Mendel Lectures
2017—2018

2017 — 2018

Erich Nigg

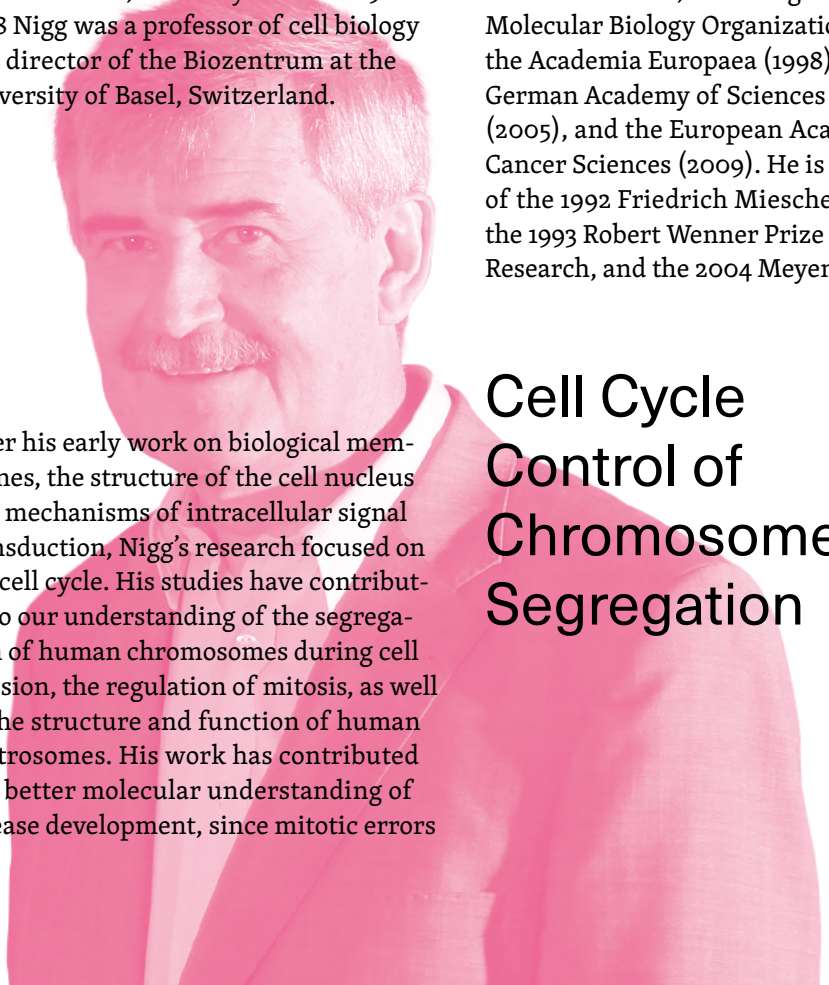
*1952

University of Basel, Switzerland

October 12, 2017

Erich Nigg is a Swiss cell biologist and former director of the Biozentrum, University of Basel.

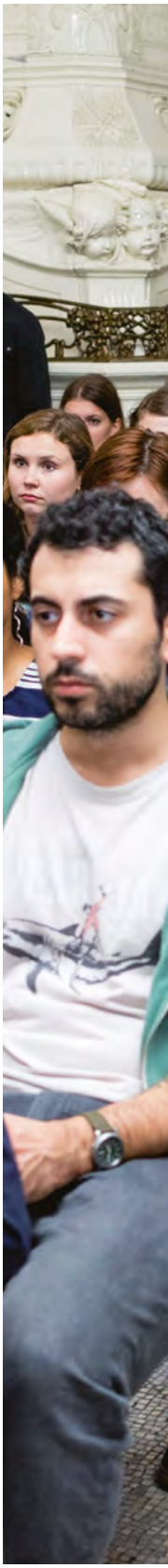
Erich Nigg studied biochemistry and microbiology at ETH in Zurich, Switzerland, where he obtained his PhD in 1980. Following postdoctoral work at the University of California, San Diego, USA, he carried out research at ETH Zürich and at the Swiss Institute for Experimental Cancer Research (ISREC). From 1995 he was professor of molecular biology at the University of Geneva before he was appointed, in 1999, to a directorship at the Max Planck Institute of Biochemistry in Martinsried, Germany. From 2009 to 2018 Nigg was a professor of cell biology and director of the Biozentrum at the University of Basel, Switzerland.



