



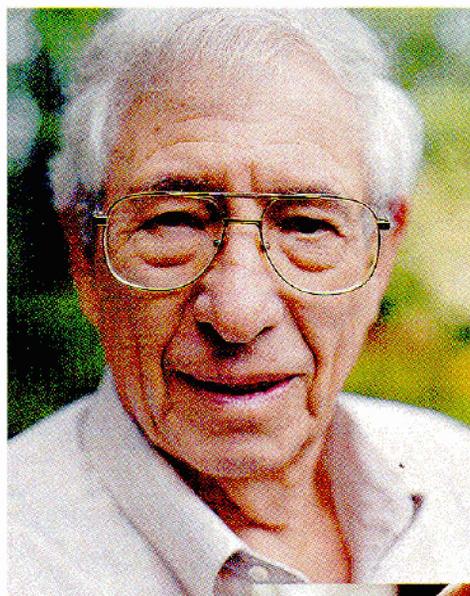
# Therapy that gets inside your head—literally

BY JOHN SIMONS ■ Robert Fischell says inventing things is a two-stage process. “Stage one: Everyone says it’s impossible,” he explains. “Stage two: They say the solution was obvious all along.” Fischell would know—he’s the 76-year-old inventor behind nearly 200 medical-device patents, many of which no one thought would work, including an insulin-pump implant for diabetics and two of the world’s bestselling coronary stents. Nearly three decades ago Fischell’s designs not only revolutionized the way pacemakers were made but rendered drug treatment for heart fibrillation a thing of the past.

What Fischell did for the heart he now hopes to do for disorders of the mind. He believes that rather than prescribing pills, doctors will soon affix computerized implants into the skulls of patients stricken with everything from depression and obsessive-compulsive disorder to migraines, Parkinson’s disease, and Alzheimer’s. “The brain is an electrical machine,” he says. “Neurons communicate using electrical signals. We can make implantable programmed devices to see those signals, stimulate the problem area, and make it better.”

Fischell, a physicist who once designed satellites for NASA, sees no problem with the notion of large swaths of the population walking around with battery-operated circuitry in their heads. The concept, no doubt, would be a leap for patients, many of whom might fear the possibility of surgical mistakes, infection, or long-term effects. Not surprisingly, Fischell thinks of drug therapy for neurological disorders as “inelegant.” “Medical devices are better than pharmaceuticals because there are fewer unknowns, fewer side effects,” he says. “Drugs affect every cell of the body. When we play with electrical signals in the brain, we’re not interfering with the heart, the stomach, the intestines. These devices will have a tremendous effect on what can be done. In five years this will be a multibillion-dollar business.”

No, he’s not lacking in confidence. But his prediction isn’t pure sci-fi fantasy either: In recent years researchers worldwide have pushed the boundaries of neurological implantation, variously employing devices to treat epilepsy and depression and even to help



Fischell and his implant, which may someday treat depression



quadruplegics move motorized appendages. Health-care equipment makers such as Johnson & Johnson and Medtronic are investing heavily in brain stimulation too.

Seven years ago, with \$10 million from venture capital firm Kleiner Perkins and roughly \$20 million from Johnson & Johnson, Fischell founded Neuropace Inc. in Silicon Valley. With the help of his son, David Fischell, and neurologist Adrian Upton, he designed the company’s flagship product, the Responsive Neurostimulator (RNS). The RNS is a silver-dollar-sized implant with electrode wires designed to detect abnormal electrical activity in the brain. The device can respond to, say, an incipient epileptic seizure by delivering electric pulses to the origin of the disturbance, thereby averting a full-blown episode before the patient knows it’s about to hit. The RNS, which contains a microprocessor and a long-lasting lithium bat-

tery, can in theory be programmed to monitor and address other ailments. “We’re a health-care company where 80% of the employees are programmers,” says Fischell, who spends most of his time on a seven-acre estate in Maryland. “What does that tell you about the future of medicine?” Neuropace’s early RNS tests on epilepsy patients were promising; the company plans tests on obsessive-compulsive disorder and depression soon.

Fischell hopes to have approval for the RNS within the next two years, but it probably won’t be the first depression-fighting implant on the market. That privilege will most likely go to a competing device called the Vagus Nerve Stimulator (VNS), made by a startup in Houston called Cyberonics. The \$15,000 VNS is controversial—plenty of doctors doubt its effectiveness—but it’s nevertheless expected to get FDA approval sometime this summer for use by chronic depression sufferers. Being runner-up suits Fischell just fine. After all, he laughs, “it’s the second mouse that gets the cheese.” **F**

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