

Mendel Lectures

2004—2005



2004 — 2005

Edward Trifonov

* 1937

University of Haifa, Israel

📅 October 7, 2004

Edward Trifonov is an Israeli molecular biophysicist and a founder of Israeli bioinformatics. In his research, he specializes in the recognition of weak signal patterns in the world of biological sequences.

At the beginning of his scientific career, Trifonov studied the characteristics of DNA using biophysical methods. After his relocation to Israel in 1976, he switched to bioinformatics, and established the first research group for that discipline in the country.

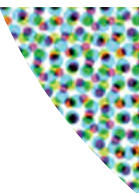
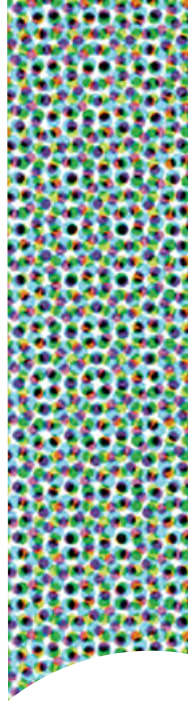
Trifonov was born in the former USSR, where he graduated in biophysics in 1961 and obtained his PhD in molecular biophysics in 1970, both at the Moscow Physico-Technical Institute. He worked as a researcher at the Moscow Physico-Technical Institute from 1961 to 1964. Then he moved to the Biological Department at the I. V. Kurchatov Institute of Atomic Energy in Moscow. In 1976 he emigrated to Israel and joined the Department of Polymer Research at the Weizmann Institute of Science. He worked there from 1976 to 1991 before moving to the Department of Structural Biology as a full professor in 1992. He was also head of the Center for Genome Structure and Evolution at the Institute of Molecular Sciences in Palo Alto, California (1992-1995). In 2002 Trifonov became head of the Genome Diversity Center at the Institute of Evolution at the University of Haifa in Israel.

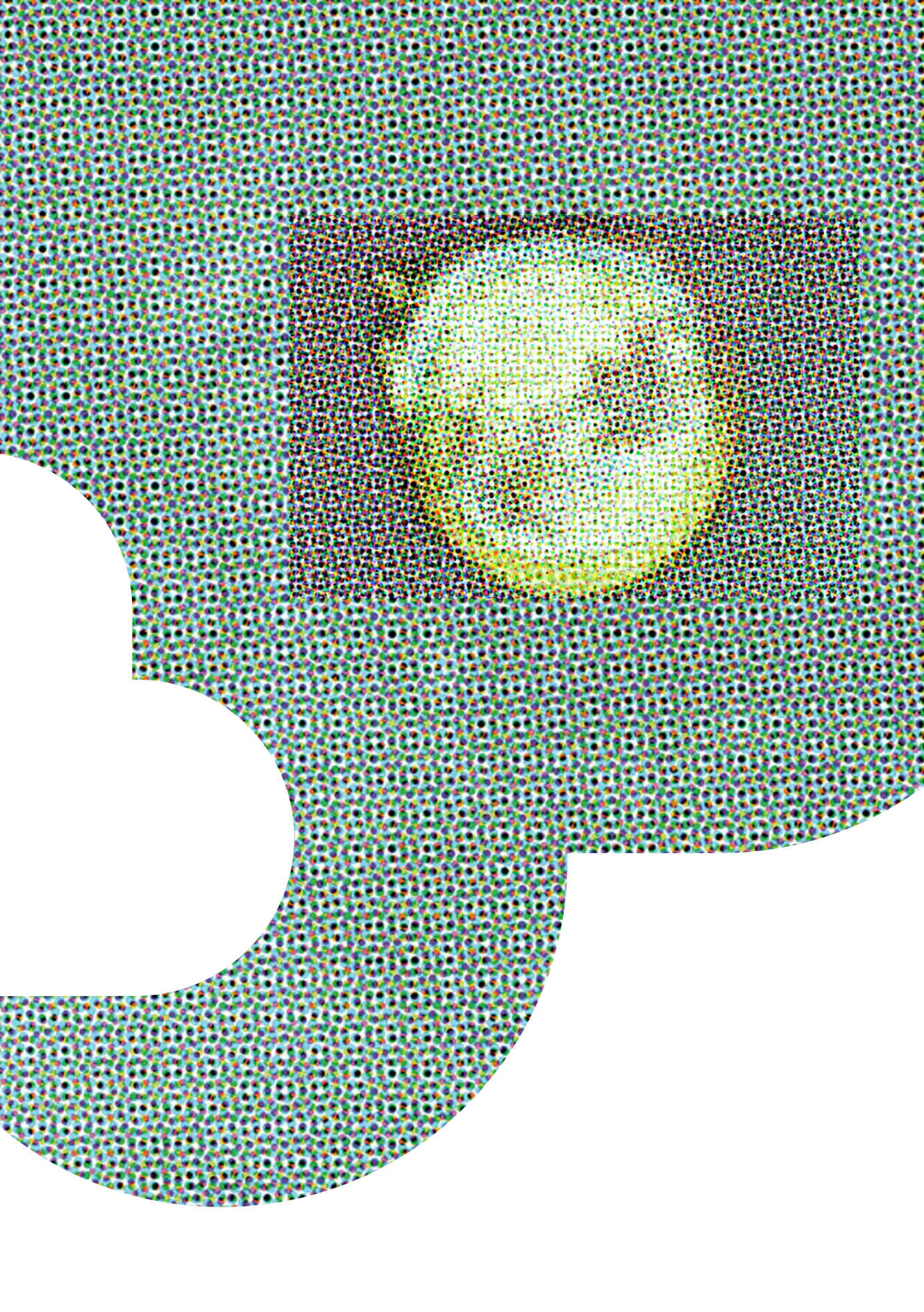
Trifonov has won several honours and awards, including the Kurchatov Prize for Basic Research (1971). He has filled

