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## ELIXIR : the distributed infrastructure for life-science information

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 @ELIXIREurope

 /company/elixir-europe

# ELIXIR: the distributed infrastructure for life-science information

A-F Adam-Blondon, INRAE, ELIXIR-FR Head of node

LERU Open Science Ambassadors meeting,  
Université Paris-Saclay, France, 2023 Nov 9th

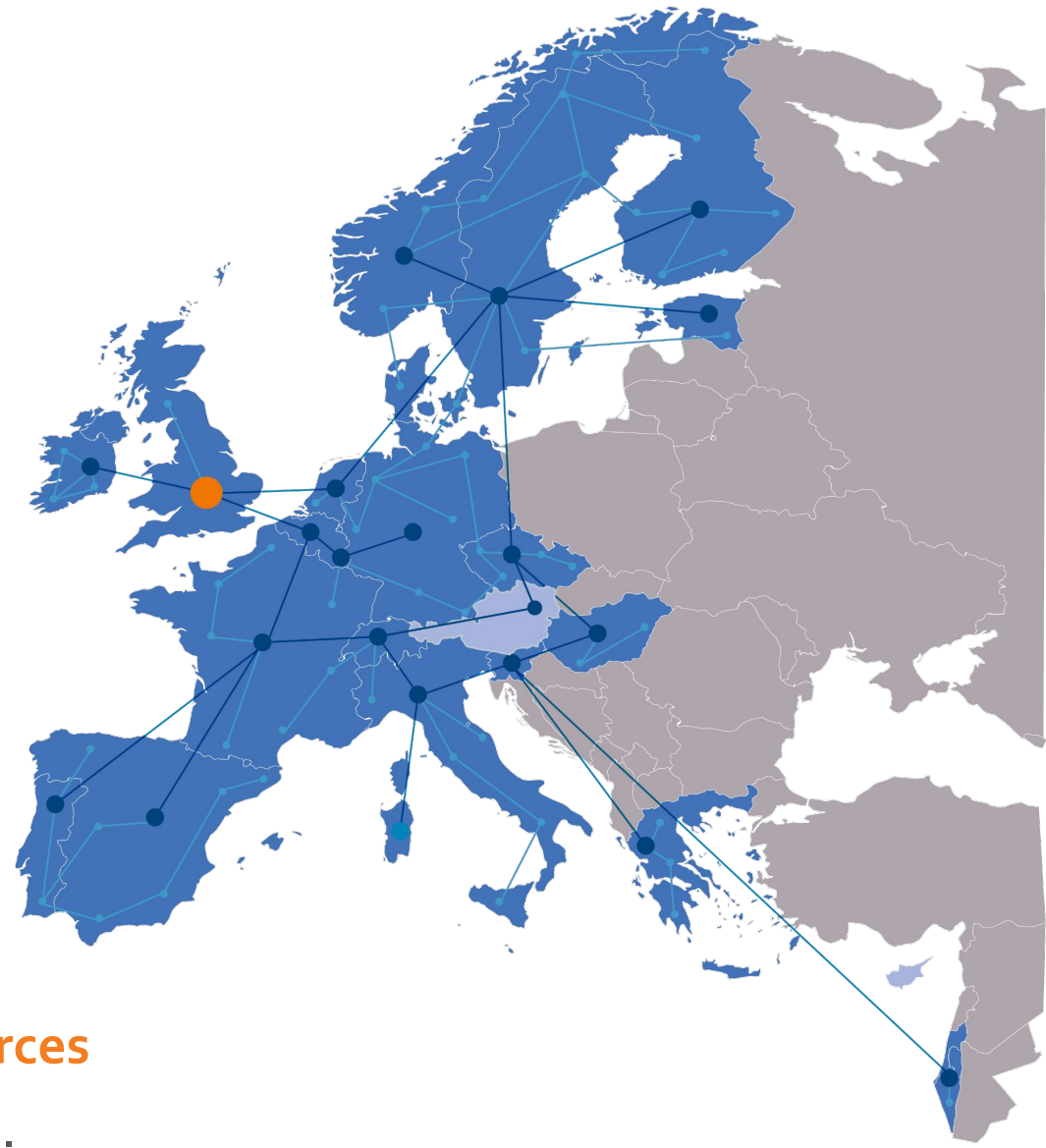
[www.elixir-europe.org](http://www.elixir-europe.org)

# ELIXIR Europe

ELIXIR is an intergovernmental organisation that brings together **life science** resources such as

- databases
- software tools
- training resources
- interoperability resources
- compute resources
- data management support

The goal of ELIXIR is to **coordinate bioinformatics resources from across Europe so they form a single infrastructure.**



