazine*, researchers have found that trees can actively defend themselves against these serious insect attacks, even to the point of communicating a warning to other trees in the vicinity. This startling suggestion was first made in the spring of 1979 by chemist and zoologist Davey Rhoades, who was working at a field site outside Seattle. Rhoades took two groups of willow trees, infested one with caterpillars, and left the other alone as a control. Two weeks later, he plucked leaves from the trees which had been infested and fed them to caterpillars in the laboratory. He found that these caterpillars grew quite slowly. The surprising finding was that a diet of leaves from the non-attacked control trees nearby also caused the caterpillars to grow slowly. Both groups of trees had apparently flooded their leaves with an unsavory chemical that discouraged the insects' growth. Rhoades concluded that the

attacked trees had slipped the control group a danger signal, and that this must have been done by releasing a chemical into the air.

Since then, other workers have achieved similar results with different approaches. Jack Schultz and Ian Baldwin, working in New Hampshire, potted 45 young poplar trees. For the experimental group, they placed 30 of them together in an isolated chamber. The other 15 trees were placed in a faraway chamber, as the control group.

They then mechanically ripped the leaves of 15 trees in the first chamber, leaving the other half of the trees in the same chamber untouched. After 52 hours they analyzed the leaves for specific noxious compounds, called phenolics, that insects disdain. They found that the leaves from both the ripped and the nonripped trees in the first chamber showed significant increases of phenolics. Leaves from the unharmed control group in the distant chamber showed no such change.

Schultz reports that Baldwin's first comment when they got the results was, "Hey, poplars talk!" When their results were announced in *Science*, (a professional journal) they received a blitz of attention from the national media (including the sensationalizing National Enquirer), and from such diverse groups as school classes in Nigeria and garden clubs in Pasadena. The odd but pleasing possibility that plants can communicate delighted the public imagination.

It is unclear whether tree communication is active (that is, initiated by the attacked tree) or passive (that is, perceived by the neighboring tree). Davey Rhoades would like to think that it is active, and that plants exhibit an organized behavior. He further speculates that after a tree is attacked, it may be able to develop immunity from insect enemies, and that this may be the reason that there are cycles of pest outbreaks such as we see in Alaska. If the trees do acquire immunity after an attack, this may suppress the insect population for a few years, until the immunity wears off and the cycle begins again.

Although no one has yet been able to achieve a definitive proof that trees can talk to each other, the hypothesis has been attractive enough to draw other researchers into the field. Much more about the subject should be learned within the next few years.

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