

## Research in brief



# EMBL in numbers

EMBL is Europe's flagship laboratory for the life sciences. Our interdisciplinary, curiosity-driven research programme fosters early independence and encourages collaboration. We offer services to the scientific community, train the next generation of scientists and strive to integrate the life sciences across Europe. EMBL research drives the development of new technology and methods in the life sciences. We work to transfer this knowledge for the benefit of society.

### **EXCELLENT RESEARCH**



EMBL ranked in top 10 institutes worldwide for life science research



26 scientists among the top 1% of highly cited researchers



## 30%

of research group and team leaders are funded by the ERC



Physicists/ Biophysicists



**Chemical Engineers** 



### OUTSTANDING TRAINING





### PUBLICATIONS

Over 90% of PhD students publish a paper as first author. PhD students publish 2 first-author papers on average.

## INTER-NATIONALITY



EMBL is supported by over 20 member states





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## 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 1600 people include mathematicians, physicists, chemists and computer engineers, as well as biologists, biochemists and bioinformaticians.

> What does it take to be an EMBL person? We call it 'the EMBL spirit': passion, curiosity, openness and a drive to develop and do better.

#### **S.embl.org/phdprogr**

## PhD programme

First-class training, dedicated mentoring and early independence in research s.embl.org/postdocprogr

## Postdoctoral fellowships

International, interdisciplinary environment and world-class facilities

**S.embl.org/jobs** 



Interdisciplinary, curiosity-driven research programme that fosters early independence and encourages collaboration s.embl.org/jobs

Other careers

Opportunities for scientists at all career stages, as well as for experts in training, communications, technology development, IT and for anyone who wants to push the boundaries of human knowledge

Research in brief 2017

# Directors' Research

#### Located in Heidelberg, Germany

How are gene expression, metabolism and disease connected? What determines cell shape? The range of themes in Directors' Research reflects the interests of the Director of EMBL and the Director of EMBO. Currently, some researchers in the unit combine biochemical and systems-level approaches to study cell metabolism, working closely with colleagues in the Genome Biology Unit. Others investigate cell shape in Drosophila and innate immune signalling in zebrafish, often in collaboration with the Developmental Biology Unit.



Matthias Hentze – *RNA biology, metabolism and molecular medicine* EMBL Director; 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. *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 the zebrafish to analyse innate immune signalling.

embl.org/leptin



#### Located in Heidelberg, Germany

From eggs to neurons, cells take on very different shapes and sizes to fulfill 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* 



#### Alba Diz-Muñoz – *Mechanics of cellular signalling* Group Leader

The Diz-Muñoz group studies the crosstalk between mechanical properties and signalling for cell polarity and migration of immune cells, and during zebrafish development. *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 mitotic chromosomes. *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 division, intra-tissue 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 a 3D culture system of primary mouse mammary epithelial cells to study cancer-initiating oncogenes. *embl.org/jechlinger* 



#### Péter Lénárt – Cytoskeletal dynamics and function in oocytes Group Leader

Using starfish as a model organism, the Lénárt group combines biochemistry with imaging assays to investigate how the fertilisable egg cell develops from the oocyte. *embl.org/lenart* 



#### François Nédélec – *Cellular architecture* Group Leader

The Nédélec group combines experimental methods and physical theory to study how the interior of cells is spatially organised and how multiple cells are arranged in space. *embl.org/nedelec* 



#### 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* Head of Core Facilities and Scientific Services; Senior Scientist

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 appointment with the Developmental Biology Unit and the Epigenetics and Neurobiology Unit

The Prevedel group develops new optical techniques for investigating dynamic cellular processes deep inside tissue *in vivo*. *embl.org/prevedel* 



#### Jonas Ries – *Cellular nanoscopy* Group Leader



The Ries group develops cutting-edge super-resolution microscopy methods to determine structures of multi-protein assemblies in the cellular context.