# ELIXIR – who we are

## 24 Nodes

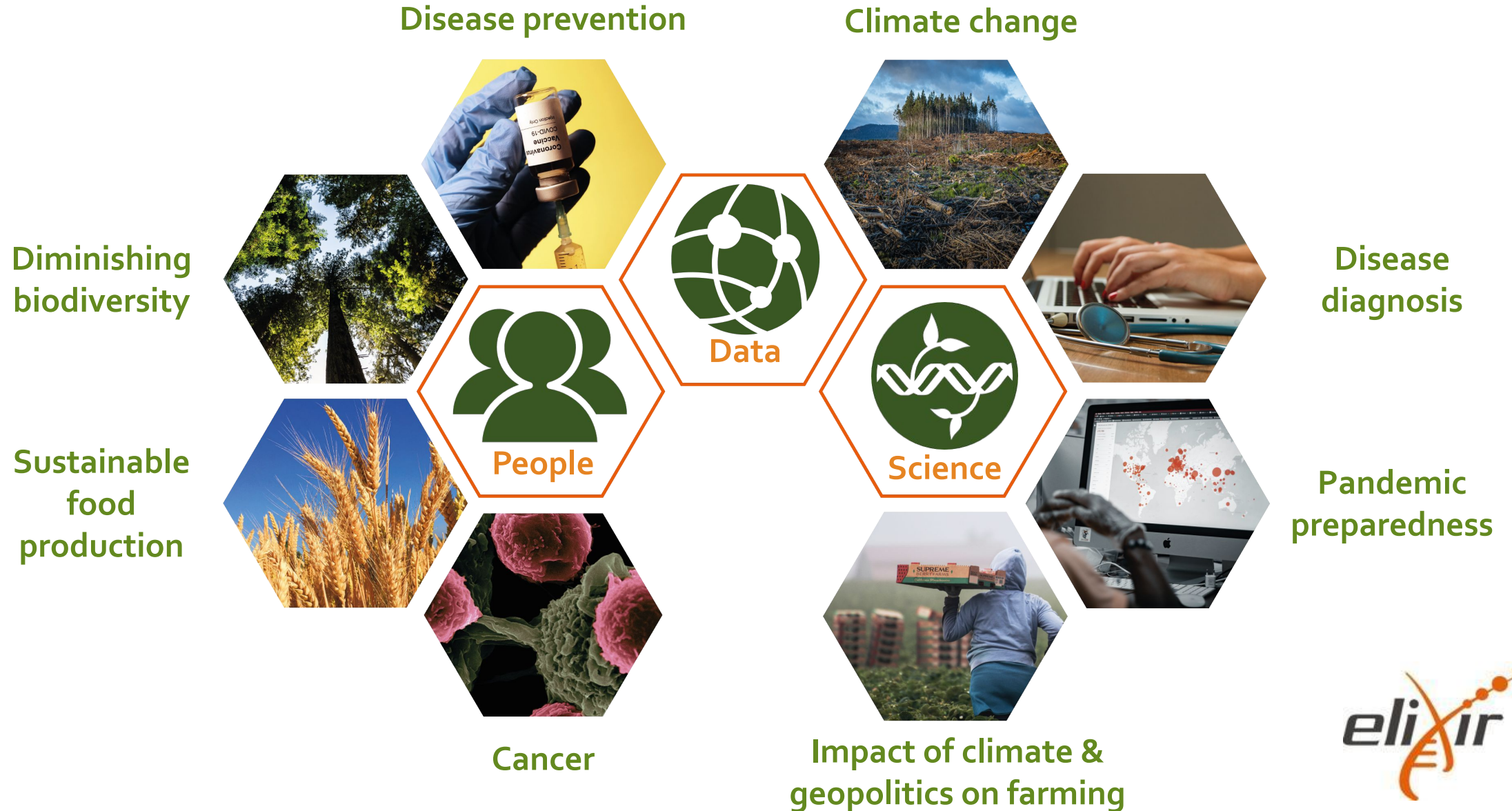
- ELIXIR Nodes form national networks of excellence, containing a total of **245** institutes/universities
- **EMBL-EBI** is one of the nodes

## 1 Hub

The Hub, located at EMBL-EBI, Cambridge, UK, provides the secretariat and coordinating activities for ELIXIR



# Enable data-driven solutions to societal challenges





## IFB is a distributed French National Research Infrastructure

- 36 platforms and research teams spread all over France

## Coordination: IFB-core

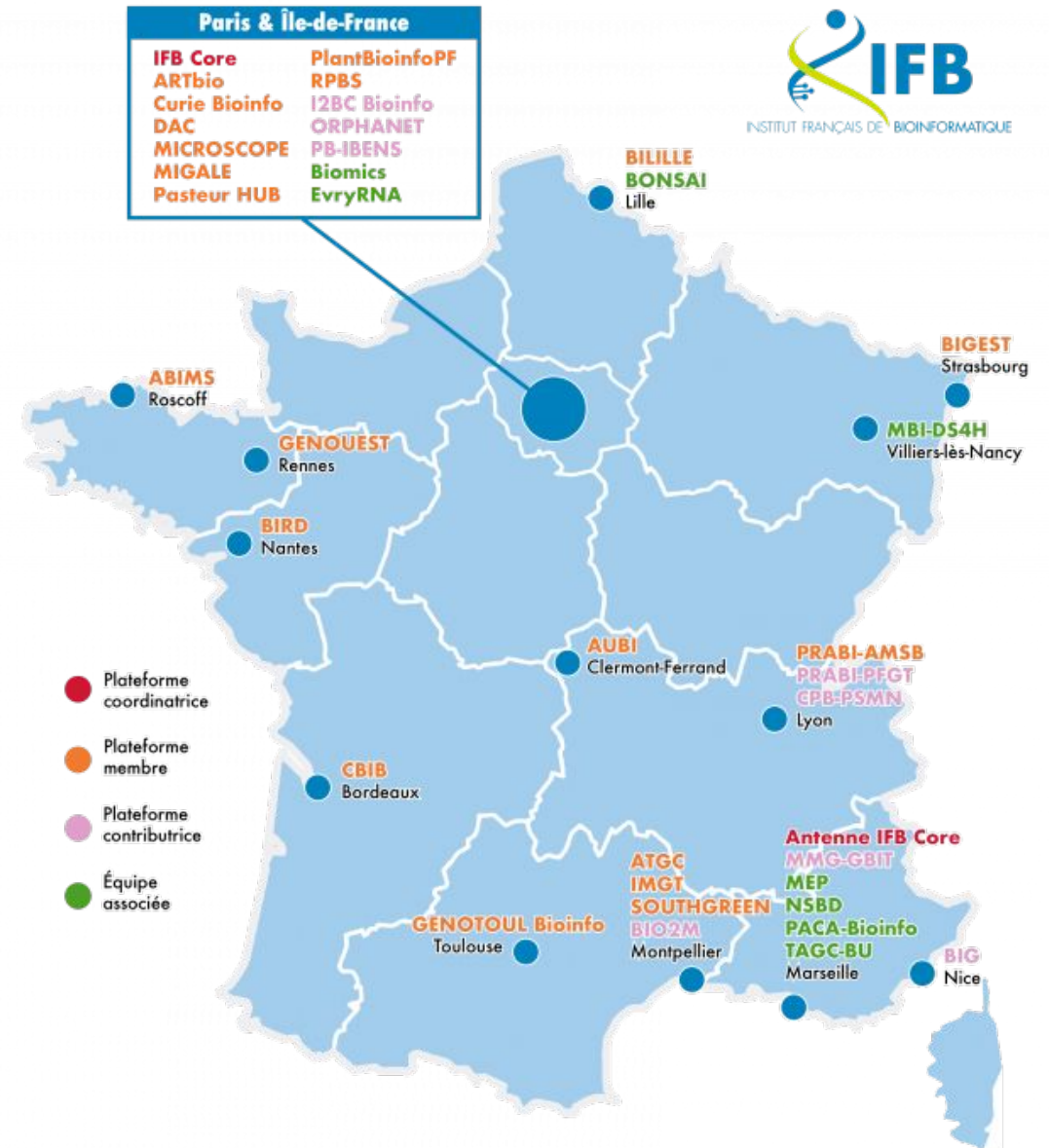
- Multi-research organizations : CNRS, Inserm, INRAE, CEA

