

# BODY & SOUL

## Cyborgs of New York

*Deep-brain implants improve the quality of life for people with neurological disorders*

BY STEVE DITLEA

**C**raaack! Craaack! In a small operating room at Beth Israel Hospital on Manhattan's upper East Side, it sounds like someone is making popcorn.

Amplified over a speaker, it's actually the sound of one brain cell firing, picked up by an electrode, no thicker than a hair, being threaded deep into a man's brain.

The brain belongs to 54-year-old Paul Luskin, who suffers from Parkinson's disease. For four years he's been walking around with a pacemaker-size computer linked to his brain. The device delivers an electrical pulse to suppress the faulty nerve signals that cause his tremors, muscular stiffness and speech difficulties.

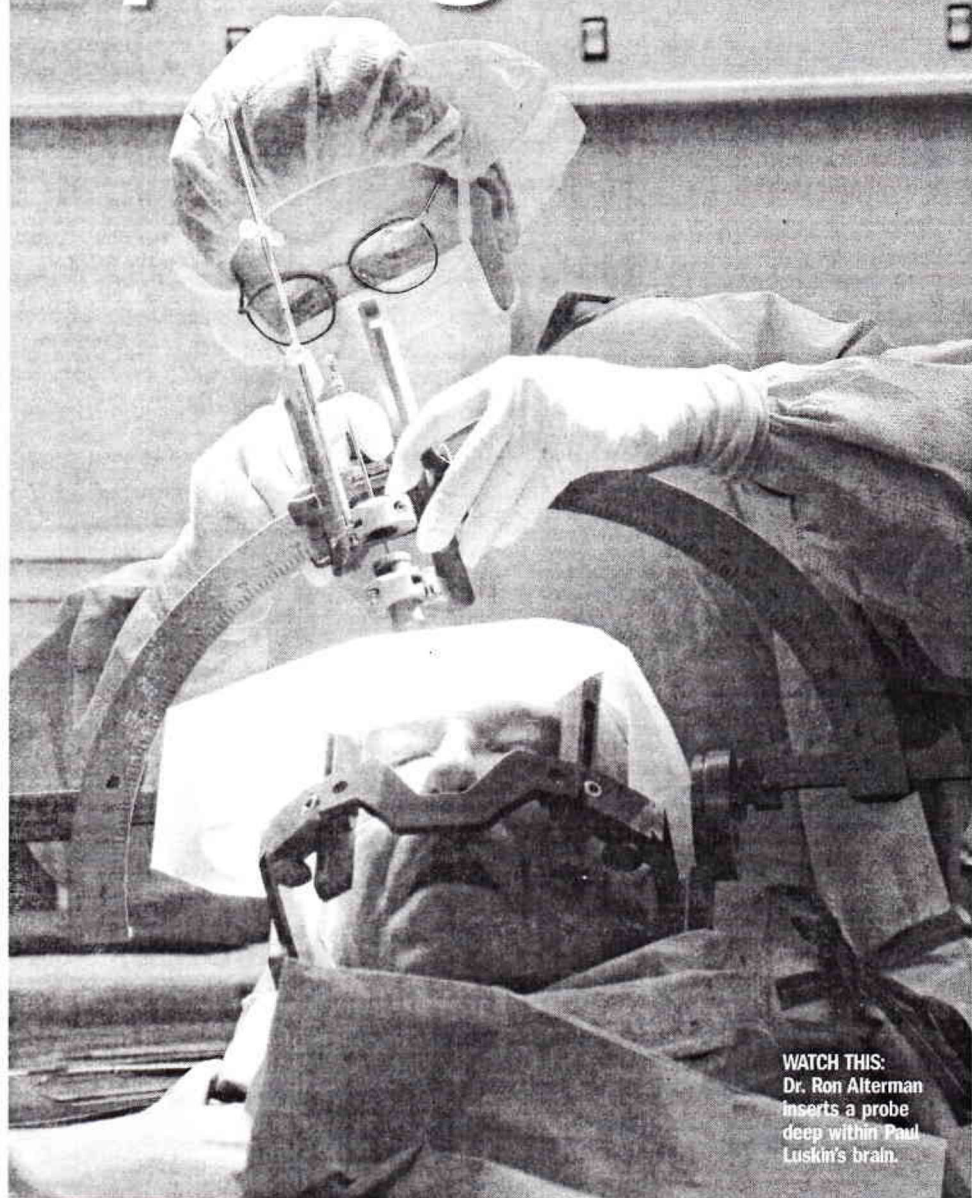
But lately the symptoms on his left side have worsened, forcing him to retire from his career as a tour organizer. He is now seeking relief with a second brain implant and another computerized pacemaker in his chest, further advancing the treatment known as deep-brain stimulation.

