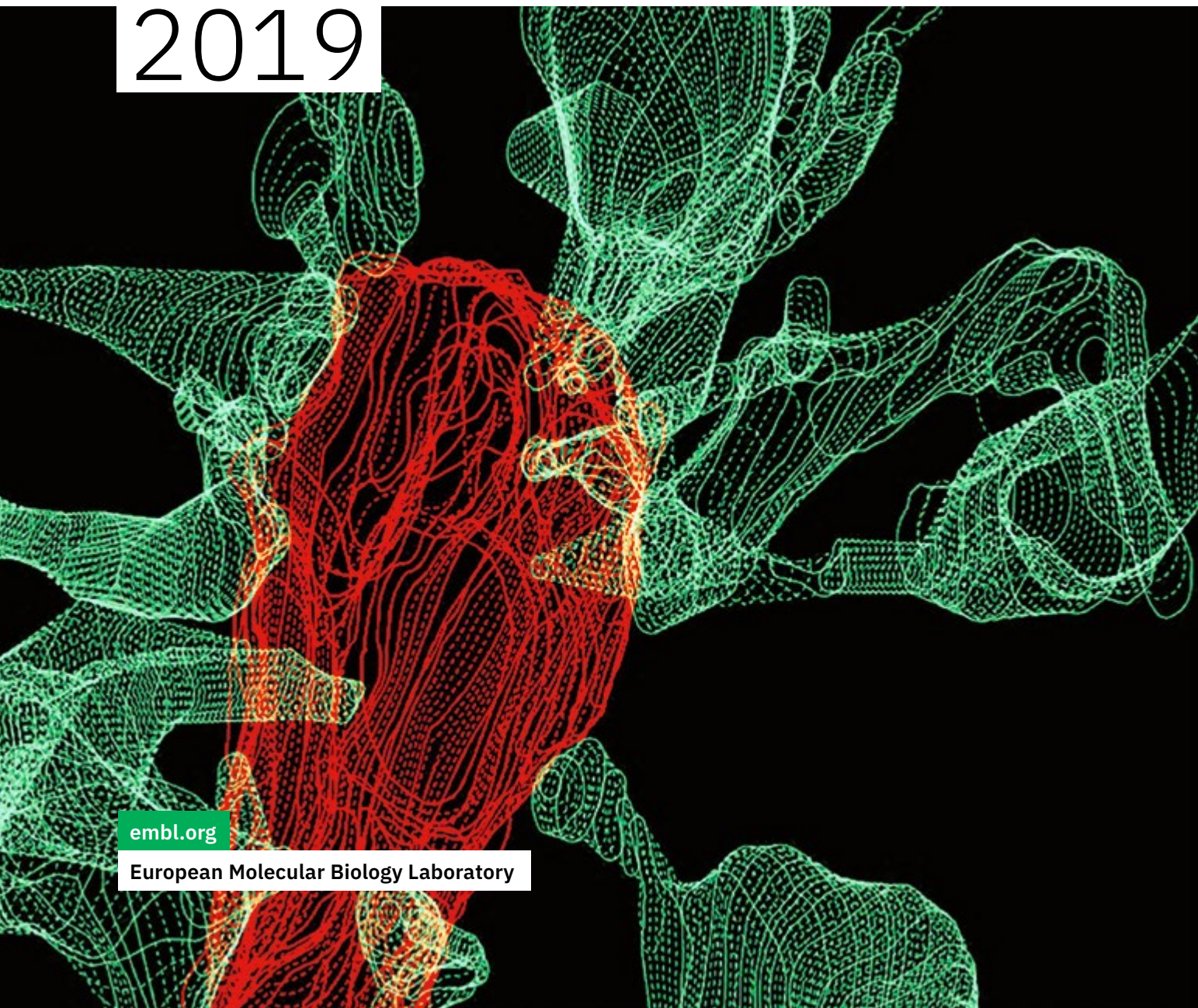


Research in brief

2019

embl.org

European Molecular Biology Laboratory



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Cover

Multiple synapse heads send out filopodia, shown in green, converging on a microglial cell, shown in red.

Image: Laetitia Weinhard/EMBL

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About EMBL

EMBL is Europe's leading laboratory for the life sciences. We are an intergovernmental organisation established in 1974 and are supported by over 20 member states.

EMBL performs fundamental research in molecular biology, studying the story of life. We offer services to the scientific community, train the next generation of scientists and strive to integrate the life sciences across Europe.

We are international, innovative and interdisciplinary. We are more than 1700 people, from over 80 countries, operating across six sites in Barcelona (Spain), Grenoble (France), Hamburg (Germany), Heidelberg (Germany), Hinxton (UK) and Rome (Italy). Our scientists work in independent groups and conduct research and offer services in all areas of molecular biology.

Our research drives the development of new technology and methods in the life sciences. We work to transfer this knowledge for the benefit of society.

BARCELONA



GRENOBLE



HAMBURG



HEIDELBERG



HINXTON



ROME



Careers at EMBL

EMBL is no ordinary place to work. We are passionate about science and its potential to improve and enrich life. We are a vibrant, driven and open community that welcomes new and diverse perspectives. We are international, friendly and supportive, and our 1700 people include mathematicians, physicists, chemists and computer engineers, as well as biologists, biochemists and bioinformaticians. Together we strive for excellence in everything we do.

Our approach is to hire the best people from around the world and give them the freedom and the conditions to do the best possible science. This includes access to cutting-edge technologies and outstanding training opportunities, a collaborative work atmosphere and great benefits.

Do you have the EMBL spirit? It is a mix of passion, curiosity, openness and a drive to develop and do better – together with others. Then EMBL is the right place for you!



CAREER OPPORTUNITIES



s.embl.org/phdprogr
PhD programme



s.embl.org/jobs
Group and team leaders



s.embl.org/postdocprogr
Postdoctoral programme



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Other careers

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EMBL BARCELONA



Tissue Biology and Disease Modelling

Located in Barcelona, Spain

An organ or a tissue is much more than just a collection of cells. It has genetic patterns, specific cell types, 3D structure and arrangement. Scientists at EMBL Barcelona trace the connections between these scales. They unveil how tissues develop, work, regenerate and heal. Thanks to the core facilities available at EMBL and at its local partner institute, the Centre for Genomic Regulation (CRG), researchers can observe, manipulate and model how changes in genes percolate through cells, tissues and organs, in health and disease.