## Common resources

- Supported by the French Ministry of Higher Education and Research since 2012

## A large set of expertise in bioinformatics

- >400 experts (~200 FTE)



# IFB/ELIXIR-FR has a large set of domain of applications



IFB's domains of application encompass the three scientific priorities of the 2024-2028 programme of ELIXIR



Enabling and responding to advances in cellular and molecular research will drive life science

Connect the latest developments and established data resources to realise the potential of cellular and molecular biology



Biodiversity, food security and pathogens are interrelated societal challenges

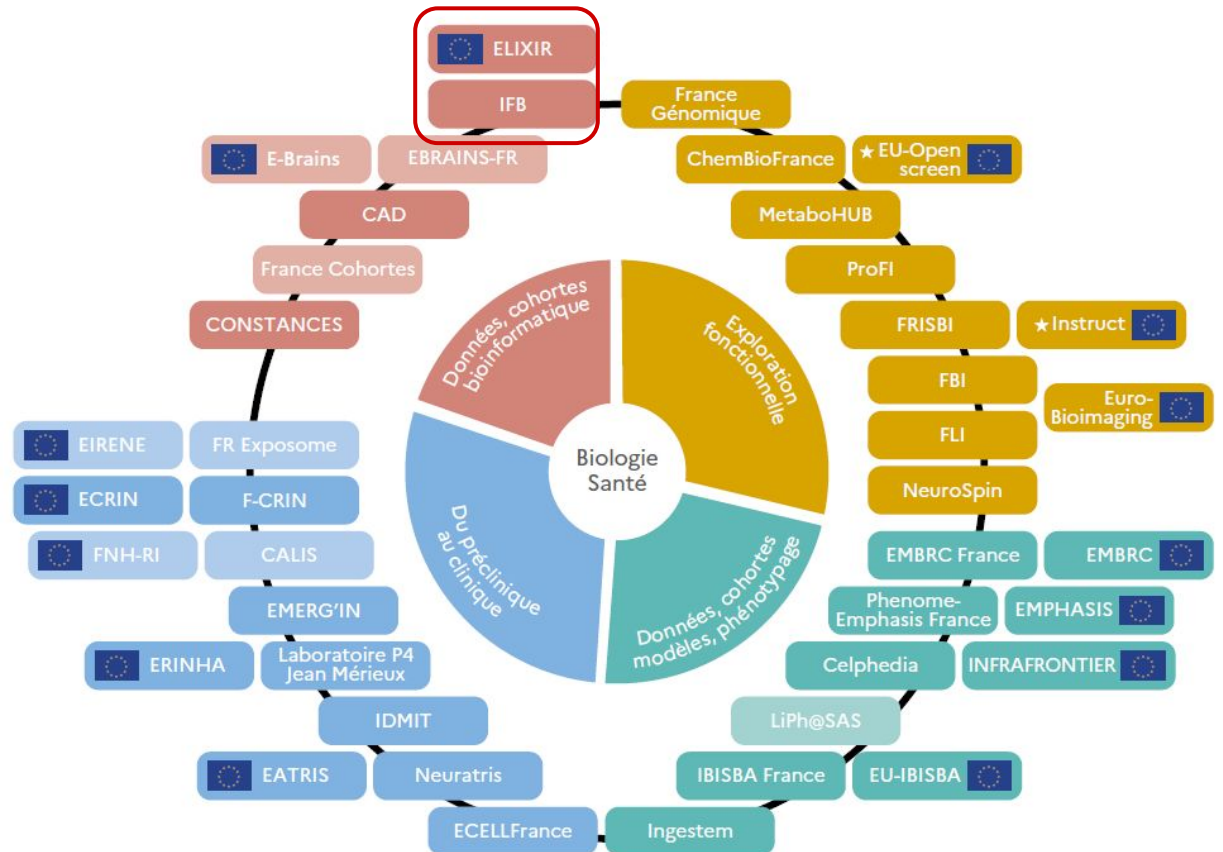
Mobilise and integrate molecular data to support transnational research programmes in biodiversity, food security and pathogens



The promise of genomics research to improve health and disease outcomes

Provide the infrastructure to support the discovery, access, sharing and analysis of human genomics data and linked data on a massive scale

- Sharing expertise and working groups on subjects of common interest
- Partnership in large national projects
- Enhance partnerships in ELIXIR activities and in European projects





# How we work - ELIXIR Platforms

**Platforms** bring together experts from Nodes to develop ELIXIR's technical vision and coordinate activities in defined technical areas. There are five Platforms:

## Compute

Builds and integrates **cloud, compute, storage and access services** for the life-science research community

