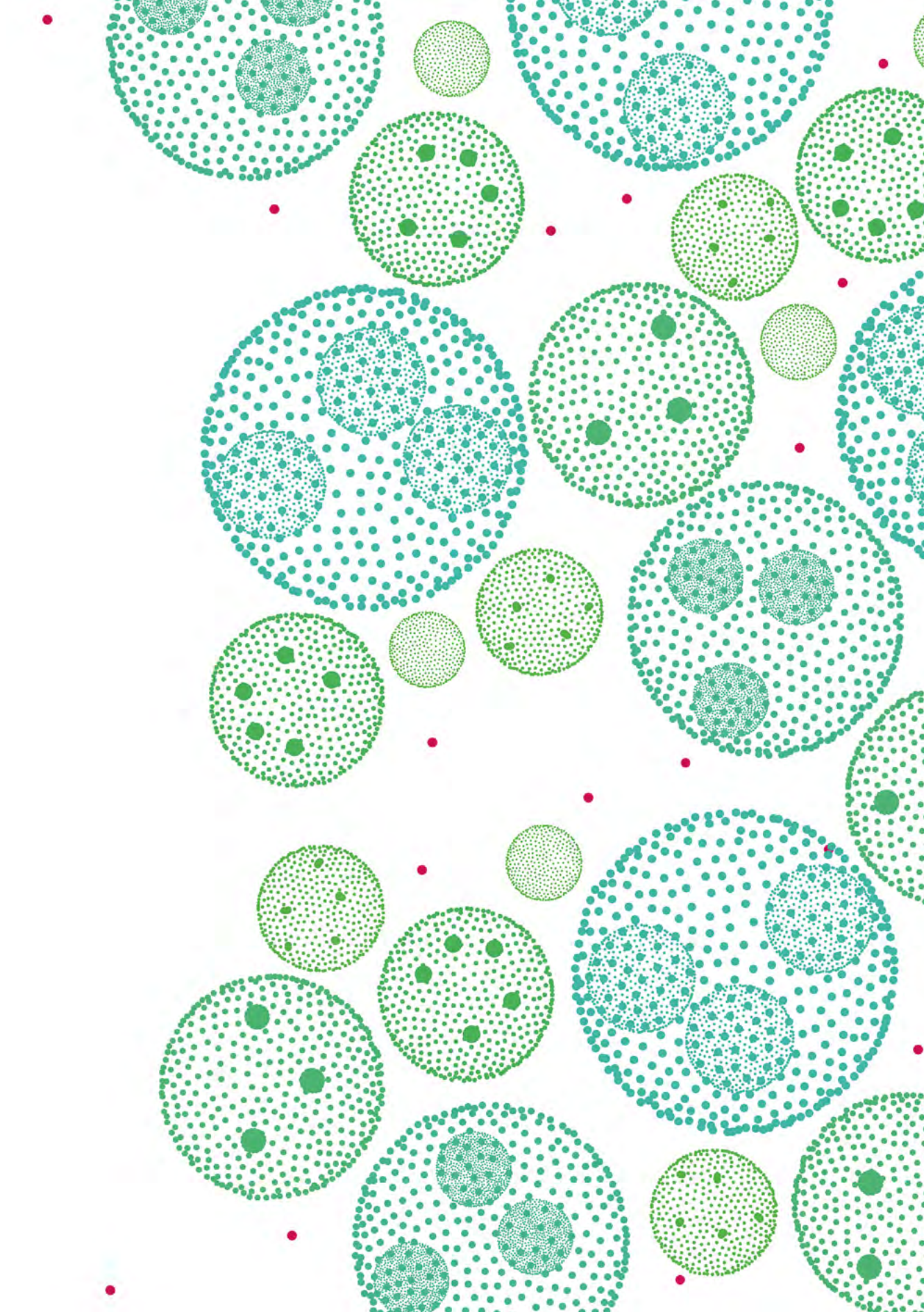
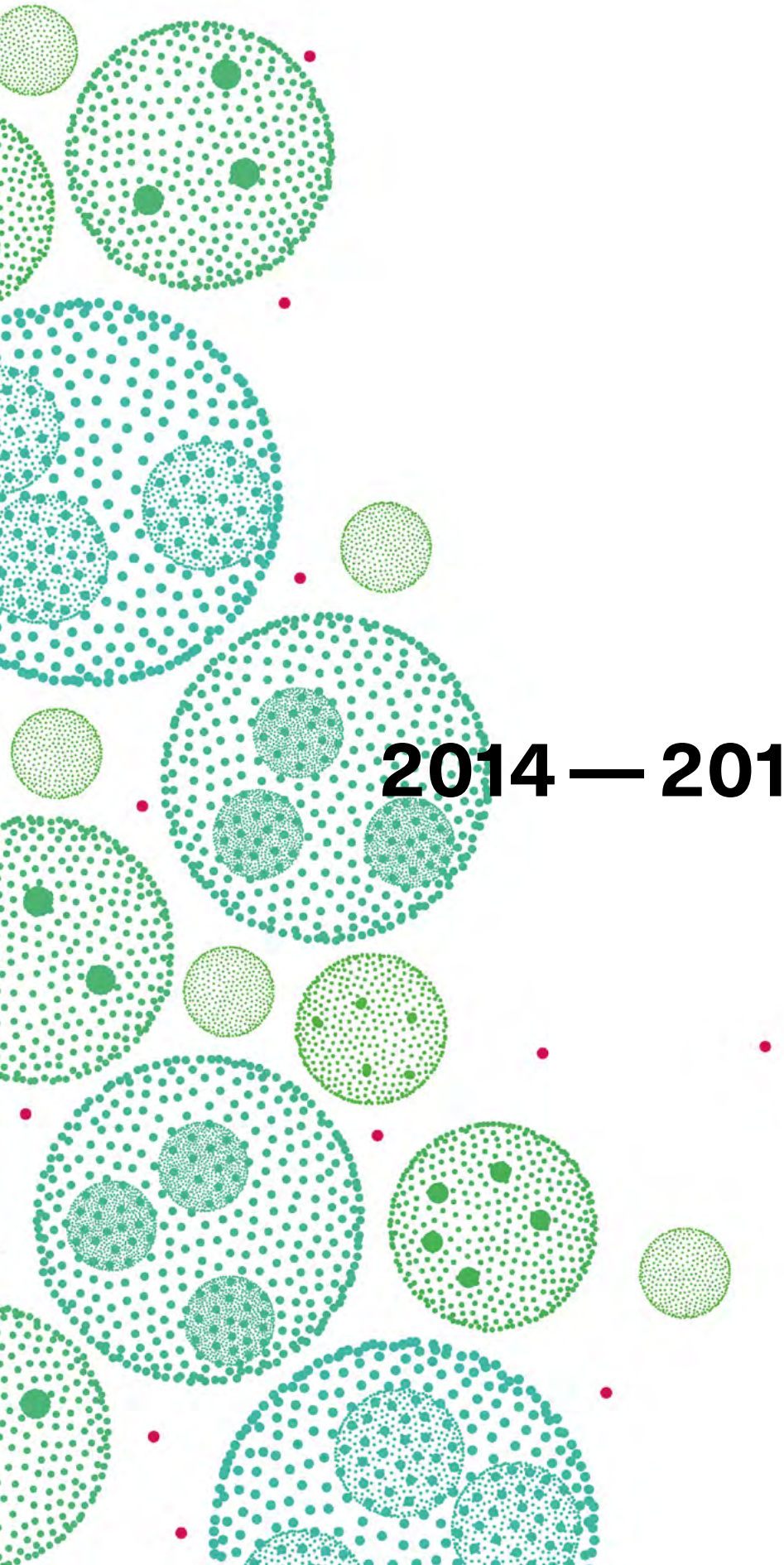
Mendel Lectures
2014—2015





