EMBL

Ewan Birney
EMBL Deputy Director General
EMBL’s Sites

- EMBL-EBI
  - Bioinformatics

- Grenoble
  - Structural Biology

- Barcelona
  - Multicellular Engineering

- Hamburg
  - Structural Biology

- Heidelberg
  - Life Sciences

- Rome
  - Epigenetics Neurobiology
EMBL’s Member States

| Member states (27) | | | |
|-------------------|-------------------|-------------------|
| Austria 1974      | Belgium 1990      | Associate member states |
| Denmark 1974      | Portugal 1998     | Australia 2008     |
| France 1974       | Ireland 2003      | Argentina 2014     |
| Germany 1974      | Iceland 2005      | | |
| Israel 1974       | Croatia 2006      | Prospect member states |
| Italy 1974        | Luxembourg 2007   | Estonia 2019       |
| Netherlands 1974  | Czech Republic 2014 | | |
| Sweden 1974       | Malta 2016        | | |
| Switzerland 1974  | Hungary 2017      | | |
| United Kingdom 1974 | Slovakia 2018    | | |
| Finland 1984      | Montenegro 2018   | | |
| Greece 1984       | Poland 2019       | | |
| Norway 1985       | Lithuania 2019    | | |
| Spain 1986        |                    | | |

EMBL is Europe’s sole life sciences intergovernmental organisation
EMBL’s Legally required turnover model

44% turnover among EMBL Group Team Leaders over 5-year period

2015: 104
2016: 97
2017: 105
2018: 105
2019: 116

46 new hires and 35 departures 2015–2019
EMBL’s Missions

Excellent fundamental research

Infrastructure and services

Advanced training

Technology development, transfer and industry

Integration of European life science research
EMBL’s Missions

- Excellent fundamental research
- Infrastructure and services
- Advanced training

Technology development, transfer and industry
Integration of European life science research
### Scientific Services: EMBL-EBI Data Resources

**Access to EMBL-EBI data resources in 2019**

- **63m** daily requests to EMBL-EBI
- **~3m** unique IP addresses every month
- **50m** jobs every month
- **300+** petabytes of raw data storage

**Enabling technologies and integrating data**

- Global leader in biological data management
- Hosting archival data resources, knowledge-bases and driving data standards
- Coordinating large-scale international research consortia
- Enabling data access to researchers and clinicians around the world
EMBL-EBI Data Resources
BiolImage Archive

- Image datasets linked to articles
- Working with communities
- Integration with omics data
- Foundation for AI and analysis methods development

Life sciences databases
Many data types

Multiple data ingest streams at scale
Community-driven metadata
Integration and curation
Links with literature, unstructured data,
Innovative Data Science

Gene x Environment technique without precise definition of environment of interest.

“BigData” Epidemiology – able to process >100 million person with >1 billion data items

Innovation in statistical methods

Innovation in data science engineering
Current human datasets

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<tr>
<th>EU Child Cohort Network</th>
<th>Danish EHR</th>
<th>UK Biobank</th>
<th>Estonian Biobank</th>
<th>Lifework</th>
<th>Constances</th>
<th>Iceland/DeCode</th>
<th>German National Cohort</th>
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- Environmental measures (e.g. place of residence/work, smoking)
- Social measures (e.g. mobile phone use, location)
- Linked to medical records
- Biopsies (e.g. blood)

>6 millions subjects
Example research
UK BioBank Cardiac MRI scans
“Standard” GWAS

Location
- Basal section
- Mid section
- Apical section

A

B

Chromosomes

-log_{10}(p-value)

FD

Slice

1.0 1.2 1.4

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Haemodynamic model
Using genetics to understand causality

Genetic Variants

Heart Trabaculae

Heart Function

Heart Disease
Genomic Medicine

Strategic advice

Reference data

Federation

Training
Theoretical approaches to reveal the principles in complex living (eco)systems

Planetary Biology: modelling ecosystems
Multi-scale modeling (e.g. SYNTERRA)

Organisms in their dynamic environment
Dynamical Systems Synchronization Theory

Microbial ecosystems
Modeling emergent properties (collective metabolism)

Researchers working on theoretical and mathematical modelling aspects of biology can apply for financial and organisational support for visits to any of EMBL’s sites.
Identifying how potential COVID-19 drugs work

Following computational analysis of potentially beneficial existing drugs, EMBL seeks to understand how the drug works in living cells and its efficacy against COVID-19.

Taking a closer look at infected cells

Electron microscopy specialists collaborate with hospital researchers to understand the changes occurring in cell structures upon SARS-CoV-2 infection.

Exploring synthetic antibodies to stop coronavirus

Identifying nanobodies that could bind to SARS-CoV-2 and prevent it from entering human cells.
SARS-CoV-2 Scientific actions: COVID-19 Data Portals

European expertise bringing global data together

One easily accessible site, where researchers can upload, share, and access data related to the new SARS-CoV-2

Data includes sequences, expression data, protein function and structures, compound activity, drug targets, literature, and others

EMBL-EBI is facilitating the set-up of national SARS-CoV-2 Data Hubs across Europe

Hubs will be used by public health agencies and research centres doing genome sequencing of the new virus at national or regional levels
## EMBL Training the Next Generation

### Internal training

- **200** PhD students
- **250** postdocs
- EMBL PhD and Postdoctoral programmes
- EMBL Fellows’ Career Service
- General training and development

### External training

- **~7,000** guests per year
- EMBL Courses and Conferences
- Virtual training and e-learning programmes
- Scientific Visitor Programme

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- **EIPOD 4**
- **EMBL | EMBO Symposium**
  - 7–9 Jun 2021
- **Phenotypic Plasticity Across Scales**
- **Theory sabbatical programme**
Training: Future – Engineers as well as Scientists

**Pre-doc course:** Scientific modules with focus on new research themes

**Post-docs:** new EIPOD-like fellowships dedicated to new research themes with our member states

**Courses and Conferences:** Focus on new research themes and enhancing e-Learning Programme

**Sabbaticals:** Developing expertise through collaborations with member state experts and institutions
Thank you all
And questions