James Sharpe

Multicellular systems biology

Head of the Tissue Biology and Disease Modelling Unit; Senior Scientist

The Sharpe group brings together an interdisciplinary team of biologists, physicists and computer scientists to build multi-scale computer simulations of a paradigm of organogenesis – mammalian limb development.

embl.org/sharpe



Maria Bernabeu

In vitro 3D blood-brain barrier model and cerebral malaria

Group Leader

The Bernabeu group aims to understand the mechanisms that lead to vascular dysfunction in cerebral malaria by developing new *in vitro* models of the human blood-brain barrier.

embl.org/bernabeu



Miki Ebisuya

Synthetic developmental biology: gene circuit and organoid zoo

Group Leader

The Ebisuya group reconstitutes developmental mechanisms by making artificial gene circuits, and studies interspecies differences by comparing organoids of different animals.

embl.org/ebisuya



Kristina Haase

Engineering vascularised tissue-specific disease models

Group Leader

The Haase group develops novel 3D vascularised *in vitro* tissues for disease modelling, drug development and regenerative medicine.

embl.org/haase



Vikas Trivedi

Self-organisation in multicellular systems

Group Leader – Joint appointment with the Developmental Biology Unit

The Trivedi group aims to understand self-organisation of cells, fundamental to metazoan development, through comparative study of embryos and organoids that generate a global coordinate system *de novo*.

embl.org/trivedi

Services

MESOSCOPIC IMAGING FACILITY



Jim Swoger

Facility Head

The Mesoscopic Imaging Facility provides access to imaging platforms and support services to enable 3D imaging of biological tissues over time.

embl.org/mif

EMBL-EBI



Bioinformatics Research

European Bioinformatics Institute

Located in Hinxton, United Kingdom

Researchers at EMBL-EBI are transforming the life sciences. They are making sense of the vast, complex datasets produced using new and emerging technologies in molecular biology. Their work spans sequence analysis methods, multi-dimensional statistical analysis and data-driven biological discovery.

At EMBL-EBI, researchers work closely with experimental scientists worldwide, increasingly tackling problems of direct significance to medicine and the environment.



Ewan Birney

Sequence algorithms and intra-species variation

Director of EMBL-EBI; Joint Head of Research; Senior Scientist –
Joint appointment with the Genome Biology Unit

The Birney group focuses on developing sequence algorithms and uses intra-species variation to study basic biology.

embl.org/birney



Nick Goldman

Evolutionary tools for genomic analysis

Joint Head of Research; Senior Scientist

The Goldman group's research focuses on the processes of molecular sequence evolution, developing data analysis methods to exploit this information and glean powerful insights into genomic function, evolutionary processes and phylogenetic history.

embl.org/goldman



Paul Flicek

Evolution of transcriptional regulation

Associate Director of EMBL-EBI Services; Head of Genes, Genomes and Variation Services; Senior Scientist

The Flicek group uses comparative regulatory genomics to study the evolution of transcriptional regulation, with the ultimate goal of understanding the mechanisms and maintenance of cell-type specificity.

embl.org/flicek

**Alex Bateman***Microbial sequence and structure analysis*

Head of Protein Sequence Resources; Senior Team Leader

The Bateman group's research focuses on the sequence and structure of microbial cell surface proteins to understand their function and evolution.

embl.org/bateman

**Pedro Beltrão***Evolution of cellular networks*

Group Leader – Joint appointment with the Genome Biology Unit

The Beltrão group studies the molecular impacts of genetic variability on phenotypic variability to better understand the function and evolution of cellular networks.

embl.org/beltrao

**Alvis Brazma***Functional genomics research*

Head of Molecular Atlas; Senior Scientist

The Brazma group focuses on the analysis of gene, transcript and protein expression, cancer genomics and proteomics, and image analysis.

embl.org/brazma

**Isidro Cortés-Ciriano***Cancer Genomics*

Group Leader

The Cortés-Ciriano group develops computational tools to characterise the patterns of mutations and genome instability processes in human cancers through the analysis of genome sequencing data from clinical samples and preclinical models.

embl.org/cortes-ciriano

**Rob Finn***Computational approaches to understanding microbiomes*

Team Leader

The Finn research group focuses on developing computational approaches for the reconstruction of genomes from metagenomes, and investigates the distribution of microbes and functions in different environments.

embl.org/finn



Moritz Gerstung

Cancer data science

Group Leader

The Gerstung group develops statistical models and bioinformatics tools for understanding the characteristics of cancer genomes and their effects. They seek to understand the differences in therapy success and outcomes between individuals.

embl.org/gerstung



Zamin Iqbal

Computational microbial genomics

Group Leader

The Iqbal group develops computational methods for analysing genetic variation and uses them to study bacteria and parasites. The group also works on translational projects, especially related to antimicrobial resistance, diagnostics and surveillance.

embl.org/iqbal



Gerard Kleywegt

Protein structure, analysis and validation

Head of Molecular and Cellular Structure; Senior Team Leader

Research in the Kleywegt group aims to transform the structural archives into a truly useful resource for biomedical and related disciplines.

embl.org/gerard-kleywegt



Andrew Leach

Molecular recognition and design; drug discovery

Head of Chemistry Services; Team Leader

The Leach group uses a range of techniques to understand and predict molecular interactions, with a particular interest in drug discovery applications.

embl.org/leach



John Marioni

Computational biology

Group Leader – Joint appointment with the Developmental Biology Unit

The Marioni group develops and applies statistical tools to complex large-scale datasets in order to understand cell fate decisions in the context of development, the immune system and cancer.

embl.org/marioni



Evangelia Petsalaki

Whole-cell signalling

Group Leader

The Petsalaki group uses diverse ‘omics’ datasets to create data-driven models of context-specific cell signalling. Their aim is to understand the principles of cell signalling and its rewiring in different conditions and genetic backgrounds.

embl.org/petsalaki



Janet Thornton

Computational biology of proteins (structure, function and evolution) and ageing

Director Emeritus of EMBL-EBI; Senior Scientist

The Thornton group builds on knowledge of the 3D structures of proteins and their complexes to understand their evolution and how variants and small molecules can cause or modulate diseases and ageing.

embl.org/thornton



Virginie Uhlmann

Mathematical models for bioimage analysis

Group Leader – Joint appointment with the Developmental Biology Unit

The Uhlmann group develops tools that blend mathematical models and image processing (e.g. learning-based) algorithms to quantitatively characterise the content of bioimages.

embl.org/uhlmann



Daniel Zerbino

Genome analysis research

Team Leader

The Zerbino group aims to leverage the power of high-throughput processing and novel machine learning techniques to integrate large collections of available experiments and to better understand the mechanisms of gene expression regulation.

embl.org/zerbino

Joint appointments to EMBL-EBI

Wolfgang Huber (*Genome Biology*) – 35

Jan Korbelt (*Genome Biology*) – 36

Oliver Stegle (*Genome Biology*) – 37

Judith Zaugg (*Structural and Computational Biology*) – 41

Bioinformatics Services

European Bioinformatics Institute

Located in Hinxton, United Kingdom

EMBL-EBI maintains the world's most comprehensive range of freely available molecular data resources. Developed in collaboration with colleagues worldwide,

EMBL-EBI's databases and tools help scientists share data efficiently, perform complex queries and analyse the results in different ways. The service teams' work supports millions of wet-lab and computational biologists working in all areas of the life sciences, from biomedicine to biodiversity and agri-food research.

