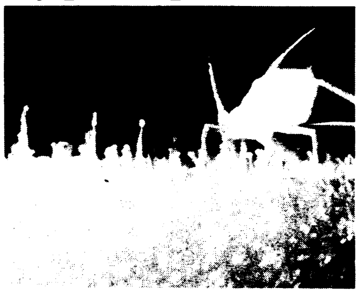
Entrapment by a hairy potato plant



Microscopic view of a green peach aphid trapped on potato plant.

When a green peach aphid — one of the world's most serious potato pests — approaches a potato plant of a new variety it is in for a dreadful surprise. Some of the hairs that cover the hybrid plant are tipped with pouches of glue. When an insect lands, the pouches burst, spilling a strong adhesive that traps the unlucky insect. Even if the insect escapes, it will not live long because its feet and mouthparts become immobilized by the glue.

This vegetable flypaper was created from a cross between cultivated potato varieties in commercial use in the United States and a wild potato species *(Solanum berthaultii)* that grows as a weed in Bolivia. The wild potato has the sticky hairs on all above-ground parts — leaves, stems and even sprouts. Cornell University plant breeder Robert L. Plaisted overcame the initial hurdles in transferring the hairy trait into cultivated potato varieties.

The peach green aphid is only one of the many insect pests susceptible to the hairy pesticide. Colorado potato beetles, leafhoppers, aphids, spider mites, fleabeetles and thrips also succumb. In field tests, the hairy plants were able to control the aphid population by 40 to 60 percent throughout the growing season, reports Cornell entomologist Ward M. Tingey.

One problem with the glue-as-pesticide approach is that the hairy plants also trap beneficial insects. The Cornell scientists believe that limiting the density of the glue-tipped hairs may spare beneficial insects while trapping harmful ones. The investigators predict it will take 10 to 15 years to develop a hairy potato variety with good productivity, nutritional value, disease resistance and taste. The Cornell work was performed cooperatively with the International Potato Center in Peru.

Plants bearing imported genes

In the next logical step for genetic engineering of plants, selected genes have been introduced into plant cells that were then reliably converted into normal adult plants. Although foreign genes have been expressed in genetically engineered plant cells growing in laboratory culture (SN: 1/29/83, p. 68), no one has yet announced activity of deliberately transplanted genes in adult plants.

The successful method for transferring foreign genes into plants was announced by Andrew Binns of the University of Pennsylvania, Kenneth A. Barton of Cetus Corp. in Madison, Wis., and Mary-Dell Chilton of Washington University in St. Louis. As with the other work on plant genetic engineering, these researchers use the bacterium that causes crown gall disease. They find that a genetic change in the ring of DNA that is transferred from the bacterium to a plant cell can prevent the bacterial genetic material from causing tumors in the plant cells. This allows the scientists to grow the cells into intact plants more reliably than they could by previous methods.

In their first experiments the scientists moved a yeast gene into tobacco plants. The gene did not work there because it lacked the proper control signals, but the researchers expect to have little difficulty in overcoming that obstacle. "There are plenty of significant problems left before we can actually have an achievement of genetic engineering sitting on the table in front of us," Chilton says. "But in terms of vector [gene carrier] construction we can see our way clear of all the difficulties."

Catching monopoles is a gas

At a workshop on magnetic monopoles held last fall, Peter Trower of Virginia Polytechnic Institute expressed the difficulty of trying to use the standard sort of particle detectors for magnetic monopoles: "We don't even know dE/dx [the rate at which monopoles would lose energy passing through]." It is by energy loss that the usual solid and gaseous detectors record particles. Now it seems it may be possible to use tanks of gas as monopole detectors, if a recent calculation by Sidney D. Drell, Norman M. Kroll, Mark T. Mueller and Stephen J. Parke of Stanford University and Malvin A. Ruderman of Columbia University is correct. They report their work in the Feb. 28 PHYSICAL REVIEW LETTERS.

A magnetic monopole is, or would be, if it exists, a single north or south pole flying along free. Ordinary magnets always have at least one south and one north pole inseparably bound together; they are dipoles. The idea that monopoles might exist began as a marginal suggestion of modern theories of electricity and magnetism. The most recent theoretical work has put monopoles in the center of the attempt at a unified theory of all physics (SN: 11/27/82, p. 348). There is one experimental event, recorded by Blas Cabrera of Stanford, that may be the detection of a monopole. This experiment implies that any monopoles near the earth will be moving slowly, at between a thousandth and a ten-thousandth the velocity of light, and the calculations are for such speeds.

Theorists had previously thought that slow monopoles would lose too little energy to ordinary matter to be detected by that loss. But Drell and associates point out that to an atom a monopole passing through would look like a time-varying pulse of magnetic field. This pulse would rearrange the energy levels of the atom's electrons in a complex way. The atom would thereby gain more energy from the monopole than had been previously thought and would gain it in such a way that it could emit characteristic radiation signaling the monopole's passage. Atomic helium and maybe other gases would make good monopole detectors, Drell and associates figure.

Dark matter in dwarf spheroids

Just outside our Milky Way galaxy are a number of associations of stars known as dwarf spheroids. Astrophysicists have wondered whether these dwarf spheroids are larger versions of the globular clusters of stars that also surround our galaxy or whether they are true, if tiny, galaxies. Two papers in the March 1 ASTROPHYSICAL JOURNAL LETTERS, one by Marc Aaronson of the University of Arizona's Steward Observatory and one by Sandra M. Faber and D.N.C. Lin of the University of California's Lick Observatory, present evidence that dwarf spheroids have large amounts of dark matter in them, like galaxies, and therefore ought to be considered as such. A third paper, by Lin and Faber, assesses some cosmological consequences.

Aaronson measured velocities of three stars in the Draco dwarf and one in the Ursa Minor dwarf. From such measurements one can estimate how fast the stars in the dwarf spheroids are moving away from each other, and then calculate the gravitational field necessary to hold the dward spheroid together and the mass needed to produce that field. Faber and Lin used the tidal forces exerted by the Milky Way on the dwarf spheroids to calculate the mass necessary to produce a field to hold them together against the tides. Both indicate large amounts of dark matter. From arguments based on the dynamic history of the universe and the scale difference between normal and dwarf galaxies, Lin and Faber conclude that the dark matter cannot be neutrinos as some cosmologists have supposed. The neutrinos would have to be heavier than particle physics would allow them to be. Similarly, miniature black holes, another common candidate, would have to have about 100 times the mass of the sun to fit the argument.