## Data

Drives the use, re-use and value of life science data by providing **curated, robust, long-term sustainable data resources** within a coordinated, scalable and connected data ecosystem

## Tools

Helps communities **find, register and benchmark** software tools; maintains information standards and produces, adopts and promotes **best practices for tool development**

## Interoperability

Helps people and machines to **discover, access, integrate and analyse biological data**; encourages the life science community to adopt **standardised file formats, metadata & vocabularies**

## Training

Strengthens **national training** programmes; grows bioinformatics and research data management **training capacity and competence across Europe**; empowers researchers to use ELIXIR's resources

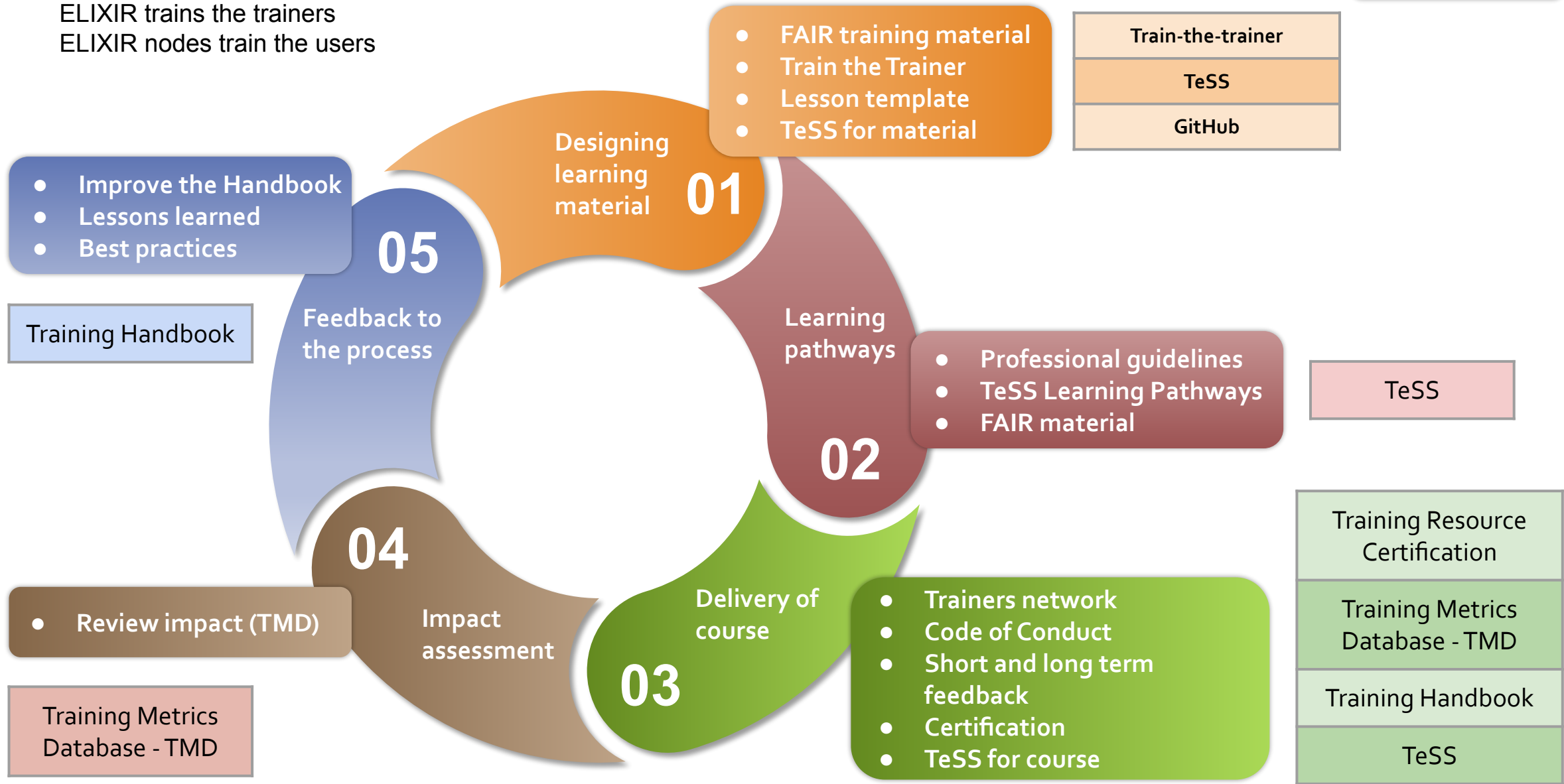


# ELIXIR Training Platform

Service/Product

• Activity

ELIXIR trains the trainers  
ELIXIR nodes train the users



# How we work - ELIXIR Communities: connecting infrastructure & life science experts



Formed around domain experts in ELIXIR Nodes (including non-ELIXIR partners)



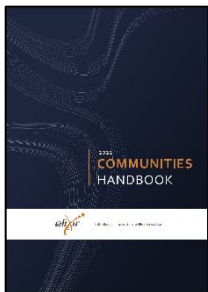
Provide a mechanism for long-term collaborations with other ESFRIs and large-scale initiatives



Drive service developments in the ELIXIR Platforms




Provide a framework to develop and maintain community standards



The [ELIXIR Communities Handbook](#) tells you what a Community is, who can join, what the benefits are, and how Communities are structured.




- **Liaising and networking** with all platforms and most of the communities and contributing to their activities
- **Co-coordinating and contributing to the strategic planning of some of them =>** 
- Contributing to **European projects**: 9 since 2020


 **Platforms**

ELIXIR Platforms bring together experts from Nodes to develop ELIXIR's technical vision and coordinate activities in defined technical areas. There are five Platforms: Data, Tools, Interoperability, Compute and Training.

 **Tools Platform**   
Helps researchers find the best software tools to analyse their data.

 **Data Platform**  
Aims to identify key data resources across Europe and support the linkages between data and literature.

















