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## Review: The Gene: An Intimate History. By Siddhartha Mukherjee

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*The Gene: An Intimate History*. By SIDDHARTHA MUKHERJEE. New York: Scribner, 2017. 592 pp. \$32.00 (hardback).

Dr. Siddhartha Mukherjee, author of the highly regarded and Pulitzer Prize winning *The Emperor of All Maladies*, has undertaken what he terms as an “intimate history” of the gene. Mukherjee’s medical credentials are impressive, yet they are also atypical for research and writing on the history of science. *The Gene* is impeccably written and expands our understanding of a well-known history through his unique viewpoint. In fact, Mukherjee’s work is reminiscent of another Pulitzer Prize winner, Jared Diamond. Originally a physiologist, Diamond, is best known for applying his scientific viewpoint to the Spanish Conquest in his 1997 Pulitzer Prize winning *Guns, Germs, and Steel*.

Mukherjee gives two reasons behind writing the book. First and foremost is his family’s medical history. The opening chapter of the book, and consistent interludes throughout, share the stories of three family members plagued with mental illness: Rajesh, Jagu, and Moni. Moni, who at the time of publication resides in a mental institution in Calcutta, was particularly influential to the author’s mindset on heredity. In a stirring paragraph, the author remarks that *The Gene* is “a very personal sort—an intimate history. The weight of heredity is not an abstraction for me” (p. 14). The second root behind *The Gene* is Mukherjee’s medical work as a cancer biologist. On a daily basis, he was interfacing with genetics, as he describes cancer as the “ultimate perversion of genetics—a genome that becomes pathologically obsessed with replicating itself” (p. 9).

The primary claim made in the book is one of significance, specifically the importance of the gene within the history of science. Mukherjee argues that the gene is a “powerful and dangerous idea...the fundamental unit of heredity, and the basic unit of all biological information” (p. 9). Mukherjee goes on to explain that the gene parallels the atom and the byte. Just as the atom is the basic unit of all matter and the byte is the basis for all digitized information, the gene the basis of all biology.

In order to prove his point, Mukherjee opted to craft *The Gene* as a (mostly) chronological history, broken up into six sections. In the first section, Mukherjee tours all early scientific research relevant to heredity and genetics. He begins with Gregor Mendel’s pea garden, covers Charles Darwin’s *On the Origin of Species*, and ends with the rise of eugenics as told from the stories of Francis Galton and *Buck v. Bell*. In this section Mukherjee also briefly tours the Ancient Greek minds of Pythagoras, Aristotle, and Plato within the context of how they influenced Mendel and Darwin.

In the second section, entitled, “In the Sum of the Parts, There Are Only the Parts,” Mukherjee continues following the history of human understanding of the gene. Of note here is the initial realization that “the gene was born ‘outside’ biology” (pg. 95). That is to say that the discovery was not made by biologists nor was it immediately applied by the renown biologists of the era. Of course, the irony is that the gene held the answers to many of the major questions that the biological field was addressing at the time; it just took a while for biologists to realize that. This section includes a discussion of Thomas Morgan’s discovery that genes moved in “packs,” the Third Reich’s “applied biology,” and a number of major post-World War II breakthroughs in biology (p. 120).

Parts three and four denote a slight change in content; whereas Mukherjee continues to focus on the development of human understanding, but he does so through the detailed analysis of two transformative technologies from the 1970s: gene sequencing and gene cloning. By emphasizing these specific technologies, the book takes a more technical turn exploring modern medical research and the techniques used to map and identify genes linked to disease. The highlight of these sections is found in part four with analysis on the launch and findings of the Human Genome Project. The last chapter of these two sections, “The Book of Man,” simply lists bullet points highlighting facts from the complete human genome mapping, such

as “It has 3,088,286,401 letters of DNA (give or take a few)” (p. 322).

Parts five and six continue the narrative of increased human understanding over time; however, they do so almost as applied science, analyzing the gene within a variety of particularly relevant social issues. Section five, “Through the Looking Glass,” discusses different topics researched over the past twenty years as a means of linking the gene with personal and cultural identities and the concept of societal “normalcy.” This includes topics such as racial identity, sexual determination, and Dean Hamer’s search for a genetic link with sexual orientation. Part six looks toward the future, including potential medical breakthroughs and ethical dilemmas. Most notable here is our current ability to manipulate human genetics, which invites the cliché ‘opening Pandora’s Box’ metaphor. Luckily, the author supplied a better summation with his poignant contention that “our capacity to understand and manipulate human genomes alters our conception of what it means to be ‘human’” (p. 12).

Taken in its entirety, *The Gene* synthesizes an impressive breath of information from multiple fields. Much of the book’s content is typically recorded by historians who study the history of science; however, Mukherjee additionally analyzes recent genetics and biological research (as well as legal history, politics, and social mores) to compile a narrative that shows how human understanding of the gene has changed over time. In order to craft this history, the author largely leans on previously published works for sections one and two. In parts two and three, however this methodology appears to shift as Mukherjee crafts what is arguably the first complete draft on the history of genetics from 1970 to the early 2000s. Parts five and six are less cohesive as a narrative history, but this is an expected problem when one’s historical narrative arrives at the

present and speculates into the future. *The Gene* represents an incredible amount of research, and his work is to be commended.

As for its application to the field of big history, the book notably does not employ familiar concepts or tools such as complexity, scale, or emergent properties to tell his story. Perhaps the crux of the issue is that *The Gene: An Intimate History* is really not a history of the gene as the title seems to imply and does not utilize different scales of time, which seems like a natural fit, for analysis. Instead, Mukherjee’s remarkable book is a better labeled as a history of science, crafted by studying scientists and using their published papers, the historical record, and signs of their impact on society as evidence. In addition, *The Gene* functions more as a textbook designed for a popular audience rather than as a monograph with extensive archival or data based research. Despite its academic approach and formatting, its appeal, with the notable exception of parts three and four, is likely to be less to big historians and more for curious readers.

The big history of the gene remains unwritten, but this is not to say that *The Gene* does not hold value for big historians. Mukherjee asks thought-provoking questions, adds perspective on multiple well-known figures in the big history narrative, and traces the interesting concept of human understanding of genetics into what was previously a largely unwritten history. *The Gene: An Intimate History* certainly has a place on every big historian’s bookshelf.

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