

Venue:

Spanish National Cancer Research Centre – CNIO Auditorium, Madrid, Spain

Organizing committee:

Óscar Llorca, CNIO, Structural Biology Programme, Madrid, Spain

Rafael Fernández Leiro, CNIO, Structural Biology Programme, Madrid, Spain

Eva Nogales, University of California, Berkeley, US

Machines acting on DNA and RNA, a molecular mechanistic perspective

Rationale:

Cells have evolved complex macromolecular machines capable of dealing with the challenges involved in the manipulation of nucleic acids during DNA replication, DNA repair, RNA processing, transcription, translation, and other DNA and RNA transactions. The combination of advances in cryo-electron microscopy with cell and molecular biology, biochemistry and biophysics is providing unprecedented advances in our understanding of these complex and highly regulated processes. This meeting will bring together research leaders in the field with a focus on the integration of structural, biophysical and biochemical studies to define the molecular mechanisms underlying the function of the large molecular machines carrying out nucleic acid transactions essential for the cell and the organism.

SPEAKER LIST

Dr. Alexey Amunts, University of Münster, Germany

Dr. Gina Buchel, Yale University, US

Dr. Elena Conti, Max Planck – Biophysical Chemistry, Germany

Dr. Alessandro Costa, The Francis Crick Institute, UK

Dr. Israel S. Fernández, Biophysics in the Basque Country (CSIC-UPV/EHU), Spain

Dr. Yuan He, Johns Hopkins University, US

Dr. Siddhant Jain, Harvard Medical School, US

Dr. Leemor Joshua-Tor, Cold Spring Harbor Laboratory, US

Dr. Elizabeth Kellogg, St. Jude Children's Research Hospital, US

Dr. Meindert Lamers, Leiden University Medical Center (LUMC), The Netherlands

Dr. Jun-Jie Liu, Tsinghua University, China

Dr. Nicole Hoitsma, University of Colorado Boulder, US

Dr. Lori Passmore, MRC Laboratory of Molecular Biology (LMB), UK

Dr. Christian M. T. Spahn, Institute of Medical Physics and Biophysics, Germany

Dr. Alessandro Vannini, Human Technopole, Italy

Dr. Wei Yang, National Institutes of Health (NIH), US

Dr. Xiaodong Zhang, Imperial College London, UK

Wednesday May 28th, 2025

08:30-09:15 Registration - main hall

09:15-09:30 Welcome address

09:30-11:45 Session 1. Chromatin structure and remodelling
Chair: Eva Nogales

09:30 – 10:00 Transcriptional and extra-transcriptional roles of the RNA Polymerase III machinery in genome function and organisation
Alessandro Vannini, Human Technopole, Italy

10:00 – 10:30 Unraveling SMARCAD1 as a multifaceted chromatin remodeler
Nicole Hoitsma, University of Colorado Boulder, US

10:30-11:00 Poster session 1 - coffee break – social room

11:00 – 11:15 *short talk*: Structural basis for the capture of a DNA double helix by the ATP-dependent protein clamp of a type IIA topoisomerase
Dmitry Ghilarov, Department of Biochemistry, University of Oxford, UK

11:15 – 11:45 Structure and Function of Mammalian SWI/SNF Chromatin Remodeling Complexes in Health and Disease
Siddhant Jain, Harvard Medical School, US

11:45-15:00 Session 2. DNA damage signalling and repair
Chair: Lori Passmore

11:45 – 12:15 From RAG to NHEJ: Splicing Together Our Adaptive Immune System
Wei Yang, National Institutes of Health-NIH, US

12:15-13:45 Lunch break – Canteen

13:45 – 14:00 *short talk*:
Natalia de Martin Garrido, The Institute of Cancer Research, UK

14:00 – 14:30 Deciphering the Molecular Blueprint of NHEJ-Mediated DNA Repair
Yuan He, Johns Hopkins University, US

14:30 – 15:00 How Poxviruses target NHEJ proteins
Óscar Llorca, Spanish National Cancer Research Centre-CNIO, Spain

15:00-16:00 Poster session 1- coffee break – social room

16:00-17:30 Session 3. Genome Editing

Chair: Rafael Fernández Leiro

16:00 – 16:30 Understanding and engineering programmable transposons for genome-editing
Elisabeth Kellogg, St. Jude Children's Research Hospital, US

16:30 – 16:45 *short talk*: Molecular and Structural Insights into AAA+-Mediated Transposase Activation
Ernesto Arias-Palomo, Center for Biological Research (CIB) Margarita Salas, Spain

16:45 – 17:00 *short talk*. Structural basis driving Tn7 target site selection
Alba Guarné, McGill University, Canada