 **Compute Platform**  
Develops services to make it easier to store, share and analyse large datasets.

 **Interoperability Platform**  
Develops and encourages the adoption of standards to describe life science data.


 **Training Platform**  
Helps scientists and developers find the training they need, and also provides that training.

 **Science**

**Communities**

|  |   |
|--|---|
|  3D-Bioinfo   |  Biodiversity  |
|  Food and nutrition   |  Galaxy  |
|  Intrinsically Disordered Proteins  |  Marine Metagenomics  |
|  Metabolomics   |  Microbial Biotechnology   |
|  Plant Sciences <small>litate crop and</small>  |  Proteomics  |
|  Single-Cell Omics  |  Systems Biology   |
|  Toxicology  |   |

**Human Data Communities**

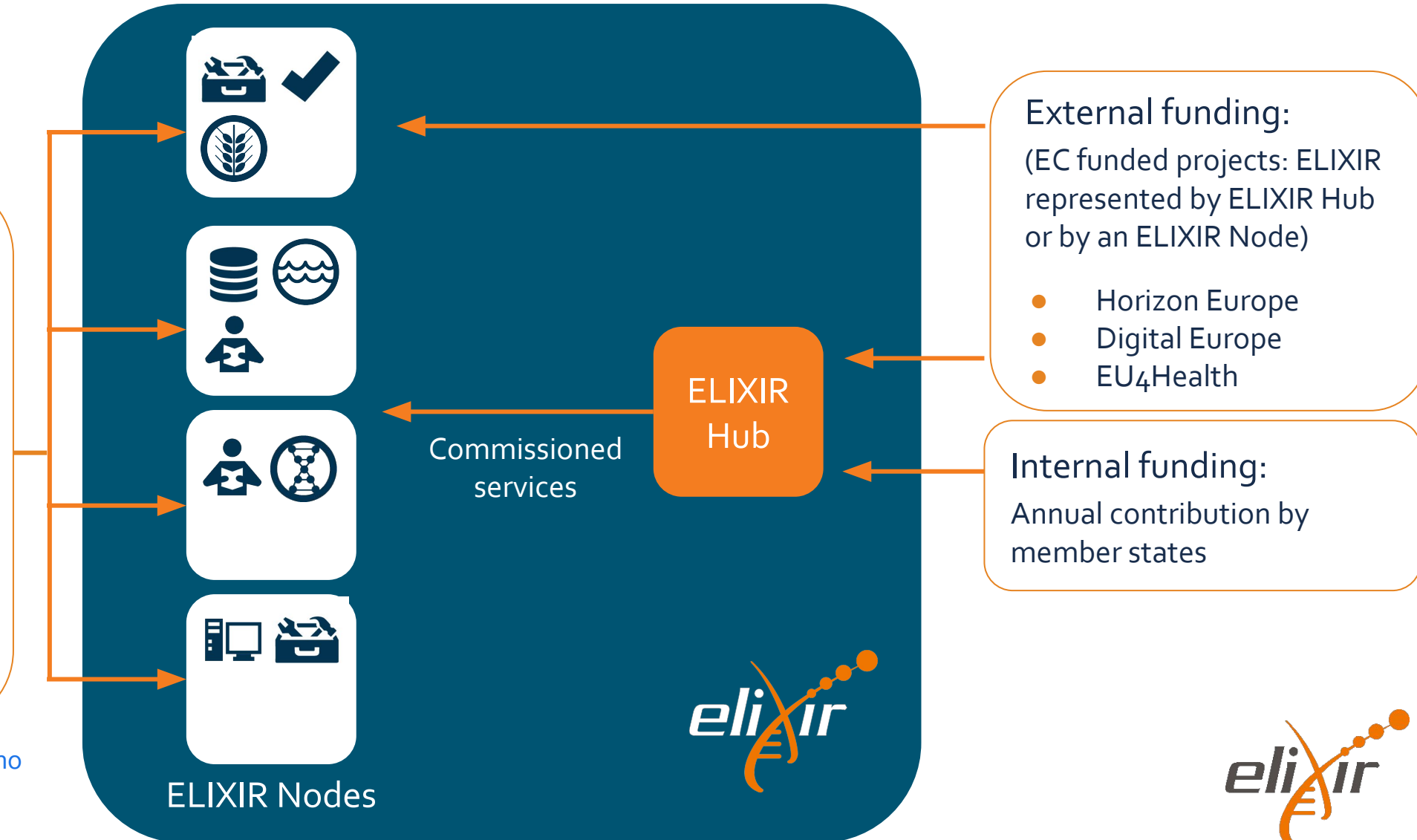
|  |   |
|--|---|
|  Federated Human Data |  Human Copy Number Variation  |
|  Rare diseases        |  Cancer Data (focus group)    |

# ELIXIR's funding model

## Node funding:

- National roadmap funding
- Competitive research grants
- EU Structural Funds or Recovery and Resilience Facility (RRF)
- Trusts and foundations
- Industry collaboration

<https://elixir-europe.org/about-us/how-funded/sustainability-plan>



# ELIXIR's key stakeholders



## ELIXIR Nodes

24 ELIXIR Nodes  
245+ institutes  
850+ scientists



## Users

Bioinformaticians  
500,000+ life science researchers  
Users in industry



## Funders & decision makers

European Union  
National funding agencies  
ESFRI delegates  
ELIXIR Board members



## Collaborators

ESFRI RIs  
Global initiatives (GA4GH, Galaxy)  
National initiatives (Australian  
BioCommons, NIH)