GENES, GENOMES AND VARIATION



Paul Flicek

Associate Director of EMBL-EBI Services; Head of Genes, Genomes and Variation Services; Senior Scientist

The data resources of the cluster include core EMBL-EBI services such as Ensembl, Ensembl Genomes and the GWAS Catalog. Within the cluster, the Flicek team has overall scientific leadership of the Ensembl genome annotation resources and analysis infrastructure. embl.org/paul-flicek

LITERATURE SERVICES



Johanna McEntyre

Associate Director of EMBL-EBI Services; Head of Literature Services; Senior Scientist

The McEntyre team runs Europe PMC, the database for life science literature and platform for text mining, which has recently included preprints. The team also integrates textual content with molecular databases, both at EMBL-EBI and more widely. embl.org/mcentyre

PROTEINS AND PROTEIN FAMILIES



Alex Bateman

Head of Protein Sequence Resources; Senior Team Leader

The cluster provides foundational resources for researchers who work with protein sequences and protein families, including the UniProt, InterPro and Pfam data resources, and the HMMER homology search tool. They also provide unique resources for studying non-coding RNA with Rfam and RNACentral.

embl.org/alex-bateman

MOLECULAR ATLAS



Alvis Brazma

Head of Molecular Atlas; Senior Scientist

The cluster manages ArrayExpress, the Expression Atlas and PRIDE data resources, and works very closely with the Literature Services team to develop the BioStudies database, and with the Molecular and Cellular Structure cluster to develop the BioImage Archive.

embl.org/alvis-brazma

ARCHIVAL INFRASTRUCTURE AND TECHNOLOGY



Tony Burdett

Team Leader

The Burdett team develops services and technology to support the activities of EMBL-EBI's molecular archives, including data submission and storage. The team also develops and operates the data ingestion services for the Human Cell Atlas, EMBL-EBI's Unified Submission Interface and the BioSamples database.

embl.org/burdett

DATA COORDINATION AND ARCHIVING



Guy Cochrane

Team Leader

The Cochrane team provides data coordination services for a host of collaborative projects across vertebrate, microbial and marine biodiversity domains. They maintain the European Nucleotide Archive, an open platform for sequence data.

embl.org/cochrane

ENRICHING UNDERSTANDING OF GENOMIC VARIATION**Fiona Cunningham**

Team Leader

The Cunningham team delivers robust, reliable reference resources for consistent variant annotation in any species. The team catalogues and stores large-scale data, and develops methods and tools to facilitate integration and broad access to these data. embl.org/cunningham

OPEN TARGETS**Ian Dunham**

Director of Open Targets

The Dunham group conducts research in bioinformatics and experimental genomics and genetics, with the aim of integrating data that will improve drug target choice. embl.org/dunham

BIOINFORMATICS SERVICES FOR RNA, PROTEIN AND METAGENOMIC SEQUENCE DATA**Rob Finn**

Team Leader

The Finn team is responsible for protein and RNA data resources that provide fast and sophisticated tools for analysis, simplify access to curated data, extend annotation and provide characterisation of sequences derived from environmental samples. embl.org/sequence-families

MOLECULAR SYSTEMS**Henning Hermjakob**

Head of Molecular Systems; Team Leader

The Hermjakob team develops data resources for the representation, deposition, distribution and analysis of pathway and systems biology data, and develops standards for proteomics and systems biology. embl.org/hermjakob

EUKARYOTIC ANNOTATION



Kevin Howe

Team Leader

The Howe team is responsible for the gene annotation and comparative genomics components of Ensembl, and for EMBL-EBI's contribution to WormBase and to the Alliance of Genome Resources. embl.org/howe

EUROPEAN GENOME-PHENOME ARCHIVE AND EUROPEAN VARIATION ARCHIVE



Thomas Keane

Team Leader

The Keane team is responsible for the European Genome-phenome Archive (EGA), the controlled-access database of human genomic data, and the European Variation Archive (EVA), an open-access resource of raw variant data. embl.org/keane

MOLECULAR AND CELLULAR STRUCTURE



Gerard Kleywegt

Head of Molecular and Cellular Structure; Senior Team Leader

The cluster aims to bring structure to biology by making this complex field more accessible to non-specialists. They manage three major archives in structural biology: the Protein Data Bank in Europe, the Electron Microscopy Data Bank and the Electron Microscopy Public Image Archive. embl.org/gerard-kleywegt

CHEMISTRY SERVICES



Andrew Leach

Head of Chemistry Services; Team Leader

The chemistry resources of the cluster help researchers to design and study small molecules and their effects on biological systems. Resources managed by the Leach team include ChEMBL, SureChEMBL, UniChem and ChEBI. embl.org/leach

PROTEIN FUNCTION DEVELOPMENT



Maria J. Martin

Team Leader

The Martin team provides the bioinformatics infrastructure for UniProt at EMBL-EBI, maintains the Gene Ontology Annotation and Enzyme Portal services, and develops novel automatic methods for protein annotation and representation. embl.org/martin

METABOLOMICS



Claire O'Donovan

Team Leader

The O'Donovan team is responsible for the MetaboLights resource. They collate, represent and integrate metabolomics data, predict metabolomes in collaboration with other omics resources and enable the identification of molecules with desired properties for both industrial and medical applications. embl.org/odonovan

PROTEIN FUNCTION CONTENT



Sandra Orchard

Team Leader

The Orchard team manually curates the Universal Protein Resource (UniProt) at EMBL-EBI, as well as the Gene Ontology Annotation and Enzyme Portal services. The team is instrumental in developing community standards for protein annotation. embl.org/orchard

GENE EXPRESSION



Irene Papatheodorou

Team Leader

The Papatheodorou team analyses expression data at tissue or single-cell level and develops Expression Atlas, a multi-species resource for gene and protein expression. The team develops flexible, cloud-based data analysis workflows and is responsible for the content of ArrayExpress. embl.org/papatheodorou

MOLECULAR ARCHIVAL RESOURCES



Helen Parkinson

Head of Molecular Archival Resources; Team Leader

The cluster provides international archiving and data access for millions of DNA sequences, genetic variants, and biological sample records. Within the cluster, the Parkinson team develops ontologies, tooling and data resources that provide access to samples and ontologies.

embl.org/parkinson

IMAGING DATA SERVICES



Ardan Patwardhan

Team Leader

The Patwardhan team is responsible for the EMDB and EMPIAR data resources. The team develops resources for searching, validation and visualisation of structural and bioimaging data, and integrates and data-mines multi-scale structural and bioimaging data to facilitate data reuse.