17:00 – 17:30 Exploring RNA machineries for DNA manipulation
Jun-Jie Liu, Tsinghua University, China

17:30-19:00 Poster session 1 – refreshments for all participants – social room

Thursday May 29th, 2025

09:30-12:30 Session 4. Macromolecular complexes in DNA / RNA processing

Chair: Oscar Llorca

09:30 – 10:00 Molecular Machines that sense and respond to viral RNA: the RIG-I like family
Gina Buchel, Yale University, US

10:00 – 10:15 *short talk*: Helicase-mediated mechanism of SSU processome maturation and disassembly
Sebastian Klinge, The Rockefeller University, US

10:15 – 10:45 Molecular insights into the mRNA poly(A) tail machinery
Lori Passmore, MRC Laboratory of Molecular Biology (LMB), UK

10:45-11:30 Group picture CNIO main entrance / poster session 2 & coffee break – social room

11:30 – 12:00 The RNA exosome complex at the crossroads of RNA processing and decay
Elena Conti, Max Planck – Biophysical Chemistry, Germany

12:00 – 12:15 *short talk*: Cryo-EM reveals the architecture of an active yeast m6A Methyltransferase Core Complex
Michelangelo Lassandro, Human Technopole, Italy

12:15 – 12:30 *short talk*: Molecular basis of mRNA delivery to the bacterial ribosome
Michael Webster, John Innes Centre, UK

12:30-13:45 Lunch break – Canteen

13:45-17:30 Session 5a. Replication and Transcription

Chair: Wei Yang

- 13:45 – 14:15 Understanding the mitochondrial DNA replication machinery
Rafael Fernández-Leiro, Spanish National Cancer Research Centre-CNIO, Spain
- 14:15 – 14:30 *short talk*: Structural basis of transcription reduction by a promoter-proximal +1 nucleosome
Julio Abril Garrido, Max Planck for Multidisciplinary Sciences, Germany
- 14:30 – 15:00 Molecular mechanisms of ATPase-driven bacterial transcription initiation
Xiaodong Zhang, Imperial College London, UK
- 15:00 – 15:15 *short talk*: The bacterial helicase loader DnaI is a redox-sensing switch
Amy Fernandez, Johns Hopkins School of Medicine, US
- 15:15 – 15:45 Surprises in the modularity of large transcriptional cofactors
Eva Nogales, University of California, Berkeley, US

15:45-16:15 Poster session 2 - coffee break – social room

- 16:15 – 16:45 Mechanism of parental nucleosome disruption and histone redistribution by the replisome
Alessandro Costa, The Francis Crick Institute, UK
- 16:45 – 17:00 *short talk*: Structural basis of RNA polymerase III backtracking and reactivation
Carlos Fernandez-Tornero, Margarita Salas Center for Biological Research, Spain
- 17:00 – 17:30 To be or not to be, specific? That is the question!
Leemor Joshua-Tor, Cold Spring Harbor Laboratory, US

17:30-19:00 Poster session 2 – refreshments for all participants – social room

Friday, May 30th, 2025

09:30-10:30 Session 5b. Replication and Transcription

Chair: Alessandro Costa

- 09:30 – 10:00 Targeting bacterial DNA polymerases for the next generation of antibiotics
Meindert Lamers, Leiden University Medical Center-LUMC, The Netherlands
- 10:00 – 10:15 *short talk*: Coupling of ribosome biogenesis and translation initiation in human mitochondria.
Anna Franziska Finke, University Medical Center Goettingen, Germany
- 10:15 – 10:30 *short talk*: Structural basis of de novo chromatin assembly during DNA replication
Jolijn Govers, Hubrecht Institute, The Netherlands

10:30-12:45 Session 6. Translation

Chair: Alessandro Costa

10:30 – 11:00 Cryo-electron microscopy of actively translating ribosomes

Christian M. T. Spahn, Institute of Medical Physics and Biophysics, Germany

11:00 – 11:15 *short talk*: Mechanisms to Create Specialized Ribosomes in Bacteria

Joaquin Ortega, McGill University, Canada

11:15-11:45 Coffee break – social room

11:45 – 12:15 Where to start: The Dynamic Adventure of Identifying Start Codons in mRNAs

Israel S. Fernández, Biofisika Institute (CSIC-UPV/EHU), Spain

12:15 – 12:45 From RNA to Membrane: Mitochondrial Ribosomes at Work **EMBO Young Investigator Lecture**

Alexey Amunts, University of Münster, Germany

12:45 Poster/talk prizes

Wrap up and closing: Oscar Llorca, Eva Nogales and Rafael Fernandez Leiro