Illinois Mathematics and Science Academy

Great Minds Program®

presents

Extreme Epigenetics

featuring

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Tuesday, December 4, 2012
12:35-2:00 p.m.
IMSA Academic Pit

Epigenetics is the emerging branch of science aimed at understanding how environmental influences (diet, stress, xenobiotic exposure) can act on an organism at the level of controlling gene activity and how these environmentally induced changes may be inherited by offspring. From the catenation of “epi”, the greek root for above, and “genetics”, the longstanding branch of biology that concerns itself with the function of genes and their connection to traits in organisms, Epigenetics is concerned with molecular pathways that are layered on top of DNA and are involved in controlling access to the underlying genes.

Until recently, epigenetics was a catchall for all we do not yet understand about heredity beyond the double helix of DNA, a murky backwater of exceptions to the standard rules of genetics, where Lamarck is seemingly more right than Darwin. New research is beginning to shed light onto these puzzling phenomena and what we have learned thus far suggests that these epigenetic pathways may be far more general and central to genome management than ever imagined. Epigenetic information systems appear to control gene usage at the cellular level by altering the way DNA is packaged in the nucleus into a compact fiber called chromatin. Indeed, the way DNA is packaged impacts a number of important processes ranging from generating stem cells from adult tissue, to the causes of certain cancers, to changes in the brain as a function of stress, mental illness or chronic drug abuse.

Starting from the counterintuitive notion that DNA is not the only molecule encoding hereditary biological information, we will explore several areas where epigenetic information carriers are known to function, reveal what we as a field have discovered (and are still wrestling with) about mechanism and conclude with tantalizing connections between these molecular players and human health.

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