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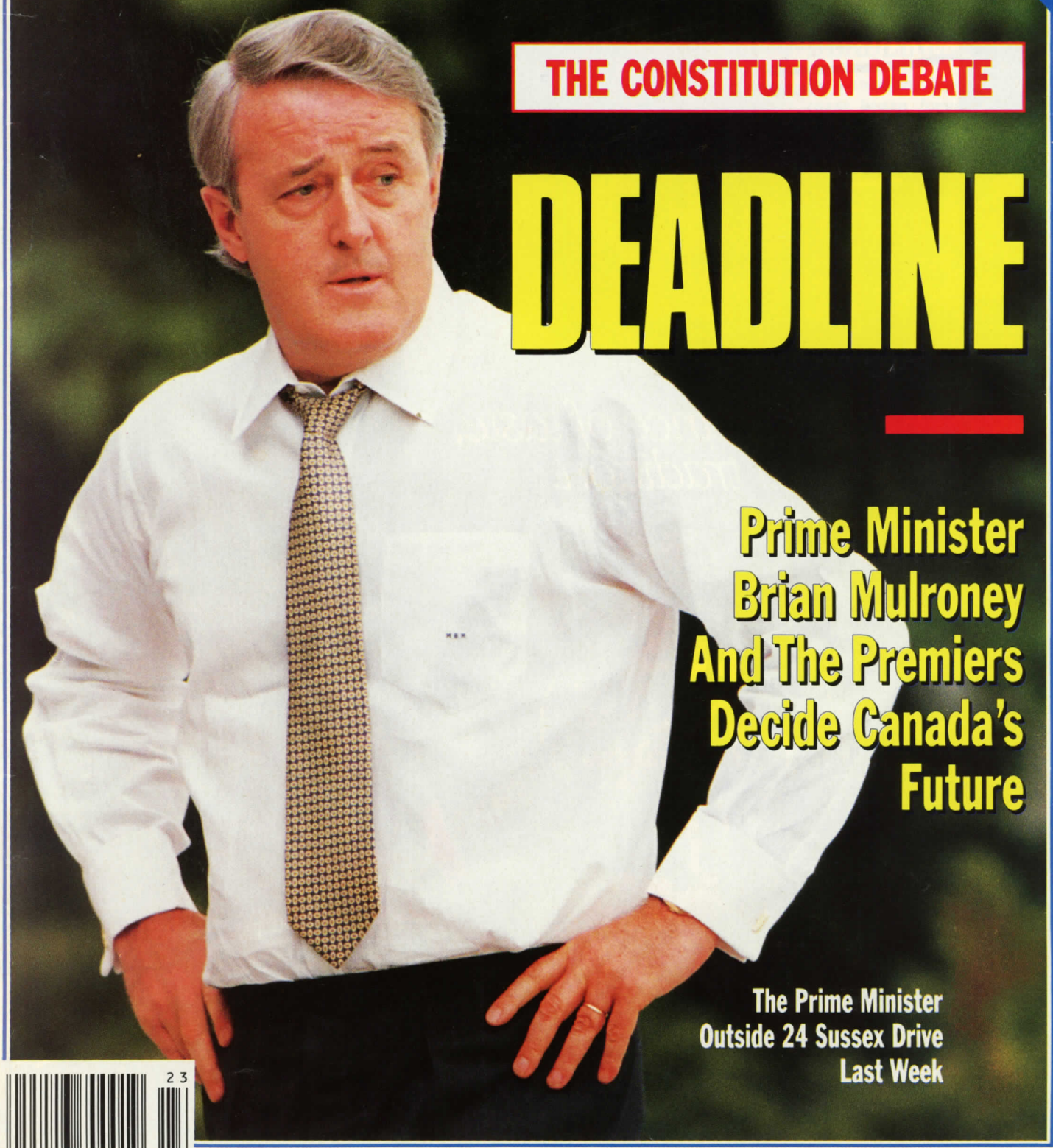
THE CONSTITUTION DEBATE

DEADLINE

Prime Minister Brian Mulroney And The Premiers Decide Canada's Future



The Prime Minister Outside 24 Sussex Drive Last Week

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Re-creating reality

A new development has tantalizing applications

Michael McGreevy says that he will walk on the planet Venus within the next two years. But he plans to do it without leaving his laboratory in California's Silicon Valley. McGreevy, a 40-year-old research scientist with the National Aeronautics and Space Administration (NASA), is one of dozens of American and Japanese scientists racing to perfect a newly developed computer technology called virtual reality. The technology involves the use of computers to create full-color, three-dimensional images of everything from molecules to planetary surfaces. And rather than merely looking at the images, scientists are using headgear resembling scuba diving masks equipped with image-bearing screens to enter the so-called virtual realities and even manipulate their contents. There are also potentially tantalizing applications for the entertainment industry. Some theorists predict that people who now watch steamy TV sex videos could instead experience the sensation of participating in them.

