Genetic Explanations: Sense and Nonsense

Author: Olson, Steve

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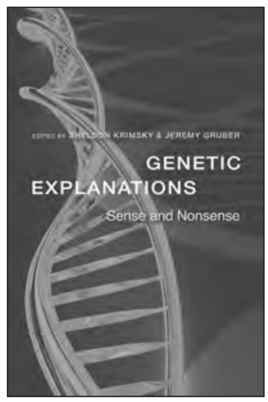
The Case against DNA

Genetic Explanations: Sense and Nonsense. Sheldon Krimsky and Jeremy Gruber, eds. Harvard University Press, 2013. 384 pp., illus. $45.00 (ISBN 9780674064461 cloth).

For decades, a small but persistent band of iconoclasts has been chipping away at the reigning orthodoxy of molecular biology. DNA sequences have very little power to predict how most of us will die, they say. Our genes should be seen more as a handy filing cabinet in which the cell stores information than as the blueprint of life. An obsession with DNA has not only distorted research priorities but stunted the ability of science to improve human health.

Genetic Explanations: Sense and Nonsense compiles 18 essays that broadly share this outlook, and it is hard not to detect a note of triumphalism in the book. Biology has indeed turned out to be much more complicated than the architects of the genomic age envisioned. The problem of missing heritability has raised the possibility that something other than DNA is responsible for much of the continuity between generations—or that the concept of heritability itself has been misunderstood. Epigenetic influences on traits, and even inheritance, hint at layers of unsuspected mechanisms within cells. Very few of the benefits foreseen by the proponents of large-scale DNA sequencing have yet materialized. In an era in which even the definition of the term *gene* is being disputed, genetics is undergoing something of an identity crisis.

The first five essays of *Genetic Explanations*, along with the introduction by coeditor Sheldon Krimsky, examine the crisis from a philosophical—and sometimes even aesthetic—perspective. Ruth Hubbard, whom Krimsky cites as the inspiration for the book and who was arguing against genetic reductionism as early as the 1970s, points out that explanatory hubris can have "unpredicted and unintended consequences" (p. 24). She focuses more on the biological dangers of genetic tinkering, but of course, the observation is more general. When President Clinton can hail DNA as "the language in which God created life" (p. 23), the perils of lionizing DNA seem obvious.



Other essays in part one of the book examine evolution, heritability, and development, all from perspectives that range far beyond DNA. One objective of these essays, as Evelyn Fox Keller writes, is not so much to answer existing questions as "to reformulate the questions to conform to what the realities of biological development permit scientists actually to answer" (p. 41). The genetic contribution to differences in complex traits between groups is, from this perspective, not a scientific question, Keller notes. Potentially answerable questions instead include the following: How malleable is individual human development? What are the influences on development? How can human potential be maximized?

An intriguing chapter by Stephen L. Talbott examines "The myth of the machine-organism," arguing that mechanistic views of biology have yielded about as much progress as they ever will. Comparing biological processes to the swirling currents of a river, the movements of a flock of birds, a dance, a nest of snakes, a sculpture, he writes, "The cell nucleus, in its plastic spatial gesturing, is more like an organism than a machine" (p. 55). Biological systems need to be viewed as a "preexistent whole," he argues, in which discrete physical causes become fluid and diffuse. Instead of causation, contextual transformation is the central truth, as ongoing revelations of biology's complexity have demonstrated. "Far from being reduced to something unrecognizable, the organism is being given back to us as we have always known it—whole, full of surprises, and singing a song in harmony with our own being" (p. 68).

The six essays making up part two of the book turn to medical genetics, although some degree of overlap with the previous essays is inevitable. Eva Jablonka looks at "Some problems with genetic horoscopes," a chapter title that gives away her conclusion. Subsequent essays search in vain for cancer genes, genes that cause psychiatric disorders, and genes responsible for autism. The writers do not go so far as to suggest dismantling large parts of the genetics research enterprise, but they repeatedly emphasize the need to diversify research beyond genomics. At the very least, as Carl F. Cranor writes, "Scientists and the public alike should not be quick either to overemphasize or to underemphasize genetic contributions to disease" (p. 121).

The third and final part of the book covers the genetics of behavior and human culture, with a conclusion written by the other coeditor, Jeremy Gruber. Here, the essays are wide ranging, from an examination of forensic DNA evidence to a recounting of adventures with direct-to-consumer genetic testing, from a chapter on "Creating a 'better baby'" to a review of recent epigenetics research. Particularly interesting is Jonathan Beckwith's

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essay on "The persistent influence of failed scientific ideas," which documents the many ways in which discredited genetic ideas insert themselves into the public's consciousness—and into high school textbooks—and are difficult to dislodge.

