Mendel Lectures
2003—2004

2003 — 2004

Photo: Kiva

Sir Tim Hunt

*1943

Cancer Research UK, Clare Hall Laboratories, UK

September 29, 2003

Sir Richard Timothy Hunt is a British biochemist and molecular physiologist.

Dr. Hunt was accepted into Clare College, Cambridge, in 1961 to study Natural Sciences, graduating in 1964 and immediately beginning work in the university's Department of Biochemistry under Asher Korner. A 1965 talk by Vernon Ingram interested Hunt in haemoglobin synthesis, and he spent the summer of 1966 in Irving London's laboratory in New York working on this subject. He finished his PhD in 1968 and returned to New York to work with London. After returning to Cambridge, he further worked on haemoglobin questions until the 1980s when he became interested in the cell cycle.

While studying fertilized sea urchin (*Arbacia punctulata*) eggs in the early 1980s, Hunt discovered cyclin, a protein that cyclically aggregates and is depleted during cell division cycles. He and others subsequently showed that cyclins bind and activate a family of protein kinases, now called cyclin-dependent kinases, one of which was identified as a crucial cell cycle regulator by Paul Nurse. The cyclin mechanism of cell division is fundamental to all living organisms (excluding bacteria) and thus the study of the process in simple organisms helps shed light on the growth of tumours in humans.

In 1990, he began work at the Cancer Research UK London Research Institute, where his work focused on understanding what makes cells go cancerous, that is, proliferate uncontrollably, with the ordinary inhibitory signals switched off.

Sir Tim Hunt became a fellow of the Royal Society in 1991, received the Abraham White Scientific Achievement Award of the George Washington University in 1993, and became a foreign associate of the US National Academy of Sciences in 1999. In 2001 he was awarded the Nobel Prize in Physiology or Medicine with Sir Paul Nurse and US scientist Leland Hartwell for their discoveries regarding cell cycle regulation by cyclin and cyclin-dependent kinases. In 2003, Hunt was made an honorary Fellow of the Royal Society of Edinburgh (HonFRSE).

In 2006 Sir Tim Hunt was awarded the Royal Medal for "discovering a key aspect of cell cycle control" and was knighted by the Queen for his service to science.

Dr. Hunt had his own laboratory at the Clare Hall Laboratories until the end of 2010, and remained an Emeritus Group Leader at the Francis Crick Institute until 2015.

Cells and Their Division

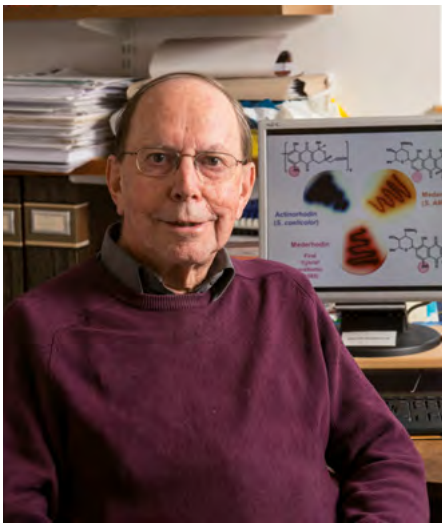
Sir David Hopwood

*1933

John Innes Centre, Norwich, UK

October 16, 2003

Sir David Alan Hopwood is a British microbiologist and geneticist who researches the biology of streptomycetes, the bacteria that produces the majority of antibiotics in clinical use around the world today.



Hopwood gained his Bachelor of Arts degree from St. John's College, Cambridge, and his PhD in the Botany School at Cambridge in 1959. During his PhD studies, Hopwood demonstrated that a group of antibiotic-producing microorganisms called Streptomyces can exchange genetic information between cells by a unique mechanism of conjugation, and carried on this work at the University of Glasgow where he became a Lecturer in Genetics in 1961. He became John Innes Professor of Genetics at the University of East Anglia and Head of the Genetics Department at the John Innes Centre in 1968. He has been an Emeritus Fellow in the Department of Molecular Microbiology at the John Innes Centre since his formal retirement in 1998 and continued to participate in the field of novel antibiotic discovery using genetic manipulation by editing, writing commentaries, contributing to symposia and organizing a biennial series of summer schools in Croatia.

Hopwood pioneered research into the genetics of Streptomyces. He developed original systems of genetic mapping based on their conjugation system which laid the foundations for the later demonstration of a unique linear chromosome topology. His genetic and cytological studies showed that Streptomyces are true bacteria rather than an intermediate group between bacteria and fungi, or even micro fungi, as previously widely believed.