After his early work on biological membranes, the structure of the cell nucleus and mechanisms of intracellular signal transduction, Nigg's research focused on the cell cycle. His studies have contributed to our understanding of the segregation of human chromosomes during cell division, the regulation of mitosis, as well as the structure and function of human centrosomes. His work has contributed to a better molecular understanding of disease development, since mitotic errors contribute to the genetic instability of cancer cells and centrosome abnormalities are known to cause disease, notably brain diseases and ciliopathies.

Erich Nigg is a member of several scientific associations, including the European Molecular Biology Organization (1991), the Academia Europaea (1998), the German Academy of Sciences Leopoldina (2005), and the European Academy of Cancer Sciences (2009). He is a recipient of the 1992 Friedrich Miescher Prize, the 1993 Robert Wenner Prize for Cancer Research, and the 2004 Meyenburg Prize.

Cell Cycle Control of Chromosome Segregation



The Mendel lecture in the magnificent Augustinian Abbey in Brno was one of my last public lectures prior to retirement, a great honour and vividly remembered!

Shizuo Akira

*1953

Osaka University, Japan

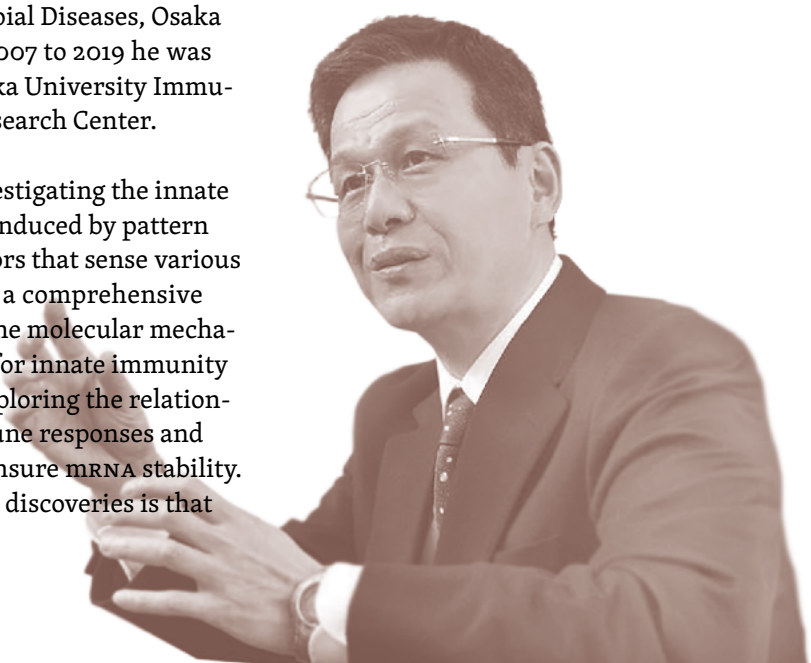
October 19, 2017

Shizuo Akira has made groundbreaking discoveries in the field of immunology, most significantly in the area of innate host defence mechanisms.

Akira gained his MD in 1977 and PhD in 1984 at the Osaka University School of Medicine. Till 1987, he did postdoctoral research at the University of California, Berkeley. After his return to Japan he held a position at the Institute for Molecular and Cellular Biology at Osaka University till 1995 when he became a professor at Hyogo College of Medicine. Since 1999 he has been a professor at the Research Institute for Microbial Diseases, Osaka University. From 2007 to 2019 he was director of the Osaka University Immunology Frontier Research Center.

Akira has been investigating the innate immune response induced by pattern recognition receptors that sense various pathogens. To gain a comprehensive understanding of the molecular mechanisms responsible for innate immunity *in vivo*, his lab is exploring the relationship between immune responses and mechanisms that ensure mRNA stability. Among his greatest discoveries is that of pattern recognition receptors, which detect intruding pathogens and initiate the antimicrobial response in the host. He demonstrated, through the ablation of toll-like receptor (TLR) genes, that TLRs recognize a discrete collection of molecules of microbial origin, and later the RNA helicases, RIG-I (retinoic-acid-inducible protein I) and MDA5 (melanoma differentiation-associated protein 5).

Akira is the recipient of several international awards, including the Robert Koch Prize (2004), the William B. Coley Award (2006), the Milstein Award (2007), the Imperial Prize and Japan Academy Prize (academics) (2007), the Keio Medical Science Prize (2010), and the Gairdner Foundation International Award (2011). Besides being the world's most-cited scientist, he also on the list of most influential biomedical researchers.




Functional
Diversity of
Macrophage/
Monocyte
Subsets
lenovo

Greg Hannon

*1964

Cancer Research UK Cambridge Institute, University of Cambridge, UK

December 14, 2017

Gregory Hannon is a pioneer in the study of small RNA biology and mammalian genomics.

