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"Biology": How Words Shape Our View of Nature

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Fox Keller, Evelyn, *Refiguring Life: Metaphors of Twentieth-Century Biology* (Columbia University Press, 1996).

In a thoughtful blog post about the **coronavirus epidemic** this spring, Canadian intellectual David Cayley pointed out a surprising convergence in the thought of feminist philosopher of science Donna Haraway and Catholic philosopher and social critic Ivan Illich concerning contemporary perceptions of the human body. In view of her studies of science and technology, Haraway pronounced in her 1991 book *Simians, Cyborgs, and Women: The Reinvention of Women* that “we are all chimeras, theorized and fabricated hybrids of machine and organism” and that “no objects, spaces or bodies are sacred in themselves; . . . components can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language.” Embracing this “cyborg ontology,” Haraway regarded the effacement of the distinction between body and mechanical construct as a path to liberation, and she issued an “argument for *pleasure* in the confusion of boundaries and *responsibility* in their construction.”

By contrast, the growing hold of this scientific revision of the body on the collective imagination awakened consternation in Illich, as he grappled to understand profound changes in the practice of medicine and their consequences for our self-understanding. In the mid-twentieth century, medicine as an art began giving way to medicine as a science; several generations into this trend, it is difficult for us to appreciate our extensive menu of curative treatments as the watershed it is. We have learned to see and treat the body as a system to be repaired, and to repair that system relying on biomedical experimentation that abstracts from the body and statistical analyses that abstract from the particular person within a population. This approach to medicine has issued in cures—but also in a new sense of illness as a technical failure and

health as an achievable entitlement. Where suffering and death become equated with failures of the organismic “system,” the medical system, or both, the inescapable human task of facing finitude, as represented in the body’s vulnerability and mortality, is displaced and reconfigured.

Evelyn Fox Keller’s 1995 volume *Refiguring Life: Metaphors of Twentieth-Century Biology* sheds light on the point of agreement between Haraway and Illich—that our sciences are reshaping our view of ourselves—by offering an historical overview of the biological discourse of the foregoing century. Keller’s purpose is not to join these other thinkers in evaluating the broader cultural influence of the sciences; instead, her delineation of some of the entanglements of language, culture, and history *within* the sciences offers a valuable prologue to such work. A theoretical physicist turned historian and philosopher of biology, Keller is in a good position to navigate the intertwining developments of genetics, embryology, thermodynamics, and cybernetics that comprise her story. Her central claim is that the ideas enshrined in words, metaphors, and images, set the boundaries of imagination and thought in every discipline. Speech and acts are not to be rigidly distinguished; the words we choose dispose us and our interlocutors to particular interpretations and indeed to particular pursuits. Thus the language used in describing the objects of scientific study, Keller says, “are not simply determined by empirical evidence but rather actively influence the kind of evidence we seek (and hence are more likely to find).” And this language does not arise in a vacuum.

To illustrate, Keller considers the shift in language used to describe the union of egg and sperm in sexual reproduction. A generation before the publication of *Refiguring Life*, fertilization could “effectively and acceptably be described in terms evocative of the Sleeping Beauty myth (for example, penetration, vanquishing, or awakening of the egg by the sperm), precisely because of the consonance of that image with prevailing sexual stereotypes.” On this side of the sexual revolution, however, she observes it is “equal opportunity” imagery that prevails: fertilization becomes “the process by which egg and sperm find each other and fuse.” The shift is interesting, but is it significant? Keller offers evidence that it is, bound up with her complicated exposition of another image, the one that dominates her slim volume: “gene action.”

The history of the gene is a complicated one, spanning numerous decades, disciplines, and protagonists, and Keller only scratches the surface in the three lectures that form *Refiguring Life*. A key part of the story she tells is the growing antagonism in the early twentieth century between embryology and the alluring new field of genetics, which initially sought an increasingly fine-grained particulate explanation of heredity, growth, and development, with genes as the star of the show. But the burgeoning new discipline also revised and co-opted its elder brother’s main question. The query “how does an egg develop into a complex many-celled organism?” now reduces to “how do genes produce their effects?” Embryology is reduced to genetics.

The idea of the genome as the agent or producer of life found vivid expression in physicist Erwin Schrödinger’s oft-quoted 1944 characterization of chromosomes as “law-code and executive power—or to use another simile, they are architect’s plan and builder’s craft—in one.” This attribution of intelligence and will to the genome *preceded* key research breakthroughs that specified what genes actually, physically are and how they work, but it presaged the perception of their centrality and power that in fact would both guide a highly successful research program and also capture the public imagination.

