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The Wild and Wacky World of Epigenetics

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ABSTRACT:

If Gregor Mendel, the 19th century father of modern genetics, were alive today, his head would be spinning. The simple rules of “Mendelian” inheritance, which he painstakingly worked out with garden peas, have had to be substantially expanded and revised in the last several decades to accommodate the fact that genes are not nearly as well behaved as he thought. A pristine gene, free of any debilitating mutations, may or may not be expressed, depending upon parental inheritance, environmental influences, and even pure chance. This phenomenon, in which external factors influence the decision of a gene to be expressed or remain silent, is called *epigenetics*. The existence of epigenetic effects is right before our eyes: the stripes of the tabby cat; the complex patterns of pigment in petunia petals; the variegated colors in the compound eyes of fruit flies. The implications for human biology are also widespread. For example epigenetics has forced us to revise our understanding of how cancers arise and is responsible for the low success rate of animal cloning. Altogether the underlying molecular epigenetic mechanisms are revealing a wacky new world of gene regulation, which this lecture will explore.

BIOGRAPHY:

Shirley M. Tilghman was elected Princeton University's 19th president on May 5, 2001 after serving for 15 years as a faculty member in the Department of Molecular Biology. During her tenure the university expanded its undergraduate and graduate student bodies, and instituted a four-year college system. She oversaw the creation of major new academic programs, including the Princeton Neuroscience Institute, the Andlinger Center for Energy and the Environment and the Lewis Center for the Arts. Upon the completion of her term in June of 2012, she returned to the faculty.

A native of Canada, Tilghman received her Honors B.Sc. in chemistry from Queen's University in Kingston, Ontario. Following two years teaching secondary school in Sierra Leone, West Africa, Tilghman completed her Ph.D. in biochemistry from Temple University. During her scientific career as a mammalian developmental geneticist, she studied the way in which genes are organized in the genome and regulated during early development. A member of the National Research Council's committee that set the blueprint for the United States effort in the Human Genome Project, she also was one of the founding members of the National Advisory Council of the Human Genome Project for the National Institutes of Health. Tilghman was appointed an investigator of the Howard Hughes Medical Institute in 1988, and in 1998 was named the founding director of Princeton's multidisciplinary Lewis-Sigler Institute for Integrative Genomics.

She is the recipient of a Lifetime Achievement Award from the Society for Developmental Biology, the Genetics Society of America Medal, and the L'Oreal-UNESCO Award for Women in Science. She is a member of the American Philosophical Society, The National Academy of Sciences, the Institute of Medicine and The Royal Society of London. She also serves as a Trustee of Amherst College, the King Abdullah University of Science and Technology, the Institute for Advanced Study, Leadership Enterprise for a Diverse America, the Carnegie Endowment for International Peace and is a director of Google Inc.