Hannon received his BA in biochemistry in 1986 and his PhD in molecular biology in 1992 at Case Western Reserve University. He was formerly an HHMI Investigator and a professor at Cold Spring Harbor Laboratory. He served as Director of Cancer Genomics at the New York Genome Center. He is currently a Professor of Molecular Cancer Biology and a Senior Group Leader at the Cancer Research UK Cambridge Institute at the University of Cambridge. He is a Fellow of Trinity College, Cambridge, and an adjunct professor at Cold Spring Harbor Laboratory. In 2018 he became the Director of the Cancer Research UK Cambridge Institute.

The Hannon lab has focused on studying the roles of small RNAs in germ cells, which tend to have the most elaborate set of small RNA pathways of any cell type. They have discovered an essential role for small RNAs, called Piwi-interacting RNAs (piRNAs), which are critical for proper oocyte development and guard the genome against transposable elements. His lab also developed selective re-sequencing strategies (exome capture) that are used in the clinic to guide patient care. Furthermore, he developed tools and strategies for manipulation of gene expression, generated genome-wide short-harpin RNA libraries, and demonstrated the roles of microRNA in cancer. His research strives to understand the biology of cancer cells, with a focus on breast and pancreatic cancer. Another research thrust of Hannon's team exploits the power of next-generation sequencing to understand the biology of the mammalian genome.

Hannon has accepted numerous awards including the Pew Scholar Award (1997), the US Army Breast Cancer Research Program Collaborative Scholars and Innovators Award (2002), the AACR Award for Outstanding Achievement in Cancer Research (2005), the National Academy of Sciences Award (2007), and the Memorial Sloan-Kettering Cancer Center Paul Marks Prize (2007). He has been a Member of the National Academy of Sciences since 2012, a Member of the Academy of Medical Sciences since 2017, a Member of EMBO and a Fellow of the Royal Society since 2018, a Fellow of the European Academy of Cancer Sciences since 2019, and a Fellow of the American Association for Cancer Research Academy since 2020.

A Small RNA-based Innate Immune System Guards the Integrity of Germ Cell Genomes

Elena Conti

*1967

Max Planck Institute of Biochemistry, Germany

March 6, 2018

After graduating in chemistry at the University of Pavia in 1991, Conti earned a PhD in biophysics at the Imperial College in London in 1996, with a dissertation on the crystal structure of firefly luciferase. From 1997 to 1999 she worked as a postdoctoral fellow at the Rockefeller University in New York City. From 1999 she was a group leader at the European Molecular Biology Laboratory in Heidelberg, Germany, and in 2006 she became director and a scientific member at the Max Planck Institute of Biochemistry in Martinsried, Germany, in the Structural Cell Biology Department.

She is an elected member of the European Molecular Biology Organization and of the Academy of Sciences Leopoldina.

The Conti group studies the cellular control mechanisms that monitor and eliminate RNA molecules that are either no longer needed or are aberrant because of deleterious genomic mutations or errors in their production. In recent years, Conti's group has deciphered the atomic structures and biochemical mechanisms of large macromolecular complexes involved in RNA recognition and degradation, such as the exosome and deadenylation complexes. Their current work aims at understanding how the RNA degradation machinery is physically coupled and coordinated with the translation machinery.

In 2008, Conti was awarded the Gottfried Wilhelm Leibniz Prize, the most prestigious prize awarded to researchers in Germany. In 2014 she received the Louis-Jeantet Prize for Medicine and in 2018 the Bijvoet Medal of the Bijvoet Center for Biomolecular Research of Utrecht University.

The RNA Eosome-Ribosome Connection: Coupling Synthesis to Degradation


The 30-nucleotide channel in Exo-10
In vivo rRNA biogenesis
In vitro RNase protection
Exo-10
wt
rrp6Δ
7S rRNA precursor
5.8S + 30 nt
5.8S rRNA
Northern blot
Briggs/Butler JBC 1998
60A
50A
40A
30A
25A
15A
10A
RNase A/T1
Bonneau/Conti

