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Neuron Renovation

The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science by Norman Doidge. Viking. 2007 (\$24.95)

For most of the 20th century, neuroscientists believed that adult brains, unlike those of children, could not grow new neurons or form new networks among existing brain cells. According to this view, if part of the brain were damaged or underdeveloped, the functions of that part would be lost.

But in the past couple of decades, scientists have compiled formidable evidence of the persistence throughout adulthood of neuroplasticity, the brain's capacity for structural and functional change. Sophisticated scanning technologies reveal brains to be more flexible and dynamic than traditionally thought. Moreover, new therapies and exercises draw on neuroplasticity to counteract conditions ranging from strokes and balance disorders to learning disabilities and age-related cognitive decline. .

Norman Doidge, a research psychiatrist and psychoanalyst at Columbia University and the University of Toronto, recounts these developments through vignettes of the scientists, physicians and patients, as well as animal and human research subjects, at the forefront of the science of neuroplasticity. The result is an absorbing and encouraging depiction of the brain's potential to overcome debilities and diseases.

The book features protagonists such as Paul Bach-y Rita, a University of Wisconsin-Madison physician and biomedical engineer. By placing a motion-sensing device on the tongue of patient Cheryl Schiltz, Bach-y-Rita (who died in late 2006) enabled Schiltz to regain the sense of balance she had lost as the result of inner-ear damage. The device sparked small electric charges that felt like champagne bubbles on her tongue, letting her know if she was leaning too far one way or another. In time, her brain was retrained to keep her body upright, letting her maintain her balance without the tongue device.

Other neuroplasticity pioneers discussed include psychologist Edward Taub, whose "constraint-induced" therapy involves binding the unaffected limbs of stroke patients so they will relearn to use their affected limbs; neuroscientist Michael Merzenich, whose computer-learning programs help kids with autism; and educator Barbara Arrowsmith Young, who developed mental exercises, such as reading cards with complex clock faces, to overcome her own early difficulties with abstract thought. Doidge also profiles Michelle Mack, who was born without a left brain hemisphere and whose right brain handles language functions normally done by the left.

Despite the book's ebullient subtitle, Doidge's tone is one of measured optimism. He notes that neuroplasticity also has its downsides, as when amputees' brains rewire to produce phantom pains or, more prosaically, when people learn bad habits. -Ken Silber