embl.org/patwardhan

FUNCTIONAL GENOMICS DEVELOPMENT



Ugis Sarkans

Team Leader

The Sarkans team develops and runs the BioStudies database, which aggregates data associated with biological publications. The team also maintains the software for ArrayExpress, and – together with other teams at EMBL-EBI – is building the BioImage Archive.

embl.org/sarkans

PROTEIN DATA BANK IN EUROPE (PDBe)



Sameer Velankar

Team Leader

The Velankar team is responsible for the PDBe and PDBe Knowledge Base data resources. The team also focuses on data integration and develops data query, analysis and visualisation tools to facilitate the use of macromolecular structure data.

embl.org/velankar

PROTEOMICS



Juan Antonio Vizcaino

Team Leader

The Vizcaino team manages the PRIDE database of mass spectrometry proteomics data. PRIDE is a founding member of the ProteomeX-change consortium. The team integrates proteomics data in public data resources and develops community data standards and open source tools, including data analysis workflows.

embl.org/vizcaino

DATA VISUALISATION, TOOLS AND OUTREACH FOR ENSEMBL RESOURCES



Andy Yates

Team Leader

The Yates team develops novel data visualisations for genome interpretation, creates tools for genome data processing and provides outreach and support for the Ensembl and Ensembl Genomes projects. They also maintain the data-mining tool BioMart.

embl.org/yates

GENOME ANALYSIS



Daniel Zerbino

Team Leader

The Zerbino team stores, processes and analyses genome-wide datasets for the Ensembl project and maintains the services that unite its associated databases. This includes the functional annotation of non-coding variants from experimental epigenomic data.

embl.org/genome-analysis

EMBL GRENOBLE



Structural Biology

Located in Grenoble, France

The 3D shape of a biological molecule can tell you a lot about what that molecule does – and how its biological activity might be altered, for example to treat a disease. Scientists at EMBL Grenoble determine 3D structures of human and viral proteins to understand how they interact with the nucleic acids DNA and RNA. To do so, they work closely with instrumentation developers and colleagues across the European Photon and Neutron (EPN) science campus to obtain the best possible data from synchrotron X-ray diffraction or cryo-electron microscopy experiments.



Stephen Cusack

Structural biology of RNA-protein complexes in gene expression and host-pathogen interactions

Head of the Structural Biology Unit in Grenoble; Senior Scientist

The Cusack group uses X-ray crystallography and cryo-electron microscopy (cryo-EM) to study the structural biology of protein-RNA complexes involved in RNA virus replication, innate immunity and cellular RNA metabolism.

embl.org/cusack



Sagar Bhogaraju

Ubiquitin signalling in bacterial pathogenicity and cancer

Group Leader

The Bhogaraju group uses structural and cell biology-based approaches to study ubiquitination pathways in normal physiology and disease.

embl.org/bhogaraju



Florent Cipriani

Instrumentation team

Team Leader; Senior Scientist

The Cipriani team develops instruments and methods for structural biology research and works with industry to make them available to scientists worldwide.

embl.org/cipriani



Wojciech Galej

Structure and function of RNA-protein complexes

Group Leader

The Galej group uses an integrated structural biology approach combined with biochemistry and biophysics to investigate large RNA-protein complexes involved in gene expression.

embl.org/galej



Eva Kowalinski

Structural biology of macromolecular protein-RNA complexes

Group Leader

The Kowalinski group investigates the architecture and mechanisms of macromolecular complexes involved in cellular RNA editing and modification.

embl.org/kowalinski



Andrew McCarthy

Synchrotron crystallography team

Team Leader

The McCarthy team works on the operation, improvement, and automation of MX and bioSAXS beamlines, and studies proteins involved in signalling and neuronal development.

embl.org/mccarthy



Marco Marcia

Structure and function of lncRNA-protein complexes regulating development and stress responses

Group Leader

The Marcia group uses integrated cell biology and biophysical approaches to study the molecular interactions between long non-coding RNAs (lncRNAs) and nuclear proteins, and how their complexes regulate gene expression.

embl.org/marcia



José A. Marquez

High-Throughput Crystallisation Laboratory

Head of the Crystallisation Facility; Team Leader

The Marquez team develops methods and software supporting high-throughput and fully automated crystallography pipelines, using them to study the structure of sensing and signalling molecules.

embl.org/marquez

EMBL HAMBURG



Structural Biology

Located in Hamburg, Germany

Proteins are key components of the cell's workforce. Alone or in groups, they can fine-tune genes, break down bacteria, or make muscles contract. At EMBL Hamburg, scientists unveil the structure of proteins that impact human health. Researchers in the unit use the state-of-the-art infrastructure for integrative structural biology available on the DESY campus. They investigate how molecules behave, and use the insights gained to develop new therapies.



Matthias Wilmanns

Structure and function of molecular machinery for protein translocation across membranes

Head of the Structural Biology Unit in Hamburg; Senior Scientist

The Wilmanns group aims to unravel the overall architecture of machineries for protein translocation across membranes and mechanisms of molecular elasticity, by employing an integrative structural biology approach complemented by functional experiments.

embl.org/wilmanns



Stefan Fiedler

Synchrotron instrumentation for structural biology beamlines at PETRA III

Team Leader

The Fiedler team focuses on the construction, customisation and integration of X-ray optics, precision mechanics, robotics, control electronics, cryogenics and control software for synchrotron-based structural biology research.

embl.org/fiedler



Maria Marta Garcia Alai

Molecular biophysics and high-throughput crystallisation

Team Leader

The Garcia Alai team develops methods for sample optimisation and characterisation for SAXS, MX and EM experiments and applies systematic pipelines of biophysical techniques to solve dynamic structural puzzles, with particular focus on protein-lipid interactions.

embl.org/garcia-alai



Jan Kosinski

Integrative modelling of infection cycles

Group Leader

The Kosinski group investigates infection cycles and host-pathogen interactions using computational and experimental approaches.

embl.org/kosinski



Victor Lamzin

Integrative modelling for structural biology

Group Leader; Senior Scientist

The Lamzin group applies and develops cutting-edge computational methods and experimental approaches for sample quality control, experimentation, data interpretation and model validation in structural biology, with a major focus on macromolecular crystallography.

embl.org/lamzin



Christian Löw

Structural and dynamic insights into nutrient uptake systems

Group Leader

The Löw group uses innovative structural and biochemical tools to enhance the understanding of substrate and drug recognition in nutrient transporters.

embl.org/loew



Rob Meijers

Structural biology of cell surface receptors

Group Leader

The Meijers group investigates signalling mechanisms across the cell membrane using integrated structural biology and biophysical techniques.

