

Nature, Nurture, and Gender: The Evolution of Evelyn Fox Keller

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The Mirage of a Space Between Nature and Nurture

Evelyn Fox Keller

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For those of us who came of age as women scientists in the 1980s, Evelyn Fox Keller was our torch bearer – a beacon of feminism in the masculine world of science; physics in particular. She created a new paradigm in her book *Reflections on Gender and Science*. The central thesis of that book was that science, like gender, was a social construct, and therefore bore the stamp of its creators, the majority of whom were men. She later showed how science had to be reconstructed to accommodate methods which differ from the standard. One such notion was that of the gene being a fixed, unchanging unit. Her study of Nobel Laureate Barbara McClintock's work on 'jumping genes' convinced her that the genetic apparatus is more labile and flexible than the central dogma allowed.

Fox Keller has now shifted her focus from feminism and science to the more general question of – the role that language of science

plays, in the metaphors for gender and race.

In her latest book *The Mirage of a Space between Nature and Nurture*, she argues that old prejudices still permeate genetics, and even though the concept of a gene as a singular hereditary entity has changed, there is resistance to the fact that non-chromosomal factors can play a role in development and inheritance. Fox Keller examines the role of language in science and how it has affected the perennial Nature vs. Nurture debate. She traces the history of the divide between nature and nurture to Francis Galton's work *English Men: Their Nature and Nurture*. Fox Keller claims that in earlier mentions of this phrase (In Shakespeare's *Tempest* and in the writings of Confucius), nature and nurture were in conjunction, not in the disjunction which pervades the debate today. An interesting link between this earlier conjunction and women's education was provided by an Elizabethan scholar Richard Mulcaster in 1581 who wrote that "young maidens deserve training because they had that treasure (the ability to learn) bestowed on them through nature and bettered in them through nurture." The opposition of nature and nurture introduced by Galton was used by Darwin to interiorize traits as transmitting something that resided in the body. 'Innate' became heredity and 'acquired' became environment. Such concepts were misused by proponents of eugenics and misogynists, who used the innate argument to 'breed out weaklings'.

Fox Keller's central thesis is that the idea of the particulate gene as carrier of heritable



traits has become fluid, that the gene is not an autonomous entity, but requires expression to be given meaning. Gene expression is the fundamental level at which the genotype becomes a phenotype, *i.e.*, an observable trait. She also defines heritability as the statistics of characteristics of a population rather than the traits of an individual. Regulation of gene expression cannot be divided into nature or nurture. There is no causal role of a gene without environment, there is an entanglement of nature and nurture. This change of the notion of a gene from a particulate causal entity of heredity, to a fluid element, to a complex pattern of gene expression determining phenotypic traits, has all the makings of a scientific revolution. Fox Keller laments that the transformation of language that should be attached to a paradigm shift, has not happened in biology. The recognition of nature and nurture working in conjunction will come from a change of the language used in developmen-

tal biology. She sees high hopes in the new studies on phenotypic plasticity.

If one thinks about relative plasticity of genes, then the nature *vs.* nurture debate become a question of how malleable a trait is with developmental age. She ends on a positive note of hope that the new generation of developmental biologists will swerve away from this debate and give us new concepts to maximize the development of human potential. Such concepts, she feels, will come from not only a change of language, but also a dialogue between developmental biology, neuroscience, physiology, and ecology to study phenotypic plasticity. This is not an easy book to read. It requires one's complete attention, but is a worthwhile read. The ideas developed in this book will lead us to see the universality in humanity, a shift from the individual to the collective, a dissolution of artificial boundaries, and hope for the future of science and humanity.

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