IS THE INTERNET CHANGING THE WAY YOU THINK?

The Net's Impact on Our Minds and Future

Edited by John Brockman

HARPER PERENNIAL

NEW YORK • LONDON • TORONTO • SYDNEY • NEW DELHI • AUCKLAND

This Is Your Brain on Internet

Terrence Sejnowski

Computational neuroscientist, Salk Institute; coauthor (with Patricia Churchland), The Computational Brain

What is the impact of spending hours each day in front of a monitor, surfing the Internet and playing games? Brains are highly adaptable, and experiences have long-term effects on its structure and function. You are aware of some of the changes and call it your memory, but this is just the tip of the iceberg. We are not aware of more subtle changes, which nonetheless can affect your perception and behavior. These changes occur at all levels of your brain, from the earliest perceptual levels to the highest cognitive levels.

Priming is a dramatic example of unconscious learning, in which a brief exposure to an image or a word can affect how you respond to the same image or word, even in degraded forms, many months later. In one experiment, subjects briefly viewed the outlines of animals and other familiar objects, and seventeen years later they could identify the animals and objects, above chance levels, from versions in which half the outlines had been erased. Some of these subjects did not even remember participating in the original experiment. With conceptual priming, an object like a table can prime the response to a chair. Interestingly, priming decreases reaction times and is accompanied by a decrease in brain activity—the brain becomes faster and more efficient.

Brains, especially youthful ones, have an omnivorous appetite for information, novelty, and social interaction, but it is less obvious why we are so good at unconscious learning. One advantage of unconscious learning is that it allows the brain to build up an internal representation of the statistical structure of the world: the frequency of neighboring letters in words, say, or the textures, forms, and colors that make up images. Brains are also adept at adapting to sensorimotor interfaces. We first adapted to clunky keyboards, then to virtual pointers to virtual files, and now to texting with fingers and thumbs. As you become an expert at using it, the Internet, as with other tools, becomes an extension of your brain.

Are the changes occurring in your brain as you interact with the Internet good or bad for you? Adapting to the touch and feel of the Internet makes it easier for you to extract information, but a better question is whether the changes in your brain will improve your fitness. There was a time, not long ago, when CEOs didn't use the Internet because they had never learned to type—but these folks are going extinct and have been replaced with more Internet-savvy managers.

Gaining knowledge and skills should benefit your survival, but not if you spend *all* your time immersed in the Internet. The intermittent rewards can become addictive, hijacking your dopamine neurons (which predict future rewards). But the Internet has not been around long enough—and is changing too rapidly—for us to know what the long-term effects will be on brain function. What is the ultimate price for omniscience?