Hopwood discovered the first clear example of plasmid-encoded antibiotic synthesis, while showing that most antibiotic biosynthesis is controlled by clusters of chromosomal genes. This led to the ability to clone whole biosynthetic pathways and transfer genes between species of Streptomyces to yield novel, "hybrid" antibiotics. He co-ordinated the sequencing of the *Streptomyces coelicolor* chromosome, which, in 2001, was the largest sequenced microbial genome. Strikingly, the sequence revealed more than 20 clusters of natural product biosynthetic genes, indicating that that the organism had the capacity to make many more potentially interesting molecules than could be discovered by conventional screening approaches. This has led to the finding of vast numbers of novel natural product gene clusters in microbial genomes subsequently sequenced around the world.

Hopwood was elected a Fellow of the Royal Society in 1979, delivered their Leeuwenhoek Lecture in 1987, and received their Gabor Medal in 1995 for his distinguished work in genetic engineering and molecular biology. He was knighted in 1994 for his service to the study of genetics. He is the author of *Streptomyces in Nature and Medicine: The Antibiotic Makers*, reviewing the development of knowledge about Streptomyces and their genetics as of 2007. The field has developed profoundly since then, especially in the explosion of natural product chemistry based on molecular biological approaches.

Photo: Kiva

Fifty Years of Streptomyces Genetics: Implications for Antibiotic Discovery

Dame Anne McLaren

*1927

Cancer Research UK, Cambridge, UK

October 30, 2003

Anne McLaren was one of the most eminent and highly respected reproductive biologists of the twentieth century. Her most enduring interest as a scientist was in germ cells and early mammalian development. Her work helped further recognition of the importance of stem cells in the treatment of human disease and her research in the basic science underlying the treatment of infertility helped develop several human-assisted reproduction techniques.

Anne McLaren gained a zoology degree at Lady Margaret Hall, Oxford, completed her postgraduate degree at Oxford, and obtained her PhD in 1952. The topic of her thesis was murine neurotropic viruses. Anne then worked with her husband Donald Michie at University College London (1952–55) and at the Royal Veterinary College, London (1955–59). During this time, the couple studied the effects of the maternal environment in mice on the number of lumbar vertebrae. This work led them to take an interest in the technique of embryo transfer and implantation, showing it was possible to culture mouse embryos in a test tube and obtain live young after placing them in the uterus of a surrogate mother. McLaren continued her work on mammalian fertility, embryo transfer techniques, immunocontraception, and the mixing of early embryos to form chimeras (organisms consisting of two or more genetically different kinds of tissue) at the University of Edinburgh (1959–74). Her book on chimeras, published in 1976, became a classic in the field. She returned to UCL as director of the Medical Research Council's Mammalian Development Unit (1974–92), and, following her mandatory retirement, she served as a principal researcher at the Wellcome Trust (1992–2007).

McLaren was made a fellow of the Royal Society in 1975. She was famously the first woman to hold office in the 330-year-old history of the Royal Society, becoming its Foreign Secretary in 1991 (until 1996), and a year later its Vice President (1992–1996), and did much to promote the advancement of women in science. McLaren was also President of the British Association for the Advancement of Science (1993–94) and received an impressive array of awards for her contributions to the field, including the March of Dimes (2002). She was appointed Dame Commander of the Order of the British Empire (DBE) in 1993.

Dame Anne McLaren still held a position as a principal research associate at the Wellcome Trust at the time of her death in 2007.

Photo: Kiva

Emil Paleček

*1930

Institute of Biophysics, Brno, Czech Republic

November 11, 2003

Emil Paleček was a Czech biochemist specializing in the electrochemistry of nucleic acids.

In 1959, Paleček received a PhD in biochemistry from Masaryk University in Brno, Czechoslovakia (now in the Czech Republic). During the 1960s, Paleček worked at the Institute of Biophysics at the Academy of Sciences in Brno. His first work focused on the investigation of DNA damage caused by radiation. In 1960, Paleček discovered that nucleic acids could be analyzed by electrochemical methods, which allowed him to explore how DNA can be used to diagnose genetic diseases. His discovery contradicted previous assumptions from the 1950s that DNA molecules were too large to be analyzed by electrochemistry. It took the scientific world 30 years to understand the importance of his findings, although the method began to be commonly used in the 1990s. In the 1960s, Paleček spent a year doing research at Harvard University in the United States. In the last years of his career, Professor Paleček focused on glycoproteins which could serve as tumour markers. During his life, Paleček published over 300 scientific works, making him one of the most respected scientists in the Czech Republic.

In 1989, Paleček became a member of the Czechoslovak Academy of Sciences. From 1993–97, he was a member of the Czech Academy of Sciences. In 1994, Paleček was one of the founding members of the Learned Society of the Czech Republic.