embl.org/meijers



Thomas Schneider

Tools for structure determination and analysis

Joint Head of Research Infrastructures; Senior Scientist

The Schneider group operates two beamlines for macromolecular crystallography at the PETRA III synchrotron and develops new methods for structure determination.

embl.org/schneider



Dmitri Svergun

Small-angle X-ray scattering from macromolecular solutions

Joint Head of Research Infrastructures; Senior Scientist

The Svergun group runs and further enhances a biological small-angle X-ray scattering beamline at the Petra III storage ring and develops novel approaches for scattering data analysis and hybrid structural modelling.

embl.org/svergun

EMBL HEIDELBERG



Cell Biology and Biophysics

Located in Heidelberg, Germany

From egg cells to neurons, cells take on very different shapes and sizes to fulfil their roles. Scientists in the Cell Biology and Biophysics Unit investigate the molecular and biophysical mechanisms that enable cells to function. In the Unit, biologists, chemists and physicists probe molecular networks and machines as well as mechanical forces and signalling. Experts in optics work with biologists to develop new imaging technologies to visualise life's molecular machinery at work.



Jan Ellenberg

Systems biology of cell division and nuclear organisation

Head of the Cell Biology and Biophysics Unit; Senior Scientist

The Ellenberg group studies cell division and nuclear organisation, focusing on chromatin organisation and formation, segregation of mitotic and meiotic chromosomes, and nuclear pore complex structure and assembly.

embl.org/ellenberg



Sara Cuylen-Häring

Cellular phase separation by surfactants

Group Leader

The Cuylen group investigates how proteins act as surfactants to regulate the spatial separation of chromosomes and other cellular organelles.

embl.org/cuylen



Claire Deo

Building next-generation fluorescent tools for biological imaging

Group Leader

The Deo group develops enhanced fluorescent reporters for light microscopy by combining synthetic chemistry and protein engineering.

embl.org/deo



Alba Diz-Muñoz

Mechanics of cellular signalling

Group Leader

The Diz-Muñoz group studies the crosstalk between mechanical properties and signalling processes that drive morphogenesis and fate specification in immune cells, embryonic stem cells and zebrafish embryos.

embl.org/diz-munoz



Christian Häring

Chromosome structure and dynamics

Group Leader – Joint appointment with the Structural and Computational Biology Unit

The Häring group aims to understand the molecular machinery that organises eukaryotic genomes.

embl.org/haering



Lars Hufnagel

Dynamics of cell growth and tissue architecture

Group Leader – Joint appointment with the Developmental Biology Unit

The Hufnagel group studies the role of mechanical constraints in processes such as cell growth, programmed cell death, orientation of cell division, intratissue rearrangements and cell differentiation.

embl.org/hufnagel



Martin Jechlinger

Mechanisms of oncogene dependence and tumour relapse

Group Leader – Joint appointment with the Epigenetics and Neurobiology Unit

The Jechlinger group uses mouse models of breast cancer and organoid systems derived from these mice to study the response of breast tumours towards therapeutic interference and survival of treatment-refractory cells.

embl.org/jechlinger



Simone Köhler

Self-organisation in meiosis

Group Leader

The Köhler group studies how chromatin is organised during meiosis to allow for the production of haploid gametes from diploid precursor cells.

embl.org/koehler



Anna Kreshuk

Machine learning for bioimage analysis

Group Leader

The Kreshuk group develops machine learning-based methods and tools for automatic segmentation, classification and analysis of biological images.

embl.org/kreshuk



Pierre Neveu

Systems biology of stem cell differentiation

Group Leader

The Neveu group takes an integrated systems biology approach to investigate the molecular changes that determine what a stem cell becomes.

embl.org/neveu



Rainer Pepperkok

Membrane traffic and organelle biogenesis

Director of Scientific Core Facilities and Scientific Services; Senior Scientist – Joint appointment with the Molecular Medicine Partnership Unit

The Pepperkok team develops novel approaches to study the temporal and spatial organisation of membrane traffic and organelle biogenesis in the secretory pathway.

embl.org/pepperkok



Robert Prevedel

Advanced optical techniques for deep tissue microscopy

Group Leader – Joint appointments with the Developmental Biology Unit and the Epigenetics and Neurobiology Unit

The Prevedel group develops optical techniques for investigating dynamic cellular processes deep inside tissue *in vivo*.

embl.org/prevedel





Jonas Ries

Super-resolution microscopy for structural cell biology

Group Leader

The Ries group studies nanoscale multi-protein machineries in their functional cellular context, and elucidates their dynamic structural organisation using tailor-made super-resolution microscopy technologies.

embl.org/ries



Yannick Schwab

Volume correlative light and electron microscopy

Head of the Electron Microscopy Core Facility; Team Leader

The Schwab team is developing tools for the 3D correlation of data generated by multiple imaging modalities, such as fluorescence microscopy, X-ray imaging and electron microscopy.

embl.org/schwab

Joint appointments to the Cell Biology and Biophysics Unit

Martin Beck (*Structural and Computational Biology*) – 39

Julia Mahamid (*Structural and Computational Biology*) – 40

Paul Heppenstall (*Epigenetics and Neurobiology*) – 47

Developmental Biology

Located in Heidelberg, Germany

The breaking of symmetry, acquisition of cell fate, cell shape changes, collective cell behaviours, and the emergence of order and function through self-organisation are events whose timing and coordination are essential for organismal development and plasticity. Scientists in the Developmental Biology Unit seek to understand the fundamental principles that govern multicellular development, taking an interdisciplinary and systems perspective to track, decipher, predict and ultimately control such events in space and time.



Anne Ephrussi

RNA localisation and localised translation in development

Head of the Developmental Biology Unit; Senior Scientist;
Director of the EMBL International Centre for Advanced Training

The Ephrussi group dissects the mechanisms underlying intracellular RNA transport and localised translation – fundamental processes mediating the functional polarisation of cells during development and in the nervous system.

embl.org/ephrussi



Detlev Arendt

Evolution of the nervous system in bilateria

Group Leader; Senior Scientist

By studying and comparing simple marine animals and their constituent cells, the Arendt group looks to understand the origin and evolution of the nervous system and of the entire animal body.

embl.org/arendt



Alexander Aulehla

Timing in embryonic development

Group Leader; Senior Scientist

The Aulehla group studies the role of timing during development, in particular how signalling dynamics and oscillations control spatiotemporal pattern formation as an embryo develops.

embl.org/aulehla





Justin Crocker

Gene regulation during evolution and development

Group Leader

The Crocker group aims to understand the fundamental principles driving development, to allow for programming and predictive control of cell fates. embl.org/crocker



Stefano De Renzis

Cell dynamics and signalling during morphogenesis

Group Leader

The De Renzis group aims to understand how cells build tissues during organismal development, using a combination of quantitative imaging and optogenetics-based synthetic approaches. embl.org/derenzis