2014 — 2015

Lorraine S. Symington

*1958

Columbia University Medical Center, New York, USA

October 30, 2014

Lorraine Symington received her BSc degree in biology from the University of Sussex, and a PhD in genetics from the University of Glasgow in 1979, studying horizontal gene transfer in bacteria with Dr. David J. Sherratt. After postdoctoral training in DNA biochemistry at Harvard Medical School and in yeast genetics at the University of Chicago, she joined the faculty at Columbia University in 1988. Since 2020 she has been the Harold S. Ginsberg Professor and Director of Graduate Studies of Microbiology and Immunology at Columbia University.

Symington has made major contributions in defining the key steps in the mechanism of homology-directed double strand breaks (DSB) using yeast as an experimental system. The failure to repair, or inaccurate repair of, DSBs can result in loss of genetic information or chromosomal rearrangements that can be an underlying cause of a number of hereditary syndromes. She focuses on three aspects of homologous recombination: (1) mechanisms and regulation of DNA-end processing, (2) mechanisms of break-induced replication, and in doing so (3) discovered and characterized many of the key enzymes that act in these processes. Her work led to the commonly accepted model that end processing occurs by a two-step mechanism, the first catalyzed by the conserved Mre11 complex, followed by the action of two functionally redundant nucleases (Exo1 and DNA2). She also defined the mutagenic recombination processes that lead to the formation of chromosomal translocations.

For her scientific contributions Lorraine Symington received the Irma T. Hirschl Career Scientist Award in 1989, the 1994 Harold and Golden Lamport Basic Research Award, and was appointed a Fellow of the American Association for the Advancement of Science in 2009. Symington became a Member of the American Academy of Arts Sciences in 2018 and a Member of the National Academy of Sciences in 2020.