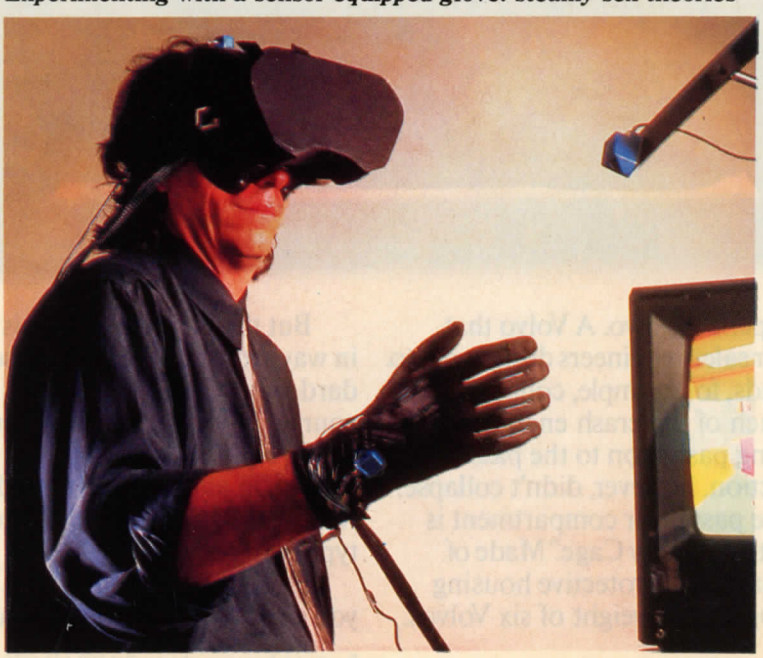
Proponents of virtual reality contend that within 10 years, the technology will have a profound influence on the work of architects, engineers and urban planners. They will be able to translate blueprints and plans for buildings, airplanes and expressways into lifelike, 3-D images that the designers or users can simulate entering to explore and change before construction begins. Surgeons may be able to put themselves inside the human body, while other scientists will be able to explore room-sized models of molecules. Said Robert Jacobson, associate director of the Seattle-based Human Interface Technology Laboratory, which is devoted solely to developing virtual reality: "It's a fabulous idea. If it comes off, it's going to be remarkable."

But other experts predict that virtual reality could lead to the problems foreseen by Vancouver author William Gibson in his award-winning 1984 novel *Neuromancer*. The book deals with a young man in a futuristic society who becomes obsessed with a virtual-reality fantasy world called "cyberspace." Louis (Bo) Gehring, a Toronto-based computer graphics expert who is working on virtual-reality projects for the U.S. air force, said, "When you look at the impact video games have already had on kids and compare them to the quality of cyberspace, you cannot overstate the potential impact."

People who have sampled virtual reality describe it as a powerful experience. David Cohn, a senior editor with the Vancouver-based magazine *CADalyst*, a publication for specialists in computer-aided design, said that he has entered the world of virtual reality four times. Once, during a demonstration at a Boston hotel, he wore a headpiece that resembled a diving mask and rode a stationary exercise bike that was hooked up to a computer that produced images of outdoor scenes. Cohn said that when he began pedalling, he felt he had actually entered the computer-generated environment. The harder he pedalled, the faster the bike appeared to travel. When he reached 25 m.p.h., the bicycle actually left the ground in the artificial environment and he felt as though he were flying. Said Cohn: "It was wonderful. I didn't want to take off the mask."

Still, some computer scientists dismiss the technology's entertainment potential and its addictive possibilities. They maintain that it will be a valuable tool for professionals in several different fields. Jacobson said that urban planners could translate proposals for expressways into 3-D virtual-reality freeways, then change routes and simulate traffic-flow patterns as they would be now or years into the future. Said Jacobson: "You need a visceral experience in order to appreciate traffic congestion. Numbers on paper don't capture the frustration."

