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SCIENTIFIC AMERICAN

Tech Leaders of 2004

The Scientific American 50

DECEMBER 2004
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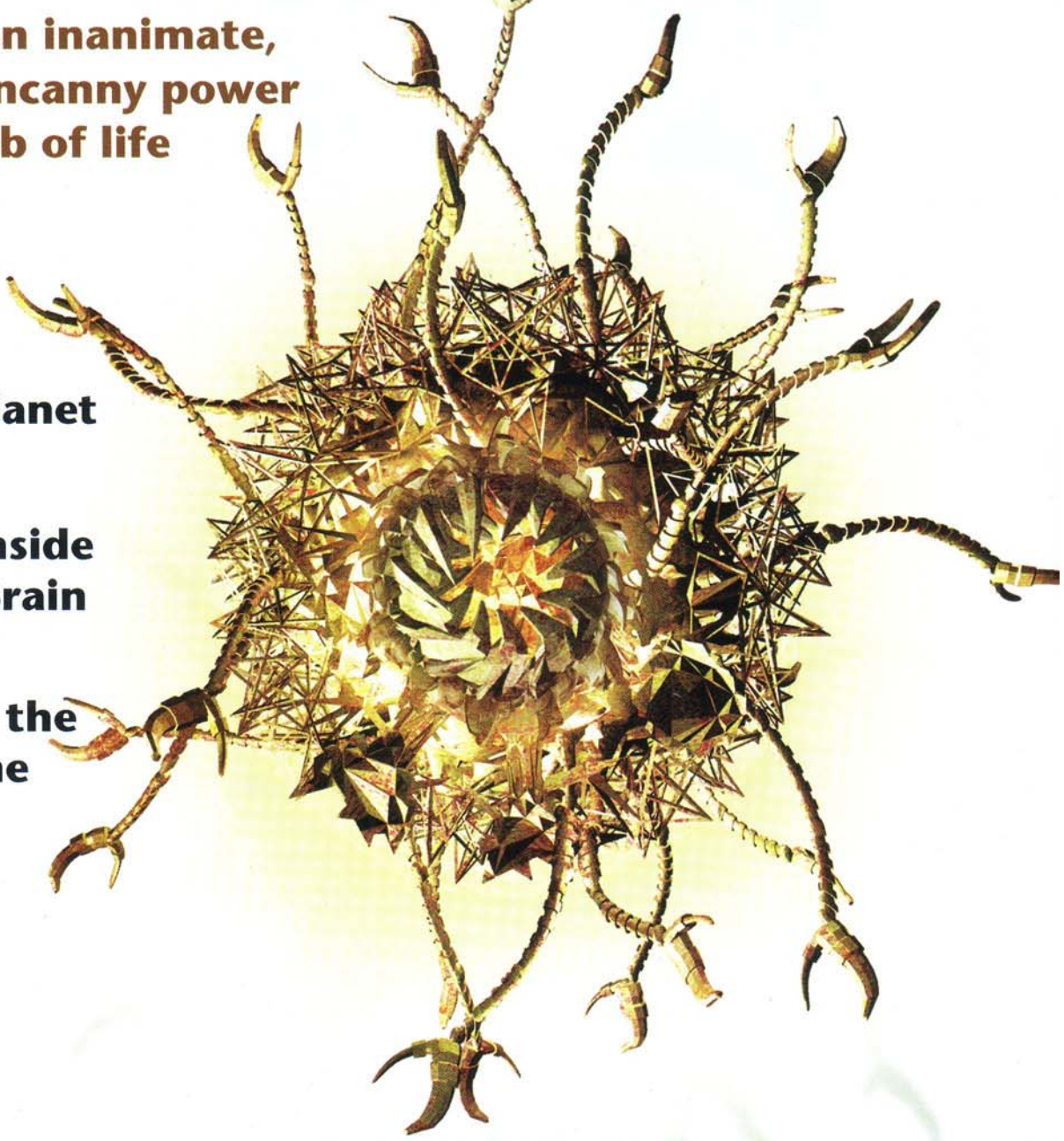

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(research leaders)
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AEROSPACE

AGRICULTURE

AUTOMOTIVE

BIOMEDICAL ENGINEERING

CHEMICALS & MATERIALS

COMMUNICATIONS

COMPUTING

DEFENSE

ECONOMIC DEVELOPMENT

ENERGY

ENVIRONMENT

IMAGING

MANUFACTURING

MEDICAL DIAGNOSTICS

MEDICAL PHYSIOLOGY

MEDICAL TREATMENT

NANOTECHNOLOGY

PUBLIC HEALTH

ROBOTICS

A PHYSICIST CREATES A FUNDAMENTALLY NEW state of matter and foresees that it could one day lead to better superconductors. Meanwhile a nonprofit drug company—yes, there really is such a thing—labors to recycle an old antibiotic to combat a deadly parasitic disease in developing nations. Those two innovations, one a basic discovery, the other a novel application of existing technology, illustrate the breadth of ingenuity recognized by the third annual SCIENTIFIC AMERICAN 50.