Takashi Hiiragi

Symmetry breaking and self-organisation

Group Leader

The Hiiragi group studies early mammalian development at the molecular, cellular and systems levels to elucidate how an intricate embryo emerges from a spherical mass of cells. embl.org/hiiragi



Aissam Ikmi

Plasticity of animal body design

Group Leader

The Ikmi group studies how the interplay between genetic and environmental factors shapes animal body plans. embl.org/ikmi



Georgia Rapti

Initiation of nervous system assembly

Group Leader

The Rapti group dissects cellular and molecular mechanisms of nervous system assembly and the underlying glia/neuron crosstalk, using advanced genetics, genomics and imaging approaches. embl.org/rapti

Joint appointments to the Developmental Biology Unit

Matthieu Boulard (*Epigenetics and Neurobiology*) – 47

Lars Hufnagel (*Cell Biology and Biophysics*) – 29

Robert Prevedel (*Cell Biology and Biophysics*) – 30

John Marioni (*EMBL-EBI*) – 12

Hiroki Asari (*Epigenetics and Neurobiology*) – 46

Cornelius Gross (*Epigenetics and Neurobiology*) – 46

Christophe Lancrin (*Epigenetics and Neurobiology*) – 47

Vikas Trivedi (*Tissue Biology and Disease Modelling*) – 8

Virginie Uhlmann (*EMBL-EBI*) – 13

Directors' Research

Located in Heidelberg, Germany

How are gene expression, metabolism and disease connected?
 What are the epigenetic mechanisms involved in development and disease?
 How does the immune system work? The range of themes in Directors' Research reflects the interests of EMBL's and EMBO's leadership. Current research themes in the Unit include the roles of chromosome architecture and non-coding RNAs in gene regulation; the connections between gene expression and cell metabolism; and innate immune signalling and the mechanisms and forces that determine cell shape.



Edith Heard

Epigenetic mechanisms in development and disease

EMBL Director General; Group Leader

The Heard group focuses on epigenetic processes such as X-chromosome inactivation, in order to learn more about the basic principles of gene regulation, and to explore the roles of chromatin modifications, chromosome organisation and non-coding RNAs on gene expression in development and disease.

embl.org/heard



Matthias Hentze

RNA biology, metabolism and molecular medicine

EMBL Director; Co-Director of the Molecular Medicine Partnership Unit; Senior Scientist – Joint appointment with the Genome Biology Unit

The Hentze group combines biochemical and systems-level approaches to investigate the connections between gene expression and cell metabolism, and their roles in human disease. The group focuses particularly on RNA biology and RNA-binding proteins.

embl.org/hentze



Maria Leptin

Cell shape and morphogenesis: subcellular and supracellular mechanisms

EMBO Director; Group Leader

The Leptin group studies the mechanisms and forces that determine cell shape in *Drosophila* and uses zebrafish to analyse innate immune signalling.

embl.org/leptin

Genome Biology

Located in Heidelberg, Germany

Many of our traits stem from the information in our genome. The Genome Biology Unit uses and develops cutting-edge methods to study how this information is regulated, processed and utilised across different molecular layers, including DNA, RNA, protein and metabolites, and how their alteration leads to disease. Within the Unit, biologists, computer scientists, mathematicians and engineers work together to understand how the genome gives rise to diverse phenotypes, by dissecting function at the level of individual molecules and more global interconnected networks.

The Unit works closely with colleagues in the Genomics and Proteomics Core Facilities to dissect and model complex processes going from genotype to phenotype.



Eileen Furlong

Genome regulation and chromatin topology during embryonic development

Head of the Genome Biology Unit; Co-Head of the Single Cell Center Heidelberg; Senior Scientist



The Furlong group dissects general principles of genome regulation and enhancer function and how this drives cell fate decisions during development, focusing on organisational and functional properties of the genome.

embl.org/furlong



Wolfgang Huber

Multi-omics and statistical computing

Group Leader; Senior Scientist – Joint appointments with the Structural and Computational Biology Unit, EMBL-EBI and the Molecular Medicine Partnership Unit



The Huber group develops theoretical concepts and methods for computational biology and uses them for discovery in tissue biology and precision oncology. embl.org/huber



Jan Korbel

From genomic variation to molecular mechanism

Group Leader; Co-Director of the Molecular Medicine Partnership Unit;
Senior Scientist – Joint appointment with EMBL-EBI



The Korbel group combines computational and experimental approaches, including in single cells, to unravel determinants and consequences of germline and somatic genetic variation with a special focus on disease mechanisms. embl.org/korbel



Arnaud Krebs

Decoding gene regulation using single-molecule genomics

Group Leader

The Krebs group develops and employs innovative genomics strategies to understand the multiple regulatory layers that control gene expression. embl.org/krebs



Christoph A. Merten

Microfluidic approaches in drug discovery and personalised medicine

Group Leader – Joint appointment with the Molecular Medicine Partnership Unit

The Merten group develops and applies microfluidic technology with a strong translational focus. The group's ultimate goal is to establish novel treatments against cancer. embl.org/merten



Kyung-Min Noh

Epigenetic mechanisms of neurodevelopment and disease

Group Leader – Joint appointment with the Epigenetics and Neurobiology Unit

The Noh group studies the vital role of chromatin structure and modifications in neurodevelopment and brain disorders. embl.org/noh



Mikhail Savitski

Stability proteomics for assessing the state of the proteome

Head of the Proteomics Core Facility; Team Leader – Joint appointment with the Structural and Computational Biology Unit

The Savitski team uses and develops stability proteomics for understanding the phenomena of aggregation and disaggregation, cell phenotyping, and detection of protein interactions with drugs, metabolites, DNA and RNA. embl.org/savitski



Oliver Stegle

Statistical genomics and systems genetics

Associate Group Leader – Joint appointment with EMBL-EBI

The Stegle group develops advanced statistical approaches for unravelling molecular variation at a genome-wide scale and applies them to systems genetics and oncology.

embl.org/stegle



Lars Steinmetz

Systems genetics and precision health

Group Leader; Senior Scientist

The Steinmetz group develops interdisciplinary approaches to read, edit and control entire genomes across scales. The group applies these technologies to trace the developmental trajectory of individual stem cells, determine the molecular underpinnings of diseases, and understand the genetic basis of complex phenotypes.

embl.org/steinmetz



Nassos Typas

Systems microbiology

Group Leader – Joint appointment with the Structural and Computational Biology Unit

The Typas group develops high-throughput approaches to study bacterial cellular networks, and to understand their interactions with the environment, the host and other bacterial species.

embl.org/typas



Joint appointments to the Genome Biology Unit

Matthias Hentze (*Directors' Research*) – 34

Christoph Müller (*Structural and Computational Biology*) – 38

Judith Zaugg (*Structural and Computational Biology*) – 41

Ewan Birney (*EMBL-EBI*) – 10

Pedro Beltrão (*EMBL-EBI*) – 11

Jamie Hackett (*Epigenetics and Neurobiology*) – 47

Structural and Computational Biology

Located in Heidelberg, Germany

Life in the Structural and Computational Biology Unit is all about interactions: from the molecular networks inside cells to the ecological relationships between species, via the collaboration between experts from different fields. Scientists in the unit cover everything from crystallography to cryo-electron microscopy and from metabolomics to microbiomes. They support colleagues throughout EMBL in the use of state-of-the-art structural biology instruments. The unit also serves as a hub for bioinformatics activities across EMBL Heidelberg.