Mechanisms of Homologous Recombination

Herbert Waldmann

*1957

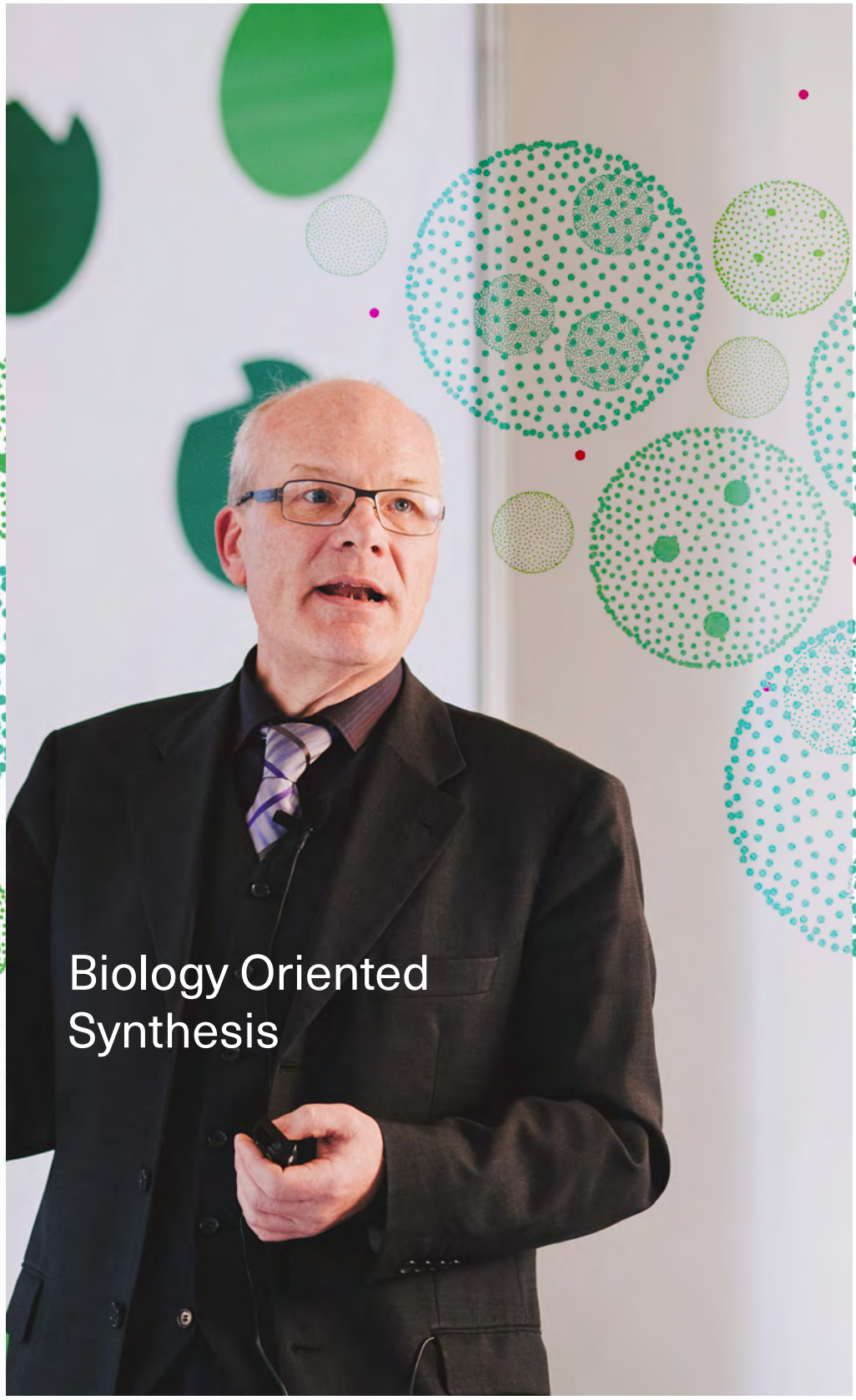
Max Planck Institute of Molecular Physiology, Dortmund, Germany

March 5, 2015

Herbert Waldmann studied chemistry and completed his PhD in organic chemistry in 1985. During the next two years he worked as a postdoctoral fellow at Harvard University in Cambridge, USA. In 1991 he qualified as professor at the University of Mainz. Shortly thereafter he was appointed professor of organic chemistry at the University of Bonn, and in 1993 he became professor of organic chemistry at the University of Karlsruhe. Since 1999 he has headed the Department of Chemical Biology at the Max Planck Institute of Molecular Physiology and, concurrently, has also held the position of professor of biochemistry at the Technische Universität Dortmund.

His current research interests include chemical biology and synthesis of natural product-inspired bioactive small molecule synthesis as well as stereoselective synthesis. A major focus of his research activities is the combination of organic chemistry, biophysics and biology for the synthesis and biological evaluation of peptide and protein conjugates that are involved in biological signal transduction processes. More recently syntheses of natural-product-derived compound libraries have been investigated by the Waldmann group.

Waldmann has been awarded numerous academic distinctions, including the Otto Bayer Prize, the Emil-Fischer Medal of the German Chemical Society (GDCh), one of the highest distinctions in Organic Chemistry in Germany, the Hans Herloff Inhoffen Medal, and the Max Bergmann Medal. In 2017 Waldmann delivered the Paul Karrer Lecture and in 2020 received the Liebig commemorative coin from the Society of German Chemists. He is a Member of the German Academy of Sciences Leopoldina (2004) and a Fellow of the Royal Society of Chemistry (2005). For more than 20 years Waldmann has been a scientific consultant and advisor to major pharmaceutical, agrochemical and chemical companies and biotechnology companies.


