dual resistance in corn varieties from Antigua and Puerto Rico. This is the first time, they state, that corn varieties with natural resistance to both of the damaging insects have been found. The European corn borer destroys an estimated five percent of the crop in the United States Corn Belt and parts of the Northeast (as well as temperate areas in other countries), and the sugar cane borer does extensive damage to corn crops in tropical areas.

The insect resistance is controlled genetically, and the team hopes it can transfer the resistance from the exotic varieties to temperate varieties. Some corn now used in the Corn Belt is partially resistant to the European corn borer, but the exotic types show an improved resistance in the field.

Two generations of the insects attack the corn each growing season. Small caterpillars attack in the spring when the corn is short and leafy. Some Corn Belt varieties produce a natural toxin which kills some of the insects at this stage. But the survivors change into adult moths and lay eggs which hatch into a second generation of caterpillars the same season. These attack the plant in the summer when the corn is in the tassel stage, and damage the pollen, silk and stalks. The natural toxin does not protect against the second attack, but some mechanism (as yet unknown) in the exotic varieties protects against both generations of the borers.

The natural toxin in existing Corn Belt varieties disrupts the larva's life cycle, Gracen says, "and it is a feeding deterrent—it doesn't taste good." Studies have revealed low levels of the natural toxin in the exotic varieties, so "we know it's not involved in the insect resistance," he says. "Our hunch is that the varieties are nonpreferred or contain some other feeding deterrent. They may not contain a biological poison, but may perhaps have the wrong nutritional composition, so that the larvae die of malnutrition."

Gracen says the exotic varieties had no selective pressure from the European corn borer but probably did from the sugar cane borer and so evolved with resistance to that insect. "Our hypothesis is that the mechanism of resistance gives cross-protection." Cornell entomologist Ward M. Tingey is studying possible mechanisms.

After extensive cross-breeding between the exotic, resistant strains and Corn Belt varieties, the team hopes to release a synthetic with resistance. "We are shooting to release the synthetic two years from now," Gracen says. In areas where the resistant strains are already adapted, such as South and Central America, and where the sugar cane borer is the main problem, there should be "more immediate application," Gracen says. □

Progress on quake prediction

By successfully anticipating a small earthquake near Hollister, Calif., on Thanksgiving Day through measuring a variety of premonitory geologic changes, scientists of the U.S. Geological Survey have made "significant progress" toward actual quake prediction, says Director V. E. McKelvey. "This is the first time that such a variety of precursory phenomena have been observed for a single earthquake in the United States," he says.

The quake occurred in a geologically active area between the San Andreas and Calaveras Faults, which has fallen under close scrutiny in the agency's intensified earthquake research efforts. Beginning some six weeks before the quake, survey scientists began noticing a "dramatic anomaly" in the earth's magnetic field near the region where the quake later occurred. About four weeks before Thanksgiving, tilting of the earth's surface was measured at two nearby locations. Finally, significant changes in the velocity of various seismic waves were reported.

Such observations are expected as results of the "dilatancy" phenomenon now thought to precede earthquakes (SN: 3/9/74, p. 161). As pressure rises in a fault area, subterranean rocks begin to bulge and crack, allowing water to soak into the tiny fissures. The bulging can be measured as a slight tilting in the earth's surface; increased water content brings changes in wave conductivity and resistance to the flow of electricity. But monitoring all these changes over a wide region with sensitive and expensive equipment is difficult, and previous attempts to use these data to predict quakes have sometimes been frustrated by gradual release of the underlying pressure through slow creeping of the fault (SN: 4/20/74, p. 252).

Thus the recent success, "while adding greatly to our confidence and optimism" about attaining earthquake prediction, represents only the beginning of a much larger effort, McKelvey says. "Much more research and much more extensive installation of geophysical instruments must be accomplished before predictions will be of use in planning for public safety." Nevertheless, in the future, such premonitory observations will be reported to other scientists for evaluation and the public will be warned if a damaging quake is anticipated.

A dying child's sense of isolation

When a fatally ill child's condition becomes more critical, parents, as well as professionals (nurses and doctors) often tend to lessen the amount of time and contact with him. Research has also shown that children over 10 with a terminal illness can be aware and anxious of their impending deaths. But what about children under 10 years of age? Are they also aware of their hopeless condition? Do they feel anxieties as well as a growing sense of isolation? John J. Spinetta of San Diego State University and his colleagues at the Childrens' Hospital of Los Angeles report in the December JOURNAL OF CONSULTING AND CLINICAL PSYCHOLOGY their attempts to measure this alleged sense of being left alone.

The psychologists asked 25 leukemic children and 25 children with chronic but nonfatal illnesses between the ages of 6 and 10 to place four figures (nurse, doctor, mother and father) in their usual places, and where they preferred them, in a three-dimensional hospital-room replica which also included a doll representing a sick child in bed. Taking the distances between the statuettes and the patient doll as a reflection of the child's growing sense of isolation, the researchers found that the fatally ill youngster not only perceives a growing psychological distance from those around him but also for whatever reasons prefers it that way. And in both groups, distance of placement increased in subsequent hospital admissions, though the leukemic children increased the distances significantly more than the chronically ill children.

"A lot of studies presume that if a child does not talk openly or use the word death, he isn't anxious about it," Spinetta told SCIENCE NEWS. "Our feeling is the child is very anxious about death."

Could the children have picked up their sense of isolation from the decrease in the amount of adult contact? "I think it works both ways," Spinetta says. "The child perceives he is getting more and more ill from external as well as internal clues he picks up from the nurses and family. I think he is also aware that something is going wrong inside of him."

The researchers hope that their study will provide further impetus to those working with dying children to take whatever steps are necessary to reduce adverse effects in the present methods of treating their illnesses. □