any laboratory that has a superconducting accelerator, which includes Fermilab, Brookhaven, and the soon-to-be-completed CEBAF outside Norfolk, Virginia. SSC scientists say the cryogenic facilities could probably be dismantled and moved for just a few million dollars.

The linac is another bone of contention. Instead of making it the centerpiece of a medical facility for cancer therapy and other biomedical purposes, as Richards envisions, Brookhaven scientists are thinking about its value as an upgrade of Brookhaven's 33-year-old Alternating Gradient Synchrotron (AGS), converting it into a machine that could generate intense beams of particles known as kaons.

Of all the ideas floating around, the most intriguing to physicists is to use the facilities as a base for U.S. participation at CERN, the European physics laboratory. Advances in the SSC's detector technology complement what's being planned for CERN's proposed Large Hadron Collider (LHC) project, say SSC scientists, and the magnet test and development laboratory could build and test magnets for the LHC as well. "The Europeans do not have magnets yet for the LHC," says Burton Richter, director of the Stanford Linear Accelerator Center and president of the American Physical Society. "It would make sense to use a cut-down SSC laboratory to do the industrial construction and testing of those magnets."

Both ideas fall into the realm of wild speculation, however, because U.S. participation at CERN is still in an inchoate state, and the LHC itself has yet to be formally approved. Lorenzo Foa, who will become the next research director of CERN and is the lab's representative to HEPAP, told a meeting of the HEPAP panel last month that CERN is considering delaying for 6 months any further decisions on the LHC to provide time to evaluate possible U.S. participation.

While discussions about assets continue, lab officials are more worried about carrying out the "orderly termination" Congress has demanded. On 12 November, John Peoples, the director of Fermilab, became the SSC director after Schwitters resigned. Peoples says his first task is to implement DOE's forthcoming orders to reduce the laboratory staff, including 150 physicists, as well as deciding the fate of some 3000 outstanding contracts. After that, he says, he will work on the thorny issue of maximizing assets. "When the contractors come back with their possibilities," he says, "and the physicists think of what's possible, and the SSC staff thinks of what's possible, and the state of Texas thinks about what's possible, then something sensible and very defensible will come out. And that's what we'll bring back to Congress."

–Gary Taubes

PEST CONTROL

Debating the Use of Transgenic Predators

Marjorie Hoy wants to do the right thing. The University of Florida biological control specialist hopes to use genetic engineering to produce mites and insects that are highly effective enemies of crop pests. Her work is in its early stages—neither she nor other researchers are poised to field test genetically engineered arthropods—but she wants to know that, when she does release such an arthropod, it won't do more harm than good. The problem she faces, however, is that the rules for determining safety haven't yet been determined themselves.

So, with the help of the U.S. Department of Agriculture's (USDA) National Biological Control Institute, Hoy organized a small workshop on the topic in Gainesville, Florida: "Risks of releasing transgenic arthropod biological control agents." From 13 to 16 November, some 30 ecologists, entomologists, and molecular biologists gathered to outline scientific guidelines that researchers can use to help them plan experimental releases of transgenic arthropods.

The potential such creatures have for controlling crop pests is many and varied. Hoy, for instance, is working to develop a transgenic version of a mite, *Metaseiulus occidentalis*, that helps control pest spider mites in California almond orchards. Hoy has inserted a marker gene into the mite that could be used to track how far transgenic mites disperse when they are released. The next step is to make a predatory mite with a gene for insecticide resistance; conventional spraying for other almond pests currently kills off the predatory mite, leading to a spider mite population boom. More desirable traits in a predator—such as altering its host specificity or improving its ability to diapause over winter—are more complex genetically and will take longer to develop.

Scientists have been field testing transgenic crops in this country for years, so why are they worried about arthropods? For one thing, arthropods move. The same problem faces researchers working with transgenic fish, such as salmon that grow faster than wild salmon. Unlike transgenic plants, which typically can survive only in managed agricultural systems, fisheries geneticist Anne Kapuscinski of the University of Minnesota says, "many transgenic fish and insects can escape and do well. It makes the questions you must ask more complex and important because there is a greater chance of environmental risk." (Kapuscinski organized a similar workshop back in August at the University of Minnesota on environmental safety standards for releases of genetically modified fish and shellfish.)

M. HOY

Future pest control. This predatory mite could be genetically modified to improve its ability to feed on spider mites (smaller animal with dark spots).

Concerns about transgenic arthropods aren't limited to their mobility, but extend to shifts in their appetites and even in their genes. University of Minnesota entomologist David Andow, who attended the conference, says that a biological control agent might develop a taste for a nontarget herbivore, for example, which could release a weed previously controlled by the herbivore.

Workshop participants also discussed the possibility of transfer of the foreign gene from the genetically engineered organism to other arthropod species. Insects sport a wide variety of transposable elements, so-called jumping genes, that are likely vectors for incorporating foreign genes into arthropods. But these genes may facilitate their own cross-species transfer, and if the transposable element contained a gene that conferred resistance to an insecticide, for example, such a transfer to a pest would be a calamity.

Many scientists at the workshop felt this fear was somewhat exaggerated. Hugh Robertson, a molecular biologist at the University of Illinois, says this type of transfer may occur "more often than we thought" on an evolutionary time scale, "but on a human time scale it is a rare event." But Jane Rissler, a senior staff scientist at the Union of Concerned Scientists, doesn't think this is reassuring enough. "How can you know so little [about transposable elements] and predict that nothing else will happen?" she asks. "It doesn't appear to be a big risk but is something to keep in mind when you don't know the genome very well."

That's the type of concern workshop participants hope to address in their draft guidelines, now being drawn up. These guidelines are intended to stimulate scientific discussion about the risks and benefits of this type of pest control, and eventually to play a role in formulating government policy.

–Billy Goodman

Billy Goodman is a science writer in Montclair, New Jersey.