

Nancy A Moran, PhD

Yale Evolutionary Biologist Nancy Moran Wins Coveted Japanese Science Prize

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New Haven, Conn. — Yale University's [Nancy Moran](#), the William H. Fleming Professor of Biology, has been awarded the [International Prize for Biology](#) by the Japanese Society for the Promotion of Science for her work on [symbiotic relationships between insects and bacteria that live within them](#).

The annual award, which commemorates the 60-year reign of Emperor Showa, was announced Oct. 7 and carries a prize of 10 million yen (about \$120,000).

Moran was a 1997 recipient of a MacArthur Fellowship and is a member of the U.S. National Academy of Sciences and current chair of the Section on Evolutionary Biology of the National Academy. She researches the genetic co-evolution between aphids and the symbiotic bacteria.

The former University of Arizona scientist was recruited by Yale in 2009 to help anchor new research efforts at the [Microbial Diversity Institute](#) at [Yale's West Campus](#).

In announcing the award, which is open to scientists of all countries, the Committee on the International Prize for Biology noted: "Dr. Moran has contributed greatly to the advancement of the biology of symbiosis in recent years through her studies of intimate co-evolutionary relationships between insects and the endosymbiotic bacteria that live within them. Her studies have yielded by far the largest number of outstanding research results in this field thanks to Dr. Moran's versatile approach, which draws on molecular biology, genomics, and experimental and theoretical biology."

Nancy A Moran, PhD

William H. Fleming, M.D. Professor of Ecology and Evolutionary Biology

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Research Interests

Symbiosis; Genomics; Evolutionary Biology; metagenomics; metabolism

Current Projects

1. Dimensions of Biodiversity: "Genomics, Functional Roles, and the Diversity of the Gut Microbiotae of Honey Bees and Bumble Bees." Grant begins January 1, 2011 (PI is Nancy Moran; co-PIs is Jay Evans (Bee Laboratory, USDA), collaborator is Rachael Winfree (Rutgers Univ.))

The research will determine genome sequences and metabolic capabilities for bacterial species that occur in bee guts and will probe how their abundances and gene expression respond when hosts are subjected to different environments.

2. Environmental Genomics: "Mutation in Genomes of Obligate Symbionts and Impacts on the Ecological Tolerances and Distributions of Hosts: Buchnera and Pea Aphids"

This project focuses on mutations affecting symbiont genomes and on how these mutations impact the functioning and environmental tolerances of aphid hosts.

3. Microbial Genomics: "Highly Reduced Genomes of Coresident Bacterial Symbionts of Xylem-Feeding Insects: Ecological and Evolutionary Implications"

This research, collaborative with John McCutcheon, uses NextGen sequencing and other methods to reconstruct the extremely small genomes of bacteria that are symbiotic in insects feeding on plant sap or wood.

Research Summary

My research focus is on symbiosis, particularly that between multicellular hosts and bacteria. Symbioses are central in the evolution of biological complexity; have evolved many times and are critical to the lifestyles of many animals and plants and also to whole ecosystems, in which symbiotic organisms are key players. The primary reason that symbiosis research is suddenly active, after decades at the margins of mainstream biology, is that DNA technology and genomics give us enormous new ability to discover symbiont diversity, and more significantly, to reveal how microbial metabolic capabilities contribute to the functioning of hosts and biological communities. Current projects concern genomic approaches to understanding symbiont functions and symbiont evolution in herbivorous insects (aphids) and in pollinators (honey bees).

Selected Publications

- McCutcheon, J. M., B. R. MacDonald, and N. A. Moran. 2009. Convergent evolution of metabolic roles in bacterial co-symbionts of insects. *Proceedings of the National Academy of Sciences USA* 106:15394–15399.
- Oliver, K. M., P. H. Degan, M. S. Hunter, and N. A. Moran. 2009. Bacteriophage encode factors required for protection in a symbiotic mutualism. *Science* 325: 992–994.
- Peccoud, J., J. C. Simon, H. J. McLaughlin, and N. A. Moran. 2009. Recent adaptive radiation of pea aphids revealed by their rapidly evolving symbionts. *Proceedings of the National Academy of Sciences USA* 106: 16315–16320.
- Degan, P.H., Y. Yu, N. Sisneros, R. A. Wing, and N. A. Moran. 2009. *Hamiltonella defensa*, genome evolution of a protective bacterial endosymbiont from pathogenic ancestors. *Proceedings of the National Academy of Sciences USA* 106: 9063–9068
- Moran, N. A., H. J. McLaughlin, and R. Sorek. 2009. The dynamics and timescale of ongoing genomic erosion in symbiotic bacteria. *Science* 323: 379–382.
- Moran, N. A. and T. Jarvik. 2010. Lateral transfer of genes from fungi underlies carotenoid production in aphids. *Science* 328: 624–627.

BBS Program

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