ally excited. "It is one thing to represent a horse, but another thing to represent something that is a figment of the collective imagination, something that doesn't exist in reality," says White. "People had ideas about the world that were abstractions, which we can only describe as religious. We are looking at a widespread belief system that is very ancient." –MICHAEL BALTER

ECOLOGY

Plant Invader May Use Chemical Weapons

In Montana and other parts of the northwestern United States, an imported purple-flowered plant called knapweed grows so thickly that it looks as if ranchers are cultivating it as a crop. Yet in the Caucasus foothills of the Republic of Georgia where knapweed is native, this plant is so uncommon that plant ecologist Ragan Callaway of the University of Montana in Missoula had to enlist the help of local botanists just to find any at all.

Clean sweep. Knapweed is hard to find in its native land, but in Montana it colors the hills purple.

CREDIT: CATHERINE ZABINSKI/MONTANA STATE UNIVERSITY

Ecologists would love to know what explains the rollicking success of invaders such as knapweed, which in the United States is an aggressive, thistlelike weed that cows don't eat and ranchers and government agencies battle using herbicides. A traditional answer is that all the invaders' natural predators and pathogens have been left behind. On page 521, however, Callaway and colleague Erik Aschehoug offer a novel explanation for the success of invasive plants. By comparing how one species of knapweed, *Centaurea diffusa*, behaves with its natural neighbors and with foreign plant species that evolved separately, they found that the invader gains an edge in its adopted home not only by ditching its herbivores but also by wielding weaponry: chemicals exuded from its roots that hamper its new neighbors' growth.

The work is "important" because it could help predict which organisms will be successful invaders, says Kevin Rice, a plant population biologist at the University of California, Davis. "We haven't considered [such underground interactions] in the past." The finding that some plants use subsurface chemical warfare on foreign soil also suggests, says Callaway, that a popular strategy of fighting exotics—siccing insects from back home on the plants—may be even less effective than experts think.

To explore knapweed's underground maneuvers, Callaway and Aschehoug, now a plant ecologist with The Nature Conservancy in Ventura, California, began by pitting *C. diffusa*, or diffuse knapweed, plants against either American or Eurasian grasses in pots. The researchers found that the American grasses produced 85% less leaf and root mass when they were planted with knapweed, whereas knapweed's growth was unaffected. A more complex picture emerged when Eurasian grasses were planted with knapweed: The grasses' biomass dropped by 50%, and the knapweed's growth declined as well.

Callaway and Aschehoug suspected that knapweed's roots exude organic chemicals that stopped the Montana plants from absorbing nutrients. To test that idea, they added to their knapweed-grass pairs some activated carbon, which sucks up organic molecules. They found, Callaway says, that the addition "changed the balance of competition. The American grasses did better, and the Eurasian grasses did worse." Confirmation that knapweed interferes with the American grasses' ability to take up nutrients came when the team then injected the soil with a radioactive form of one potentially limiting nutrient—phosphorus—and tracked how much the various plant pairs snagged.

In the absence of the carbon, knapweed more than halved the amount of phosphorus captured by the American grasses; adding the carbon helped these grasses a bit. In contrast, the Eurasian grasses not only took up just as much phosphorus when grown with knapweed, but also appeared to pack weapons of their own: Adding carbon in the presence of knapweed drastically reduced the amount of phosphorus the Eurasian species took up, suggesting they had been pumping out chemicals that helped them

ScienceScope

Making Amends Following through on a promise made earlier this year, the U.K. government has handed out grants totaling $36 million to scientists who lost the contest for a valuable facility. Last March, the government announced that the $880 million Diamond synchrotron, which will produce x-rays for studying materials, will be built at the Rutherford Appleton Laboratory in central England near Oxford and not at the Daresbury Laboratory in the northwest (*Science*, 17 March, p. 1899). As compensation, the government promised new science funds for the northwest.

This week, a panel awarded the first nine grants, choosing from 52 proposed projects. The winners include a $3.6 million genomics center, a $3 million virtual engineering effort, and a $10 million imaging institute. The panel recommended further study of two other big-ticket items, including a $120 million advanced light source at Daresbury and a $25 million biopharmaceutical facility.

Some scientists think the funding is inadequate. Physicist John Dainton of Liverpool University, a member of the grants panel, said that the "compensation is just a drop in the ocean compared with the loss of a synchrotron."

Dedicated to History The leaders of Germany's top basic research organizations gathered in Berlin this week to dedicate a monument to the victims of Nazi-era brain research, just days after a historical commission released a preliminary report on biomedical science abuses during the Hitler era.

The new monument to "the victims of Nazi euthanasia crimes" marks the site—now on the campus of the Max Delbrück Center for Molecular Medicine—where scientists at the Kaiser Wilhelm Institute for Brain Research experimented on brains taken from Nazi victims, including the mentally disabled. At the ceremony, Max Planck president Hubert Markl said his commission's new report makes it clear that "directors, scientists, and lab assistants of several biomedical Kaiser Wilhelm institutes placed themselves in the service of a criminal regime." Max Planck succeeded the Wilhelm institutes.

Markl joined Ernst-Ludwig Winnacker, head of the DFG granting agency, and Detlev Ganten, head of the Max Delbrück Center and the association of German research centers, in calling for a full accounting of Nazi-era abuses. Winnacker said a new DFG panel (*Science*, 2 June, p. 1576) plans to share information with the Max Planck commission's ongoing inquiry.

compete with knapweed.