Luskin is one of several hundred New Yorkers who since the turn of the 21st century have become figures seemingly out of science fiction: they are cyborgs (an abbreviation of "cybernetic organism," a NASA-coined term that describes a person whose physiological functioning is aided by, or dependent on, a mechanical or electronic device.)

In city cyborgs, hardware (a computer) is directly connected to "wetware" (the brain) in an attempt to regain control over bodies wracked by Parkinson's disease, essential tremor or dystonia — the ailments for which such treatment is approved by the Food and Drug Administration.

Though few patients have received total relief from their symptoms, the condition of many has shown marked improvement for several years — results encouraging enough for similar treatments to have been given, successfully, to sufferers of Tourette's syndrome, epilepsy, migraine, even severe depression.

CONTINUED INSIDE



WATCH THIS: Dr. Ron Alterman inserts a probe deep within Paul Luskin's brain.

MILLER PHOTOGRAPHY

INSIDE

**MIND MATTERS**  
Researchers look for better ways to overcome the pain of a broken heart.  
**PAGE 4**



**BODY WORK**  
An older, simpler version of volleyball is being revived on the playgrounds of New York.  
**PAGE 5**



**CASE HISTORY**  
Her fatigue, achiness and fever were troubling, persistent and, to the doctor, all too familiar.  
**PAGE 11**



DAILY NEWS  
Wednesday, June 9, 2004

# Giving the brain a boost

## CONTINUED FROM COVER

For Parkinson's disease patients like Luskin, the brain-stimulating electrode must be placed in a region of the brain about the size of a pea. Brain scans give the surgical team a detailed view of internal structures, but for the sake of accuracy there is no substitute for listening to the electrical activity of parts of the brain as a lead crosses through them.

With Luskin immobilized in a metal frame, Dr. Ron Alterman, the neurosurgeon heading the Beth Israel team, which has performed more than 300 electrode implants, has drilled a hole the size of quarter in the patient's skull and inserted a thin metal rod bearing the positioning electrode. The rod is lowered deep into the brain by a tiny electric motor mounted at an angle on a large protractor, which crowns the patient like something out of the sci-fi movie classic "Metropolis."

While the probe descends, neurophysiology specialist Jay Shils calls out the type of sound encountered and the depth (in millimeters), as if on a submarine. At 13.2 mm there is an eerie quiet. At 15.3 mm the sound is raucous. The neurologist on the team, Italian-born Dr. Michele Tagliati, compares this part of the operation to traveling through Europe blindfolded and trying to figure out where you are by listening. He explains the quiet region: "They say the thalamus is Germany. When you get into the sub-thalamus

you're in Italy. There's a lot of noise."

The sub-thalamic nucleus is one of the regions in the brain responsible for the planning and initiation of motor activity. When there's a loss of the neurochemical dopamine, the region becomes too active, leading to Parkinsonian symptoms. For nearly 40 years the medication levodopa has been the standard treatment for Parkinson's disease. But levodopa tends to lose its effectiveness.

That's what happened in Luskin's case. Diagnosed with Parkinson's disease in 1993, he found that his meds offered relief for shorter and shorter periods of time. He had his first deep-brain implant in 2000 when it was still an experimental procedure. The latest clinical wisdom is that treatment should include a brain implant for each of the body's sides and a neurostimulator, as the brain pacemaker is called.

Now that Luskin's sub-thalamic nucleus has been located, a permanent electrode to the brain is lowered into place. Wires to the electrode are sheathed in a rubbery tube, slightly thicker than a blood vessel, that will run up the brain through a plastic cap, which will cover the hole in the skull, under the scalp to behind the ear, and then to the chest or shoulder, where the neurostimulator will be implanted under the skin. Luskin is awake throughout brain surgery (there are no pain receptors inside the brain) so physical reactions to test stimulation can confirm that the implanted electrode is properly positioned.

