Book review

Keller, E.F.: A Feeling for the Organism: The Life and Work of Barbara McClintock. San Francisco: Freeman 1983. 235 pp., 17 figs. Hard bound £ 12.95.

This book presents a revealing portrait of a pioneering female research scientist and Nobel Laureate, Barbara McClintock, but, more importantly, critically analyzes the complex interaction between the individual scientist and the development of genetics. Dr. McClintock and the growth of genetics as a science are, in a real sense, contemporaries, born in the first years of the 20th century and maturing together during the 20s, 30s, and 40s. During this period, many honors and accolades were presented to her for her outstanding contributions to this new science. However, in the late 40s and early 50s, her most noteworthy investigations with maize which led to the discovery of genetic transposition and, only recently, to international recognition, were largely ignored for many years. In the 50s and 60s, the development of DNA replication and coding models to describe the most basic biological processes at the cellular level generated a rapid growth and expansion of molecular biology as a science. During that period, *Escherichia coli* studies indicated an elegant simplicity in these cellular processes. The relationship between the processes at the cellular level and the developmental and genetic complexity of multicellular higher organisms, was ignored or the processes were considered identical. In fact, Jacques Monod, a French pioneer in molecular biology and 1965 Nobel Laureate, reportedly said that what was true for *E. coli* would be true for the elephant. However, as so often has occurred in the history of science, additional studies complicated this simple picture drawn largely from biochemical assay studies of *E. coli.* In the 70s, it became increasingly clear that what was true for *E. coli* was not true for the elephant and wasn't even true for *E. coli* in all environments. In the late 40s and early 50s, many of the perplexing problems such as genetic regulation, transposition, "jumping genes" etc. encountered in the 70s had been studied by Dr. McClintock using a much more complicated organism, maize. However, her scientific papers and presentations in 1951, 1952, and 1953 did not arouse any interest in the scientific community. To many biologists at the time, genetic regulation and transposition sounded like a wild idea. Furthermore, few scientists knew enough about maize genetics to follow her very intricate arguments that were necessary to support her radical conclusions. Also, the mood in biology had grown impatient with the complexity of higher organisms and her writing was dense and difficult to follow. So today, over 30 years after her initial discovery, genetic transposition is included as an integral part of genetic theory and Dr. McClintock has been accorded many honors: Albert and May Lasker Award, the Macarthur Laureate Award, and the most prestigious, the 1983 Nobel Prize in Medicine.

This extreme time gap in recognition probably was caused, in part, by her gender, personality, and general attitude. She was described as a rugged individualist with high intelligence, great originality and ingenuity, and boundless energy. Her individuality was expressed by a tremendous capacity and/or need to be alone, total absorption in the problem at hand, little or no conformity to social expectations, and extreme frankness in speech. After graduation with a doctorate from Cornell University, she had a difficult time finding a position because she was unwilling to take available academic teaching jobs. From 1936 to 1941, she was on the faculty of the University of Missouri doing research with Dr. Lewis Stadler. In 1941, she was fired because, according to reports, she was a troublemaker, disobeyed rules, had no institutional loyalty, was too outspoken and probably because she was a woman in a predominantly male bailiwick. Since 1941, she has done research at Cold Spring Harbor in relative seclusion sheltered from the vicissitudes of biological fashion by an aura of privacy and reserve. Her attitudes on certain areas of genetics and research approaches were freely expressed and should be mentioned. She was dubious about the synthesis of genetics and evolution into population genetics since she felt the entire analysis was based on inadequate concepts. More generally, she was critical of the zeal geneticists had for quantitative genetics. They were "so intent on making everything numerical" so that they frequently missed seeing what was there to be seen. Her own method was "to see one kernel (of corn) that was different and make that understandable". The main title of the book "A feeling for the organism" indicates this highly developed intutitive sense and keen insight that she relied upon extensively to interpret and analyze results.

The appearance of this book at this time is most appropriate since the nature of research has changed dramatically, paralleling the period covered in this book. In the 30s, 40s, and 50s, research was generally conducted by one scientist or, at most, a very small number of scientists who worked on a restricted number of problems, with limited budgets, few graduate students, and technicians, and, by today's standards, primitive equipment. In the 60s, 70s, and into the 80s, the research emphasis shifted, because of complexity of the problems, to the multidisciplinary team of scientists working on a broad spectrum of problems with extremely large budgets, large numbers of graduate students, postdoctorals and technicians, and very complicated, expensive equipment. In general, research teams demand uniformity which is contrary to the "loner-rugged individualist" type of scientist. Even in that period when individual efforts were respected, the exceptional investigations of Dr. McClintock in the 40s and 50s were overlooked for many years, in part, because of her "loner" attitude. Research administrators who emphasize team research should be aware that much individual originality and insight is lost in such large and diverse teams especially if verbal communication, social interaction, and personality traits play a prominent part in the selection of research topics and in the reward system. Measuring research productivity only in terms of publication number from scientific teams and assuming more information or publications equals increased knowledge, probably will lead to routine and uninspired research.

Recommendation: This very readable, well researched book is highly recommended for everyone with even the slightest interest in the human relations and shifting directions of scientific research. The author who has all the proper credentials (personal association with Dr. McClintock, professional training in the field of molecular biology, intense interest in relating this story) has done an outstanding job in capturing the essence of the main character and identifying the various human, scientific, and societal forces acting on her individually and in the recognition of her research. In this era of shrinking research budgets, changing research climates and goals, and redefining research priorties, a glimpse into the recent past may prove invaluable in understanding the human nature of scientific fashion, in maximizing research efforts and productivity, and in plotting future directions in research.

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