embl.org/ries



#### Carsten Schultz – *Chemical cell biology* Group Leader; Senior Scientist

The Schultz group develops tools for imaging and manipulating cellular enzyme activities, with an emphasis on lipid signalling in diabetes and the hereditary disease cystic fibrosis. *embl.org/schultz* 



Yannick Schwab – Volume correlative light and electron microscopy Head of the Electron Microscopy Core Facility; Team Leader

The Schwab team is interested in developing tools for the 3D correlation of data generated by fluorescent imaging and electron microscopy. *embl.org/schwab* 

#### Joint appointments to the Cell Biology and Biophysics Unit

Martin Beck (Structural and Computational Biology) – 14 John Briggs (Structural and Computational Biology) – 14 Edward Lemke (Structural and Computational Biology) – 14 Paul Heppenstall (Epigenetics and Neurobiology) – 30



#### Located in Heidelberg, Germany

Multicellular development is a feat of coordination. Molecular and physical cues – both intrinsic and extrinsic – are integrated at the cellular and tissue levels to generate the morphology, pattern and physiology of living organisms, from embryo to adult. Scientists in the Developmental Biology Unit investigate these complex, dynamic interactions. They use highly interdisciplinary approaches to reveal the fundamental mechanisms that shape life during development and evolution.



Anne Ephrussi – *RNA localisation and localised translation in development* Head of the Developmental Biology Unit; Senior Scientist

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 organisms, the Arendt group looks to understand the origin and evolution of our central nervous system. *embl.org/arendt* 



Alexander Aulehla – *Timing of mammalian embryogenesis* Group Leader



The Aulehla group studies how the precise timing and sequence of events that unfold as an embryo develops are controlled. *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

The De Renzis group aims to understand how cells build tissues during organismal development using a combination of quantitative imaging and optogenetic-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* 

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#### 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* 



Francesca Peri – *Microglia: the guardians of the developing brain* Group Leader

The Peri group combines genetic approaches with quantitative imaging techniques to study how microglia shape neuronal connectivity by removing unwanted neurons and synapses. *embl.org/peri* 

#### Joint appointments to the Developmental Biology Unit

Lars Hufnagel (*Cell Biology and Biophysics*) – 7 Robert Prevedel (*Cell Biology and Biophysics*) – 8 John Marioni (*EMBL-EBI*) – 20 Hiroki Asari (*Epigenetics and Neurobiology*) – 29 Cornelius Gross (*Epigenetics and Neurobiology*) – 29 Christophe Lancrin (*Epigenetics and Neurobiology*) – 30

# Genome Biology

### Located in Heidelberg, Germany

Many of our traits stem from the information in our genome which must be expressed at the right place and time. This entails strict regulation at multiple steps, including transcriptional, post-transcriptional and post-translational. Scientists in the Genome Biology Unit take an integrated, multi-tiered approach to study these processes and how their alteration leads to disease. They combine wet-lab and computational research, and work closely with colleagues in the Genomics and Proteomics Core Facilities to understand the molecular processes leading from genotype to phenotype.



Eileen Furlong – Genome regulation and topology during embryonic development Head of the Genome Biology Unit; Senior Scientist



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The Furlong group dissects fundamental principles of transcriptional regulation and how that 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 appointment with the Structural and Computational Biology Unit and EMBL-EBI

The Huber group develops statistical and bioinformatics methods for novel assays in high-throughput biology and the integrative analysis of multi-omic data types. *embl.org/huber* 



### Jan Korbel – From genomic variation to molecular mechanism



The Korbel group combines experimental and computational approaches, including single-cell sequencing technology, to unravel determinants and consequences of germline and somatic genetic variation. *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* 





 $\label{eq:christoph} \begin{array}{l} \mbox{Christoph} \mbox{A}. \ \mbox{Merten} - {\it Microfluidic} \ approaches \ in \ drug \ discovery \ and \ personalised \ medicine \end{array}$ 

Group Leader

The Merten group develops microfluidic technology to address complex questions in biomedical sciences and developmental biology. *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 vital chromatin links for 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* Group Leader – Joint appointment with EMBL-EBI