Biology Oriented
Synthesis

Kurt Wüthrich

*1938

Institute of Molecular Biology and Biophysics ETH *Zürich, Switzerland*

March 19, 2015

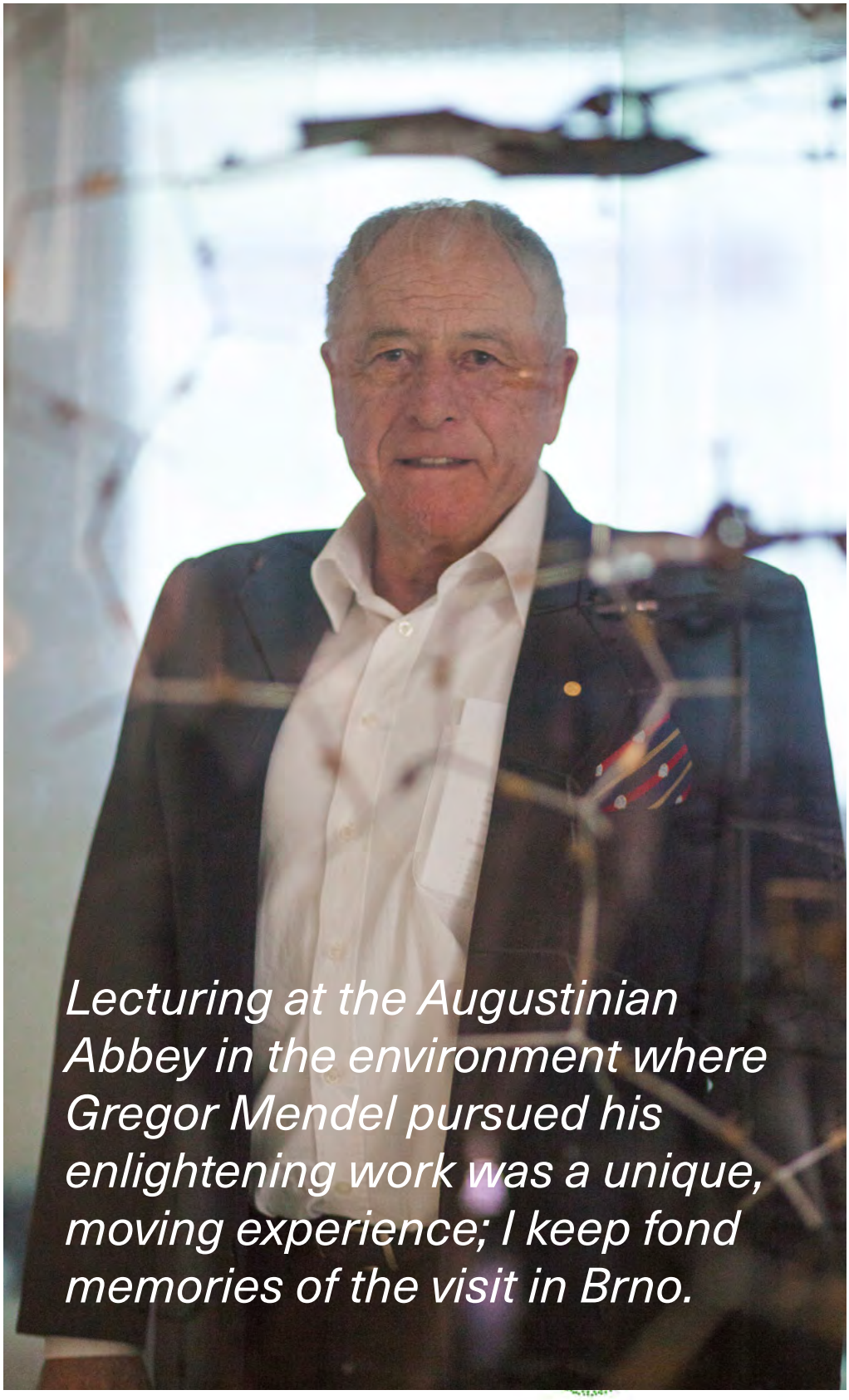
Kurt Wüthrich is a Swiss chemist/biophysicist and Nobel chemistry laureate, known for developing nuclear magnetic resonance (NMR) methods for studying biological macromolecules.

Wüthrich studied chemistry, physics and mathematics at the University of Bern and obtained a PhD in chemistry at the University of Basel in 1964. Following his PhD, Wüthrich continued postdoctoral research in Basel for a short time before leaving in 1965 to work at the University of California, Berkeley, for two years. After working at the Bell Telephone Laboratories in Murray Hill, New Jersey, Wüthrich returned in 1969 to Switzerland where he began his career at the ETH Zürich. In 1980 he became a Professor of Biophysics and since 2001 he has divided his time between the ETH Zürich and the Scripps Research Institute in California.