Tom Misteli

*1966

National Cancer Institute, NIH, Bethesda, USA

April 19, 2018

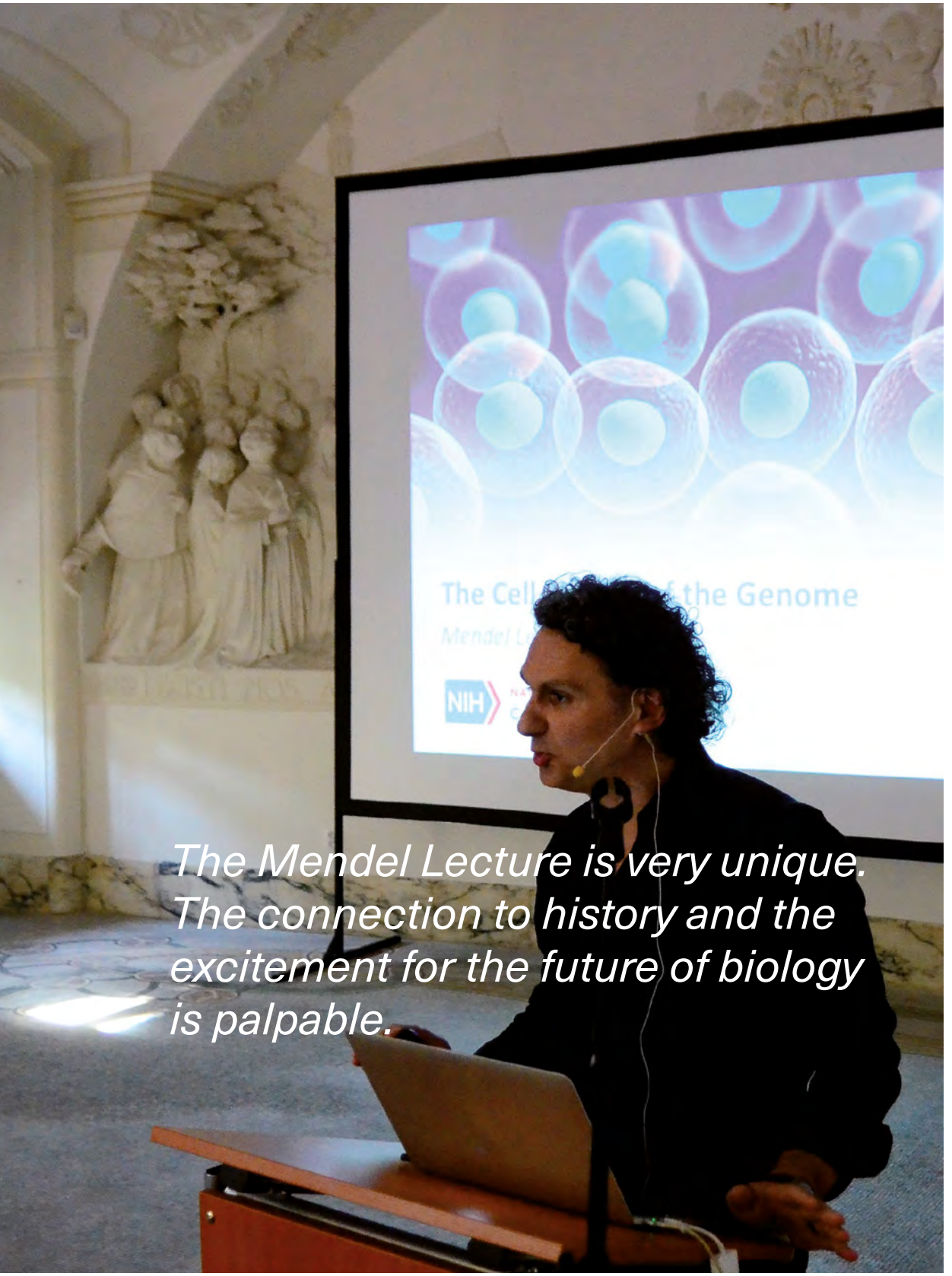
Tom Misteli, PhD, is a Swiss-born cell biologist known for his pioneering work in the field of genome cell biology.

After completing a master's thesis in cell biology at the University of Basel, and a PhD in biochemistry at the University of London in 1995, he performed postdoctoral work at Cold Spring Harbor Laboratory. In 1999 he joined the NIH's National Cancer Institute (NCI) as a tenure-track Investigator, in 2005 was appointed Associate Director in the NCI Center for Cancer Research, and was named its Director in 2016. In the same year, he was also appointed as an NIH Distinguished Investigator.

Misteli's laboratory aims to uncover the fundamental principles of higher order genome organization and to apply this knowledge to the development of novel diagnostic and therapeutic strategies for cancer and aging. He is best known for his work on elucidation of how genomes function in living cells. While a postdoc at the Cold Spring Harbor Laboratory, he developed methods to visualize proteins in the nucleus of living mammalian cells, allowing for the first time the study of gene expression in intact cells. His more recent work has focused on the role of genome organization and nuclear architecture on differentiation and disease. His cell biological elucidation of the mechanisms involved in Hutchinson-Gilford progeria syndrome has revealed novel mechanisms of human aging.

