By Judith Roof

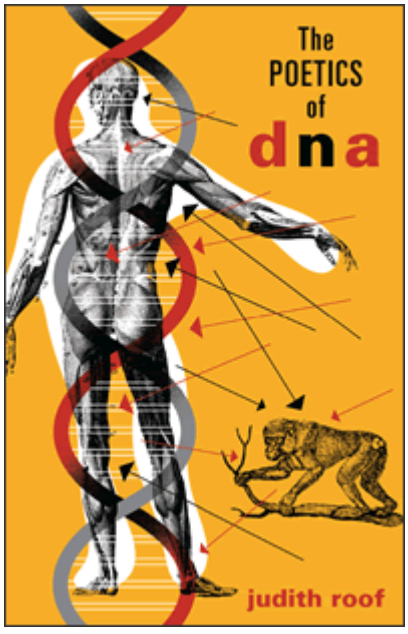
NEWS

The book of life

The words we use to describe genetics matter, according to the author of a new book - for instance, "genetic code" should really be "genetic cipher"

[Published 24th August 2007 02:36 PM GMT]

At the announcement of the human genome's near completion in 2000, John Toy, the medical director of the UK's Imperial Cancer Research Fund, said: "We have discovered the human alphabet -- what we now have to do is put the letters in the right order and make a sentence. Only when all of that is done shall we have the book of life to read." Across the pond, Eric Lander, head of the Whitehead Institute at MIT, commented: "I don't know if people realize that we just found the world's greatest history book. We are going to be up every night reading tales from the genome."



We often hear about the "book of life," the "human alphabet," language, script, code, blueprint, software, Holy Grail, and the Rosetta Stone. Such comparisons simplify and make accessible the more complex functioning of DNA, genes, and genomes. But they bring with them ways of thinking, values, and assumptions about the complex phenomena of how DNA operates in heredity and life-processes, and we need to always remember that.

Comparing DNA to a word or a gene to a Chicago gangster (such as in Richard Dawkins's *Selfish Gene*) may seem innocuous, but language itself is never completely neutral. Words and metaphors all have connotations, which can contradict the biological mechanisms they attempt to explain. For example, referring to the genome as an "alphabet" suggests that the genome is a text that can be written, read, translated, re-written, and copyrighted. Texts become someone's property more easily than naturally occurring phenomena, such as trees and stars.

Thinking of DNA as letters implies that such DNA letters regularly "spell" genetic "words," or traits in a one-on-one fashion, similar to the way language works. This may help explain why many people continue to adopt the mindset that one gene describes one trait, just as one noun describes one object: There may be a gene for thrill-seeking or criminality or any of a myriad of illnesses. If a genetic word is misplaced or incorrectly spelled, we simply change the word or correct the spelling, a familiar concept that contributed to early optimistic visions of genetic therapies. If only it were that simple.

Linguistics have a strong impact on how scientists envision genomics, as well. Even before James Watson and Francis Crick discerned the structure of DNA, physicist Erwin Shrodinger called the mysterious element by which biological structures and life processes are governed a "life-code" in the lectures he gave in Dublin during World War II, published as *What Is Life*? As Crick commented later, Schrodinger's analogy to Morse code influenced the direction of his and Watson's thinking -- but, he noted, Morse code should have been Morse cipher.

Why "cipher," and not "code?" The difference, while seemingly technical, is in fact significant. The word "code" refers to a linguistic operation in which one piece of code (dots and dashes, flags) stands for another in an arbitrary but consistent manner. This is the way language itself works, a word standing conventionally for an object, say a tree, with which it has no intrinsic relation. There's no reason why the word "tree" should stand for the object it describes. The metaphor of the code ultimately implies that, DNA's nucleic acid chains have a consistent but arbitrary relation to the other acids with which they associate, a situation that is not the case at all.

DNA is anything but arbitrary, and therefore acts more like a cipher. A cipher has no intrinsic meaning in itself, but operates according to a strict, mathematical set of rules, such as A for adenine, G for guanine, and so forth. As Crick himself reflected at the time of his research, "You understand. I didn't know the difference at the time. 'Code' sounds better, too. 'Genetic cipher' doesn't sound anything like as impressive."

Imagine, then, what even more complex metaphors might import. The suggestion that genes function like Chicago gangsters, or act as representatives of the gender psychology of their parental contributors (Matt Ridley, *Genome: The Autobiography of a Species in 23 Chapters*) smuggle elaborate, psychologically motivated, political narratives of struggle, competition, and bizarre Ozzie and Harriet scenarios of squabbling domesticity into our conceptions of genes. Instead of biochemistry, DNA operates according to our estimations of human psychology and the way the story always goes.

Judith Roof is author of The Poetics of DNA, published this year by the University of Minnesota. She is a professor of English and film studies at

Michigan State University.

Do you see other metaphors in science that you believe don't accurately represent what they describe? Tell us here.

Judith Roof
mail@the-scientist.com

Image: University of Minnesota Press.

Links within this article:

Eric Lander
http://www.pbs.org/saf/1202/features/landerprofile.htm

J. Rohn, "Rhyme and reason," *The Scientist*, August 17, 2007.
http://www.the-scientist.com/news/display/53489

Richard Dawkins, *Selfish Gene*
http://en.wikipedia.org/wiki/Selfish_gene

M. Wenner, "The war against war metaphors," *The Scientist*, February 16, 2007.
http://www.the-scientist.com/news/display/52851/

Matt Ridley, *Genome: The Autobiography of a Species in 23 Chapters*
http://tinyurl.com/2ktan2

J. Roof, *Poetics of DNA*
http://tinyurl.com/35q6xe