Experimenting with a sensor-equipped glove: steamy sex theories



Computer scientists and doctors at the University of North Carolina at Chapel Hill have used virtual reality to study the accuracy and impact of X-ray treatment beams used to destroy tumors in human patients. Frederick Brooks, a computer scientist at the university, said that they generated images of internal human organs. Doctors then simulated entering the artificial realities by putting on special headgear. They could then watch as computer-generated X-ray treatment beams entered the body from different directions and attacked the tumor. Brooks said that the purpose of the experiment was to determine whether doctors could aim

Cycling in the computer-generated outdoors: the sensation of participation

the beams more accurately so that they would destroy the tumor without damaging other body organs.

Apart from its potential for improving medical treatment or the design of earthly structures, virtual reality could be a valuable tool in space exploration. NASA's McGreevy said that he plans to create virtual-reality images of Venus using data collected by an unmanned NASA spacecraft currently travelling towards the planet. Said McGreevy: "We will be able to re-create the surface of Venus in virtual reality and explore it almost as you would your office."

McGreevy said that the technology may be used on a manned mission to Mars that NASA hopes to undertake by the year 2019. He said that after landing on Mars, astronauts could send an unmanned rover out from the spacecraft to explore the surface for miles around. With virtual-reality images of the Martian surface, produced on the basis of previously collected data, astronauts could see in advance what kind of terrain the rover would be crossing and guide it around any hazards. The rovers would also be equipped with video cameras, which would complement the virtual-reality images.

BAYNE STANLEY

Gibson: futuristic society

But before virtual reality can be used on an everyday basis, scientists say that they will have to greatly improve the technology for creating computer-generated imagery. Brooks described the images of human organs generated at the University of North Carolina as "pretty crude, Saturday-morning cartoon quality." Stephen Hines, research director at a Los Angeles company called 3-D Image-Tek Corp., added that even the best color images currently lack detail or any shading.

According to Hines, time delays that occur when using the existing technology are another problem. His firm's virtual-reality headgear is equipped with a sensor that informs the computer of the location and position of the user. If he were to take three steps forward, the computer would have to produce new images to show how a building or human organ might look from his new position. But so far, computers cannot produce color images fast enough to keep up with human movements. As a result, the viewer sees a jerky or choppy movement in virtual reality, said Hines.

According to Gehring, who is working with American military and civilian scientists, the U.S. air force has developed the most sophisticated virtual-reality equipment to date in an attempt to reduce the clutter and complexity of the cockpits in modern fighter aircraft. The instrument panels in jet fighters, said Gehring, "look like a Swiss clock shop gone berserk. There are typically as many as 200 displays and switches." Since 1982, the air force has been trying to develop a system that would allow a pilot to fly highly complex aircraft on the basis of an artificial reality presented to him through his headgear. Rather than dealing with a confusing instrument panel, the pilot would be immersed in computer-generated images of the landscape beneath him and computer symbols projected into his field of vision. The headgear would also contain 3-D sound so that the pilot could determine with greater speed and precision the position of other planes in his squadron or incoming enemy missiles. But Gehring said that the development of such a system would not be complete until the mid-1990s at the earliest.

Although virtual reality is in the development stages, a California company named VPL Research Inc. has already begun selling headgear called an "eyephone" and a lightweight, sensor-equipped glove that would allow a user to experience the sensation of picking up and moving objects that appear in a virtual-reality environment. David Benman, VPL's sales-support engineer, said that the eyephone, which also resembles a scuba mask, sells for $11,200, while the glove costs $10,500. A complete package, which includes the eyephone, glove and two computers manufactured by Silicon Graphics Computer Systems of Newport Beach, Calif., costs about $267,000. Benman said that VPL has sold its eyephone and glove to most of the U.S. research institutes and universities that are currently conducting virtual-reality research. Its most prized customer has been NASA. Benman conceded that VPL's equipment is so far capable of producing only grainy images that lack detail. But he said that virtual reality is a captivating concept. Said Benman: "You get immersed in it even if the image quality isn't there yet."

Indeed, most of the scientists working on the new technology say that they have merely crossed the frontier of an exciting new concept. But Jacobson predicts that virtual-reality products will be available to such commercial users as architects and engineers within five years, while mass-market consumer entertainment products will be available within a decade. But given the rate at which previous computer revolutions have occurred, virtual reality could become a commonplace technology much sooner than that.

D'ARCY JENISH *with ALAN EARLE in Vancouver*