Wüthrich's research interests lie in molecular structural biology, and in structural genomics. His specialty is nuclear magnetic resonance (NMR) spectroscopy with biological macromolecules, a field in which he contributed the NMR method of three-dimensional structure determination of proteins and nucleic acids in solution. The Wüthrich groups have determined more than 200 NMR structures of proteins and nucleic acids, including the immunosuppression system cyclophilin A–cyclosporin A, the homeodomain–operator DNA transcriptional regulatory system, and prion proteins from a variety of species.

His achievements have been recognized by the Louisa Gross Horwitz Prize in 1991, the Louis-Jeantet Prize for Medicine in 1993, the Kyoto Prize in Advanced Technology in 1998, the Otto Warburg Medal in 1999, the Nobel Prize in Chemistry for "his development of nuclear magnetic resonance spectroscopy for determining the three-dimensional structure of biological macromolecules in solution" in 2002, the President's Gold Medal from the Government of India in 2010, the Theodor Bücher Medal in 2013, and a number of other awards and honorary degrees.

The Colourful Postgenomic World of Proteins



Lecturing at the Augustinian Abbey in the environment where Gregor Mendel pursued his enlightening work was a unique, moving experience; I keep fond memories of the visit in Brno.

Xiaoliang Sunney Xie

*1962

Harvard University, Cambridge, USA

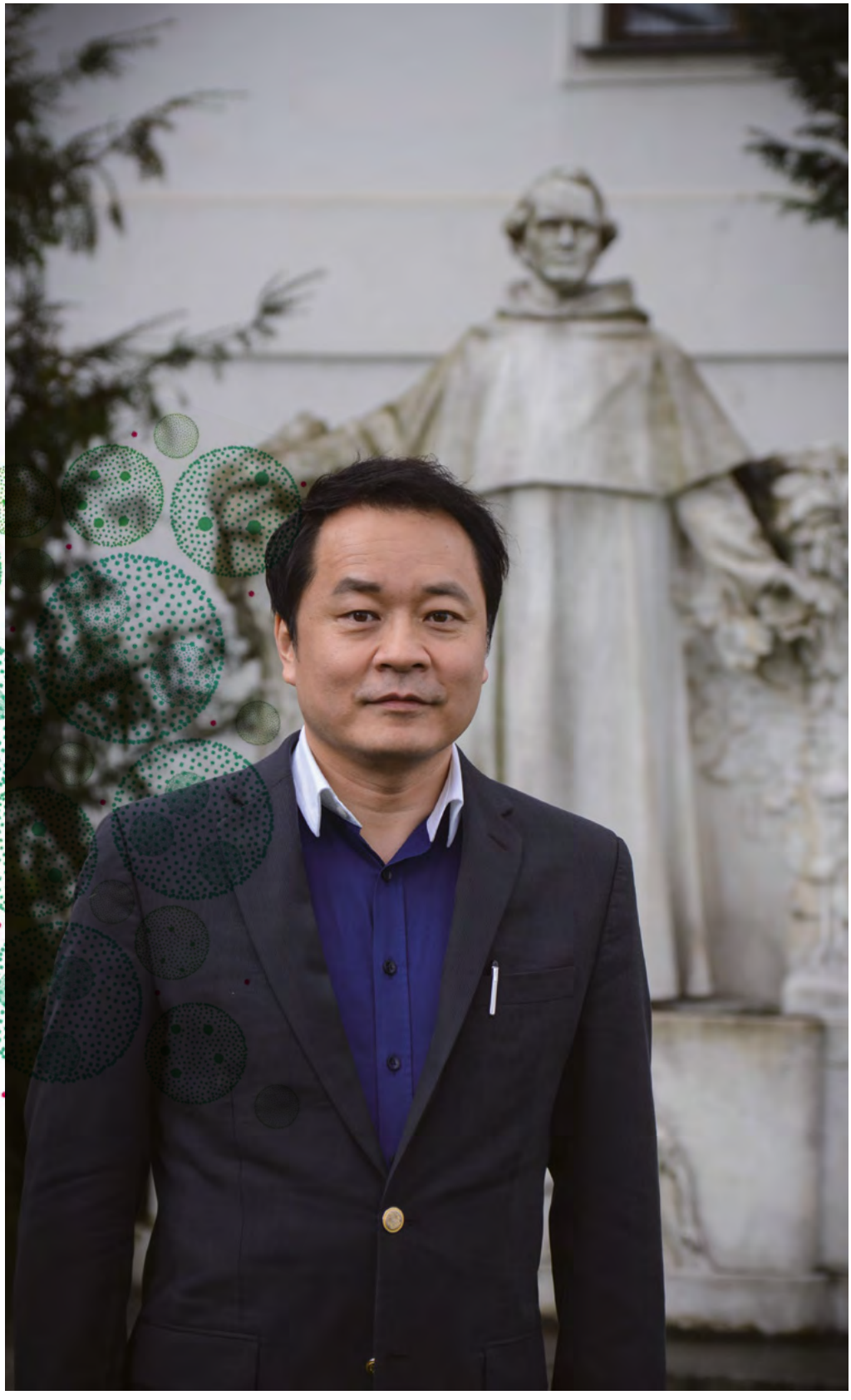
April 2, 2015

Xiaoliang Sunney Xie received a BS degree from Peking University in China in 1984, and his PhD from the University of California at San Diego in 1990, followed by a short postdoctoral experience at the University of Chicago. In 1992, Xie joined the Pacific Northwest National Laboratory, where he later became a chief scientist. In 1999, he was appointed professor of chemistry at Harvard University. He is now the Mallinckrodt Professor of Chemistry and Chemical Biology at Harvard, and the Cheung Kong Visiting Professor at Peking University, Biodynamics Optical Imaging Center (BIOPIC). Since 2019 he has served as Dean of the Faculty of Sciences at Peking University.

