Morgan, T. H.

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U.S. geneticist Thomas Hunt Morgan (1866–1945) pioneered studies in classical genetics. He was the first to work on the fruit fly (*Drosophila melanogaster*) which has since become a major focus of genetic research.

When the Nobel committee selected Morgan for its 1933 prize in medicine, they cited “his discoveries concerning the role played by the chromosome in heredity.” In particular, they noted his combination of methods from Mendelian genetics with microscopic chromosomal studies, his choice of *D. melanogaster* as a research subject, and his genius at assembling a powerful team of collaborators. Although the committee realized that it might seem odd to award the prize in medicine for work on flies, they cited the value for understanding the “hereditary diseases of man.”

With hindsight, this recognition still seems right. We retain our hopes for unlocking the hereditary codes to cure human diseases. Yet Morgan always recognized that heredity does nothing by itself and that it is wrong to isolate genetics from the embryology and evolution that also shape organisms. Throughout his career, Morgan saw genetics as just one part of a very complex study of life.

Born into prominent families, Morgan explored the natural history of his native Kentucky. He obtained a doctorate in 1890 from Johns Hopkins University for his study of sea spiders. Morgan spent his career at Bryn Mawr College (1891–1904), Columbia University (1904–1928), and the California Institute of Technology (Cal Tech) (1928–1945). Morgan's study of embryology was inspired by his 1894–1895 visit to the Naples Stazione Zoological. That study of organismal development remained his focus, even though he is more widely known for his contributions to genetics. He saw heredity as part of individual development. Evolution shaped both heredity and development, but Morgan remained skeptical about contemporary interpretations of natural selection's power to effect species change.

Bryn Mawr shaped Morgan as a teacher and a researcher, and he married former Bryn Mawr student Lilian Vaughan Morgan, a fine biologist in her own right. Yet it was at Columbia that he developed his style and new research programs. Always an opportunist in trying different things and following the ones that worked, Morgan worked with various animal species and asked diverse questions. He expressed dissatisfaction with the current state of evolution, for example, in his *Evolution and Adaptation* (1903), and asked how variations arise and are preserved through heredity and evolution. The year 1910 brought two important papers: one critiquing the Mendelian-chromosomal theory of heredity and arguing for epigenetic interpretations of development, the other stimulating the rush of work on the fly and providing key evidence in favor of the Mendelian-chromosomal theory. This apparent contradiction reveals much about Morgan and his time.

Morgan sought empirical evidence to support his theories, and he did not see evidence in favor of the Mendelian-chromosomal theory of heredity. Something was inherited, certainly, but that did not explain development. Among his experimental organisms, however, was *Drosophila*. He realized that it was useful for research—easy to grow, taking little space, satisfied to eat bananas. Among other questions, Morgan was seeking variations sufficient for evolution of new species. In 1910, he observed the white-eyed male fly that changed the way he did biology.

At first, Morgan thought that the white-eyed fly might be the sort of mutation that the Dutch botanist Hugo De Vries (1848–1935) had suggested could give rise to a new species. He did breeding experiments to see whether he could create a new species. He could not, but he did find something at least as interesting. In the first cross between the white-eyed male and red-eyed female flies, the offspring were red-eyed like the mother. Yet the second crossed generation brought some white eyes. Because the white eyes appeared predominantly in males, no matter how the crosses were conducted, there seemed to be a link. And because maleness was connected with chromosomes, white eyes were linked with chromosomes. This raised many possibilities for future research and interpretations.

Morgan did two important things: he recognized the significance of that white-eyed male fly and followed the research path that revolutionized our thinking about heredity and development. Second, he changed his mind. Rather than sticking stubbornly with his skepticism about Mendelism, Morgan followed his evidence.

Furthermore, Morgan created one of the most effective collaborative research teams in the history of biology. Undergraduates Alfred Sturtevant and Calvin Bridges and graduate student Hermann J. Muller became indispensable players in the “fly room” culture. [See Muller, Hermann Joseph.] Under Morgan's leadership, the others often took the intellectual lead and directed innovations in laboratory techniques, mapping chromosomes and offering many of the major generalizations that underlie modern genetics. At Columbia and Cal Tech, Morgan directed the team. Increasingly, however, his own focus remained on individual development and the relations of heredity, development, and evolution. Rather than seeing him as a struggling geneticist who could not understand the latest theories of population genetics (as Muller later charged), Morgan should be seen as exhibiting unusual flexibility and recognition of the complexities of biology.

See also Mutation, article on Evolution of Mutation Rates.

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