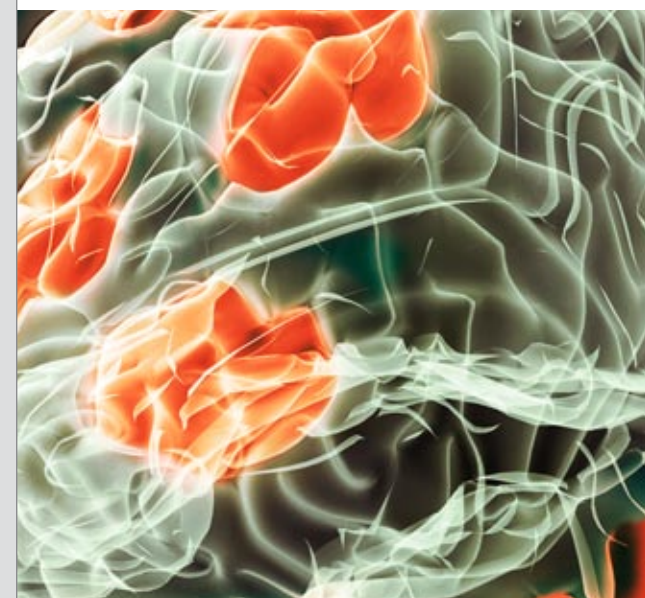


## THE SCIENCE THAT WILL PROLONG YOUR FUTURE

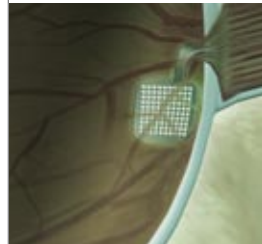
Will you live to see the day that you could live forever? Here are six examples of present-day technology that could help you

words by mico tatalovic and katherine austen // images by equinox graphics



### SMART DRUGS >

Smart cars have added artificial intelligence features that help the driver. Smart drugs (also known as nootropics) can make the drivers themselves smarter. Although people have used natural remedies such as ginkgo and ginseng for millennia to enhance their memory, such remedies have limited effectiveness on short-term memory enhancement. Smart drugs, on the other hand, can enhance our brains in more powerful ways. Drugs being used to treat dementia and depression can be also used by healthy people to enhance mood and concentration. In a 2002 experiment, pilots who took donepezil, an Alzheimer's medication, had much better results in their flight tests than pilots taking a placebo. Recent reports found more and more students taking smart drugs such as Ritalin or Adderall (normally prescribed for Attention Deficit Hyperactivity Disorder) to enhance their exam performance. The general attitude toward these controversial, mind-altering drugs still tends to be one of disbelief, but perhaps in the near future these smart drugs will be considered as normal and as necessary as smart-car features are today.



### BIONIC EYES >

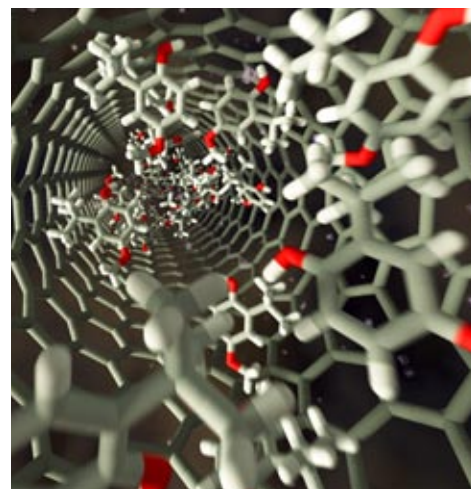
Bionic eyes have given sight back to the blind. In trials at the Doheny Eye Institute, part of the University of Southern California, sight was partially restored to six blind people after electronic devices were implanted in their eyes.

The patients, some of whom had been completely blind for a decade or more, could see movement, and differentiate between light and dark as a result of the treatment. Electrodes are placed behind the retina to stimulate ganglion cells in the eye, which then transmit visual information to the brain via the optic nerve. The patient must have a healthy optic nerve and at least some functioning ganglion cells for the technique to work.

