

versity uses Lake Cayuga as a source.

Geneva would be an ideal candidate for the system, as Lake Geneva is both cold and deep. The city is investigating a scheme. Tokyo also has deep water, but has not yet done anything about using it. But not all cities can benefit. Chicago, for example, initially appeared promising as it has harsher winters than Toronto and sits beside frigid Lake Michigan. But close to the city, Lake Michigan is shallower than Lake Ontario. To get cold water, engineers would have to lay pipelines that were six times as long as Toronto's. Officials in New York have also explored using such a system, but they ran into a similar problem: the neighbouring ocean is too shallow.

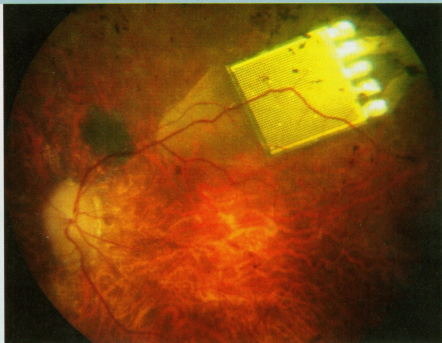
Using cold water for air conditioning saves more than just energy. Most office and apartment towers put the cooling units on the roof. Removing them means the space can be used for other things, such as running tracks or gardens. The three original Van der Rohe towers in Toronto have the cooling units built-in between floors, so they appear as black, windowless bands from the outside. The owner of the buildings is now working out how to convert the area previously occupied by the cooling units into office space—which in downtown Toronto is as precious as electricity. ■

Seeing the light

Visual implants: An electronic retinal implant uses technology borrowed from digital cameras to restore some sight to the blind

THESE days using silicon chips to allow machines to see is commonplace. So why not use them to restore sight to the blind? That is the reasoning behind a study being carried out in the eye hospitals of Tübingen and Regensburg universities, in Germany. The project, which is being led by Eberhart Zrenner, involves implanting chips into the eyes of seven people who have lost their sight to a disease called retinitis pigmentosa.

Retinitis pigmentosa is an inherited disorder that accounts for 11% of cases of blindness and has no medical treatment. It gradually destroys the rods and cones that detect light in the retina of the eye. But it does not harm the optic nerve, which transmits electrical impulses from the retina to the brain. Feed some appropriate electrical signals to this nerve, Dr Zrenner reasoned, and the brain would be able to see again.



A glimpse of a bionic future

The chip that does this was designed by a firm called Retina Implant. Its researchers used photodiodes (the technology found in digital cameras) that generate an electrical signal when light strikes them. By putting 1,540 such sensors on a chip that can be implanted over the retina the company has created a device that can produce an image made up of 1,540 picture elements, or pixels—though it is a very coarse image, given that a healthy eye has 120m rods, which produce the bulk of the image, and 6m cones, which add colour to it.

Each diode stimulates the nerve cells that have their endings in the retina—unlike the photoreceptors, these cells are unharmed by retinitis pigmentosa—and the nerve cells in question then relay their individual signals to the brain via the optic nerve. Electrical power is supplied using a cable connected to a small battery slung around the patient's neck, though Retina Implant eventually hopes to supply power wirelessly, using electrical induction. That would not require anything to penetrate the skin.

The seven volunteers spent a month with the implants and reported being able to distinguish between dark walls and a light window, and a dark table and white plates. The image was coarse compared with normal vision because of the small number of pixels, and the patients did not see fully in colour, although they reported being able to distinguish white, grey and yellow tones. Nevertheless, enough sight was restored to make a difference to each of the volunteers' lives.

The researchers now want to repeat the experiment and keep the implants in place for at least a year. (Their original

search licence was limited to four weeks.) They hope this will be long enough for their patients' brains to learn how to interpret the images more accurately than they now can. Newer versions of the devices will also have more pixels, so that the image-quality should be better. Walter Wrobel, the boss of Retina Implants, reckons the cost for each one at about €25,000 (\$35,000). That is less than the bill for training a guide dog—and the implants will not require feeding. ■

Bubbling under

Microbubbles: A new technique to treat disease involves the careful injection of tiny, drug-coated bubbles in the bloodstream

THILO HOELSCHER, a neurologist at the University of California, San Diego, is a man with a plan. His plan is to deal with strokes by blowing bubbles at them. The bubbles in question would be small enough to inject into blood vessels leading to the affected part of the brain. When they got to the blood clot that caused the stroke, they would be jiggled into action by the application of ultrasound. The result would be myriads of tiny jackhammers chipping away at the clot before it had a chance to cause too much permanent damage.

What makes this approach particularly interesting is that Dr Hoelscher