the positions of Kleeman Professor of Molecular Biophysics (1982-2002) and Adjunct Professor of Lomonosov Moscow State University (1999), and is a member of several learned societies.

Trifonov was appointed professor emeritus in 2003. He continues to be a leader at the Genome Diversity Center at the University of Haifa, and has been a professor at Masaryk University in Brno, Czech Republic, since 2007.

The Nature and Organization of Genomes, Their Sequence Structure and Evolution





Jack W. Szostak

* 1952

Howard Hughes Medical Institute, Boston, USA

📅 October 21, 2004

Jack W. Szostak is an English-born American biochemist and geneticist. He received his bachelor's degree in cell biology from McGill University in Montreal in 1972 and a PhD in biochemistry from Cornell University in Ithaca, New York, in 1977. After working as a research associate at Cornell from 1977 to 1979, Szostak took a position as assistant professor in the Department of Biological Chemistry of the Sidney Farber Cancer Institute (now the Dana-Farber Cancer Institute) at Harvard Medical School. His early research was concerned with the process of genetic recombination during meiosis, and he centred his investigations on telomeres. In 1980 Szostak met Elizabeth H. Blackburn, who had elucidated the genetic sequence of telomeres in the protozoan *Tetrahymena*. They conducted an experiment in which *Tetrahymena* telomeres were attached to the ends of yeast chromosomes and discovered that the yeast utilized the foreign telomeres as their own. The yeast also added its own telomere DNA to the *Tetrahymena* DNA, indicating that a cellular mechanism exists for telomere maintenance. Blackburn and Carol W. Greider, then a graduate student in Blackburn's laboratory, later discovered that this maintenance process is regulated by an enzyme called telomerase. Szostak's later work with yeast demonstrated that the loss of telomerase activity leads to premature cell aging and cell death.

