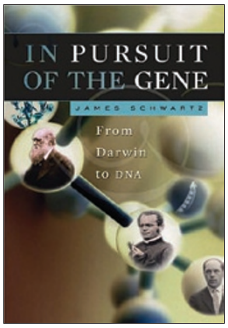
The genesis of genetics



In Pursuit of the Gene: From Darwin to DNA

By James Schwartz

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Reviewed by Marga Vicedo

This is a lucid and engaging account of the major discoveries and personalities in the history of inheritance up until the middle of the twentieth century.

Schwartz begins the story of the gene with Darwin's theory of pangenesis, which posited the existence of gemmules, microscopic particles circulating through the body that eventually assemble into the reproductive cells. Darwin's own cousin, Francis Galton, designed a simple test of this hypothesis: he transferred the blood from mongrel rabbits into pure breeds. After several attempts and many rabbits, he concluded the pure breeds did not inherit the characteristics of the blood donors. Darwin retorted that gemmules did not travel through the blood, but he never specified how they worked. For Galton, the rabbits eliminated pangenesis and shored up his belief that heredity was immutable and determinant of an organism's traits.

Whether inheritance was best studied by searching for hereditary particles or by statistically analyzing traits became a central issue in the biometrician–mendelian controversy after the rediscovery of Mendel's work with the common garden pea. Karl Pearson and W. F. R. Weldon viewed the postulation of unobservable hereditary particles with suspicion, emphasized the need to use biometric methods to study the distribution of characteristics in a population and focused on continuous variation, following Darwin's view that natural selection operated upon populations in a gradual manner. The leading mendelian in England, William Bateson, used breeding experiments to analyze the patterns of inheritance of discrete characters, thus emphasizing the significance of discontinuous variations in nature. As a result, the dispute about the significance of Mendel's work became entangled with different positions about evolution, natural selection and eugenics, eventually resulting in broken friendships and hurt feelings. Although scholars have written extensively about this controversy, Schwartz presents it in a fresh light by dealing carefully with the science and introducing some players with smaller roles, such as A. D. Darbishire and Charles Chamberlain Hurst.

Marga Vicedo is at the Institute for the History and Philosophy of Science and Technology, University of Toronto, Toronto M5S 1K7, Canada.
e-mail: marga.vicedo@utoronto.ca

From these bitter debates, Schwartz moves to recount in a brief and straightforward manner the discovery of the individuality of chromosomes, the existence of sex chromosomes and the postulation of the hypothesis that chromosomes could be the physical carriers of mendelian units of inheritance.

After this respite, we move soon to further wars, this time within the most famous group in the history of genetics. Schwartz examines how Thomas Hunt Morgan, Calvin Bridges, Hermann J. Muller and Alfred Sturtevant developed the chromosome theory of mendelian inheritance. Analyzing mutations in the fruit fly, these researchers correlated cytological findings with observable phenotypic changes and provided convincing evidence for the view that genes are pieces of chromosomes. The group itself was as interesting as the science they produced: a senior scientist at a leading research university, a modest room crammed with ripe bananas, fruit flies in bottles and brilliant young men struggling with their egos and their hormones. This is the stuff of legends. In an early one, Morgan's genius in managing boys and flies turned his group into a successful example of the collaborative nature of scientific enquiry. In Robert Kohler's more recent account, the hero was the fly, whose unbounded fertility and, thus, massive production of mutations made possible both the scientific success of the group and the development of a moral economy in which scientists could be generous with flies and credit. There was plenty of both to keep everyone happy. Or perhaps not.

Using the private correspondence of several scientists to great effect, Schwartz reveals the complex life and work of Muller, a pretty unhappy maverick who went from Columbia to Houston to Russia to Indiana, where he finally obtained a tenured position. The following year, Muller won the Nobel Prize for his work inducing artificial mutations with X-rays. In Schwartz's view, the other members of the fly room systematically undervalued the importance of Muller's work. But in trying to give Muller his proper place in the larger history of genetics, Schwartz constructs another legend: that of the genius ahead of his time who fought tirelessly for his ideas and "went on to develop the modern theory of the gene, which served as the foundation for modern molecular biology." The complexity of the history of science gets lost in narratives of heroes and antiheroes, pedestrian scientists and revolutionary thinkers. Schwartz gives us an engrossing account of Muller's life and work, but to present Muller as the major artificer of the "modern theory of the gene" is a gross simplification and, given the magnitude of Muller's contribution to genetics, an unnecessary one.

The lure of the fly room and its golden boys has dominated accounts of the early history of American genetics to this day. For a better understanding of this history, however, we still need fuller contextualization of this group within the much larger community of researchers who were studying heredity at the time, including the breeders in agricultural stations and other plant and animal geneticists in research institutions.

In Pursuit of the Gene is a solidly researched, well-written book that does not shy away from explaining the science, engaging with the political ideas and social context of the scientists' work and assessing the scientists' contributions and actions. A general reader interested in the history of genetics will find much to ponder and enjoy.

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