# Nobel Prize to McClintock and Her Mobile Elements

In the earliest days of classical genetics, before any knowledge of the double helix, DNA sequences or recombinant DNA, genes were thought to be simple units strung like beads in a fixed linear array. But in 1951, after seven years of painstaking analysis of corn kernels, Barbara McClintock announced that some segments of DNA that control other genes can spontaneously move from one chromosome site to another. Her finding was greeted with silence; it did not fit into what was then known of genes and the data, based on the complex genetics of corn, were difficult to understand. But McClintock was confident in her work, and singlehandedly pursued it, giving few talks and writing few papers. Since the late 1960s, however, other examples of mobile genetic elements have cropped up in microorganisms, insects, animals and man; and McClintock's early insights were at last recognized with scientific interest and numerous honors.

In awarding her the 1983 Nobel Prize in Physiology or Medicine, the Karolinska Institute in Stockholm says, "The discovery of mobile genetic elements by McClintock is of profound importance for our understanding of the organization and function of genes. She carried out this research alone and at a time when her contemporaries were not yet able to realize the generality and significance of her findings." She is the seventh woman to receive a Nobel prize.

The institute points out a historical similarity between McClintock's "situation" and that of Gregor Mendel, who, studying the garden pea a hundred years ago, discovered basic principles of genetics. Both were so far ahead of their time that their discoveries were not appreciated until the principles were rediscovered by other geneticists decades later.

Whereas in recent years many scientists championed McClintock for major awards, there was considerable doubt whether she would win the Nobel prize. Her work would only fit under the category of "physiology or medicine." Usually this award recognizes work in medicine or animal biology; occasionally it has been given for microbiology. "I think this is the first Nobel prize given for work originally done in higher plants," says Eugene Fox of ARCO Plant Cell Research Institute in Dublin, Calif. He points out, however, the award was made only after it became clear that the implications of McClintock's work were not restricted to plants.

For more than 40 years, McClintock has lived and worked mainly in solitude at the Cold Spring Harbor (N.Y.) Laboratory as a scientist of the Carnegie Institute of Washington, outlasting both Carnegie's Department of Genetics and Genetics Research Unit based at Cold Spring Harbor. In 1970 she became an independent Carnegie investigator and now, at 81, she continues her research as a "retiree" and distinguished service member.

Carnegie Institution

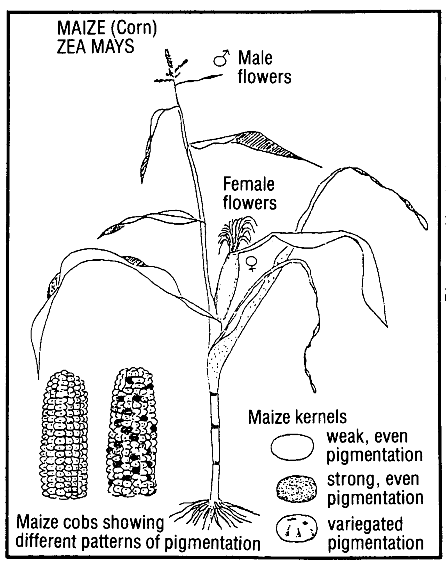
*Barbara McClintock in her laboratory.*

Biographer Evelyn Fox Keller describes McClintock's solitary work. "There [at Cold Spring Harbor], each spring, she plants her corn, judiciously fertilizing the budding kernels according to a carefully worked out plan of genetic crosses, watches the plants grow over the summer, and spends the long quiet winters analyzing the results."

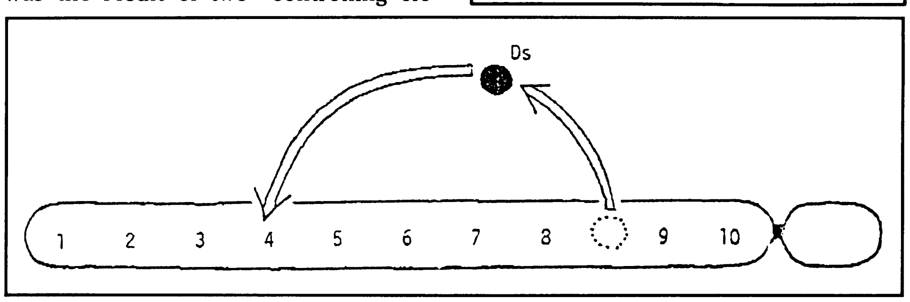
McClintock's early work on Indian corn in the 1930s helped demonstrate the relationship between inherited physical characteristics that can be examined with the naked eye and chromosome changes seen through the microscope. In 1944 she first observed an unusual pattern on some kernels. Colored spots were distributed in an arrangement that suggested to her genetic instability under some form of regulation. Eventually she worked out that the pattern was the result of two "controlling elements" whose location on the chromosomes are not fixed. The first element turns on and off any adjacent gene and is under the control of the second element, located some distance away. McClintock proposed that such elements underlie the cell diversity that arises during an organism's development.

Current interest in mobile elements is pragmatic, as well as intellectual. They are likely to be useful in biotechnology for moving genes. For example, a mobile, or transposable, element is already employed to do genetic engineering in fruit flies (SN: 10/23/82, p. 260). And at least one laboratory has begun using a transposable element for work in maize.

McClintock, who generally shies away from publicity, characteristically went out to pick walnuts along a wooded path near her house at the Cold Spring Harbor Laboratory after learning of her award. She later said, "The prize is such an extraordinary honor. It might seem unfair, however, to reward a person for having so much pleasure, over the years, asking the maize plant to solve specific problems and then watching its responses."  —*J. A. Miller*




Diagrams: Karolinska Institute, Stockholm




*When control element "Ds" jumps from its resting position to a spot near the gene designated as 4 in diagram above, the gene is switched off. If Ds later moves to another position, gene 4 resumes function. If gene 4 determines kernel coloration (above right), Ds may entirely suppress pigment production and a pale kernel results. If the action of Ds is interrupted, a speckled, or variegated, kernel may be produced.*