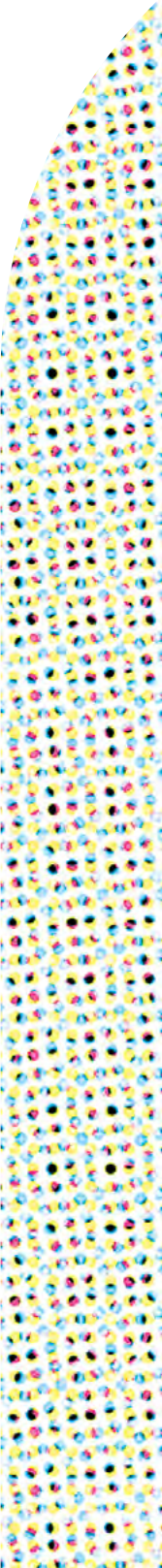
Szostak remained at Harvard Medical School and in 1988 became professor in the Department of Genetics. He also held a position in the Department of

Molecular Biology at Massachusetts General Hospital. In addition to his investigations into telomeres, Szostak was the first to create a yeast artificial chromosome (1983), which can be used to clone DNA and consists of a vector (or carrier) molecule that contains the yeast genes necessary for replication and a DNA segment of interest.

By 1991 Szostak had shifted the focus of his research to RNA and its role in evolution. Using only simple molecules, he developed techniques to generate functional RNA in a test tube. The goal of this research was to synthesize a self-replicating protocell susceptible to Darwinian evolution, which could then serve as a model to investigate the transition from chemical to biological life on early Earth.

In 1998 Szostak became a Howard Hughes Medical Institute Investigator and was elected a member of the National Academy of Sciences. He was also elected a member of the American Academy of Arts and Sciences and a fellow of the New York Academy of Sciences.

Jack Szostak was awarded the 2009 Nobel Prize for Physiology or Medicine, along with Blackburn and Greider, for his discoveries concerning the function of telomeres, which play a vital role in determining cell life span. In addition to the 2009 Nobel Prize, he has received a variety of other awards during his career, including the Albert Lasker Basic Medical Research Award in 2006 (shared with Blackburn and Greider).





The Origin of Life and the Emergence of Darwinian Evolution

Photo: Jussi Puikkonen

Barry Dickson

* 1962

Institute of Molecular Pathology (IMP), Vienna, Austria

📅 November 18, 2004

Barry Dickson is an Australian neurobiologist who studies the development of neuronal networks in the fruit fly *Drosophila melanogaster*.

Barry Dickson originally studied mathematics and obtained a degree from the University of Melbourne. Then, after reading the book *The Eighth Day of Creation* by Horace Freeland Judson, he swapped mathematics for biology. He moved to Switzerland and in 1992 obtained his PhD at the University of Zurich studying the development of the insect eye. During a postdoctoral stay in Berkeley, he came in contact with neurobiology. His research focus shifted to the developing central nervous system. When Barry Dickson returned to Switzerland, he set up his first independent research group at the University of Zurich, and in 1998 accepted a position as Group Leader at the IMP.

In 2003, Barry Dickson was appointed Senior Scientist at the newly established Institute of Molecular Biotechnology (IMBA) of the Austrian Academy of Sciences. Dickson not only moved his lab, but also shifted his research focus and embarked on a project to explain the origins of complex innate behaviours, and ultimately to understand how these behaviours are modified by experience.

Barry Dickson's scientific achievements were recognized through a number of prestigious awards and honours. In 2000, he was selected into the EMBO Young Investigator Programme and later was appointed EMBO member.

In June 2005 he published a breakthrough paper showing that the mating ritual of *Drosophila* – as an example of complex innate behaviour – is orchestrated by the activity of a single “master-gene”, fruitless. In 2006, Dickson became scientific director of the IMP. One of his most challenging projects during this time was setting up a library of 15,000 transgenic fly strains that would be available via mail-order to researchers around the world. The “Vienna *Drosophila* Resource Center” (VDRC) was officially founded in 2007 and continues to be a valuable resource for geneticists. In 2013, Barry Dickson moved to the Janelia Farm Research Campus of the Howard Hughes Medical Institute, where he continues to study neural circuits in the *Drosophila* nervous system. Using the fly as a model system, the lab focuses on the fly's mating behaviours.