Sometimes, statements in the book drift into overstatement. Has genetic sequencing really "not put us conceptually that far ahead of where we were at the beginning of the twentieth century" (p. 24), as Hubbard states? Probably not, but I had to think about it for a while. Is it true that "genes for psychiatric disorders and for normal variation in psychological traits do not exist" (p. 95), as Jay Joseph and Carl Ratner contend? Perhaps, but an "alternative paradigm that emphasizes the role of familial, social, cultural, and political influences" (p. 106) may swing the pendulum too far in the other direction. Still, even when trying to be provocative, the authors move the discussion forward.

Genetic Explanations: Sense and Nonsense is a valuable compendium of ideas that deserve far more attention than they have received. All geneticists should be familiar with these arguments, even if they disagree with some of them. After all, the naysayers so far have a better track record than do the gene jockeys.

STEVE OLSON

Steve Olson (steve@steveolson.com) is the author of Mapping Human History: Genes, Race, and Our Common Origins, *among other books.*

A THOROUGH VIEW OF FOOD WEBS

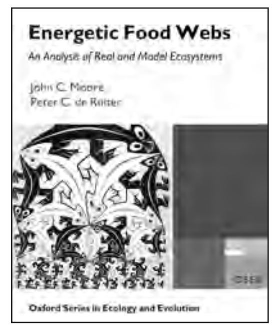
Energetic Food Webs: An Analysis of Real and Model Ecosystems. John C. Moore and Peter C. de Ruiter. Oxford University Press, 2012. 344 pp., illus. $59.99 (ISBN 9780198566199 paper).

Energetic Food Webs: An Analysis of Real and Model Ecosystems is a new title in the Oxford Series in Ecology and Evolution, which is edited by Paul H. Harvey, Robert M. May, H. Charles J. Godfray, and Jennifer A. Dunne. In today's world of academic sound bites, in which journal articles have become shorter and shorter, often containing the smallest publishable unit of science, I am happy to see in this and in similar series that a significant number of ecologists still find the time to write monographs that thoroughly outline and develop an important topic.

Coauthors John C. Moore and Peter C. de Ruiter have a long history of joint publications, their first (to my knowledge) dating back to 1990 and also focused on food webs (Moore et al. 1990). Moore is a professor and head of the Department of Ecosystem Science and Sustainability and director of the Natural Resource Ecology Laboratory at Colorado State University. He has received many honors, including the Eugene P. Odum Award for Excellence in Ecological Education in 2011 from the Ecological Society of America. De Ruiter is professor of theoretical ecology at Wageningen University, in the Netherlands. Together with Volkmar Wolters, de Ruiter and Moore previously edited another book on food webs (de Ruiter et al. 2005).

Energetic Food Webs targets both graduate-level students and professional researchers and strives to "advocate an integrative approach" to the study of food webs, which uses aspects of both "an individualistic community-based approach and a holistic ecosystem-based approach" (pp. 3–5). The authors have organized the book into three sections: The first section is a treatment of simple and multispecies community modeling, the second section addresses the stability of simple and complex communities, and the third section develops the dynamic architecture of food webs.

The first section begins with simple connectedness food webs (representing a community-based perspective), in which the feeding relationships between organisms are depicted and an example is made of a soil food web of the North American shortgrass prairie. Moore and de Ruiter then extend the connectedness food web to an energy flux web (representing an ecosystem-based perspective), in which the transfer of energy or matter from resources to consumers is depicted. Finally, their integrative approach is extended to functional webs, in which the strength of interactions among species is depicted, thus merging the community- and ecosystem-based perspectives. The authors use several empirical food webs to illustrate their models, and this combination of theory and example is very useful.



After describing the different kinds of food webs, Moore and de Ruiter explore the stability of food webs in the second section of the book and, in particular, how stability is affected by energy flux (e.g., responses to enrichment and disturbances). They investigate whether the architecture of food webs is compartmentalized, thereby identifying "energy channels as energy-based compartments within food webs that describe the flow of matter and energy through food webs" (p. 125) and how such compartments affect the stability of food webs.

Whereas Moore and de Ruiter assume a static architecture of food webs in the first two sections, they introduce food webs changing over time in the third. The authors also link this dynamic perspective of food webs to classic concepts and theories in ecology, specifically to the keystone species concept, which "was introduced as a metaphor to signify the importance of species that are low in number or biomass yet exert a high

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