# Collaborator example – the ELIXIR EOSC strategic vision

## ELIXIR maps to EOSC at all levels

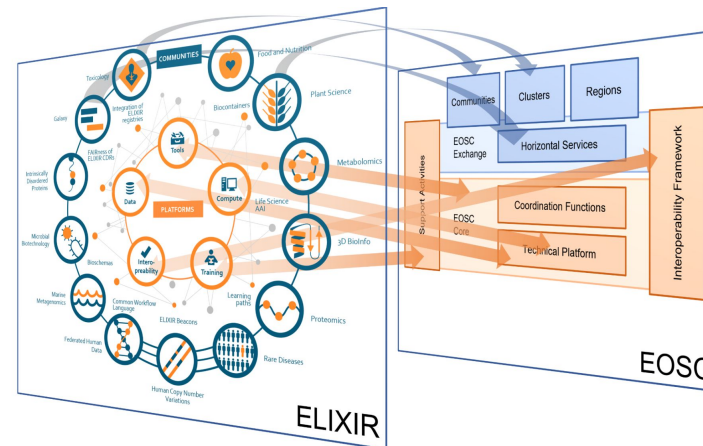
- Throughout the EOSC Core and Interoperability frameworks
- Bidirectional relationships, with best of breed solutions being adopted by both sides
- ELIXIR Communities will over time adopt EOSC Services and become driving user communities for both organisations



## ELIXIR and the EOSC Association Task Forces

### ELIXIR on Advisory Groups

- ✓ The Implementation of EOSC
- ✓ Metadata and Data Quality
- ✓ Research Careers and Curricula
- ✓ Sustaining EOSC
- ✓ Technical Challenges on EOS



## ELIXIR involvement in EOSC projects



EOSC-Pilot



EOSC-Enhance



EOSC-Life



EOSC-Future



# ELIXIR flagship events

## BioHackathon Europe

- Bringing together bioinformaticians for **five days of hacking**
- **Five successful annual events** since 2018
- Projects to advance **open source infrastructure** for data integration to accelerate scientific innovation
- Supporting operations across ELIXIR Platforms, Communities and Focus Groups through technology implementations (e.g. **FAIR, identifiers, metadata standards, ontologies and metadata catalogues**)



## Innovation and SME Forums

- Approximately **two one-day** events per year
- Providing **Small to Medium Sized Enterprises** (SMEs) the opportunity to present their innovative ideas
- Enabling companies to learn more about **current and emerging ELIXIR services**
- Forging strong links with the **local ELIXIR Node representatives** running ELIXIR services



## ELIXIR Bioinformatics Industry Forum (EBIF)

- **One-day** annual event
- Discussions with industry experts around **visionary ideas, bottlenecks and solutions** to major challenges in the data-driven life science sector
- A forum for **knowledge exchange and collaboration** in the pre-competitive space
- **Networking** opportunities with bioinformatics opinion leaders, academic experts in ELIXIR and the commercial sector





# ELIXIR's Code of Conduct – the principles



The Code of Conduct pertains to ELIXIR organised or funded events



**We value**  
each other's perspectives

**We adopt**  
a zero-tolerance approach to harassment  
and discrimination

**We maintain**  
high ethical standards

**We'll apply**  
honesty and integrity in the dealing of any  
transgressions against the Code.

**We're committed**  
to making ELIXIR events collaborative,  
supportive and enjoyable

**We'll ensure**  
a respectful and inclusive environment



# What we offer



## Guidelines

Guidelines and best practices to help you manage life science data, run training courses, develop software and more.



## Web portals

Find the right software, training courses, standards and more in our interlinked portals to life science resources.



## Services

Find compute services, databases, and the full list of resources ELIXIR coordinates.



## Partnerships with Industry and SMEs

Join events and projects that bring the private and public sectors together.



## Opportunities to work together

Join a scientific group in ELIXIR or partner with us to apply for EC funding.



## For ELIXIR members











If you work at an institute that is part of ELIXIR, then remember to take advantage of the benefits ELIXIR offers.

ELIXIR coordinates the provision of life science services and resources, developed and managed by ELIXIR Nodes

The services and resources are freely available to researchers around the world

The services and resources support efficient manipulation, analysis, storage and exchange of life science data

# Examples of ELIXIR high impact services

|  |                           |  |  |                       |
|--|---------------------------|--|--|-----------------------|
|   | <b>Life Science Login</b> | Authentication service   |   | Users                 |
|   | <b>FAIRsharing</b>        | Data and metadata resource including standards, databases and policies |   | Standards             |
|   | <b>ELIXIR TeSS</b>        | ELIXIR's training portal   |   | Training materials    |
|   | <b>BioContainers</b>      | Software standardisation resource                                      |   | Containers & packages |
|  | <b>BioTools</b>           | Registry of tools, databases and services                              |  | Monthly visits        |

# ELIXIR research data management resources

Guidance for data stewards, project managers and researchers

Overview of good data management practices



The Research Data Management Kit (RDMkit) guides you through the whole data management life cycle and includes advice specific to your domain, your role and your country.