Typically, the patient leaves the hospital the day after surgery, then waits a few

weeks for the computerized pacemaker to be turned on and adjusted.

The implanted device used for deep-brain stimulation is similar to a heart pacemaker, except that it sends out electrical vibrations at a rate two to three times faster than a heartbeat. Manufactured by Medtronic, the company that pioneered heart pacemakers and is now the health industry's largest firm devoted to medical devices, the deep-brain stimulation gear implanted in a patient runs \$20,000 per side. The entire operation can cost \$80,000 to \$100,000.

At the moment, patients eligible for deep-brain stimulation are limited to advanced cases for whom response to medication has become erratic and short-lived. Few Parkinson's patients go off medication entirely once their implants are turned on, but dosages can be lowered and the effects last longer.

An assistant professor of neurology at Beth Israel's Yarmon Center for Parkinson's Disease, Tagliati (who is also John Heslin's neurologist; see below), teaches the techniques of deep-brain stimulation to his medical colleagues. He wishes more doctors were aware of and practiced the high-tech procedure. (In New York, deep-brain stimulation procedures are also regularly performed at Columbia Presbyterian, Cornell, Mount Sinai and NYU medical centers.)

"As a neurologist it's very gratifying," he says. "Patients are so grateful. It isn't a cure, but it turns the clock back."

Deep-brain stimulation has an even higher success rate for other ailments. "In the majority of essential tremor patients,

'Patients are so grateful. It isn't a cure, but it turns the clock back.'



CHRISTIE JOHNSTON DAILY NEWS

*'I can shave without decapitating myself'*

**John Heslin**

**53 YEARS OLD**

For Bay Ridge, Brooklyn resident John Heslin, 53, becoming a cyborg has meant being able to shave "without decapitating myself," going back to work as a bartender after three years of idleness imposed by severe Parkinson's disease symptoms and walking without pain for the first time in five years. His medication is at half the dosage it was before his dual brain implants in 2002, with a far steadier effect on his symptoms.

"Before, my days were peaks and

valleys. Every two hours the medication would wear off fast," he recalls. "All I was doing was watching the clock. Now when I tell people I have Parkinson's disease, they're amazed."

How does he feel being linked to two computers day and night?

"They work. I feel great."

## 'It's cool having these machines inside me'

**L**aura Herbert, 34, has been aware of her dystonia since the fifth grade, but it didn't become debilitating until the last five years. Medications made her sluggish. An implanted medication-dispensing pump never worked properly. Before receiving brain implants in two separate operations in May 2003, she could barely walk.

"My case was an uncommon one," she cautions. "I was fully prepared to

wait eight to 10 months to see improvement. With me, they practically hit the switch and I was better."

She still has problems with her hands and handwriting, but Herbert, an Oxygen Media producer who was back at work four days after her surgeries, shows no outward symptoms of her condition.

As for becoming a cyborg, she says: "I prefer to think of myself as being bionic. I think it's pretty cool having these machines inside me."



**Laura Herbert**

34 YEARS OLD

LINDA ROSIER DAILY NEWS

we can eliminate tremor and take them off anti-tremor medications, which aren't very effective anyway," notes Alterman. For sufferers of dystonia, a neurological disorder that causes abrupt, painful movements and postures, improvement can also be dramatic.

As clinical experience grows, deep-brain stimulation may eventually be offered to patients at earlier stages of their disease, holding out the hope of staving off any deterioration in their condition and weaning them entirely off medication.

"We have hit a wall with medications," Alterman explains. "Deep-brain stimulation is a bridging technology that will provide a significant benefit until we can get

to more restorative therapies, things like gene therapy, growth factor infusion or cellular transplantation, aimed at restoring the neural function that's lost."