In 2005, he received Austria's major science award, the Wittgenstein Prize, from the federal government and in 2006 he was awarded the Remedios Caro Almela Prize for Research in Developmental Neurobiology. In 2009, Dickson was elected AAAS Fellow.



Wired for Sex:
How Reproductive
Behaviours Are
Programmed into
a Fly's Brain

Ernst Hafen

* 1956

University of Zurich, Switzerland

 March 17, 2005

Ernst Hafen studies the genes involved in growth control and metabolism using *Drosophila* as a model system. He has made several contributions to the field of developmental biology and cell biology. These include the development of an *in situ* hybridization method and its application of the localization of transcripts from homeotic genes and segmentation genes, the characterization of genes and the corresponding signalling pathways involved in photoreceptor cell fate specification and in the control of cell and body size.

Ernst Hafen studied molecular and cellular biology at the Biocenter in Basel. In 1983 he obtained his PhD in developmental biology. Following a postdoctoral stay at the University of California at Berkeley, he moved to the Institute of Zoology at the University of Zurich as an assistant professor in 1987 and was promoted to full professor in 1997.

Ernst Hafen has received several prestigious awards, including the Ernst Jung Prize, the Friedrich Miescher Award, and the Otto Naegeli Award.

He has helped develop joint centres of ETH and the University of Zurich, including SystemsX, Life Science Zurich, and the Life Science Zurich Learning Center. Furthermore, Ernst Hafen is co-founder and scientific advisor of the biotech start-up The Genetics Company.

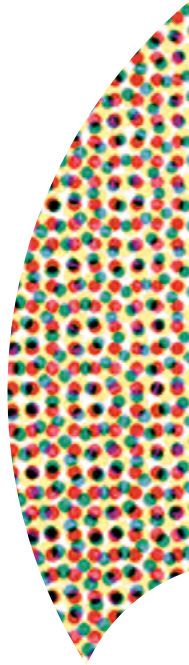
Ernst Hafen was elected President of ETH Zurich on 1 December 2005. Only one year later he announced his resignation.

