out these abnormal autoantibodies, and found that although the antibodies had no effect on an egg's capacity for fertilization, they *were* associated with a decreased chance of pregnancy. "The study therefore suggests that abnormal phospholipid autoantibodies may be associated with implantation failure," he says. Moreover, taking into account previous studies that have implicated the same class of antibodies with autoimmune diseases such as rheumatoid arthritis and lupus erythematosis, the new research suggests that unrecognized autoimmune diseases may be to blame for many cases of infertility.

"Infertility is a huge and ever-increasing problem," Gleicher says. "The data suggest today that approximately 15 percent of all couples in the United States who are trying to conceive do have an infertility problem." (Infertility is defined as one year of unprotected regular intercourse without conception.) "I think that autoantibodies will become a major issue in reproduction, from the earliest part of the reproductive process throughout pregnancy and up to delivery," he says, noting that certain antibodies have already been associated with fetal distress and fetal death in patients with autoimmune disease.

As for the bigger questions, such as how the body actually distinguishes between "self" and "nonself" and why certain people develop autoimmunity, Gleicher says, "If I knew that I'd win the Nobel Prize in medicine." However, he notes, autoantibody levels are normally regulated by specialized suppressor cells, and "suppressor activity in the female is set at a higher thermostat level than in the male," leaving even healthy women with relatively high levels of autoantibodies. It's possible, he speculates, that women have had to evolve a certain tolerance to high levels of autoantibodies in order to accommodate the partially foreign fetus. "Normally, of course, these levels are not a problem, but sometimes there's a glitch in the system," he says. Some cases of immune-mediated infertility or autoimmune disease "may be the price that women have to pay for being generally capable of tolerating higher autoantibody levels in pregnancy." *– R. Weiss*

The electric life of plants gives fungal spores a charge

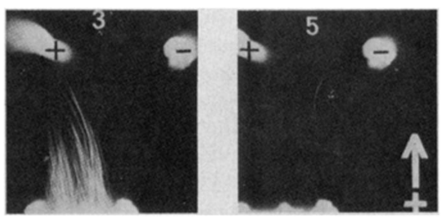
If the relative humidity in your area is falling this morning, you may find that plant-attacking fungi are energetically spewing out spores, spreading plant diseases throughout your garden. Scientists have known for some time that weather conditions can affect the release of fungal spores, but the exact mechanism for this has remained cloudy.

One theory cultivated for the last several years by Charles M. Leach, a plant pathologist at Oregon State University in Corvallis, is that plants possess electrostatic fields that can be influenced by weather changes. Spores, according to the theory, are jettisoned by an electrostatic repulsion that builds up between the similarly charged fungal spores and the underlying leaves suffering a fungal invasion. Leach is publishing his most recent evidence in support of this idea in an upcoming issue of ENVIRONMENTAL AND EXPERIMENTAL BOTANY. If his theory is correct, he says, it could suggest strategies for controlling fungal diseases that have ravaged forests of American elms, white pines and American chestnuts and have caused billions of dollars worth of damage to crops.

A traditional theory of spore release holds that fungi throw out spores when changes in humidity make the fungi twist. Leach notes, however, that if this were the case, spores would be ejected in all directions relative to the surface of the leaf being invaded by fungi. Instead, Leach has observed in laboratory experiments that ejected spores move at a right angle to the infected leaf. He also has found that the spores of some species, such as the downy mildew fungus (which causes disease in onions), are propelled in these parallel trajectories even though they are borne in grape-like clusters. The only explanation for this behavior, he says, is that the spores are moving under the influence of an electric field associated with the leaf surface.

Leach has demonstrated in laboratory studies with detached leaves that ejected spores are charged (since they are attracted to an electrode). He has also been able to stop spore release by electrically neutralizing the underlying leaf with an antistatic gun and, by changing the intensity of the leaf's electric field, he has altered the velocities of the ejected spores.

Most recently, Leach has extended his studies to whole plants in the natural environment. He discovered that there is an electrical potential of up to 120 volts between the ground and the surfaces of bean, cucumber and cherry leaves. Moreover, he found that the potential follows a diurnal cycle, peaking (usually with a positive polarity) in midafternoon and dropping to low values at night. Most notably, says Leach, this cycle is quite similar to the daily pattern of spore release.



Leach/PHYTOPATHOLOGY

Paths of spores ejected from fungi (left) show that the spores are electrically charged, since they move toward an electrode. Spore release halts when the underlying leaf is neutralized (right).

What causes plants to become electrically charged "is the ultimate question," says Leach, "but I have not resolved it." It's possible that some process within the plant itself is responsible, he says, because the diurnal voltage changes under stable weather conditions resemble daily patterns of photosynthesis and transpiration. But it's also conceivable, he adds, that the plant is acting as an antenna and passively picking up changes in the ambient electric field.

Whatever the cause, says Leach, the finding of a diurnal voltage pattern has a number of ramifications. He suggests that farmers could more judiciously apply pesticides that have been electrically charged by noting the weather conditions, time of day and electrical polarity of the plants they are trying to protect. A better understanding of the electrostatics of plants, spores and pollen, he adds, might also provide greater insights for people trying to predict when allergy sufferers will be at their worst or what kinds of plant-damaging air pollutants might most easily settle on vegetation.

In addition to his work with plants and spores, Leach says he has measured the electrostatic fields of bees as they pass in and out of their hive. He found that bees can have fields of up to 9 kilovolts per meter, which is much higher than those found in previous studies. Depending on the weather, the bees' electric fields, much like those of plants, vary during the day, typically peaking in midafternoon. Leach's co-worker Sarah Corbet, at Cambridge University in England, has shown in the laboratory that charged pollen can jump between bees and flowers, but the researchers do not know for certain whether electrostatics is important to pollination in natural environments.

After measuring the high voltages at the surface of leaves, Leach says, he decided to look for currents in the plants. Scientists have postulated that there is some sort of electrophysiological movement of organic materials through plants, he says, but they have measured voltages within plants that have been thought to be too small to drive such currents. He now reports that "there is indeed a current in the microampere range that is consistently running through the plant day and night." To see how important this current may be to the development of plants, he is now raising a crop of sunflowers, some of which have been electrically grounded. *– S. Weisburd*