Europe Medical

THE EVOLUTIONARY HISTORY OF BIOLOGICAL DIVERSITY

Winner of a MacArthur Fellowship "Genius" Award, Nancy A. Moran is the Leslie Surginer Endowed Professor of Integrative Biology at the University of Texas at Austin. Dr. Moran received a B.A. in general studies from the University of Texas, graduating with highest honors, and a Ph.D. in zoology from the University of Michigan. Elected to the U.S. National Academy of Sciences in 2004, Dr. Moran has a long-standing interest in the evolutionary history and ecological importance of symbioses. Currently, she and her students are using experimental and phylogenomic approaches to study beneficial interactions between insects such as aphids and honeybees and bacteria that live within their bodies.

An Interview with Nancy Moran

How did you first become interested in science?

As a kid, I liked insects and enjoyed gardening. However, I did not see myself as becoming a scientist, and I began college as an art major. But for me, art was just too hard, and I switched into an honors program that did not require you to declare a major. As a junior, I happened to take a class in biology, which I really enjoyed. So I took more biology courses and eventually did an honors thesis on mate choice in birds. By then, I was hooked!

Much of your work is on symbioses. What are symbioses, and what drew you to this topic?

A symbiosis is a close physiological relationship in which one species (the symbiont) lives in or on a larger species (the host). In the late 1980s, I was working on aphids, which have many bacterial symbionts. No one knew what these symbionts did because they can't live outside of their host. I wasn't planning to study symbioses, but then I got an intriguing phone call from the bacteriologist Paul Baumann. At that time, PCR had just become widely available, which enabled researchers to amplify and sequence particular genes. Paul had the foresight to realize that we could use PCR to ask, "What kinds of bacteria live within aphids as symbionts, and based on their genes, what are these symbionts doing?"

How do symbioses affect life on Earth?

Symbioses are everywhere. Every organism is engaged in symbioses, including humans. As one example, our bodies contain bacteria that break down carbohydrates that we otherwise could not digest. In the case of aphids, these insects feed on plant sap, which provides sugars but lacks other essential nutrients, such as key amino acids. These amino acids are supplied to the aphids by bacterial symbionts. At a higher level, we can say that entire ecosystems depend on symbioses. Coral reefs are built by coral polyps that depend on energy provided by algal symbionts. Without their symbionts, the corals can die, harming the reef and the many fishes and other organisms that live there.

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Adult female pea aphids and asexually produced daughters. The reddish color is due to carotenoid pigments.

What is the most surprising discovery that you've made?

One such discovery concerns carotenoids, which are colored molecules used in photosynthesis by plants and in light detection by many animals. It was thought that animals could not make carotenoids and so had to get them from their diet. While studying the genome of an aphid, we were startled to find that it had functional carotenoid-synthesizing genes. We sequenced these genes and determined that they came from a fungus. What a surprise—the carotenoid genes of a fungus had become part of the DNA of an aphid!

What advice do you have for students considering a career in biology?

Every student is different. Some students categorize themselves as not interested in or unable to "do" science. But the only way to tell is to try it: Dive in, see if you enjoy research, and discover the special skills that you bring to the table. Biology needs people with different skills. One person might excel at communication, another is meticulous, while a third can synthesize many different pieces of information. If you find that you enjoy biology, go for it—whether you are a freshman or a senior, it is not too late.