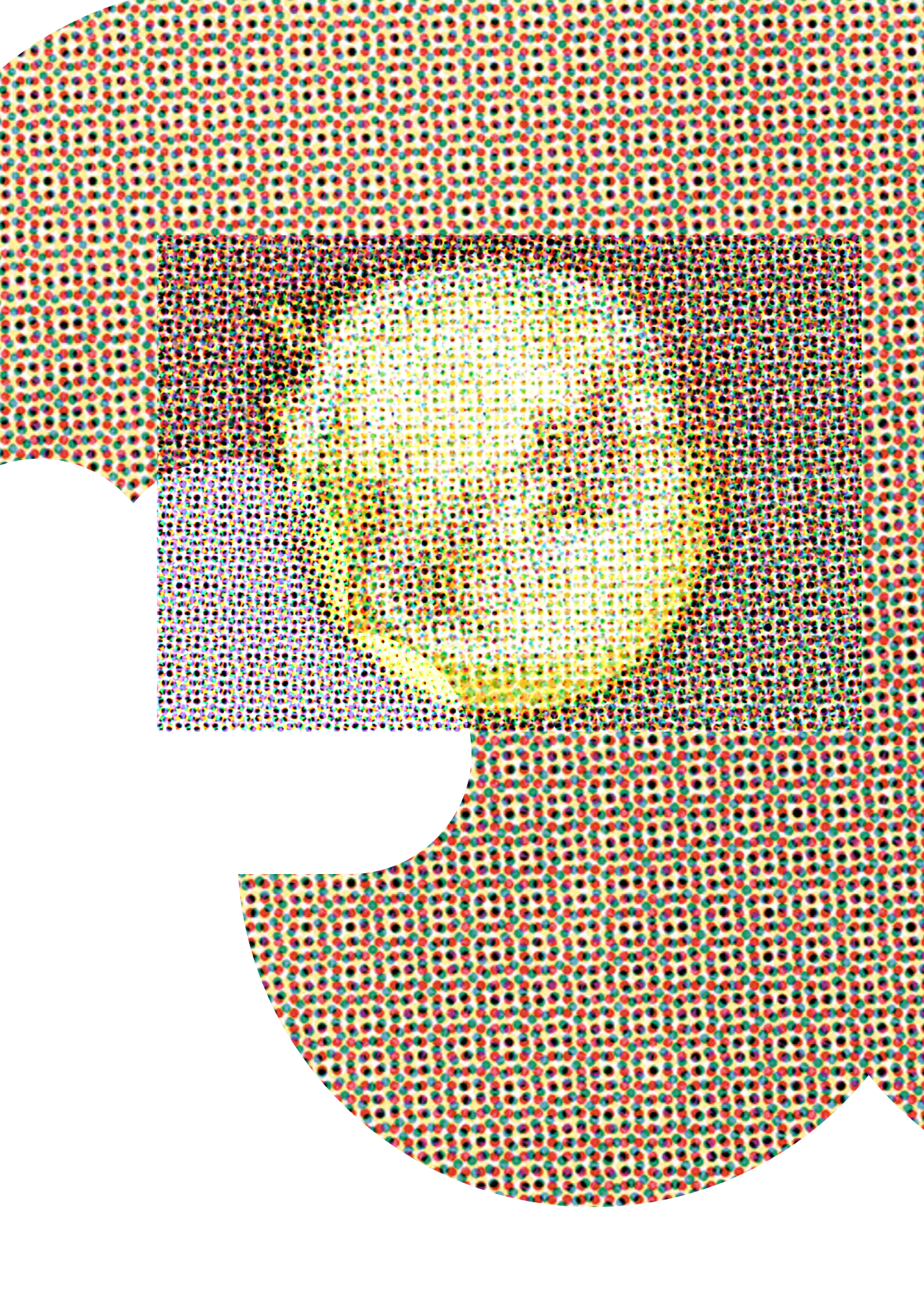
Since then, he has been a professor at the Institute of Molecular Systems Biology at ETH Zurich, where he initiated and subsequently headed the WingX project, which deals with the multidisciplinary systems biology of fruit fly wings.

In 2012 Hafen established the Data and Health Association with the aim to advance the debate on the collection and use of individual medical data in Switzerland. Linked to this is the deepening of the discussion on the scientific, ethical, social, legal and political aspects of information about personal data in the field of health and medicine.



Genetic
Dissection of
Insulin Signalling
and Growth in
Drosophila





Marc-André Sirard

* 1958

Université Laval, Quebec, Canada

📅 April 20, 2005

Marc-André Sirard graduated in 1981 from Université de Montréal, Canada. He obtained his PhD in 1985 in reproductive physiology at the Université Laval, Quebec, Canada, and then pursued postdoctoral studies at the University of Wisconsin (USA). In 1987, he came back to Université Laval as an assistant professor and was promoted to full professorship in the Department of Animal Science in 1995. In 1996 he founded the Centre de Recherche en Biologie de la Reproduction, a renowned centre that brought together top Canadian scientists in reproductive biology and in 2000 obtained the first Canadian Research chair in the field of animal reproduction and genomics. In 2001, he became the VP for Research at TGN Biotech, based in Quebec, a start-up biotechnology company with Laval University.

Sirard is renowned as one of the pioneers who developed bovine *in vitro* maturation (IVM) and fertilization (IVF) in the mid-1980s. In fact, he was among the first to use laparoscopy in the cow to retrieve bovine oocytes and culture them in rabbit oviducts, producing live progeny. Furthermore, Sirard developed a unique approach to optimize follicular quality, which resulted in the publication of the best procedure to harvest oocytes for commercial IVF. The main goal of his research is to describe and understand the genetic programme at the start of embryonic life.