A micro-camera, mounted in a pair of glasses, wirelessly transmits images via a pocket-sized computer carried by the patient, to the implant inside the eye. Each electrode stimulates between 20 and 30 ganglion cells, which then send messages to the brain's visual cortex.

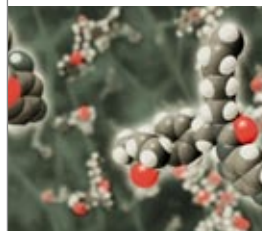
### NANOMEDICINES >

It's not just cars that are getting smaller. Nanotechnology deals with molecules less than 100 nanometers (one billionth of a metre) wide. Nanomedicine, the medical application of this technology, promises to improve the way we detect and cure diseases. Researchers are creating nano-robots that could be sent inside the body to find problems, flag them up and deal with them by delivering drugs. One recent breakthrough involved creating a minuscule worm (three million times smaller than an earthworm) made of tiny balls of iron oxide which could find and tag cancer cells by attaching itself to them. The worm could easily be visualised with routine MRI scans, allowing for early detection of cancer. It can also detect cancer's size and its precise position within the body. Nanoshells, made of gold, have also been successfully used to find and attach to cancer cells. By bombarding these nanoshells with infrared light, scientists have heated them up sufficiently to destroy the cancer from within, without damaging the surrounding tissue. The technique is called 'photothermal ablation'. In the future, similar nanomedicines might allow for quick and side-effect-free treatment of cancers.



### THIN PILL >

Heart disease could be prevented by taking a new drug that reduces fat both in the heart and in the rest of the body, reducing the demand for synthetic hearts. Obesity is an increasingly severe issue for the Western world, within the USA and the UK especially. A drug has recently been developed to combat the growing problem by exploiting the body's own responses in order to increase metabolism. The drug switches on a key gene in the body that is responsible for burning body fat, PPAR-delta. PPAR-delta activity leads to a decrease in cholesterol and an increase in the body's sensitivity to insulin, as well as an increase in muscular stamina and fat metabolism around muscle tissue. In laboratory tests on rats, the drug increased resistance to obesity due to a high fat diet and it is hoped that human trials will start soon. It is expected that the drug could become an pill that, although not a substitute for exercise, could definitely augment any trip you make to the gym.



### BIONIC HEART >

One in five men and one in six women in the UK die from heart disease, with 12,000 deaths per year resulting from heart failure. New research findings could lead to improved survival from this problem by overcoming the difficulties of transplant rejection.

Beating hearts have been grown in a laboratory, outside a living body. The new technique, developed by researchers at the Centre for Cardiovascular Repair at the University of Minnesota, could provide heart-failure victims with a means to grow a new, replacement heart.

So far, the technique has only been used on rat hearts. The living tissue is stripped from the heart using detergents that break down and wash away the cells, leaving a non-living matrix of protein fibres – the framework of the heart. Stem cells are injected into the matrix, and fed with oxygen and essential nutrients through existing blood vessels. New heart tissue grows within the structure, and can be made to beat by electrical impulse. Once grown and stimulated, hearts will continue to beat without further electrical input for up to 40 days. Research is now being carried out into applying the technique to pig hearts, and into finding an appropriate source of human stem cells from an adult heart patient.



### GENE THERAPY >

Many diseases are caused by the malfunction or absence of some crucial gene. By making that gene function normally again, a disease can sometimes be prevented or cured. This is known as 'gene therapy'. In April 2008, four blind people had their sight restored; some of them could even see well enough to read. The therapy involved putting a normal copy of the faulty gene (RPE65) into a friendly virus and injecting it into the patients' eyes. The virus then incorporated the gene into the patients' own genetic material, and sight was eventually restored. Safe and efficient, this therapy could soon be used to target similar illnesses before they develop.

Gene therapy has also been used to cure skin cancer. In 2006, scientists genetically modified the immune cells of 17 men with skin melanoma, making these cells attack cancer tissues more effectively. Two of these men were completely cured. The race is now on to improve this therapy in order to cure more people suffering from a variety of different types of cancer.