Xie has made major contributions to the emergence of the field of single-molecule biophysical chemistry and single-molecule enzymology. His team also pioneered the development of coherent Raman scattering microscopy and single cell whole genome sequencing. He has made significant contributions also to the medical applications of label-free optical imaging and single-cell genomics for pre-implantation genetic testing to avoid the transmission of monogenic diseases with *in vitro* fertilization.

Xie's honours include the Sackler Prize for Physical Sciences in 2003, the NIH Director's Pioneer Award in 2004, the Leibinger Innovation Prize in 2008, the E. O. Lawrence Award in Chemistry in 2009, the Harrison Howe Award and Biophysical Society Founders Award in 2012, the 2015 Albany Medical Center Prize, and the 2018 World Outstanding Chinese Award in Hong Kong. Xie is a fellow of the American Association for the Advancement of Science, the Biophysical Society, and the American Academy of Arts and Sciences, a member of the National Academy of Sciences and the National Academy of Medicine, and a foreign member of the Chinese Academy of Sciences.

Life at the Single Molecule Level: Single Cell Genomics



Michael Rosbash

*1944

Brandeis University, Waltham, USA

April 2, 2015

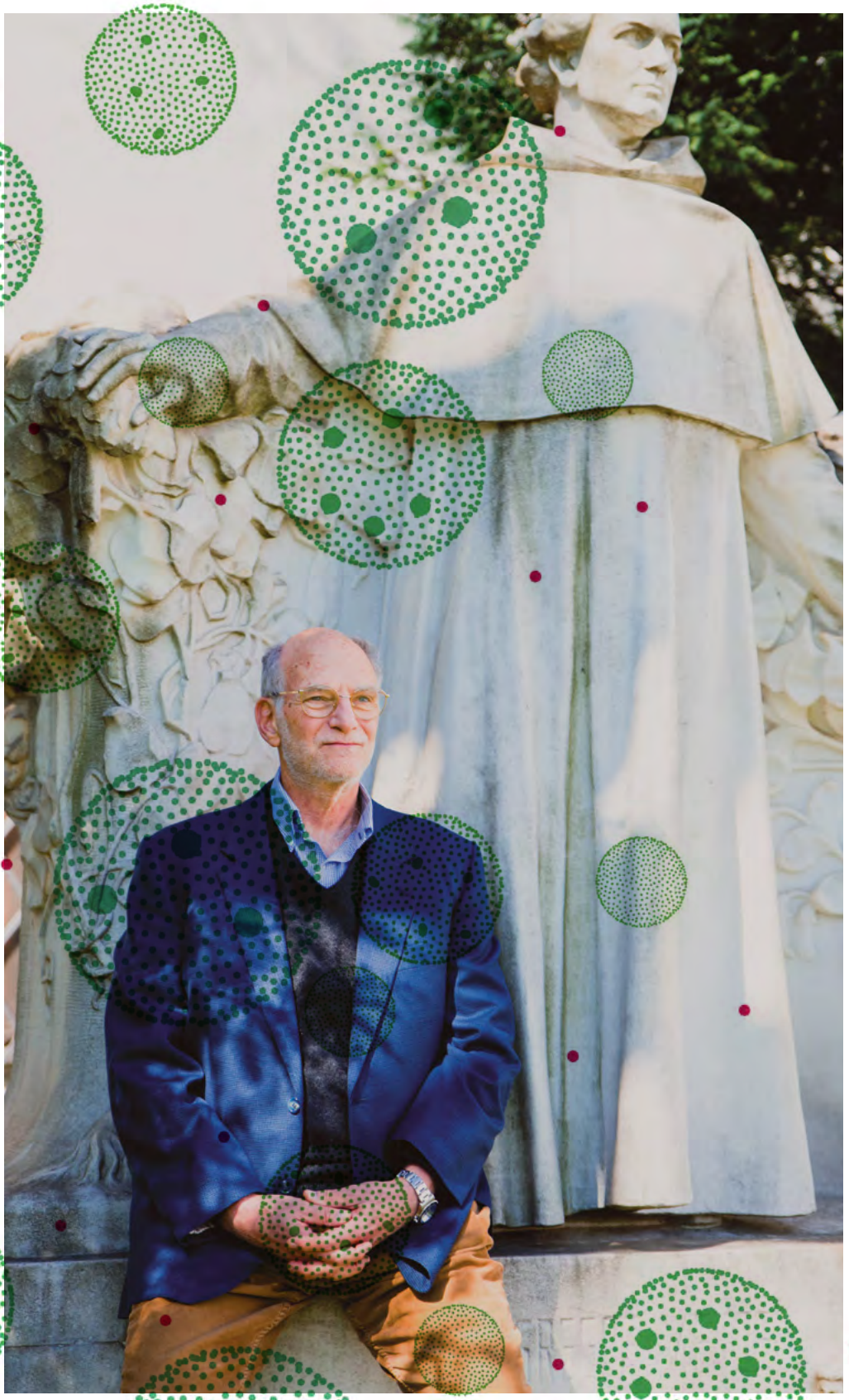
Michael Rosbash is an American geneticist and chronobiologist.