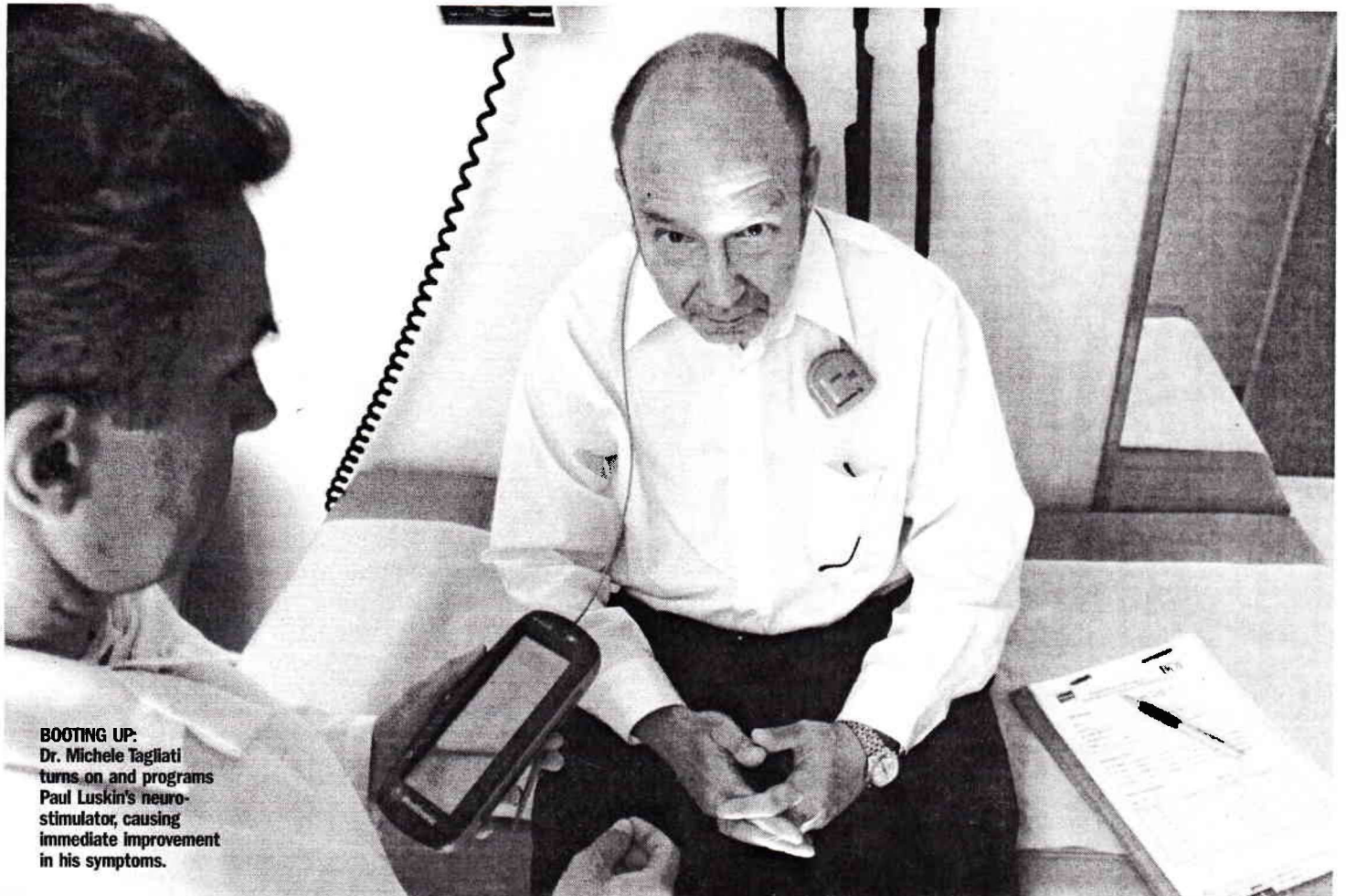
In the meantime, the day Luskin has been waiting for — the day his second neurostimulator is turned on — arrived recently.

In Tagliati's office, a device that looked like a super-sized Palm Pilot put his computerized implant through its paces, varying the strength and rate of the electrical pulses to his brain. At one combination of settings, the stiffness in his legs subsided markedly and his speech became less hesitant. The improvement seemed to extend to the other side of his body, still under the sway

of his previous implant.

With the pulse strength deliberately kept low for now, the full extent of benefits from his second neurostimulator won't be known until two weeks later at a followup adjustment session. On a lower dosage of medication, Luskin returned home, his quality of life already better.

"I can now get up out of the chair without much help," he says. "I'm able to turn around in bed without much help." So far a good outcome, but after the let-down following his first implant, he remains cautious. "The jury is still out," he remarks. "I want to see how long this will last."



**BOOTING UP:** Dr. Michele Tagliati turns on and programs Paul Luskin's neurostimulator, causing immediate improvement in his symptoms.

HOWARD SIMMONS DAILY NEWS