The Stegle group develops computational and statistical methods to study the genotype-phenotype map on a genome-wide scale. *embl.org/stegle* 



Lars Steinmetz – *Systems genetics and precision health* Group Leader; Senior Scientist



The Steinmetz group develops and applies interdisciplinary, genome-wide technologies to study genome regulation, the genetic basis of complex phenotypes and the genetic and molecular systems underpinning disease. *embl.org/steinmetz* 



Nassos Typas – Dissecting bacterial lifestyle and interspecies interactions with systems approaches Group Leader – Joint appointment with the Structural and Computational Biology Unit

The Typas group develops and utilises high-throughput methods to study the cellular networks of different bacterial species, and how these bacteria interact with the environment and with each other. *embl.org/typas* 

#### Joint appointments to the Genome Biology Unit

Matthias Hentze (Directors' Research) – 5 Christoph Müller (Structural and Computational Biology) – 13 Anne-Claude Gavin (Structural and Computational Biology) – 14 Judith Zaugg (Structural and Computational Biology) – 15 Pedro Beltrão (EMBL-EBI) – 18 Ewan Birney (EMBL-EBI) – 18 Daniel Panne (Structural Biology, in Grenoble) – 26 Jamie Hackett (Epigenetics and Neurobiology) – 30

# 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 in Heidelberg.



Peer Bork – Deciphering function and evolution of biological systems Head of the Structural and Computational Biology Unit; Senior Scientist



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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 X-ray crystallography, cryo-electron microscopy and biophysical and biochemical approaches to learn about the molecular mechanisms of transcription regulation in eukaryotes, where DNA is packaged into chromatin. *embl.org/mueller* 



Theodore Alexandrov – *Spatial metabolomics* Head of the Metabolomics Core Facility; Team Leader

The Alexandrov team develops novel computational biology tools that aim to reveal the spatial organisation of metabolic processes. *embl.org/alexandrov* 



Orsolya Barabas – *Mechanisms, regulation and exploitation of mobile DNA* Group Leader

The Barabas group uses structural and molecular biology approaches to investigate how DNA rearrangements are carried out and regulated, and uses this knowledge to develop their applications in research and medicine. *embl.org/barabas* 



#### Martin Beck – *Structure and function of large molecular assemblies* Group Leader: Senior Scientist – Joint appointment with the Cell Biol



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* 



### John Briggs – Viruses and vesicles – cryo-electron microscopy and tomography



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Group Leader; Senior Scientist – Joint appointment with the Cell Biology and Biophysics Unit

The Briggs group develops and applies cryo-electron microscopy techniques to study the assembly mechanisms of enveloped viruses such as HIV and influenza, as well as coated trafficking vesicles. *embl.org/briggs* 



#### Anne-Claude Gavin - Biomolecular networks

Group Leader; Senior Scientist - Joint appointment with the Genome Biology Unit

The Gavin group integrates biochemical, proteomics, metabolomics and microfluidicbased methods to achieve a systems-level understanding of how cellular proteomes are organised. *embl.org/gavin* 



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

The Gibson team investigates protein sequences, interactions and networks, undertakes computational analyses of macromolecules, and develops tools to enhance sequence analysis research. *embl.org/gibson* 



#### Janosch Hennig – Integrated structural biology of translation regulation mechanisms Group Leader

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



Edward Lemke – *High-resolution studies of protein plasticity* Group Leader – Joint appointment with the Cell Biology and Biophysics Unit

The Lemke group uses an interdisciplinary approach to elucidate the nature of naturally disordered proteins in biological systems and disease mechanisms at the single-molecule level. *embl.org/lemke* 



#### Julia Mahamid – In situ structural analysis of phase separation and molecular crowding Group Leader

The Mahamid group combines correlative approaches, cryo-focused ion beam milling and electron tomography to study mesoscale assemblies, such as centrosomes and stress granules, in intact cells and model organisms at molecular resolution.