Rosbash graduated from the California Institute of Technology in 1965 with a degree in chemistry, spent a year at the Institut de Biologie Physico-Chimique in Paris, and obtained a doctoral degree in biophysics in 1970 from the Massachusetts Institute of Technology. After three years of postdoctoral fellowship in genetics at the University of Edinburgh, Rosbash joined the Brandeis University faculty in 1974. He became a director of the Brandeis National Center for Behavioral Genomics.

His laboratory is interested in the metabolism and processing of RNA as well as the genes and mechanisms that underlie circadian rhythms. Rosbash's research group cloned the *Drosophila* period gene (PER) in 1984 and in 1990 discovered that levels of *per* mRNA and its associated protein (PER) fluctuate during the circadian cycle, and proposed a transcription translational negative feedback loop model as the basis of the circadian clock. He also discovered the novel clock gene cycle and demonstrated its functional conservation in mammals, together with identification of a new *Drosophila* circadian photoreceptor involved in this process. Recently his lab has focused on understanding the neural circuits relevant to circadian timekeeping and the enigmatic process of temperature compenzation within the fruit fly brain and the function of individual circadian neurons.

Rosbash was elected to the American Academy of Arts and Sciences in 1997, the National Academy of Sciences in 2003, and became a Fellow of the American Association for the Advancement of Science in 2007. In 2009 he was awarded the Gruber Prize in Neuroscience, in 2011 the Louisa Gross Horwitz Prize, in 2012 the Canada Gairdner International Award, and in 2013 the Wiley Prize. Michael Rosbash, along with Michael W. Young and Jeffrey C. Hall, was awarded the 2017 Nobel Prize in Physiology or Medicine "for their discoveries of molecular mechanisms controlling the circadian rhythm".

RNA Editing and RNA Binding within Small Numbers of Discrete Neurons



Jules A. Hoffmann

*1941

University of Strasbourg, France

May 21, 2015

Jules A. Hoffmann is a Luxembourg-born French biologist known for his contribution to the field of activation of innate immunity.

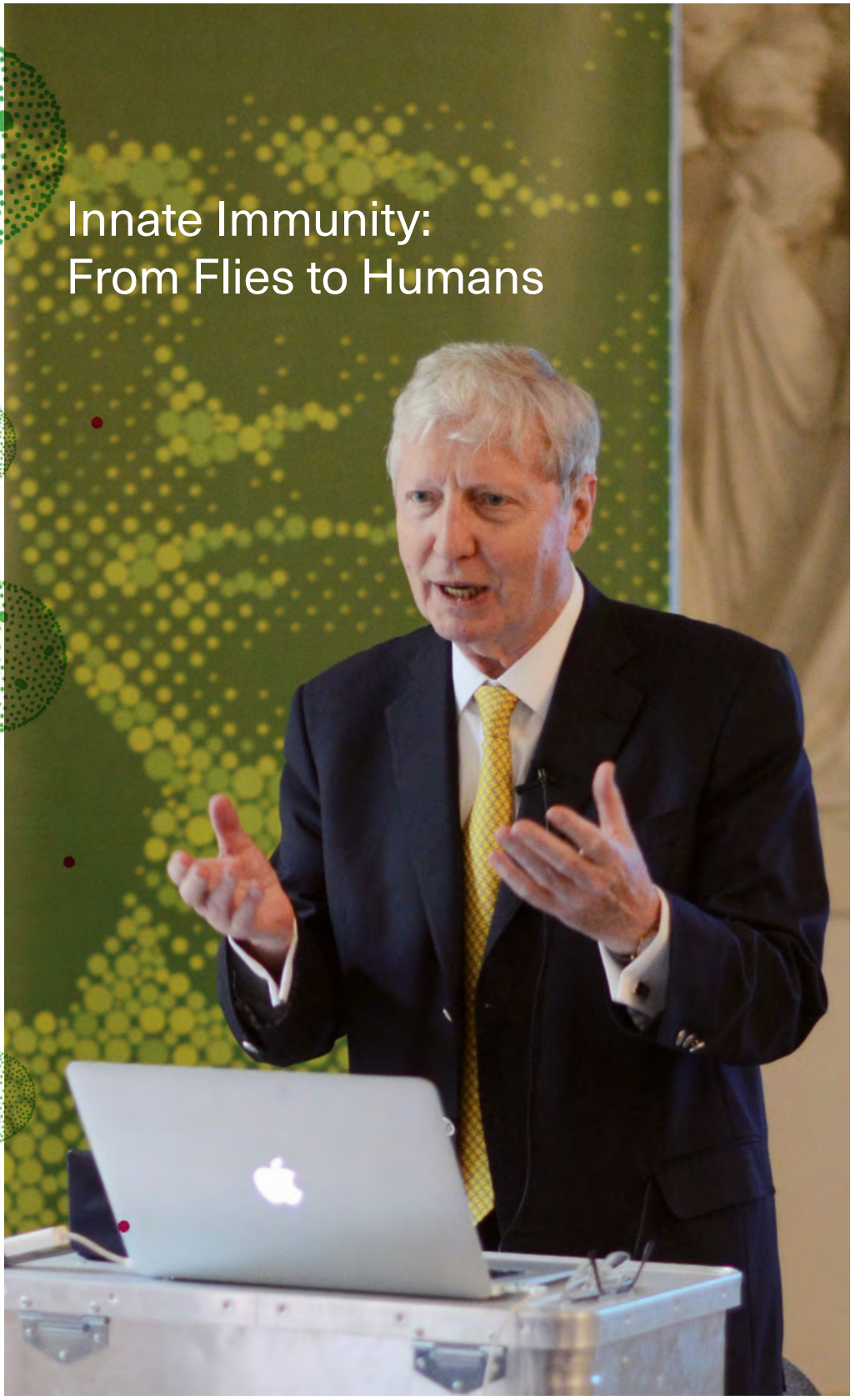
Hoffmann received undergraduate degrees in biology and chemistry at the University of Strasbourg, France. In 1969, he completed his PhD in biology at the University of Strasbourg in the Institute of Zoology. During 1973–1974 he was a postdoctoral fellow at the Institut für Physiologische Chemie at Philipps-Universität in Marburg an der Lahn, Germany. Since 1974 he has been a Research Director of the National Center of Scientific Research (CNRS) in Strasbourg. He was elected to the positions of Vice President (2005–2006) and President (2007–2008) of the French Academy of Sciences.

