

The Nature of Nurture and Gender

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## Abstract

Every year, Gustavus Adolphus College in St. Peter, Minnesota hosts the Nobel Conference. For two days, prominent scientists present issues that are at the forefront of current thought. The fall 2002 topic was entitled “The Nature of Nurture.” Featured presenters were neuroscientist and Nobel laureate in physiology/medicine in 2000 Eric R. Kandel (Columbia University, New York), psychologists Eleanor Maccoby (Stanford University), Avshalom Caspi (Social, Genetic, and Developmental Psychiatry Research Centre), and Jerome Kagan (Harvard University), behavioral geneticist Robert Plomin (Social, Genetic, and Developmental Psychiatry Research Centre and Institute of Psychiatry, King’s College London), psychiatrist Judith Rapoport (National Institute of Mental Health), and bioethicist Thomas H. Murray (The Hastings Center, New York). They represent seven of the leading researchers in human development. Seniors from Creighton University (Omaha, NE) who were attending an honors course on the psychology of gender, traveled to Minnesota to listen to the first four talks. This article represents a summary of their Nobel experience and it attempts to make new connections between the experts’ presentations and gender role development.

## The Nature of Nurture and Gender

During the fall semester 2002, seniors from Creighton University (Omaha, NE) attended the first four talks of the Nobel Conference held at Gustavus Adolphus college in St. Peter, Minnesota. The topic of that year's conference, "the nature of nurture" provided an interesting forum to address fundamental questions the students had encountered in their honors course on the psychology of gender. Why are we the way we are? The students were asked to reflect on several questions that relate to individual differences and the role of gender. In particular, they were asked to reflect on questions such as: What are some of the specific factors that contribute to the development of "gender" and what are some of the specific factors that contribute to the development of "sex"? How do they interact to produce behavior? Which side of the nature/nurture debate is "winning the argument" and why? What speaker(s) persuaded the student in one way or the other? What were the arguments that swayed them the most? Which scientific findings contributed to their opinion? Why? What new questions have arisen? What are the big challenges in this field of study? This article presents a summary of the students' observations.

On the two day trip, the seniors heard presentations given by Kandel (2002) on "Genes, synapses, and long-term memory", by Kagan (2002) on "The tapestry woven by biology and experience", by Plomin (2002) on "Nature and nurture: Genetic and environmental influences on behavioral development", and by Maccoby (2002) on "The nature of children and their nurture by parents." Overall, the speakers contended that both nature and nurture are important in human development, however, the scientists differed in the weights that they each attached to the contributions of either one of them to

development. According to Plomin (2002), the age-old debate between nature and nurture seems to have changed from a predominantly dichotomous issue to an interactive one. That is, the question seems to have evolved from which one, nature or nurture, is more influential to how they interact to affect development. Of the four speakers that the seniors heard, Kagan (2002) and Plomin (2002) showed evidence for the significance of nature in development, whereas Maccoby (2002) spoke about the importance of nurture in human development. Kandel (2002) presented a talk on the interaction between nature and nurture and how it affects learning and memory.

The first speaker was Nobel laureate Eric Kandel (2002). His research focuses on biological factors of learning and memory. His work with sea slugs (*Aplysia*) and memory showed that learning modulates the strength of specific neural connections. When the slugs' nervous systems were increasingly sensitized (i.e., increased behavioral response following exposure to a threatening stimulus) through repeated electrical shocks, it led them to have a heightened response to other stimuli. A mild touch anywhere on their body caused the *Aplysia* to withdraw its gills. This response was possible because of the alterations in the functioning of the synapses that lead to habituation and sensitization. For learning to occur, new protein must be synthesized. His research demonstrated that the environment can give rise to an alteration of the individual genetic expressions, so that different life experiences can lead to the modifications of behavior. Thus, the environment contributes to the protein synthesis that "turns on" certain genes. He contended that learning can only occur by the consistent interaction between nature and nurture.

The second speaker, Jerome Kagan (2002) emphasized the importance of nature on behavior. He stated that genetic programming serves as scaffolding and experience fills in the rest. In other words, our genes give us biological potential, and our surroundings, experiences, and social factors determine how we express that potential. He considered that during the early years of life, biology (maturation) is the primary force in development and environment is the secondary force. According to Kagan, the early development is determined by a careful plan governed by genes. These genetic effects extend over time in the form of maturation which is universal, biological, and contributes to the basic brain architecture. On the other hand, environment explains why humans differ in their value system, their vocabulary, or their emotions. He argued that individual differences in behavior are all subject to biological constraints. If the brain has not matured, it is unable to express and learn new behaviors. Furthermore, Kagan explained how temperamental differences can be traced to differences in the brain's neurochemistry.

Robert Plomin (2002) presented another nature-oriented viewpoint. He used twin and adoption studies to demonstrate the influence of nature and nurture on differences in height and weight, the incidence of mental illnesses, IQ, verbal and spatial reasoning, as well as processing speed. To illustrate the importance of biology, he presented evidence from his behavioral genetics studies that show that almost two thirds of the differences in height and weight are due to genes whereas only one third of the difference is accounted for by the environment. That is, he discussed the issue of heritability, the proportion of variation among individuals that can be attributed to genes. This genetic variance is estimated based on studies of twins and adoption studies. Plomin also showed that mental

illness may be more heritable than medical disorders because of the complexity of the brain and genes. As examples he cited that the concordance of monozygotic twins for autism is 60% and for reading disabilities about 70%.