The roots of this perception are many and tangled, but Keller draws attention to a particularly deep one that was struck in the wake of Watson and Crick's 1953 discovery of DNA's double helical structure. Building on other recent breakthroughs, they offered a new description of gene action as the orderly transfer of "information" according to a genetic "code." Keller recounts the reception of their thesis in the biological world:

Geneticists and molecular biologists were euphoric: there, surely, must be the answer! DNA carries the "genetical information" (or program), and genes "produce their effects" by providing the "instructions" for protein synthesis. DNA makes RNA, RNA makes proteins, and proteins make us. It was, without doubt, one of the greatest milestones in the history of science. But still, one might ask (although few people did at the time), what kind of answer is this? What, in fact, do information, program, instruction, or even the verb makes actually mean?

The metaphors multiplied. Genes were agents, bearers of information, the repository of a program, the locus of the instructions that dictate the structure and function of the whole body. But there were several problems with these images. A metaphor always makes an evocative comparison between unlike things. Though it is arguably impossible to communicate without them, this does not mean that every such comparison holds water. Casting genes as actors within cells propelled the field of genetics to the center of the biological stage, but this choice rests on, and perpetuates, a distortion of what genes actually are and do. Keller cites geneticist Richard Lewontin's wry 1992 critique of the attribution of quasi-spiritual directive capacities to a biochemical:

DNA is a dead molecule, among the most nonreactive, chemically inert molecules in the world. . . . [I]t has no power to reproduce itself. Rather it is produced out of elementary materials by a complex cellular machinery of proteins. While it is often said that DNA produces proteins, in fact proteins (enzymes) produce DNA. The newly manufactured DNA is certainly a copy of the old, . . . but we do not describe the Eastman Kodak factory as a place of self-reproduction [of photographs].

Despite the inadequacy of the metaphor, the discourse of gene action set the course of mainstream biology for decades and remains influential: it "framed the questions [scientists] could or could not meaningfully ask, the organisms they would choose to study, experiments that did or did not make sense to do, the explanations that were or were not acceptable."

On the assumption that life is constituted by gene-agents producing their effects, the "other" constituent of a new organism—the cytoplasm and other structures donated by the female

gamete—was reduced to a stage on which the hero of the developmental drama, the gene, could perform its feats. Keller reads the genome-cytoplasm opposition as symbolizing the practice of twentieth-century biology on multiple levels, including that of sexual stereotypes. The male gamete consists almost entirely of nuclear material (chromosomes), and thus is readily associated with the genome and genetics. Although the female gamete contributes an equal number of chromosomes, its *distinctive* contribution is the cytoplasm, which easily becomes the symbol of the feminine contribution to new life, notable for being non-genetic, hence of marginal interest. Mediated by the discourse of gene action, the difference between the gametes becomes a new spin on the male-active, female-passive trope of generation that reaches back to Aristotle. And Keller suggests that the genes-as-agents metaphor induced a kind of tunnel vision that, among other things, neutralized motivation among for studying topics like maternal inheritance because pursuing the action of the genome was the only real game in town, at least in the U.S.

Keller's charge of metaphorical slippage between disciplines also comes to light as systems theory began to take possession of—and to “refigure”—the concept of organism. She cites the “Progress Report of the Air Defense Systems (ADS) Engineering Committee” of 1950 as not only the first modern technical definition of the term “system” but also a foreshadowing of the term “cyborg” (cybernetic organism). An organism, the report said, was a thing with “sensory components, communication facilities, data analyzing devices, centers of judgment, directors of action, and effectors, or executing agencies.” This notion of organism was versatile, applicable to animals, men, groups of animals and men—but also to “partly animate organisms” like the ADS, a system involving men and machines, and to “inanimate organisms” like vending machines. The equivocation is a harbinger of Haraway's call to cultural revolution just a few decades later.

Keller's three essays are whirlwind accounts of a complex history that require, but also repay, study. Her attention to the linguistic, disciplinary, and historical-cultural influences of biology shed light on the way in which all of these forces impinge on our self-understanding by way of their construal of the body. Keller's conclusion, perceiving the new fungibility of the body in consequence of the linguistic and cultural shifts she has recorded, should give us pause:

The body of modern biology, like the DNA molecule—and also like the modern corporate or political body—has become just another part of an informational network, now machine, now message, always ready for exchange, each for the other.

But her work is also an invitation to become better acquainted with the intriguing contingency of the sciences. As Karol Wojtyła warned in *Love and Responsibility*, we should not confuse the biological order with the order of nature. Biology is a construct, a “work of the human mind separating some elements of this order from what really exists,” with “man for its immediate author.” Studies such as Keller's offer the beginnings of an antidote to rampant appeals to scientific authority as though it were the sole remaining absolute. By exposing

unquestioned suppositions borne in our habits of speech and thought, Keller's work offers a pathmark along the way of reclaiming a more adequate vision of our bodies and ourselves.

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