In 1961, Paleček was awarded the Jaroslav Heyrovský award for best young scientist. He was awarded the *Česká hlava* (Czech Head) award in 2014, and the Neuron Prize for his contributions to science in 2017. Professor Paleček died in October 2018.

DNA Double Helix in Czechoslovakia: Electrochemical DNA Sensors

Georgii P. Georgiev

*1933
Institute of Gene Biology, Moscow, Russia

November 11, 2003

Georgii Pavlovich Georgiev graduated from the I.M. Sechenov First Moscow State Medical University in 1956. In 1959, he was invited by V.A. Engelhardt to join the ranks of the newly created Institute of Radiation and Physicochemical Biology within the USSR's Academy of Sciences. Soon, he became part of the elite group of the Academy of Sciences of the Soviet Union, which allowed him to travel to the West and meet with other scientists involved in cutting-edge research.

In the late 1950s, at a time when molecular biologists focused on *E. coli* and phages, he was one of the first to practice molecular biology in eukaryotes. Here the focus was on the structure of the cell nucleus, the structure and determination of nuclear RNA, the structure of chromatin, and the development of methodological approaches that became widely used for these studies, such as the electrophoretical method for separation of nucleosomes and subnucleosomal particles.

In 1962, Georgiev announced the isolation of "DNA-like RNA" and ribosomal RNA from the nucleolo-chromosomal apparatus of mammalian cells. This was a very long single strand RNA, apparently synthesized from a DNA template in the nucleus. His lab soon found that the bulk of this long molecule could be recovered in the form of heterogeneous 30S particles. However, the small size of the particles did not coincide with that of giant DNA-like RNA. The team's attempts to characterize these structures succeeded in 1968, when they finally published their findings on the organization of nuclear complexes containing DNA-like RNA in the *Journal of Molecular Biology*.

During the 1970s Georgiev and his team continued to be deeply interested in the role of genetic structure and repetitive sequences in gene regulation of eukaryotic cells. Georgiev and his colleagues chose *Drosophila melanogaster* as an experimental model, and decided to clone and isolate individual genes and adjacent regulatory regions, which they thought corresponded with repetitive genomic elements. Soon they found clones that contained structural genes and repetitive elements; however, the repeats appeared to coincide with genes. Using hybridization experiments, they set out to locate these genes in the chromosome but unexpectedly found that the genes had no fixed location. Their chromosomal location varied in different strains and even among individuals of the same strain. They could be considered as mobile or transposable elements. This was one of Georgiev's greatest career achievements: in 1977, in a paper in *Science*, he and his collaborators were the first to report transposable elements in animals.

Georgiev's commitment to the study of gene organization in eukaryotic chromosomes, and its relation to regulation, extended well into the 1990s, when he engaged in the study of cancer, and founded the Institute of Gene Biology of the Soviet Academy of Sciences (1990) around his own laboratory and those of his previous students and collaborators.

He was appointed a number of honours and awards, including the Lenin Prize in 1976, the State Prize in 1983, and membership in the Russian Academy of Sciences, the Academia Europaea, the Leopoldina, and associate membership in the European Molecular Biology Organization.

Some Achievements of Russian Molecular Genetics Between the Double Helix and Human Genome

François Gros

*1925

Académie des Sciences, Paris, France

December 9, 2003

François Gros was a French biologist and one of the pioneers of cellular biochemistry in France. His scientific career concerned genes and their role in regulating cellular functions.

François Gros received the preparatory certificates for the license in natural sciences at the Faculty of Sciences of Toulouse and completed his university training in Paris at the end of 1944. In 1946 he was admitted to the Institute Pasteur in the biochemistry department, where he studied the mode of action of penicillin on the metabolism of bacteria sensitive to this antibiotic, then a little later extending his research to the study of streptomycin.

After defending his doctoral thesis in 1952, François Gros carried out a research stay in the United States, first at the University of Illinois, then at the Rockefeller Institute of New York. In 1954 he returned to the Institut Pasteur where he initiated his research on the biosynthesis of ribonucleic acids (RNA) and their role in protein synthesis.

The year 1961 marks an important stage in his work. Invited by Professor James D. Watson to do a research internship in his laboratory at Harvard University, he succeeded in highlighting the existence of messenger RNAs. A similar discovery made almost simultaneously and independently in a laboratory on the west coast of the United States (by F. Jacob, S. Brenner and M. Meselson) prompted the two teams to publish their work in the same issue of the journal *Nature*.

In 1963, François Gros was offered the directorship of the microbial physiology service of the Institute of Physico-chemical Biology. There he continued his work on messenger RNAs (1963–1968) and, with his colleague Michel Revel, demonstrated the existence of proteins also called "initiation factors" playing a major role in the "start of genetic translation within cells".

In 1976 he was elected Director General of the Institut Pasteur, where he served until 1981.

