

## GENOMICS

# After the genome rush

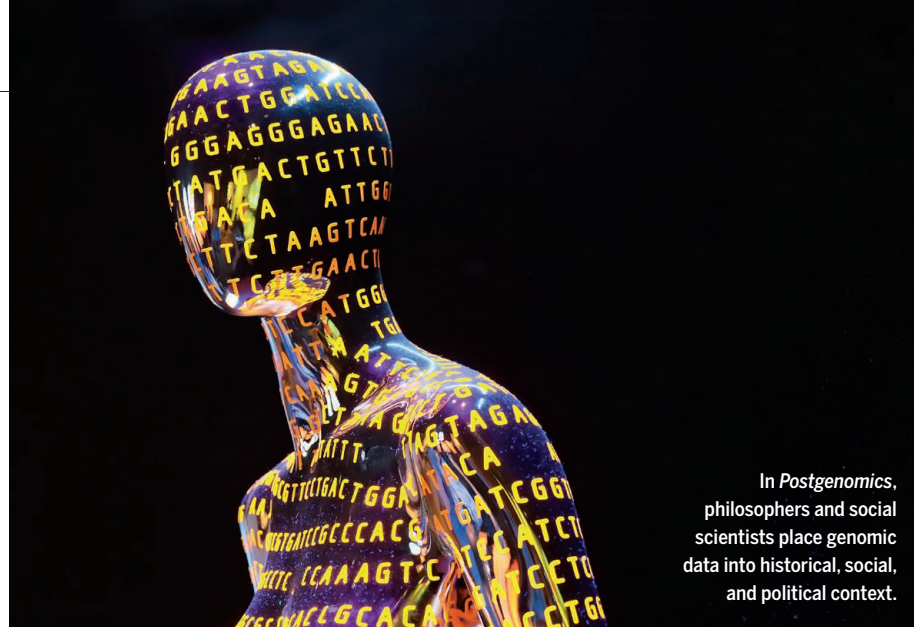
## How the life sciences changed in the wake of the genomics revolution

By P. William Hughes

The Human Genome Project (1998–2003) has been described as the frontier after which biology irrevocably changed. *Postgenomics: Perspectives on Biology After the Genome* contains 12 essays from philosophers and social scientists that reflect on the diverse consequences of this “genomics revolution.” Topics range from the history of network theory and its effect on the development of bioinformatic modeling to broader ethical and philosophical considerations, such as data donation and curation, and the role that genomic data should play in eliminating health disparities.

The primary theme of this volume is that postgenomics research is characterized by a fundamental shift in how problems are identified, hypotheses are proposed, and data are treated, rather than by improvements in DNA sequencing technology. In chapter 7, Rachel Ankeny and Sabina Leonelli define postgenomics as “a historical marker for an era where the results of genomics ... are being brought together with other types of biological traditions and outputs.” In some cases, this synthesis challenges researchers’ abilities to provide explanations for biological phenomena. For example, the effort to reconcile genomic data with insights from other biological sciences can call into question the reductionistic goal of articulating a simple relationship between genotype and phenotype.

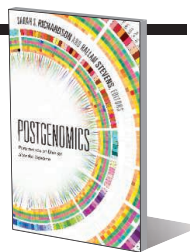
An important secondary theme of the book is that while postgenomics presents new technical and theoretical challenges for scientists, it also allows science studies scholars to observe firsthand how scientists react to new discoveries. In chapter 3, anthropologist Mike Fortun highlights the importance of affect—specifically, emotional reactions such as surprise—as a driver of



In *Postgenomics*, philosophers and social scientists place genomic data into historical, social, and political context.

### Postgenomics Perspectives on Biology After the Genome

Sarah S. Richardson  
and Hallam Stevens, Eds.  
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scientific discovery and change. Fortun argues that in repetitive, data-driven sciences such as genomics, where the formulation of hypotheses may follow rather than precede data collection, scientists’ affective reactions to unexpected phenomena will become increasingly common as a defensible justification for research.

In chapter 4, John Dupré elegantly argues that the notion that individuals have a unique, fixed genome is untenable in light of contemporary scientific knowledge. He maintains that genomes are both dynamic—because epigenetic regulation is variable and reversible—and cooperative, because genetic chimeras and obligate symbiotes use proteins transcribed from multiple genomes. (He claims that humans fall under the category of obligate symbiotes because we have both a symbiotic relationship with our own gut flora and mitochondrial endosymbiotes.) Dupré concludes that it is no simple matter to speak of “the genome” of any individual organism, given that many dynamic genomes act in concert to facilitate individual survival and reproduction.

As in many edited volumes, there are notable tensions between the perspectives of the authors of these essays. The most

important is a fundamental disagreement over the mutability of the postgenomic genome, a debate that is derived from the question of whether or not postgenomics is a methodologically distinct research program from genomics or classical genetics. Some authors maintain that postgenomics is more or less continuous with classical genetics, arguing that the ultimate goal is to find relationships between phenotypes and genomic causes. These authors treat genomes as invariant and believe that the distinction between pre- and postgenomic biology is that postgenomicists reveal insights by analyzing whole genomes instead of individual genes. Other authors argue that postgenomics is more or less distinct from genetics and is characterized by an antireductionistic (i.e., holist or emergentist) understanding of genetic material that attempts to describe syndromes of correlated phenotypes by means of developmental and probabilistic models. I believe that these unresolved tensions faithfully reflect those in the field and are a strength of the volume, which represents an honest and timely discussion of important issues in contemporary bioscience.

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I recommend this book to all biologists and philosophers interested in an accessible overview of the effect of the genomic revolution on the biosciences. It capably discusses both the new discoveries and the technical improvements that have been made since the advent of genomics, as well as the attendant philosophical and sociological implications. ■

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