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NEW-WAVE NEUROSURGERY

AFTER 50 YEARS IN EXILE, PSYCHOSURGERY WILL BE RE-ENTERING MAINSTREAM MEDICINE.
BY CARL ERIK FISHER

Half a century after the lobotomy's heyday, brain surgery for psychiatric disorders is returning. Deep-brain stimulation (DBS), a form of neurosurgery, will increasingly treat depression, obsessive-compulsive disorder, alcoholism and other mental illnesses.

In 1949, a Nobel Prize was awarded to António Egas Moniz for inventing the lobotomy. But after it was promoted to "fix" a huge range of problems from schizophrenia to headaches, and many patients were left incapacitated, psychosurgery fell into disrepute.

The modern era of psychosurgery effectively began in 2005, when US researchers, led by Helen Mayberg from Emory University, Atlanta, used DBS to treat a small group of severely depressed patients. This surgery, which delivers pulses of electricity through implanted electrodes to specific parts of the brain, had already been used for several years to treat neurologic disorders such as Parkinson's disease. In the depression study, researchers targeted stimulators to disrupt an area of the brain thought to be overactive in depression, and several participants reported dramatic improvements in their mood, even a brightening of their vision.

Yet it took a while for psychosurgery research on other mental disorders to arrive. Last year, a group of researchers at Shanghai Jiao Tong University reported the first successful treatment with DBS to manage drug addiction: a heroin addict who continued to use the drug, even after multiple rehabilitation treatments, but was finally able to stay drug-free after stimulators were implanted in his nucleus accumbens, a brain area governing pleasure and reward. Another research group, at the University of Magdeburg in Germany, is conducting a trial of DBS for severe alcoholism. The boundaries of psychosurgery are also expanding past the traditional definitions of mental illness, as new trials of DBS for obesity have recently begun in the US and Canada. Even the side-effects of DBS are generating new targets: one man developed vivid autobiographical recollections after stimulation, sparking plans to use DBS for memory enhancement.

Unsurprisingly, psychosurgery has its critics. The US-based device company Medtronic recently received a "humanitarian device exemption" from the US Food and Drug Administration, allowing use of DBS to treat obsessive-compulsive disorder; detractors criticised this manoeuvre as an attempt to bypass normal safeguards and avoid expensive clinical trials. DBS is promoted as relatively non-invasive, but haemorrhage or infection can still occur, and, as shown by the memory-enhancement example, there can be bizarre cognitive side-effects. Some argue that the money and time spent on DBS research would be better put toward current public treatment programmes. Even so, more variations of psychosurgery are forthcoming. Next year may bring the first reports of DBS for maladies as diverse as bipolar disorder, traumatic brain injury and anorexia.

Market forces will also continue to drive the development of psychosurgery – just think of the profit potential of DBS treatments for the rapidly growing elderly population or the expanding waistlines of the developed world. As psychosurgery continues to gain prominence, though, its greatest impact could be on thoughts about our own brains. Will it change our ideas about the acceptable limits of tinkering with the mind itself?

Carl Erik Fisher is a resident in psychiatry at Columbia University

TEN PENCE

The cost per paper-based kit for detecting counterfeit drugs, a huge problem in the developing world

PREDICTING EPILEPSY
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People with epilepsy will have advanced warning of an impending seizure if research being carried out by scientists at the Brain and Spine Institute (ICM) in Paris can be commercialised. Projects at ICM include implanting electrodes, 40 microns across, in the brain, which can monitor activity at single-neuron level; using neuroimaging to monitor cerebral blood flow; and artificially inducing seizures in brain tissue in the lab. The three approaches will provide a way of predicting seizures.

SMOKE-FREE LIVING
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A lifelong vaccine that neutralises the effect of nicotine will go into primate trials in 2013. Developed by scientists at Cornell University in the US, it changes the nuclear structure of certain liver cells, making them produce a constant stream of antibodies that neutralises nicotine. Traditional vaccines have either proved ineffective against nicotine or have required repeated injections. The Cornell vaccine can be introduced once into the body as a payload aboard a harmless virus.