The magazine's Board of Editors has compiled a diverse list of those who during 2003–2004 exhibited outstanding technology leadership in the realms of research, business and policymaking. Most of the members of this year's honor roll are from the U.S., but they also hail from as far afield as India, Ghana and Israel. These awards demonstrate the love of knowledge driving basic research, the entrepreneurial spirit spurring development of, say, a nanotube microchip, and the desire to find new ways to make tiny fuel cells or to use the Internet to assist poor south Asian farmers. All originate from a common need to take what we know one step further.

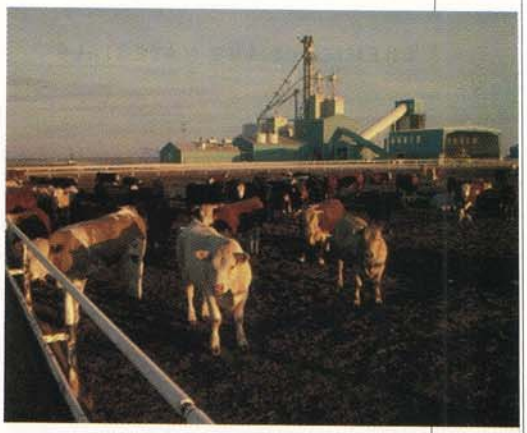
AGRICULTURE

MetaMorphix

Savage, Md.

Identified the best mates for cattle breeding by using genomic information.

Genetic engineering of animals still elicits shrill reactions from many consumers. But MetaMorphix has sought to bypass this controversy by using genetics to identify the ordinary cattle that produce the best meat. Breeding then proceeds the traditional way. Having acquired the livestock genotyping business from Celera, a company that sequenced the human genome, MetaMorphix created a test that examines DNA to identify differences between animals. Since 2002 Cargill, the partner of MetaMorphix, has tested 4,000 cattle to determine which genetic markers are associated with traits such as the marbling and tenderness of meat and the animals' growth rate. A prototype for a commercial test kit is being prepared, and the first meat produced using this genetic analysis is expected to arrive at grocery stores by next summer. Monsanto recently struck a similar arrangement with MetaMorphix to improve the quality of pork.



A partner of Metamorphix, Cargill has tested 4,000 cattle for genetic markers.

Smart safety system warns drowsy drivers to stay between the lines.

AUTOMOTIVE

Nissan North America

Gardena, Calif.

Deployed a driver-alert sensor system to keep vehicles safely inside traffic lanes.

Nissan's luxury division, Infiniti, has adopted for some of its models an innovative electronic system that warns a driver when a car veers out of a lane. Studies indicate that 55 percent of fatal accidents in the U.S. involve unintentional straying from lane to lane, which is typically caused by driver distraction, inattention or drowsiness. Developed by engineers at Valeo, a component supplier based in Auburn Hills, Mich., and Iteris, an Anaheim, Calif., maker of auto sensors, the new traffic-lane monitoring device alerts a driver when a vehicle wanders outside lane boundaries, a condition that is detected when he or she fails to engage the direction indicators. The motorist can then take corrective action in a timely fashion. The driver's aid uses a miniature video camera backed by software that recognizes lane markings. It will be offered this fall in North America on Infiniti's 2005 FX crossover sport utility vehicle.

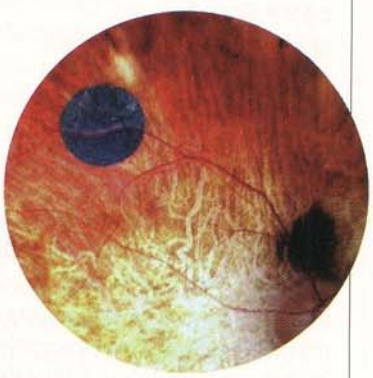
BIOMEDICAL ENGINEERING

Optobionics Corporation

Naperville, Ill.

Developed a retinal implant microchip to treat macular degeneration.

Thirty million people worldwide are afflicted with age-related macular degeneration and retinitis pigmentosa, two potentially debilitating eye diseases for which there is no cure. By crippling the retina's ability to sense and process light, the conditions can make a patient's world go from blurry to black. Clinical trial results published this past April confirmed that a microchip developed by Optobionics that is implanted under the retina resulted in significant visual improvement with virtually no adverse side effects. Designed by brothers Vincent and Alan Chow, the chip emits electrochemical impulses to stimulate the remaining healthy retinal cells. It derives its power from light entering the eye and reaching 5,000 microphotodiodes, which allows the chip to function free of wires or batteries. It is thinner than a human hair and can be implanted during a two-hour operation.



A retinal implant chip could restore vision to macular degeneration patients.

CARGILL (*top*); VALEO (*middle*); OPTOBIONICS CORPORATION (*bottom*)