In 2011, Hoffmann, Bruce Beutler and Ralph M. Steinman were jointly awarded the Nobel Prize in Physiology or Medicine for their discoveries concerning the activation of innate immunity. He discovered an intracellular signalling pathway (Tall) responsible for regulation of antifungal peptide. Activation of this signalling pathway in the presence of an infectious micro-organism results in stimulation of production of antimicrobial peptides capable of destroying the infectious agents. Hoffmann's work has prompted others to search for Toll-like receptors with antimicrobial activity in other organisms and to improve our understanding of innate immunity and development of new antimicrobial agents.

Jules Hoffmann is a member of the German Academy of Sciences Leopoldina, the French Academy of Sciences, the Academia Europaea, the European Molecular Biology Organization (EMBO), the United States National Academy of Sciences, the American Academy of Arts and Sciences, the Fondation Écologie d'Avenir, and the Russian Academy of Sciences. He was awarded numerous scientific prizes, including the 2004 Robert Koch Prize, the 2007 Balzan Prize, the 2010 Lewis S. Rosenstiel Award, the 2011 Nobel Prize, the Gairdner Foundation International Award, the Shaw Prize, and the CNRS Gold Medal. In 2012 Hoffmann became a Commander of the Legion of Honour.

In 2015, Hoffmann signed the Mainau Declaration 2015 on Climate Change on the final day of the 65th Lindau Nobel Laureate Meeting. The declaration was signed by a total of 76 Nobel laureates and handed to then-President of the French Republic, François Hollande, as part of the successful COP21 climate summit in Paris.

Innate Immunity: From Flies to Humans



Maria Jasin

*1956

Memorial Sloan-Kettering Cancer Center, New York, USA

May 28, 2015

Maria Jasin pursued her graduate studies at the Massachusetts Institute of Technology and received her PhD in 1984. She was a postdoctoral researcher at the University of Zürich and Stanford University prior to joining the faculty at Memorial Sloan Kettering Cancer Center in 1990, where she is a full professor and holds the William E. Snee chair. She also has an appointment at the Cornell University Graduate School of Medical Sciences.

Jasin's pioneering work demonstrated the usefulness of homologous recombination for the repair of DNA breaks. Her research further demonstrated that the repair of DNA breaks in chromosomes by homologous recombination is a highly effective approach of gene targeting, with important implications for gene therapy and gene editing technology.

Her work on DNA repair mechanisms demonstrated the cellular roles of the breast cancer suppressors BRCA1 and BRCA2, revealing a major mechanism for the suppression of breast cancer. Her studies fundamentally contributed to our understanding of how cells preserve their genome integrity.

Her research accomplishments have led to her election to the National Academies of Sciences in 2015, and to the American Academy of Arts and Sciences in 2017. Jasin was awarded the Basser Global Prize in 2018 and the Shaw Prize in Life Sciences in 2019.

Protecting the Genome by Homologous Recombination