His work on animal reproduction has made it possible to considerably enrich the medical arsenal used to combat

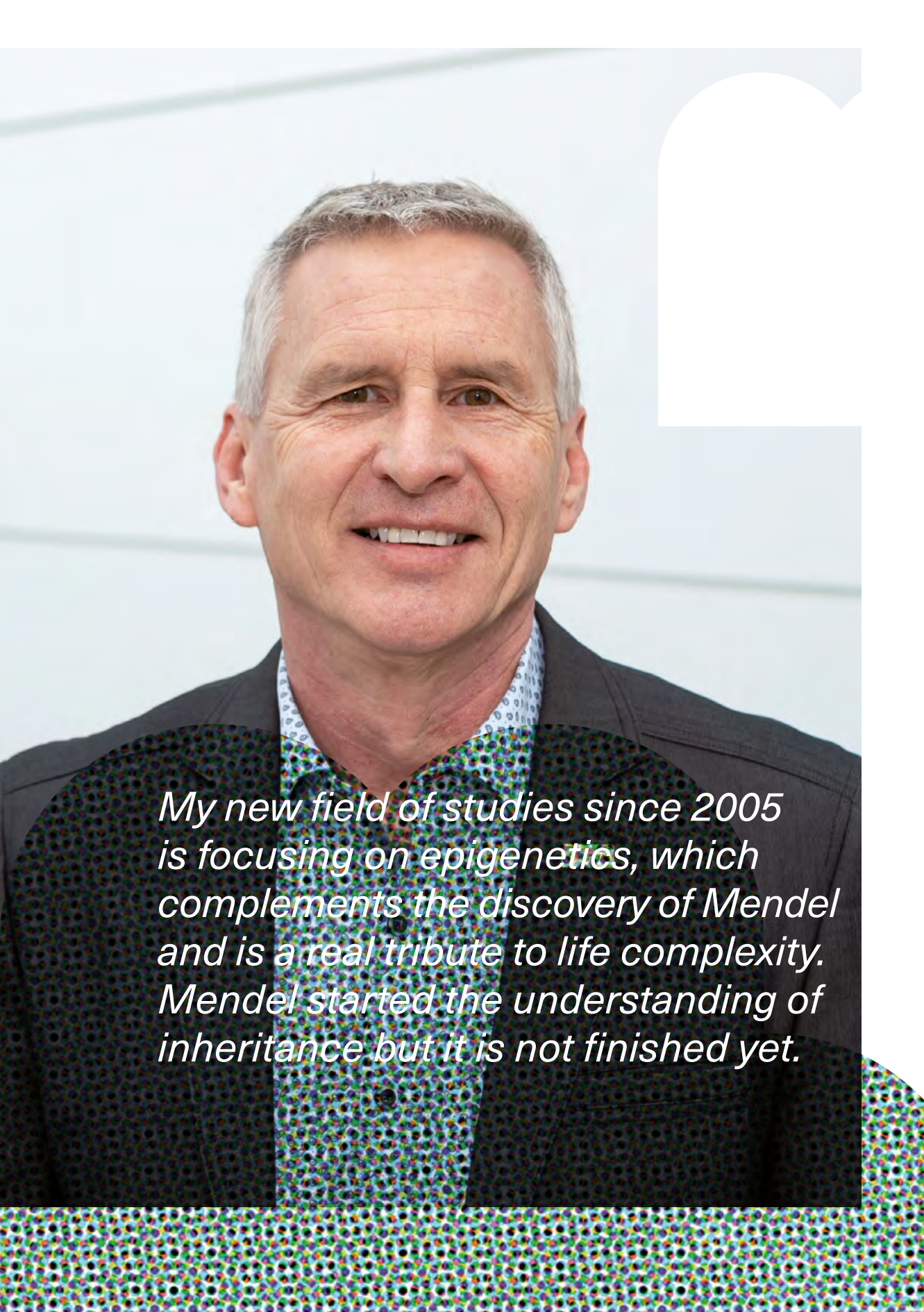
human infertility as well as a number of diseases. The method he developed to produce the first bovines conceived *in vitro* is now used around the world.