In recognition of his contributions Misteli has received numerous awards, including the 2011 Gold Medal of the First Faculty of Medicine of Charles University in Prague, the 2012 Flemming Award, the 2013 Wilhelm Bernhard Medal, and the 2016 Herman Beerman Award.

The Cell Biology of the Genome



The Mendel Lecture is very unique. The connection to history and the excitement for the future of biology is palpable.

Mark Ptashne

*1940

Sloan Kettering Memorial Cancer Center, New York, USA

May 3, 2018

Mark Ptashne earned his undergraduate degree at Reed College in Portland, Oregon, in 1961 and his PhD from Harvard in 1968, after which he joined the faculty of Harvard. He was named professor there in 1971 and became chair of the Department of Biochemistry and Molecular Biology in 1980. In 1993 he was awarded an endowed chair, and in 1997 joined the Sloan Kettering Memorial Cancer Center in New York.

The focus of his scientific career has been gene regulation. Ptashne was the first scientist to demonstrate specific binding between protein and DNA, and his lifelong work has been the elucidation of the molecular mechanisms of switch between lytic and lysogenic lifecycle of bacteriophage lambda, as well as how the yeast transcriptional activator Gal4 works. Over the decades Ptashne and his laboratory not only clarified gene regulation in bacteriophage lambda, they extended these profound discoveries from bacteria to eukaryotes, making it possible to think about development and evolution rationally, in molecular terms. Ptashne's lab is currently immersed in a study of how gene regulators deal with the fact that genes in eukaryotes are wrapped in nucleosomes, using new techniques for quantitating nucleosome formation.

In 1980 he cofounded Genetics Institute, Inc., with Thomas Maniatis, which at that time was new and considered controversial. In 1985, he was awarded the Louisa Gross Horwitz Prize from Columbia University. He won the Albert Lasker Award for Basic Medical Research in 1997, and the Massry Prize from the Keck School of Medicine, University of Southern California, in 1998. Mark Ptashne is a fellow of American Academy of Arts and Sciences and a member of the National Academy of Sciences. He has written popular books for a wider audience, including his book *Genes and Signals*.

The Logic of Gene Regulation

Steven Benner

*1954

Foundation for Applied Molecular Evolution, Alachua, USA

May 17, 2018

Steven Benner attended Yale University, receiving his BS and MS in molecular biophysics and biochemistry in 1976. He then continued at Harvard University, receiving his PhD in chemistry in 1979. After graduating, he was an assistant professor in the Department of Chemistry at Harvard University from 1982 to 1986. In 1986, he moved to ETH Zurich, where he stayed for 11 years. In 1997, Benner joined the University of Florida as a professor of both chemistry and anatomy and cell biology. He was appointed the V. T. and Louise Jackson Distinguished Professor of Chemistry at the University of Florida's Department of Chemistry in 2004. He left the University in late December 2005 to found the Westheimer Institute of Science and Technology (TWIST) and the Foundation for Applied Molecular Evolution. Benner also founded the companies EraGen Biosciences in 1999 and Firebird BioMolecular Sciences LLC in 2005.

Benner and his colleagues were the first to synthesize a gene encoding an enzyme, an important beginning in the field of protein engineering. He and his co-workers developed the first unnatural DNA base pair followed by six-letter artificially expanded genetic information. He was also instrumental in establishing the field of paleogenetics, where genes and proteins from ancient organisms are resurrected. Benner is deeply interested in the origin of life and the chemical conditions and processes needed to produce RNA ablogically, a key part of the RNA-world model for the origin of life. In particular, his work defined roles for impact glasses, borate, opals, and molybdate as important to the abiological formation of carbohydrates and the stabilization of prebiotically formed RNA. He has worked with NASA to develop detectors for alien genetic materials, using the definition of life developed by the NASA Exobiology Discipline Working Group in 1992, "a self-sustaining chemical system capable of Darwinian evolution".

Benner is a recipient of several scientific awards, including the 1993 Anniversary Prize from the Federation of European Biochemical Societies, the 1998 Nolan Summer Award, the 2001 B. R. Baker Award, and the 2005 Sigma Xi Senior Faculty Award. He is a Fellow of the American Association for the Advancement of Science and a Fellow of the International Society for the Study of the Origin of Life.

Artificial Genetics and Evolution in the New Millennium

In addition to founding genetics, Mendel's legacy continues in a lecture series that, for me, introduced me to collaborators at Masaryk University who are helping to continue the tradition of genetics, here the genetics that comes from synthetic biology.