"The big deal is that *Centaurea* is interacting really, really differently with its long-term neighbors than with its new neighbors," says Callaway. His next step will be teasing out whether knapweed's as-yet-unidentified root chemicals affect its competitors directly or have an indirect effect by changing how soil microorganisms interact with plants. **–MARI N. JENSEN**

Mari N. Jensen is a science writer in Tuscon, Arizona.

EDUCATION

Gates Gives Cambridge A Rival to Rhodes

Cambridge and Oxford universities compete in everything from chess to cricket, but for nearly a century Oxford has had the field to itself with its Rhodes Scholars program for attracting non-British students. Now Cambridge, thanks to a new $210 million trust announced on 11 October by the Bill & Melinda Gates Foundation, is launching a new high-visibility scholars' program of its own, which each year will fund at least 225 students from outside the United Kingdom.

The university will select Gates Cambridge Scholars based on merit, not need, focusing on academic ability and leadership potential. The program will support students from any country; Rhodes Scholars, in contrast, must come from one of 19 jurisdictions. The scholars, who will receive about $40,000 a year in support, will live together in what will be called the Gates House. "We are hoping that the young people we select will be motivated to use their education to put something back into society for the benefit of a much wider community," explained Bill Gates Sr., CEO of the foundation and father of the Microsoft co-founder, in a prepared statement. The Gates Foundation currently has roughly $21 billion in assets, making it the largest philanthropy in the world.

Gates Cambridge Scholars will be able to pursue either a graduate degree or a second bachelor's degree, a particular attraction for students who have attended undistinguished schools in poorer countries. Although the program will not evaluate a student's financial situation, "the large bulk of the scholarships will go to people who wouldn't be here otherwise," predicts Anne Lonsdale, pro–vice chancellor for international relations at Cambridge.

Cambridge already has scholarship funds set up for overseas students, but the new gift dramatically changes the amount of available resources. "Instead of having to worry about every penny that goes into scholarships, suddenly we have all this money," Lonsdale says. "We're deeply happy."

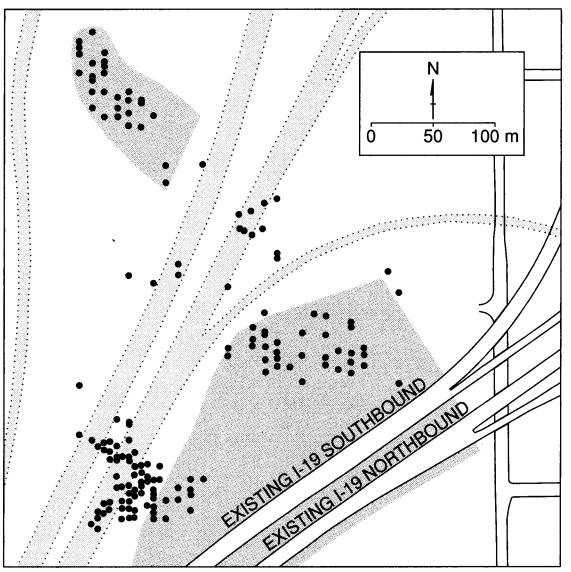
–JON COHEN

ARCHAEOLOGY

Arizona to Take High Road to Preservation?

TUCSON, ARIZONA—Building freeways is big business in this rapidly growing state. So it's news when state transportation officials agree to weigh a proposal to set aside a scientifically valuable parcel of a federal highway project for future research rather than excavating it and selling it to the highest bidder. Should it proceed, Arizona could set a new standard of stewardship for government agencies that determine the fate of ancient relics.

The renovation of Interstate 19 at its intersection with I-10, a major north-south interchange barely 2 kilometers from downtown Tucson. Under the plan, one of the nation's most prolific road-building agencies would retain and actively manage a plot of unneeded land for the sole purpose of preserving its archaeological resources. "This is a big deal," comments Jim Walker, the southwest regional director of the Archaeological Conservancy, a nonprofit group based in Albuquerque, New Mexico, that acquires and preserves key archaeological sites. "Highway rights-of-way are hot zones for archaeology, and we need to preserve much more raw data in the ground for more advanced research. This sets an important precedent for preserving archaeology rather than doing a one-time excavation before the bulldozers come in."



KEY: • prehistoric pit house
area to be preserved
proposed interchange alignment

The preserve plan, which has been tentatively embraced by the highway department, entails key portions of the so-called Julian Wash site, one of the largest and longest occupied Hohokam culture village sites in the Tucson area. About half the 22-hectare site has already been destroyed by urban development and road building, and next year construction begins on six lanes of new freeway that will slice through other sections of the site (see map).

The state has retained Desert Archaeology Inc. (DAI) of Tucson to conduct extensive "data recovery" on the site in compliance with the National Historic Preservation Act. These excavations will likely reveal scores of pit houses and other features reflecting the village's continuous occupation from 500 B.C. to A.D. 1150. That period encompasses the arrival of agriculture and pottery in southern Arizona and the rise of the Hohokam, one

Scientific road kill. These ceramic jars from a Hohokam pit structure (*right*) were uncovered during excavation preceding the realignment of I-19 (*above*) in Tucson.

CREDITS: (TOP TO BOTTOM) GEO-MAP INC.; H. D. WALLACE

corridor in the state, almost inevitably means uncovering the remains of previous civilizations. And antiquities laws require extensive investigation of any major site. These efforts, which often include surplus lands that are intended for sale, can be a boon to science: Eight major digs involving I-10 over the past 5 years have yielded important findings about the origins of prehistoric village life in the Southwest. However, even a careful excavation leaves one fewer site for the next generation of researchers.

That dilemma has led to a novel plan for a small parcel near a $60 million, three-level