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"Mere Genes" a Review of "Life Script" by Nicholas Wade and "The Misunderstood Gene" by Michael Morange

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MERE GENES

Life Script
How the Human Genome Discoveries Will Transform Medicine and Enhance Your Health
Nicholas Wade
Simon and Schuster, $23, 201 pp.

The Misunderstood Gene
Michel Morange
Harvard University Press, $24.95, 222 pp.

M. Therese Lysaught

In June 2000, all eyes were on the East Room of the White House. There, Bill Clinton, a gaggle of scientists, and British Prime Minister Tony Blair (present via the wonders of technology) assembled to announce that the Human Genome had been "sequenced" (at least almost). Light bulbs flashed. Newspapers and media outlets proclaimed and parsed the news for weeks. It was, as far as one could tell, A Big Deal.

But was it? What did this really mean? The two books under consideration here present different perspectives on these questions.

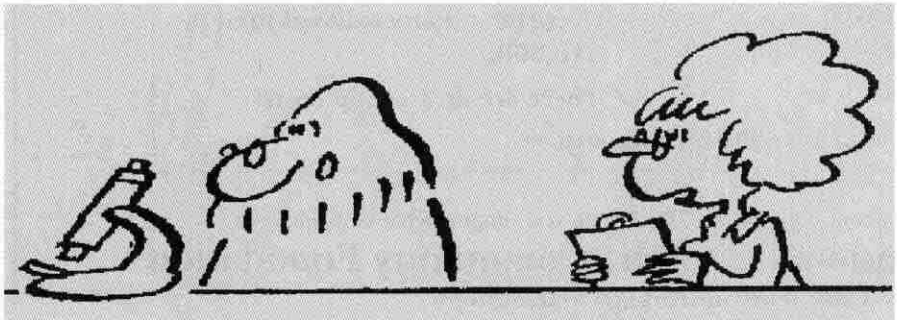
Nicholas Wade, a science writer for the *New York Times*, believes that this was a turning point in the history of civilization, marking the moment that Western medicine began to emerge from the "dark ages" of surgery and chemical poisons.

Life Script proceeds in two sections, each of which could stand alone. The first three chapters tell the story of the race to sequence the human genome. Wade valiantly tries to make the story interesting. Instead, the tale is all too familiar. The bold, courageous, maverick outsider (Craig Venter and Celera Genomics), funded well by self-made venture capitalists, takes on the plodding, inept, traditional community of academic scientists. The clear virtue in Wade's tale is brash egoism; the hero is competitive capitalism in its new biotech garb. Think Ayn Rand meets scientific triumphalism.

With the tale told, Wade devotes the remaining four chapters to medical applications of genetic technology. Here he rehearses the many fascinating possibilities that are the stuff of newspaper headlines: gene chips enabling genome-wide diagnostic scans; new protein drugs and pharmacogenomics; cures for cancer; regenerative medicine (via embryonic and adult stem cells and cloning); genetic manipulation of the life span; and genomic engineering.

Critique would take far more than my allotted space. I will mention only three points. First, the book lacks an interpretive or analytical framework. Stylistically, it reads like a cross between a book-length newspaper article and a series of press releases for various biotech companies. No critique is offered; social implications of proposed new developments are not explored; and ethical concerns are mentioned only to be dismissed. Second, Wade's understanding of the genome is reductionist and determinist. Too many times, he refers to the body as "human clay" and the genome as the human "parts list," "the program," the "human instruction manual" which will enable scientists to "fix the human machine and in time to correct most—perhaps all—of its defects." But beyond traditional biological reductionism and determinism, Wade has an unwarranted confidence in the ability of genomic technicians to turn the straw of the sequence into gold. One might call this "biotech determinism." Too often to count, Wade promises that "over the next decade," "in a few years," "in two years," one biotech company or another will have created an application that will change the face of medicine as we know it. Interestingly, gene therapy receives little space in this book.

Closer attention to the history of that field over the past decade should cool any premature prognostication. If Wade exemplifies the hype about the implications of genetics, Michel Morange provides the antidote. For Morange, a professor of biology and the director of the Center for the Study of the History of Science at the École Normale Supérieure in Paris, sequence data give us important information about the genome but cannot provide the most useful or interesting information, namely, how genes and organisms function. Morange's primary agenda is to debunk genetic determinism, especially the notion that there is a "gene for..." (fill in the blank with the disease or trait of your choice). His book brings to mind the work of Ruth Hubbard, although Morange's rhetoric is more subdued. Hubbard, the Harvard biochemist now emerita, is one of the authors of *Exploding the Gene Myth* (Beacon Press), which explores how the findings of genetic science are used to serve social and political ends.



"It's best not to get emotionally involved, Dr. Blumenkraft; they only live forty-eight hours."

Morange seeks to correct common misperceptions or outdated understandings of what genes do. He begins with a history. It is not only the story of Mendel, Morgan, Mueller, and Watson/Crick. As a historian of science, Morange also tells the story of the conceptual development of the field of genetics (discussing, for example, the "reification" of genes, their transformation into an object). This ear for the conceptual allows him to mount a convincing critique of neo-Darwinian evolutionary theory as well as other questionable extrapolations from genetic findings.

After laying out history, Morange moves to a series of chapters in which he presents the case against the notion of genes "for" diseases, cancer, development, aging, longevity, death, behavior, sexuality, personality, intelligence, and morality. Morange analyzes the assumptions behind deterministic claims, offering a scientifically more nuanced and balanced account of how genes actually contribute to these outcomes. The centerpiece of his argument is "knockout" experiments. Knockout experiments proceed by modifying a specific gene, which results in either an abnormal protein product or none at all. With a protein modified, researchers can study the role it plays in the development and functioning of an organism. Sometimes, if you knock out a gene, it leads to an expected effect. Researchers like that. Sometimes, no discernible effect can be noted. This perplexes. Other times, an array of effects is discovered which could not have been predicted from what was previously known. This confounds. Thus, for Morange, knockout experiments powerfully challenge the notion of genetic determinism.

While Morange wants to give genes their proper credit, his money is with proteins. As he notes, "If molecular biologists had to designate one category of macromolecules as being essential for life, it would be proteins and their multiple functions, not DNA and genes...Asking what genes do simply means trying to find out how proteins—the structures of which are transmitted from generation to generation—enable the organism to carry out complex functions."

This shift in focus allows Morange to critique the dominant metaphors used to talk about genes. He rejects computing metaphors that liken the genome to a program and linguistic/textual metaphors that compare it to an instruction manual, information, or "the book of life." In their place, he proposes a new metaphor that is rich with possibility: that of memory. "DNA," he notes, "is the memory that life invented so that, at each generation, its active agents—proteins—could be efficiently reproduced." This contribution alone makes the book worth reading.

Any person interested in genetics should read *The Misunderstood Gene*. Although some of Morange's technical material may be difficult for the general reader, this book will correct a wealth of genetic misunderstandings. □

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