Aware of the new issues raised by this research, Professor Sirard took the initiative to create a consultative group to deal with the consequences of using assisted-reproduction methods. The group includes ethics specialists, legal scholars, anthropologists, geneticists, clinicians and biologists. Their aim is to set out guidelines for and restrict interventions in reproduction before the technologies become available, not after.

Prof. Sirard was elected for three consecutive seven-year terms as a Canadian Research chair for animal reproduction and genomics. In 2018 he was awarded the ETS Pioneer Award.

Gene Expression in Bovine Oocytes and Embryos: Prospect and Challenges





My new field of studies since 2005 is focusing on epigenetics, which complements the discovery of Mendel and is a real tribute to life complexity. Mendel started the understanding of inheritance but it is not finished yet.

Sir Alec Jeffreys

* 1950

University of Leicester, UK

📅 May 5, 2005

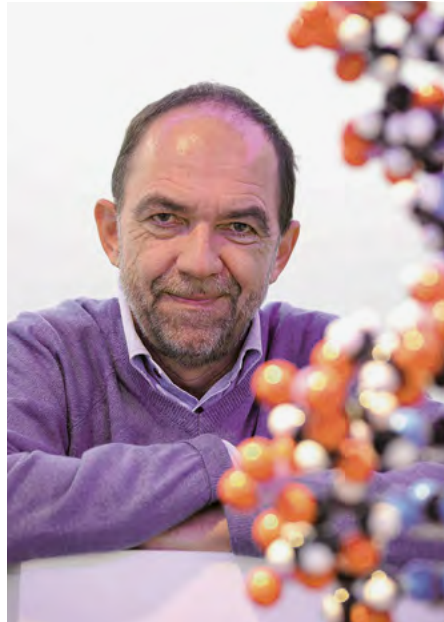
Sir Alec Jeffreys is a British geneticist who developed techniques for genetic fingerprinting and DNA profiling which are now used worldwide in forensic science to assist police detective work and to resolve paternity and immigration disputes.

Alec Jeffreys studied biochemistry and genetics at Merton College, Oxford, where he graduated in 1972, and completed his doctoral degree focusing on mitochondria in mammalian cells in 1975. Following an EMBO Postdoctoral Fellowship at the University of Amsterdam where, with Dr. Richard Flavell, he was one of the first to discover split genes, he moved in 1977 to the Department of Genetics at the University of Leicester.

Sir Alec's research at Leicester focused on exploring human DNA diversity and the mutation processes that create this diversity. He was one of the first to discover inherited variation in human DNA, and went on to invent DNA fingerprinting, showing how it can be used to resolve questions of identity and kinship, thus creating the field of forensic DNA. He then investigated how variation is generated in human DNA, by developing new and very powerful techniques to detect spontaneous changes in genetic information as it is transmitted from parent to child.

Sir Alec's work has received widespread recognition, including his election to the Royal Society in 1986. The Royal Society named him the Wolfson Research Professor for the Royal Society in 1991. He

received a Knighthood for service to the science of genetics in 1994 and conferment of the title of Honorary Freeman of the City of Leicester in 1993. In 2004 Jeffrey received the Royal Medal for introducing DNA analysis into forensic science.



Other awards include the Lasker Award (2005) and the Heineken Prize (2006). In 2007 he was voted Morgan Stanley Greatest Briton. The Royal Society awarded him the Copley Medal for outstanding achievement in any branch of science in 2014. He remained at the University of Leicester until his retirement in 2012.

Genetic Fingerprinting and Beyond