Plomin also explained the differences between nonshared and shared environments. A nonshared environment is one in which the environment makes individuals in a family different from one another. In contrast, a shared environment is one that makes family members similar to one another. Why are children raised in the same household so different? According to Plomin, one explanation is that the lives of siblings diverge in their nonshared environments. Behavioral genetics studies seem to indicate that it is the nonshared environment that accounts for most of environmental influences in one's life. Plomin emphasized that children tend to modify, select, and construct their experiences in part on the basis of their genetic propensities.

In contrast to Plomin's behavioral genetics view, Maccoby (2002) focused on the importance of the environment during development. She claimed that biology and environment are not merely additive, but rather interactive. According to Maccoby, the equation: "Heredity + Environment = 100%" is missing a crucial link, the interaction between the two. The environment is necessary to trigger individuals' genes. For example, height, a predominantly biological trait, can be changed through environmental pressures. While Plomin (2002) remarked that nutrition (e.g., diet) has only a minimal influence on height, Maccoby argued that it can have a much more profound impact. She cited a study that found that Japanese children who live in the United States are taller than Japanese children who live in Japan even though the children share the same genetic background. Clearly, the difference in nutrition (environment) is having an effect on

height despite similarities in the genes. Maccoby further disagreed with Plomin on the contributions of shared and nonshared environments on behavior. She contended that the two concepts were indistinguishable in many ways. For example, despite growing up in the same family, siblings are typically exposed to different environments (e.g., friends) and they often show different responses to divorce. According to Maccoby, these examples illustrate how it is difficult to separate environmental influences into shared and nonshared spheres. Ultimately, it is the interaction between various environmental factors and genes that determines who we become.

As part of the seminar, the Creighton seniors were asked to reflect on the development of gender roles at the beginning of the semester. At that time, the class was split in terms of the weight that they were assigning to the relative influence of nature and nurture on development. About half the students believed that it was predominantly nature that molded gender development and about half believed that it was predominantly the environment that influenced gender development. The same question was posed to the students after attending the Nobel conference. According to them, all of the speakers were persuasive, and some of them changed their preconceived notions about the nature of nurture and gender.

One student commented that an individual's genetic propensities will affect how he or she interacts with the environment. At the same time, the effects on an individual's environment and his or her experiences define how his or her biological potential is expressed. Nature and nurture concurrently influence one another in what may be seen as a continuous dialogue, establishing together which traits are expressed.

Another student confessed that, before the conference, she thought that nature only provided a blueprint and that nurture built upon it. However, the presentations provided her with another insight: although nature provides the foundation, both nature and nurture interact together continuously to build personality characteristics, and influence beliefs, thoughts, and actions. After attending the Nobel conference her views had changed to include the interaction of nature and nurture working together as a dynamic and changing force on a person. In other words, she found Maccoby's (2002) argument that it is important to include the interaction term in the nature/nurture equation very convincing.

Other students' opinions did not change. For example, one student contended that genes do seem to lay the groundwork to human behavior, but that the environment still plays a significant role in the development of behavior and gender roles. Overall, after the trip, the majority of students were leaning towards the nature side of the equation; that is, they believed that, in many instances, genes may contribute more to behavior than previously thought. Plomin (2002), according to a majority of the students, had convinced them of the importance of behavioral genetics. In the end, they all commented how they had underestimated the contributions of the interaction between environment and genes to the development of gender.

The seniors were asked to reflect on the specific factors that may contribute to the development of "gender" and the specific factors that may contribute to the development of "sex." Gender refers to the social categories of male and female, and sex refers to the biological categories of male and female, such as genes, chromosomes, and hormones. The social categories of gender are distinguished from one another by a set of

psychological features and role attributes that society has assigned to the biological category of sex (Helgeson, 2002). Students commented that, after attending the 2002 Nobel Conference, assuming that gender role was solely a function of environmental or biological factors seemed too simplistic. Gender role then refers to the expectations that go along with being male versus female. Gender must have both, a biological component that sets the foundations of development and an environmental component that causes certain neural pathways to be strengthened and others to be weakened. As Rayls (2002) wrote: "People select, modify, and create environments correlated with their genetic propensities" (p. 125). This interaction demonstrates why biology and environment cannot be separated with respect to the development of gender. However, as Maccoby (2002) cautioned, without environmental factors interacting with biology, there is little if any development. She focused on the importance of the home environment for development, citing several studies that showed that differential parenting styles can affect IQ scores, even with adopted children. Plomin's (2002) behavioral genetics arguments convinced the majority of students of the importance of genes in development and in the development of gender roles. Propensities for boys to seek out physical activities, to play outdoors, to be more aggressive, and to play with different types of toys than girls can more easily be explained using a biological than an environmental argument. Despite the different emphases that Plomin and Maccoby presented, it was clear that they both acknowledged the similarities between their viewpoints. Even though they may have contended that nature (Plomin) or nurture (Maccoby) was a more important contributing factor to certain aspects of personality, they both agreed on many issues regarding development. They agreed that nature's influence can be modified by

nurture, and that nurture can be influenced by genetic factors. The quest now is to find out how nature and nurture interact to determine who we become. Some of their differences were highlighted, but overall, their views converged in many areas. As Kagan (2002) stated, the human mind likes variation. We tend to focus on differences even though they only account for .01% of humanity.

In sum, the consensus among the speakers was that they all agreed that biology is at the base of development, behavior and differences, but that the environment acts upon these biological factors both externally (e.g., socialization) and internally (e.g., predispositions) to produce the small percentage of difference among human behavior. It is possible that this conference raised more questions than it answered. However, it showed that there is now a new direction for the nature/nurture discussion. The real debate has shifted from a mere understanding of nature and nurture, to the examination of how much of human behavior is due to nature, how much is due to nurture, and, more importantly, how much is due to the interaction between the two. The Nobel Conference was very helpful in giving new insights and explanations into the areas of nature and nurture and their possible implication for gender research.

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