Step-by-step instructions



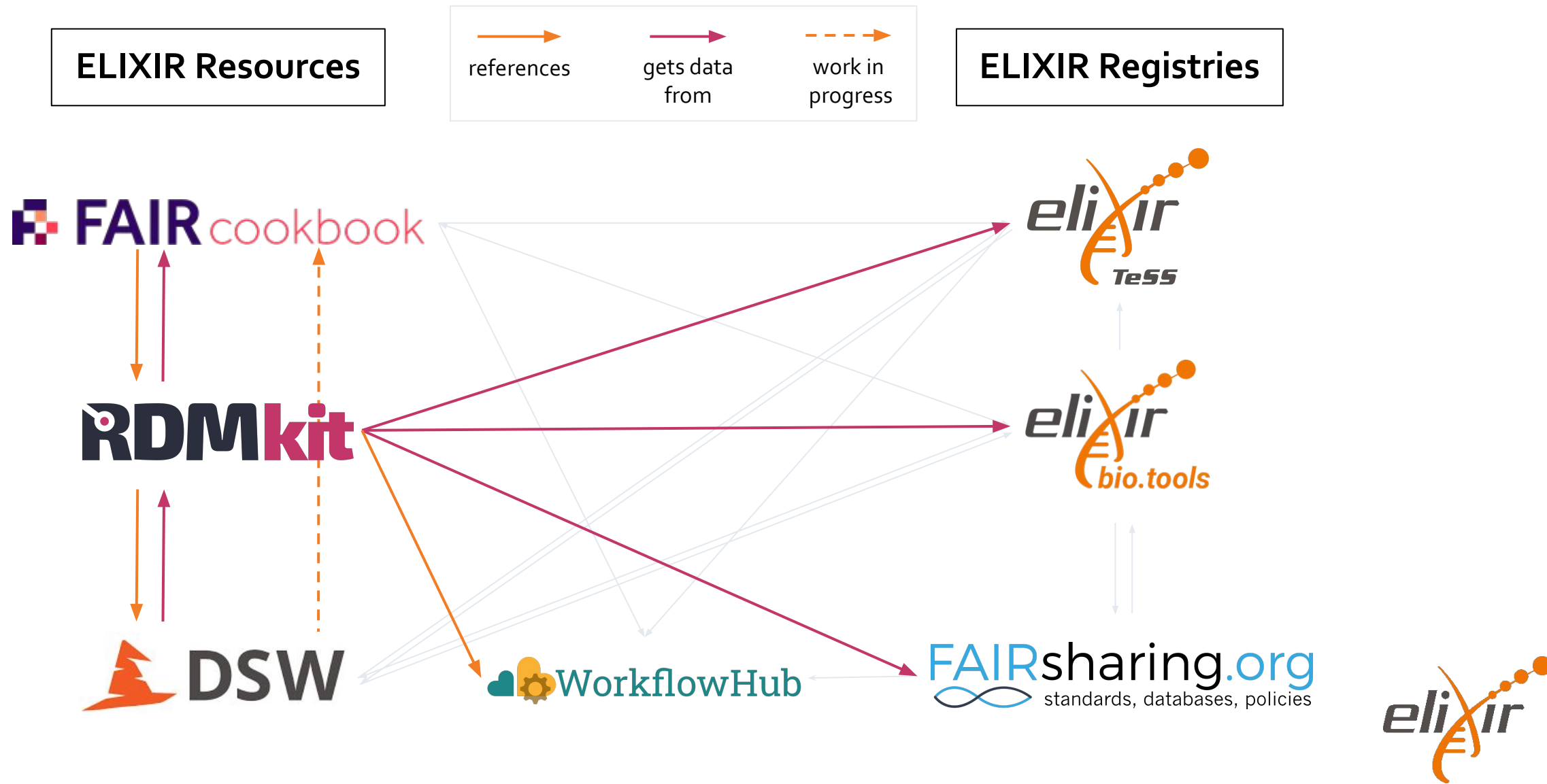
The FAIR Cookbook contains step-by-step recipes to accomplish specific data management tasks and to make your data FAIR (Findable, Accessible, Interoperable, Reusable).

Data management plan wizard



The Data Stewardship Wizard (DSW) is an online tool that guides researchers and data stewards through their data management planning.


# Research Data Management Toolkit



A web-based toolkit for the bioscience community written by the bioscience community

## RDMkit in numbers


**151**  
Contributors  
The force behind RDMkit



**336**  
Tools & resources  
Explained in the context of real world problems











**101**  
Pages  
Helping you with data management



### What can we help you find?

Search RDMkit

#### Browse all topics by

|   |  |   |
|---|--|---|
|  <p><b>Data life cycle</b><br/>Start here to get an overview of research data management based on stages in the data life cycle.</p> |  <p><b>Your role</b><br/>Identify your role in research data management, find data management resources relevant for you, and information to help you progress in your career path.</p> |  <p><b>Your domain</b><br/>Learn about data management tasks that affect your domain or research community, and the solutions adopted to address them.</p> |
|  <p><b>Your tasks</b><br/>Find guidelines and solutions for tackling common data management tasks.</p>                               |  <p><b>Tool assembly</b><br/>Find concrete combinations of tools and resources assembled into an ecosystem for research data management.</p>  |  <p><b>National resources</b><br/>Find pointers to country specific information resources and national research data management practices.</p>             |
|  <p><b>All tools and resources</b><br/>Browse the RDMkit's catalogue of tools and resources for research data management.</p>      |  <p><b>All training resources</b><br/>Browse all training resources mentioned in RDMkit pages.</p>  |   |

# Resources for reproducible environment of analysis

bio.tools



bio.tools helps you find and select bioinformatics software and connect it in workflows.

BioContainers



Search a repository of containerised software that you can build into workflows.

WorkflowHub



A registry for sharing and publishing scientific computational workflows.

FAIRsharing.org



FAIRsharing.org allows you to search for databases and data policies by aspects such as domain, species and country.

TeSS



Search for training courses, webinars, training materials and workflows in TeSS, ELIXIR's training portal.

COMMENT | FOCUS

## DOME: recommendations for supervised machine learning validation in biology

DOME is a set of community-wide recommendations for reporting supervised machine learning-based analyses applied to biological studies. Broad adoption of these recommendations will help improve machine learning assessment and reproducibility.