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



Carsten Sachse – Single-particle electron cryomicroscopy of the autophagy machinery Group Leader

The Sachse group uses electron cryomicroscopy to study the structures of autophagy complexes to elucidate the mechanisms by which cells eliminate aberrant structures such as large protein aggregates. embl.org/sachse



Judith Zaugg – Personalised genomics to study the genetic basis of complex diseases

Group Leader – Joint appointment with the Genome Biology Unit and EMBL-EBI

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

#### Joint appointments to the Structural and Computational Biology Unit

Christian Häring (Cell Biology and Biophysics Unit) – 6 Wolfgang Huber (Genome Biology) - 11 Mikhail Savitski (Genome Biology) - 12 Nassos Typas (Genome Biology) – 12

# 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. At 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 from across EMBL and beyond to achieve ambitious research goals in a cost-effective way.



Advanced Light Microscopy Facility Rainer Pepperkok Head of the Core Facilities and Scientific Services; Senior Scientist

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 a comprehensive infrastructure 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-ofthe-art technologies for functional genomics analyses and operated by highly qualified staff. *embl.org/genecore* 



*Chemical Biology Core Facility* Joe Lewis Facility Head

The Chemical Biology Core Facility assists groups in developing primary and secondary assays for screening against the in-house compound library and guides them in developing tool compounds for their specific target. *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-ofthe-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 produces and purifies proteins both from Escherichia coli and from insect cells. It implements a large array of chromatographic techniques and also provides support for the biophysical characterisation of the purified proteins. *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 large variety of biological samples. *embl.org/em* 



## European Bioinformatics Institute

#### EMBL-EBI, 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; 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* 



Alex Bateman – Analysis of protein and RNA sequence Senior Team Leader

The Bateman group endeavours to classify proteins and certain RNAs into functional families with a view to producing a 'periodic table' of these molecules.

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 Senior Team Leader; Senior Scientist

The Brazma team's research focuses on the analysis of gene, transcript and protein expression, cancer genomics and proteomics, and the integrative analysis of functional genomics data. *embl.org/brazma* 



Anton Enright – Functional genomics and analysis of small RNA function

Group Leader - Joint appointment with the Epigenetics and Neurobiology Unit

The Enright group studies small non-coding RNAs and develops computational tools, systems and algorithms to predict their functions and interactions. *embl.org/enright* 



#### Paul Flicek – *Evolution of transcriptional regulation* Team Leader; Senior Scientist

The Flicek team 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* 



#### Moritz Gerstung – *Computational cancer biology* Group Leader

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

embl.org/gerstung



#### Nick Goldman – *Evolutionary tools for genomic analysis* Group Leader; 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* 



#### 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* Senior Team Leader

Research in the Kleywegt team aims to transform the structural archives into a truly useful resource for biomedical and related disciplines. *embl.org/kleywegt* 



John Marioni – *Computational and evolutionary genomics* Group Leader – Joint appointment with the Developmental Biology Unit

The Marioni group develops statistical tools that exploit data generated using next-generation sequencing to understand the evolution and regulation of gene expression. embl.org/marioni



### Evangelia Petsalaki – Whole-cell signalling

Group Leader

The Petsalaki group uses diverse 'omics' datasets to create data-driven models of contextspecific cell signalling. Their aim is to understand the principles of cell signalling and its rewiring in different conditions and genetic backgrounds. *embl.org/petsalaki* 



Oliver Stegle – *Statistical genomics and systems genetics* Group Leader – Joint appointment with the Genome Biology Unit

The Stegle group develops computational and statistical methods to study the genotype-phenotype map on a genome-wide scale. *embl.org/stegle* 



#### Janet Thornton – *Proteins: structure, function and evolution* 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* 

#### Joint appointments to EMBL-EBI

Wolfgang Huber *(Genome Biology) – 11* Jan Korbel *(Genome Biology) – 11* Judith Zaugg *(Structural and Computational Biology) – 15* 

