



Biography of Barbara McClintock

Barbara McClintock (1902–1992) was one of the most original and pioneering geneticists of the 20th century. She trained at Cornell University in the 1920s, when genetics was still a young discipline shaped by a new view that hereditary factors reside in chromosomes. This framework was first articulated from cytological observations and was then firmly established by breeding experiments in model organisms that linked specific traits to specific chromosomes and mapped their linear order along these structures. McClintock specialized in maize cytogenetics and was known for her technical ability to visualize individual chromosomes. Early in her career, she demonstrated that genetic recombination corresponded to physical crossing-over between homologous chromosomes, providing direct cytological support for genetic theory.

Her most important work began in the 1940s at Cold Spring Harbor Laboratory. Studying variegated color patterns in maize kernels, she discovered two genetic elements that could change position within the genome, interact with one another and induce chromosome breakage. This made her conclude that certain genetic elements are mobile and can regulate the expression of nearby genes. She presented these results at a Cold Spring Harbor Symposium in 1951, describing what she called “controlling elements.” At the time, genes were generally regarded as stable units arranged in fixed order along chromosomes. The molecular structure of DNA had not yet been described and there were no tools to detect mobile DNA directly. McClintock’s conclusions therefore seemed difficult to reconcile with prevailing models. Although her work was respected for its rigor, the broader implications were not widely accepted, and interest in transposition remained limited for many years.

However in the 60s and 70s, the discovery of transposable elements in bacteria provided clear evidence that genes can indeed move. Similar elements were soon identified across organisms, including plants and animals. It became evident that transposable elements make up a substantial portion of many genomes and influence gene regulation, genome structure and evolution. This proved that McClintock was right and confirmed the significance of her earlier findings. Today, mobile elements and mechanisms that silence them are central to genetics and epigenetics.

During her career, McClintock pursued much of her work at research institutes rather than large university departments, a path shaped both by the constrained academic

opportunities available to women at the time and by her own need for intellectual independence. This permitted her to follow long, unconventional lines of research into genome organization and regulation. In 1983, her work was finally recognized and she was awarded the Nobel Prize in Physiology or Medicine for the pioneering discovery of mobile genetic elements. She became the first woman to receive an unshared Nobel Prize in that discipline.

McClintock's work changed the understanding of the genome and newly engendered fundamental concepts that are now standard in genetics and epigenetics such as mobile DNA, regulatory elements, genome plasticity. Honoring Barbara McClintock celebrates a discovery that reshaped biology, whose significance emerged fully only decades after it was first described, but that continues to be fundamental today.