Ian Walsh, Dmytro Fishman, Dario Garcia-Gasulla, Tiina Titma, Gianluca Pollastri, ELIXIR Machine Learning Focus Group, Jennifer Harrow, Fotis E. Psomopoulos and Silvio C. E. Tosatto

With the steep decline in the cost of many high-throughput technologies, large amounts of biological data are being generated and made accessible to researchers. Machine learning (ML) has come into



Check for updates

OPEN ACCESS

Citation: Brack P, Crowther P, Soiland-Reyes S, Owen S, Lowe D, Williams AR, et al. (2022) Ten

NATIONAL BIOLOGY

EDITORIAL

## Ten simple rules for making a software tool workflow-ready

Paul Brack<sup>1</sup>, Peter Crowther<sup>2</sup>, Stian Soiland-Reyes<sup>1,3\*</sup>, Stuart Owen<sup>1</sup>, Douglas Lowe<sup>4</sup>, Alan R. Williams<sup>1</sup>, Quentin Groom<sup>5</sup>, Mathias Dillen<sup>5</sup>, Frederik Coppens<sup>6,7</sup>, Björn Grüning<sup>8</sup>, Ignacio Eguinoa<sup>6,7</sup>, Philip Ewels<sup>9</sup>, Carole Goble<sup>1</sup>

1 Department of Computer Science, The University of Manchester, Manchester, United Kingdom, 2 Melandra Limited, Stockport, United Kingdom, 3 Informatics Institute, University of Amsterdam, Amsterdam, The Netherlands, 4 Research IT, IT Services, University of Manchester, Manchester, United Kingdom, 5 Meise Botanic Garden, Meise, Belgium, 6 Department of Plant Biotechnology and Bioinformatics, Ghent University, Ghent, Belgium, 7 VIB Center for Plant Systems Biology, Ghent, Belgium, 8 Bioinformatics Group, Department of Computer Science, Albert-Ludwigs-University Freiburg, Freiburg, Germany, 9 Science for Life Laboratory (SciLifeLab), Department of Biochemistry and Biophysics, Stockholm University, Stockholm, Sweden

\* soiland-reyes@manchester.ac.uk

### Introduction

In recent years, the volumes of data to be analyzed, as well as the complexity of that analysis, across many scientific fields (from genomics through to exoplanet exploration) have increased

## SCIENTIFIC DATA

Amended: Addendum

### OPEN Comment: The FAIR Guiding Principles for scientific data management and stewardship

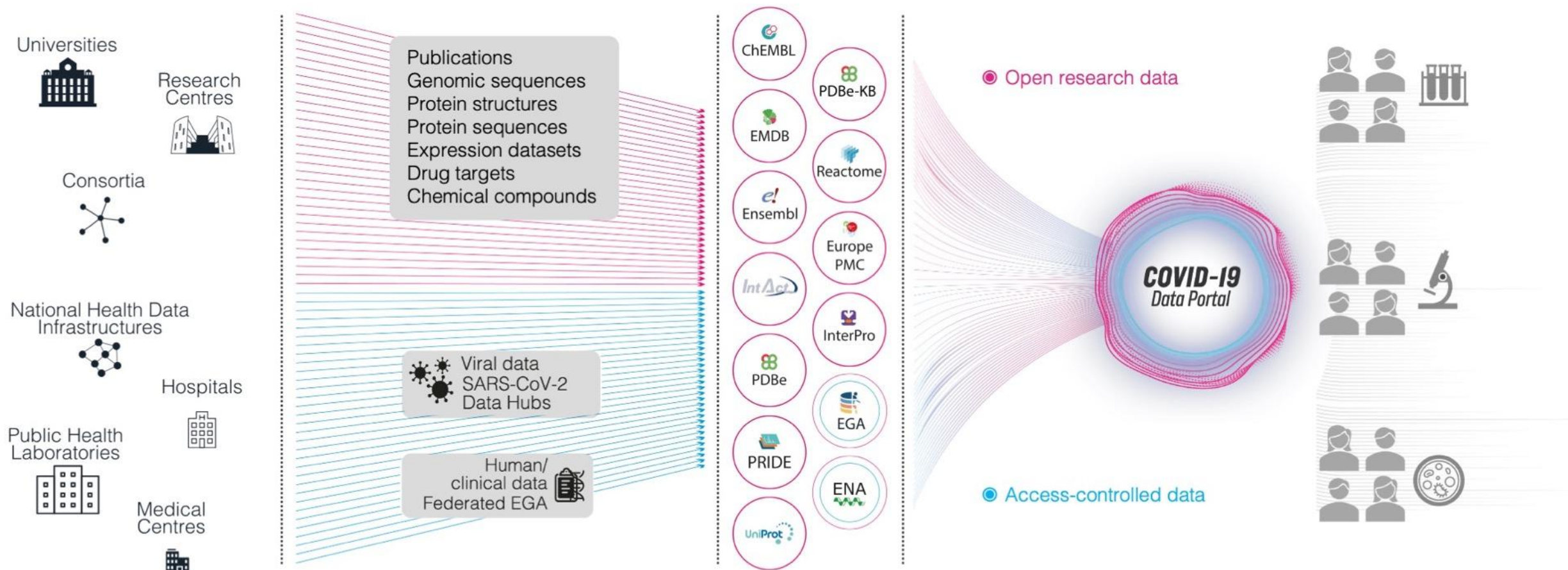
Mark D. Wilkinson *et al.*<sup>#</sup>

There is an urgent need to improve the infrastructure supporting the reuse of scholarly data. A diverse set of stakeholders—representing academia, industry, funding agencies, and scholarly publishers—have come together to design and jointly endorse a concise and measurable set of principles that we refer to as the FAIR Data Principles. The intent is that these may act as a guideline for those wishing to enhance the reusability of their data holdings. Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals. This Comment is the first formal publication of the FAIR Principles, and includes the rationale behind them, and some exemplar implementations in the community.

Supporting discovery through good data management  
Good data management is not a goal in itself, but rather is the key conduit leading to knowledge discovery and innovation, and to subsequent data and knowledge integration and reuse by the



# The European COVID-19 Data Platform



<https://www.covid19dataportal.org>





**Guy Perrière**  
ELIXIR-FR Head of Node



**Anne-Françoise Adam-Blondon**  
ELIXIR-FR Head of Node



**Angela Sáenz**  
ELIXIR-FR Node coordinator



Many thanks to the ELIXIR hub team for their slide deck!



[www.elixir-europe.org](http://www.elixir-europe.org)