# Bioinformatics Services

#### EMBL-EBI, 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.



#### *Gene annotation and comparative genomics* Bronwen Aken Team Leader

The Aken team creates gene annotation and comparative genomics data resources that further our understanding of biology, evolution and the mechanisms of disease. Distributed by Ensembl, these data provide a foundation for clinical and research communities. *embl.org/aken* 



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* 



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, sophisticated tools for analysis, simplify access to curated data, extend annotation and provide characterisation of sequences derived from environmental samples. *embl.org/finn* 



*Molecular networks, pathways, mathematical models* Henning Hermjakob 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* 



#### Sequence and variation archive infrastructure 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* 



*Non-vertebrate genomics* Paul Kersey Team Leader

The Kersey team develops Ensembl Genomes, which provides access to genomescale data of bacteria, protists, fungi, plants and invertebrate metazoa. The team is instrumental in setting relevant data standards in partnership with research communities. *embl.org/kersey* 



#### Chemogenomics Andrew Leach Team Leader

The Leach team is responsible for EMBL-EBI's ChEMBL database, which offers curated 2D chemical structures and abstracted quantitative bioactivity data alongside calculated molecular properties. *embl.org/leach* 



*Literature services* Johanna McEntyre Team Leader

The McEntyre team runs Europe PMC and integrates its textual content with molecular databases, both at EMBL-EBI and more widely through the development of data-sharing with collaborating organisations. *embl.org/mcentyre* 



#### 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 metabolomics resource. They develop workflows to process chemical information, predict meta-bolomes based on genomic information and enable the identification of molecules with desired properties. *embl.org/odonovan* 



#### Protein function content Sandra Orchard Team Leader

The Orchard team provides the manual curation for 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* 



#### Samples, phenotypes and ontologies Helen Parkinson Team Leader

The Parkinson team is responsible for BioSamples and Semantic Data Integration, as well as Mouse Informatics. The team develops develop ontologies, tooling and data resources that provide access to samples and ontologies. *embl.org/parkinson* 



#### *Imaging data services* Ardan Patwardhan Team Leader

This Patwardhan team is responsible for the EMDB and EMPIAR data resources. They develop resources for search, validation and visualisation of structural and bio-imaging data, and integrate and data-mine multi-scale structural and bioimaging data to facilitate data reuse. *embl.org/patwardhan* 



Gene expression Robert Petryszak Team Leader

The Petryszak team is responsible for the acquisition and curation of data for Array Express and develops the Expression Atlas, a data resource for gene and protein expression patterns under different biological conditions. *embl.org/petryszak* 



*Functional genomics development* Ugis Sarkans Team Leader

The Sarkans team develops software for ArrayExpress and the BioStudies database. They build and maintain data management tools, user interfaces, programmatic interfaces, and annotation and data submission systems for functional genomics resources. *embl.org/sarkans* 



*Protein Data Bank in Europe (PDBe)* Sameer Velankar Team Leader

The Velankar team is responsible for PDBe, which is a founding member of the Worldwide Protein Data Bank. Within this international consortium, PDBe works to collate, maintain and provide access to the global repository of macromolecular structure models, the Protein Data Bank (PDB). *embl.org/velankar* 



*Proteomics resources and tools* Juan Antonio Vizcaino Team Leader

The Vizcaino team is responsible for the PRIDE Archive database of mass spectrometrybased proteomics data, integrates proteomics data in public data resources and develops open-source tools. They are active in developing community standards.

embl.org/vizcaino



*Technical and outreach support for Ensembl and Ensembl Genome* Andy Yates Team Leader

The Yates team provides website, release, production and outreach support for the Ensembl and Ensembl Genomes projects. They develop the Ensembl web platform, create distribution and deployment mechanisms, and maintain the data-mining tool BioMart.

embl.org/yates



*Genome-scale analysis and storage for Ensembl* 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/zerbino* 

