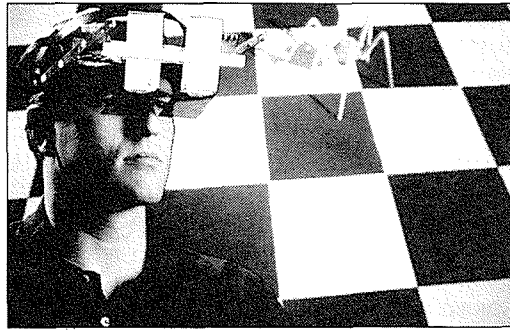


Human Interface Technology Laboratory, and other researchers hope that such travel to imaginary realms will "open up new intellectual vistas in education, entertainment, art, and architecture, as well as in science," reports Wheeler, an assistant editor at the *Chronicle of Higher Education*. But journalist Tisdale suggests there may be a darker side to such "trips."

To journey to a virtual world, as Wheeler describes one simple version of today's technology, a person dons goggles, a helmet, and a glove with fiber-optic cables. Before his eyes appear computer-generated images. "The picture in front of each eye... is slightly different, creating the illusion of three dimensions." An electromagnetic field is generated around him, and wires running from his helmet let the computer know where his head is in the field. "As the user's head moves, the computer adjusts the view being projected in the goggles to what the user would be seeing from the new stance inside the virtual reality." The user can "fly" simply by pointing with his gloved hand.

Variations on virtual-reality technology already have been used to help physicians position beams of radiation for cancer therapy and to aid biochemists seeking to attach drugs to protein molecules. But virtual-reality researchers have more exalted goals in mind. One scientist told Wheeler that the technology's main aim should be to take people to "absolutely unreal" places. He envisions, for instance, people acting as variables in mathematical equations and watching forms, colors, or curves shift around them in response to



Wearing head-mounted apparatus, a researcher at the University of North Carolina enters the computer-generated world of "virtual reality."

changes in the variable's value.

Today's technology is still earthbound, however. "Virtual reality as an experience... is more like going to the movies than going to a new world," Tisdale reports. The phrase *virtual reality*, she says, "is too clever by half for the technology itself. But it reflects the fantasy of its makers: the dream of making worlds, of visiting environments and living inside stories without leaving the living room." And such prospects have aroused some fears.

Jaron Lanier, founder of VPL Research, and others, she writes, "talk of wanting to live outside limitations, to live in a world in which even the laws of physics are designed to one's liking. The connection to [the] drug culture, both as source material and adjunct, is unmistakable.... There is no doubt that the proponents of virtual reality imagine this technology creating a culture just as powerful." That, Tisdale warns, could turn out to be a "bad trip."

Tumblin' Pest

"Tumbleweed" by James A. Young, in *Scientific American* (Mar. 1991), 415 Madison Ave., New York, N.Y. 10017.

Thanks to Hollywood westerns and Zane Grey novels, tumbleweed has come to be an evocative symbol of the Old West in all its romantic glory. But in the real West, writes Young, of the U.S. Agricultural Research Service, the weed did not appear until the late 1870s and then it became "the scourge of the frontier." As the wind

witch (just one of the names settlers had for it) spread uncontrollably across the northern Great Plains, it caused "sudden agricultural havoc."

To farmers, tumbleweed was anything but romantic. Its sharp, spiny leaves penetrated the leather gloves worn by men threshing grain and cut their hands. More

important, tumbleweeds cut the legs of horses working in infested fields. "Because the horse was the basic source of power for preparing fields and harvesting and transporting grain on prairie farms, any threat to the horses was a threat to the existence of homestead agriculture," Young notes. As the obnoxious weed tumbled across the Plains in the 1880s and '90s, the agricultural threat it presented was so serious that many worried farmers abandoned their houses and fields.

Tumbleweed first arrived in the West about 1877, on a farm in South Dakota. It was an accidental import from southern Russia. Seeds of the plant had apparently been mixed in with flax seed brought over from Europe. Once here, the Russian thistle (as U.S. Agriculture Department botanists called it) thrived on the open plains.

The tumbleweed could not have competed successfully with the Plains' native tall prairie grasses. But during the last decades of the 19th century, wheat farming

spread rapidly across the eastern part of the northern Great Plains, encouraged by railroad expansion and the development of portable, steam-powered grain threshers. "The destruction of the native prairie grasses enabled the thistle to exploit an ecological niche," Young notes.

Farmers themselves also helped the wind witch to spread. They often unwittingly sowed Russian thistle seeds along with their crop seeds, and grain shipments by railroad were contaminated. "In addition," Young writes, "the same steam threshermen who so disliked the spiny weed frequently did not thoroughly clean their machines and so dispersed the seeds as they traveled from farm to farm."

By about the turn of the century, the weed had tumbled all the way to the Pacific coast. Early eradication efforts failed—the infestation was too extensive. Not until World War II did scientists develop herbicides that finally ended the wind witch's pesky career.

RESOURCES & ENVIRONMENT

Environmental Security?

"Environment and Security: Muddled Thinking" by Daniel Deudney, in *The Bulletin of the Atomic Scientists* (Apr. 1991), Educational Foundation for Nuclear Science, 6042 S. Kimbark Ave., Chicago, Ill. 60637.

Iraq's intentional oil spills and bombing of Kuwait's oil wells during the Persian Gulf War dramatized the destructive impact warfare can have on the environment. Jessica Tuchman Mathews, vice president of the World Resources Institute, and other analysts have suggested broadening the concept of U.S. "national security" to take into account such environmental hazards. Deudney, a Fellow at Princeton's Center for Energy and Environmental Studies, strongly objects.

Despite what happened in the Persian Gulf, he points out, "most environmental degradation is not caused by war [or] preparation for war." Threats to environmental well-being and threats to national security from violence are very different,

he argues. "Both may kill people and may reduce human well-being, but not all threats to life and property are threats to security If everything that causes a decline in human well-being is labeled a security threat, the term loses any analytical usefulness."

Most environmental degradation, Deudney observes, is "largely unintentional, the side effect of many other activities." And nothing about the environmental problem is particularly "national" in character. "Few environmental threats afflict just one nation, and many altogether ignore national borders." Nor are most environmental threats simply "international," since there are perpetrators and victims in the same country. With respect to environ-