

YOU ARE DARWINIAN

It's a Jungle in There: How Competition and Cooperation in the Brain Shape the Mind

by **David A. Rosenbaum**. Oxford University Press, 2014 (\$29.95)



Natural selection—the causal mechanism that Charles Darwin showed was responsible for the origin of new species—is difficult for many people to understand. It is not the simple linear kind of causation we see when the swing of a golf club sets a ball in motion. Linear causation is usually quick and

obvious; selection by consequences takes time to work and is sometimes difficult to detect. You know it has occurred when (a) a number of interconnected events compete for resources in the environment, (b) some of those events are selected as being superior and (c) subsequent occurrences of those kinds of events now look more like the ones that were selected. The selection process changes probabilities; it strengthens the fit and weakens the unfit.

In 1978 Nobel laureate Gerald Edelman theorized that Darwinian competition among neural circuits might underlie the experience of consciousness itself. Now Rosenbaum, a psychology professor at Pennsylvania State University, asserts that the entire cognitive world operates along Darwinian lines—that competition among the neural circuits underlying motor behavior, thinking, memory and perception accounts for everything we think, say and do.

This is a radical idea, especially in one aspect. Just as Darwin's theory eliminated the need for a "designer," Rosenbaum's "jungle theory" eliminates the need for an "executive." There is, he insists—and contrary to what common sense and experience seem to tell you—no ROUNDUP *perserving self* inside you that is composing sentences, making decisions and shifting attention. Instead a population of behavioral and perceptual tendencies is in constant competition with one another, strengthened or weakened by cues and consequences in the environment. How they *sum* at any moment in time determines what you do. You are, in effect, a "plurality."

The alternative, Rosenbaum says, is

untenable—namely that there is an entity inside you who directs what you do but whose behavior we must in turn explain.

Unfortunately, this exciting idea gets lost at times when Rosenbaum sinks into the esoterica of technical experiments from the field of cognitive psychology. Of greater concern, he admits that his theory is "more a sketch than a

complete theory." How, physically, does the competition and selection process work? Rosenbaum can't say.

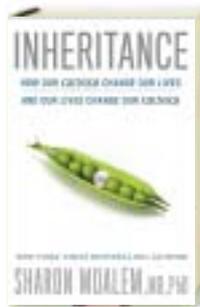
These problems aside, *Jungle* deserves to be selected. It presents a bold idea that puts human cognition squarely onto the shoulders of giants in the natural sciences, Darwin among them.

—Robert Epstein

GENE PERSUASION

Inheritance: How Our Genes Change Our Lives—And Our Lives Change Our Genes

by **Sharon Moalem**. Grand Central Publishing, 2014 (\$28)



Imagine you are at a dinner party with your spouse, but you can't keep your eyes off the host, enthralled as you are by the curve of her neck. For many, this might warrant a heated spousal talking-to. And so it does for Moalem, a specialist in rare genetic disorders, though not for the reasons you might think.

For Moalem, certain features—the cleft of a chin, the space between eyes, even extra eyelashes—may signal rare developmental and genetic diseases. In this case, to Moalem, the web of skin between neck and shoulder suggests Noonan syndrome, a disorder associated with heart defects and other problems. (He later discovered his suspicion was correct.)

As Moalem details in his new book *Inheritance*, the study of rare genetic diseases serves an important purpose. These disorders, which usually stem from mutations in a single gene, give scientists a better idea of what that gene does. These clues are important not just for treating carriers of the mutations but also for understanding other diseases. For instance, a mutation in a receptor for growth hormone causes an extreme shortness called Laron syndrome. Those with the syndrome are unusually resistant to cancer. This inverse association, which suggests a link between growth hormones and malignancy, points the way toward new potential cancer treatments.

Genes are often turned on and off, up or down, not by mutations, it turns out, but by environmental factors. Which brings us to the central thrust of Moalem's book: genes may be immutable, but how they are translated into flesh and blood absolutely is not.

Consider the honeybee. The only difference between a hive's queen and the sterile worker, both of which have the same genes, is diet. If a bee larva gorges endlessly on royal jelly, it matures into a queen. If it consumes just a few days' worth of jelly, it becomes a worker.

Mammals are not so different. Make a mouse pup anxious daily by removing it from its mother, and it becomes prone to a rodent form of depression in adulthood. Here is the kicker: pups born to this tormented animal inherit the same depressive tendency, even without experiencing the original torment. The transmission occurs not by genetic mutation but by epigenetic modification—the silencing or unsilencing of genes. This is how "our lives change our genes," which is both an empowering and, if our lives are not so great, frightening concept.

One of the more surprising takeaways is that the long-promised era of personalized medicine—where doctors tailor treatments to your particular genome—is arriving piecemeal. Currently available tests can detect important genetic variants. One variant prevents carriers from breaking down the sugar fructose, which can become hazardous if these individuals consume too much fruit. Despite their usefulness, such tests are not necessarily routinely conducted.

Inheritance is a wide-ranging and breezily written survey of an immensely important field—the science of how we may "tweak" our fixed genetic heritage to produce health and well-being. The narrative moves quickly, and what the book lacks in depth it more than makes up for with breadth, providing a solid foundation for readers. It is especially thrilling for a geneticist, of all people, to emphasize "it's not only what our genes give us that's important, but also what we give to our genes."

—Moises Velasquez-Manoff