Peer Bork

Deciphering function and evolution of biological systems

Head of the Structural and Computational Biology Unit; Senior Scientist – Joint appointment with the Molecular Medicine Partnership Unit



The main focus of the Bork group is to gain insights into the functioning of biological systems and their evolution, by comparative analysis and integration of complex molecular data.

embl.org/bork



Christoph Müller

Molecular mechanisms of transcriptional regulation in eukaryotes

Head of the Structural and Computational Biology Unit; Senior Scientist – Joint appointment with the Genome Biology Unit

The Müller group uses cryo-electron microscopy, X-ray crystallography, biophysical and biochemical approaches to learn about the molecular mechanisms of transcription regulation in eukaryotes, whose DNA is packaged into chromatin.

embl.org/mueller



Theodore Alexandrov

Spatial metabolomics

Team Leader; Head of the Metabolomics Core Facility

The Alexandrov team develops novel computational biology tools to reveal the spatial organisation of metabolic processes.

embl.org/alexandrov



Orsolya Barabas

Mechanisms, regulation and application of mobile DNA

Group Leader

The Barabas group uses structural, biochemical and cell biology approaches to investigate how DNA rearrangements are carried out and regulated in genomes, and uses this knowledge to advance research tools and medicine.

embl.org/barabas



Martin Beck

Structure and function of large molecular assemblies

Group Leader; Senior Scientist –

Joint appointment with the Cell Biology and Biophysics Unit

Research in the Beck group combines biochemical approaches, proteomics and cryo-electron microscopy to study large macromolecular assemblies.

embl.org/beck



Sebastian Eustermann

Exploring the chromatin landscape by cryo-electron microscopy

Group Leader

The Eustermann group explores the molecular landscape of chromatin to understand at an atomic level the principles underlying expression and maintenance of genomic information in eukaryotes.

embl.org/eustermann

**Toby Gibson***Biological sequence analysis**Team Leader*

The Gibson team investigates protein sequences, interactions and networks, undertakes computational analyses of macromolecules, and hosts ELM, the Eukaryotic Linear Motif Resource.

embl.org/gibson

**Janosch Hennig***Integrated structural biology of translation regulation mechanisms**Group Leader*

The Hennig group employs integrated structural biology (NMR, X-ray, small-angle scattering and cryo-EM) to investigate the molecular mechanisms underlying translation regulation and ribonucleoprotein complex assembly.

embl.org/hennig

**Julia Mahamid***In-cell structural analysis of phase separation and molecular crowding**Group Leader – Joint Appointment with the Cell Biology and Biophysics Unit*

The Mahamid group brings together two disciplines in biology, namely the emerging field of phase-separated dynamic assemblies in cell biology and state-of-the-art cellular cryo-electron tomography, to advance our understanding of the molecular organisation of the cytoplasm.

embl.org/mahamid

**Kiran Patil***Architecture and regulation of metabolic networks**Group Leader*

The Patil group uses a combination of modelling, bioinformatics and experimental approaches to study metabolic networks and how they are controlled.

embl.org/patil



Judith Zaugg

Personalised genomics to study the genetic basis of complex diseases

Group Leader – Joint appointments with the Genome Biology Unit, EMBL-EBI and the Molecular Medicine Partnership Unit

The Zaugg group investigates the variation of molecular phenotypes among individuals and their genetic variation, with the aim of better understanding the molecular basis of complex genetic diseases and inter-individual differences in drug response.

embl.org/zaugg



Georg Zeller

Computational analysis of host-microbiota interactions in disease and drug therapy

Team Leader

The Zeller team develops analysis strategies and tools to investigate how the microbiome contributes to human health, disease progression and treatment success, and how it is shaped by host factors such as nutrition and drug intake.

embl.org/zeller



Michael Zimmermann

Metabolic host-microbiome interactions

Group Leader

The Zimmermann group combines high-throughput mass spectrometry, bacterial genetics and computational models to investigate how members of microbial communities alter their chemical environment and how this shapes metabolic interactions within the microbiome and between the microbiome and its host.

embl.org/zimmermann

Joint appointments to the Structural and Computational Biology Unit

Christian Häring (*Cell Biology and Biophysics Unit*) – 29

Wolfgang Huber (*Genome Biology*) – 35

Mikhail Savitski (*Genome Biology*) – 36

Nassos Typas (*Genome Biology*) – 37

Core Facilities

Located in Heidelberg, Germany

Molecular life science requires a suite of sophisticated techniques – from high-end microscopes to protein production platforms and next-generation sequencers – and the expertise to make the most of them. In EMBL's Core Facilities, experts support scientists in designing, running and refining experiments. They help researchers make sense of results. Core Facilities staff work closely with technology developers, and are always aware of the latest advances in their field. They enable scientists across EMBL and beyond to achieve ambitious research goals in a cost-effective way.

ADVANCED LIGHT MICROSCOPY FACILITY



Rainer Pepperkok

Director of Scientific Core Facilities and Scientific Services;
Senior Scientist – Joint appointment with the Molecular Medicine
Partnership Unit

The Advanced Light Microscopy Facility offers a collection of state-of-the-art light microscopy equipment and image processing tools.

embl.org/almf

METABOLOMICS CORE FACILITY



Theodore Alexandrov

Facility Head; Team Leader

The Metabolomics Core Facility provides services for analysis of metabolites and lipids.

embl.org/metabolomics



GENOMICS CORE FACILITY**Vladimír Beneš**

Facility Head

The Genomics Core Facility is EMBL's genomics service centre equipped with state-of-the-art technologies for functional genomics analyses.

embl.org/genecore

CHEMICAL BIOLOGY CORE FACILITY**Joe Lewis**

Facility Head

The Chemical Biology Core Facility offers the infrastructure and expertise for assay development, small-molecule screening and use of medicinal chemistry to optimise compounds against novel targets for 'biotool' or early drug development.

embl.org/chemcore

FLOW CYTOMETRY CORE FACILITY**Malte Paulsen**

Facility Head

The Flow Cytometry Core Facility offers access to high-end FACS analysis and state-of-the-art cell sorting capabilities, providing scientists with adaptive setups and dedicated support.