François Gros held the post of permanent secretary of the French Academy of Sciences from 1991, later becoming Honorary Professor at the Collège de France. He was a member of various academic committees as well as the "councils" of numerous scientific and humanitarian foundations established at the Institut de France.

François Gros was a member or associate member of several academies and learned societies, including the American Academy of Arts and Science, and was awarded numerous prizes and honours, including the Gay-Lussac Humboldt Prize (1988) and the Grand Cross of the National Order of Merit (2017).

François Gros died in spring 2022.

From the Double Helix to Genomics and Beyond

Robert Olby

*1933

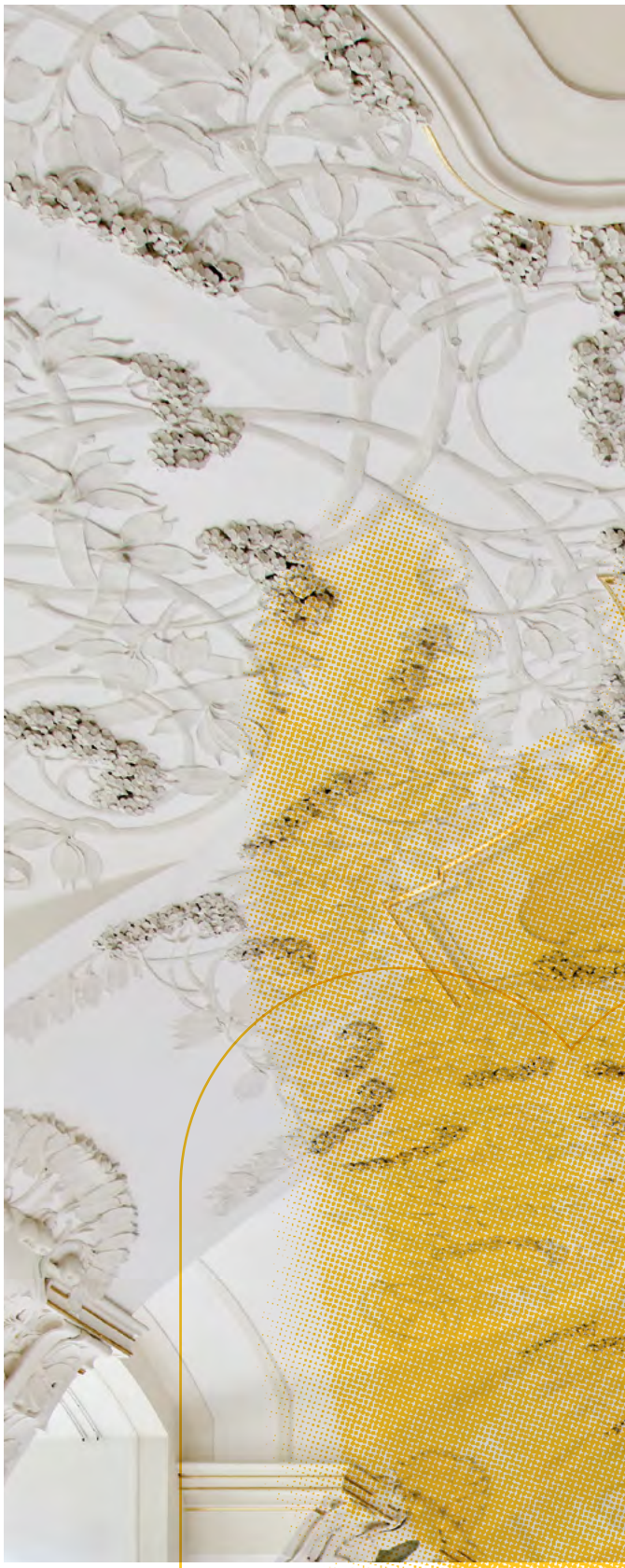
University of Pittsburgh, USA

February 2004

Robert Olby was a research professor in the Department of History and Philosophy of Science at the University of Pittsburgh. He is a historian of 19th and 20th century biology, his specialist fields being genetics and molecular biology.

After teaching courses in the United Kingdom on the history of biology, Olby moved to Pittsburgh, where he taught from 1994 to 1999, concentrating on genetics, molecular biology, and aspects of neuroscience. In 1994, he received the Marc-Auguste Pictet Medal from the Société de physique et d'histoire naturelle de Genève. He has written several books on the history of genetics, including *Charles Darwin* (1967), *Origins of Mendelism* (1966), and *The Path to the Double Helix* (1974).

After retiring, Olby researched and in 2009 published a biography of Francis Crick, *Francis Crick: Hunter of Life's Secrets*.



On Becoming a Molecular Biologist: The Early Career of Francis Crick

Photo: Kiva