# Structural Biology

#### Located in Grenoble, France

The 3D shape of a molecule can tell you a lot about what that molecule does – and how its activity might be altered, for example to treat a disease. Scientists at EMBL in Grenoble study how proteins interact with genomes, based on their 3D structure. To do so, they work closely with instrumentation developers and colleagues across the European Photons and Neutrons science (EPN) campus to obtain and analyse the best possible data from cryo-electron microscopy and X-ray or neutron diffraction 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 to study the structural biology of protein-RNA complexes involved in RNA virus replication, innate immunity and cellular RNA metabolism. *embl.org/cusack* 



#### 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

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#### 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. *embl.org/kowalinski* 



## Andrew McCarthy – *Synchrotron crystallography team* Team Leader

The McCarthy team works on the development and operation of MX and BioSAXS beamlines, and studies proteins involved in neuronal development and cell signalling. *embl.org/mccarthy* 



Marco Marcia – Structure and function of lncRNA-protein complexes involved in transcription regulation Group Leader

The Marcia group uses structural 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 processes. *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 and uses them to study the structure of sensing and signalling molecules. *embl.org/marquez* 



### Daniel Panne – Structural biology of signal transduction and epigenetic gene regulation Group Leader – Joint appointment with the Genome Biology Unit

expression and chromatin assembly.

The Panne group looks to understand how signalling pathways control gene expression, focusing on signalling in the innate immune system, epigenetic control of gene

embl.org/panne

# Structural Biology

#### Located in Hamburg, Germany

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



Matthias Wilmanns – Structure and function of protein translocation machineries Head of the Structural Biology Unit in Hamburg; Senior Scientist

The Wilmanns group aims to unravel the overall architecture of protein translocation machineries across membranes by employing an integrative structural biology approach. *embl.org/wilmanns* 



Stefan Fiedler – Synchrotron instrumentation for structural biology beamlines at PETRA III Team Leader

The Fiedler team focuses on the selection, customisation and integration of mechanics, control electronics and control software for X-ray-based structural biology research. *embl.org/fiedler* 



#### Jan Kosinski – Integrative modelling of infection cycles Group Leader

The Kosinski group investigates infection cycles and host-pathogen interaction 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 macro-molecular crystallography. *embl.org/lamzin* 



### Christian Löw - Structural and dynamic insights into nutrient uptake systems

Group Leader

Using biophysical and biochemical methods, the Löwgroup aims to enhance understanding of the structural basis for substrate recognition in peptide 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 Group Leader; 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 Group Leader; 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 the scattering data analysis and hybrid structural modelling. embl.org/svergun



#### 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 in 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

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 appointment with the Cell Biology and Biophysics 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 – Generation of a haematopoietic 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 stem cells. *embl.org/lancrin* 

Joint appointments to the Epigenetics and Neurobiology Unit

Martin Jechlinger *(Cell Biology and Biophysics) – 7* Robert Prevedel *(Cell Biology and Biophysics) – 8* Kyung-Min Noh *(Genome Biology) – 12* Anton Enright *(EMBL-EBI) – 19* 

# 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 in Barcelona trace the connections between these scales. They unveil how tissues develop, work, regenerate and heal. Thanks to the site's imaging facilities, 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 a multi-scale computer simulation of a paradigm of organogenesis – mammalian limb development. *embl.org/sharpe* 

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	Matthias Hentze Maria Leptin	Jan Ellenberg Sara Cuylen-Häring Alba Diz-Muñoz Christian Häring Lars Huŕhagel Martin Jechlinger Péter Lénárt François Nédélec Pierre Neveu Rainer Pepperkok Robert Prevedel Jonas Ries Carsten Schultz Yannick Schwab	Anne Ephrussi Detlev Arendt Alexander Aulehla Justin Crocker Stefano De Renzis Takashi Hiiragi Aissam Ikmi Francesca Peri	Bileen Furlong Wolfgang Huber Jan Korbel Arnaud Krebs Christoph A. Merten Kyung-Min Noh Milkhail Savitski Oliver Stegle Lars Steinmetz Nassos Typas	Peer Bork Christoph Müller Theodore Alexandrov Orsolya Barabas Martin Beck John Briggs
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#### **Bioinformatics Res**

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# Imprint

### Research in brief 2017

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