embl.org/fccf

PROTEIN EXPRESSION AND PURIFICATION CORE FACILITY**Kim Remans**

Facility Head

The Protein Expression and Purification Core Facility provides scientific advice and assistance regarding all experiments related to protein expression, purification and biophysical characterisation.

embl.org/pepcore



PROTEOMICS CORE FACILITY



Mikhail Savitski

Facility Head; Team Leader

The Proteomics Core Facility provides a full proteomics infrastructure for the identification and characterisation of proteins.

embl.org/proteomics

ELECTRON MICROSCOPY CORE FACILITY



Yannick Schwab

Facility Head; Team Leader

The Electron Microscopy Core Facility provides advanced expertise in electron microscopy, from sample preparation to image analysis, for a wide variety of biological samples.

embl.org/em



EMBL ROME

Epigenetics and Neurobiology

Located in Rome, Italy

How do we perceive the world around us? Can our surroundings influence our genes, and our children's genes? At EMBL Rome, scientists explore the connections between genome, environment and neural function.

Traditionally, neuroscientists and epigeneticists have moved in different circles. Here, they come together and draw on each other's insights, approaches and experience.



Philip Avner

Dynamics of epigenetic regulation

Head of the Epigenetics and Neurobiology Unit; Senior Scientist

The Avner group combines genetics, genomics, biochemistry and cell biology to study the nature of the X-inactivation process and the role of epistasis in genetic regulation.

embl.org/avner



Cornelius Gross

Neural control of instinctive behaviour

Deputy Head of the Epigenetics and Neurobiology Unit; Senior Scientist – Joint appointment with the Developmental Biology Unit

The Gross group uses pharmacological, histochemical, electrophysiological and behavioural genetic approaches to study the neural circuits underlying instinctive behaviour in mice.

embl.org/gross



Hiroki Asari

Visual systems neuroscience

Group Leader – Joint appointment with the Developmental Biology Unit

The Asari group combines experimental and computational approaches to study the principles and the function of neuronal circuits, specifically in the early visual system in mice.

embl.org/asari



Matthieu Boulard

Heritable gene silencing in mammals

Group Leader – Joint appointment with the Developmental Biology Unit

The Boulard group integrates genetic, molecular biology and genomic approaches to explore how cytosine methylation represses transcription.

embl.org/boulard



Jamie Hackett

Epigenetic reprogramming and inheritance

Group Leader – Joint appointment with the Genome Biology Unit

The Hackett group aims to understand the interplay between epigenetics, genome regulation and cell identity, with emphasis on transgenerational epigenetic inheritance.

embl.org/hackett



Paul Heppenstall

Molecular physiology of somatosensation

Group Leader – Joint appointments with the Cell Biology and Biophysics Unit and the Molecular Medicine Partnership Unit

The Heppenstall group combines molecular, imaging and electrophysiological techniques to examine how sensory neurons turn information about touch and pain into electrical signals.

embl.org/heppenstall



Christophe Lancrin

Understanding the formation of hematopoietic progenitor and stem cells during development

Group Leader – Joint appointment with the Developmental Biology Unit

The Lancrin group studies the haematopoietic system and looks to develop strategies to improve methods for generating blood cells from pluripotent stem cells.

embl.org/lancrin



Santiago Rompani

Visual circuits in the thalamus

Group Leader

The Rompani group studies the function of visual circuits in the thalamus, using a combination of functional imaging, genetics, virology, and behavioral assays in mice.

embl.org/rompani

Joint appointments to the Epigenetics and Neurobiology Unit

Martin Jechlinger (Cell Biology and Biophysics) – 29

Robert Prevedel (Cell Biology and Biophysics) – 30

Kyung-Min Noh (Genome Biology) – 36

Rome

Core Facilities

Located in Rome, Italy

EMBL Rome's Core Facilities offer services to researchers on site and across EMBL, focusing primarily on supporting the research in epigenetics and neurobiology carried out at EMBL Rome. This includes viral vector and gene editing services to produce transgenic lines and knockout mice, as well as genetically and epigenetically modified biological materials and services for their study.

LAR FACILITY



Olga Boruc

Facility Head

The Laboratory Animal Resource Facility provides infrastructure and training for activities that involve using animal research models.

embl.org/boruc

MICROSCOPY FACILITY



Alvaro Crevenna

Facility Head

The Microscopy Facility furnishes state-of-the-art instrumentation for light and electron microscopy. The facility houses a large variety of systems ranging from basic stereo and widefield fluorescence microscopes to the latest light-sheet technology. The facility also provides users with image and data analysis tools and services.

embl.org/mf



GENE EDITING & EMBRYOLOGY FACILITY



Neil Edward Humphreys

Facility Head

The Gene Editing & Embryology Facility provides services for the production of genetically modified mice to be used as models to understand human diseases.

embl.org/geef

HISTOLOGY SERVICE



Emerald Perlas

Facility Head

The Histology Service provides assistance to research scientists in processing tissue samples for routine histochemical and molecular biology staining procedures.

embl.org/histology

GENETIC & VIRAL ENGINEERING FACILITY



Jim Sawitzke

Facility Head

The EMBL Rome Genetic & Viral Engineering Facility (GAVEF) specialises in the design and engineering of viral vectors including rAAV, lentivirus and HSV.

embl.org/gavef



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Cell signalling and differentiation																															
Evolution																															
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RNA regulation and transcriptomics																															
Genetics and genomics																															
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Molecular medicine and disease mechanism																															
Neurobiology																															
Proteins and proteomics																															
Tissue and systems biology																															
METHODS & TECHNOLOGY DEVELOPMENT																															
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Chemistry and chemical biology																															
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Integrated structural biology																															
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Structural Biology

Wilmanns	Garcia Alai	Lamzin	Meijers	Schneider	Svergun
Fiedler	Kosinski	Löw			

Cell Biology & Biophysics													
Ellenberg	Cuylen-Häring	Deo	Diz-Muñoz	Häring	Hufnagel	Jechlinger	Köhler	Kreshuk	Neveu	Pepperkok	Prevedel	Ries	Schwab

Developmental Biology

Directors' Research

Heard	Furlong
Hentze	Huber
Leptin	Korbel

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Genome Biology							Structural & Computational Biology							Epigenetics & Neurobiology																			
Krebs	Merten	Noh	Savitski	Stegle	Steinmetz	Typas	Bork	Müller	Alexandrov	Barabas	Beck	Eustermann	Gibson	Hennig	Mahamid	Patil	Zaugg	Zeller	Zimmermann	Avner	Gross	Asari	Boulard	Hackett	Heppenstall	Lancrin	Rompani						
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United Kingdom