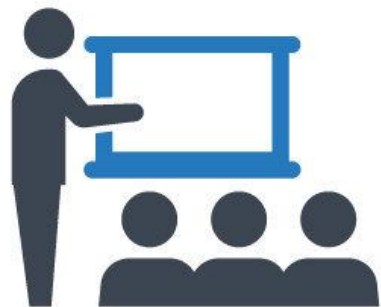


The Bicycle Principles

for Effective, Inclusive and Career-spanning Short-Format Training (SFT)



Lisanna Paladin

EMBL Bio-IT | bio-it.embl.de

Bioinformatics Community Project Manager

With feedback from **Celia van Gelder**

Why did this work start

Need: lifelong learning

STEM Careers and the Changing Skill Requirements of Work - Deming & Noray, NBER 2019

[...] the labor market impact of rapid technological change depends critically on the extent to which schooling and "lifelong learning" can help build the skills of the next generation.

Problem: short-format training is often ineffective

Null effects of boot camps and short-format training for PhD students in life sciences - Feldon et.al., PNAS 2017

[...] participation in such short-format interventions is not associated with observable benefits related to skill development, scholarly productivity, or socialization into the academic community. [...] We conclude that boot camps and other short formats may not durably impact student outcomes.

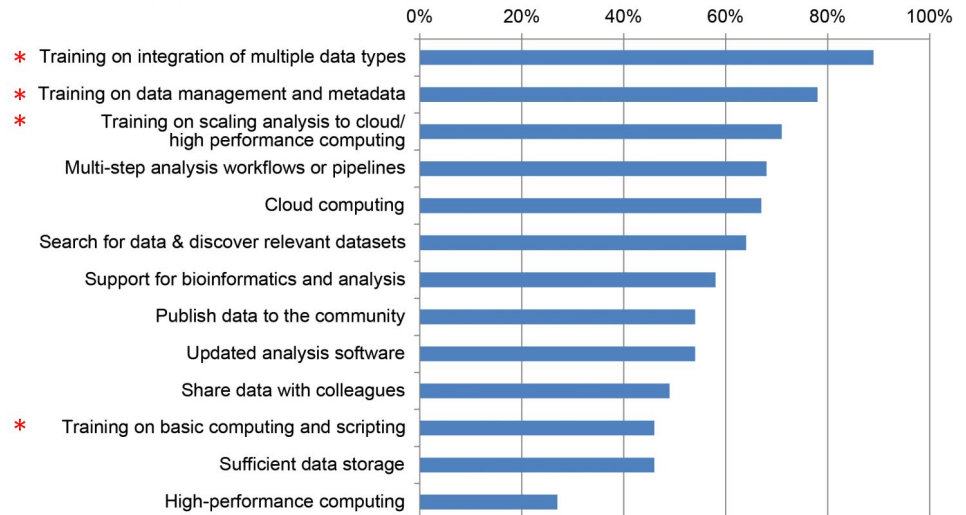
Why did this work start

Unmet needs for analyzing biological big data: A survey of 704 NSF principal investigators

Lindsay Barone  , Jason Williams , David Micklos 

Published: October 19, 2017 • <https://doi.org/10.1371/journal.pcbi.1005755>

“Does your institution meet this need?”
(‘no’ responses)



Where did this work start

December 2021 (virtual)
May 2022 (in person)



ANNOUNCEMENT

Making Career-spanning Learning in the Life Sciences Inclusive and Effective for All

Late 2021

Organized by: Jason Williams, Cold Spring Harbor Laboratory
Rochelle Tractenberg, Georgetown University
Bérénice Batut, University of Freiburg
Samuel Donovan, University of Pittsburgh
Kari L. Jordan, The Carpentries
Charla Lambert, Cold Spring Harbor Laboratory
Teresa Mourad, Ecological Society of America
Tracy Teal, Dryad
Celia van Gelder, Dutch Techcentre for Life Sciences

Who started this work



B�er�nice Batut*	Charla Lambert*	Celia van Gelder*
Erin Becker	Ainsley Latour	Jason Williams**
Anne Brown	Jessica Lindvall	Lou Woodley
Melissa Burke	Marta Lloret Llinares	*Organizing committee
Ben Busby	Gary McDowell	** Project PIs
April Clyburne-Sherin	Rana Morris	
Nisha Cooch	Teresa Mourad*	
Allissa Dillman	Amy Nisselle	
Sam Donovan*	Patricia Ord�o�ez	
Maria Doyle	Lisanna Paladin	
Jessica Guo	Patricia Palagi	
Christina Hall	Mahadeo Sukhai	
Kate Hertweck	Tracy Teal*	
Kari Jordan*	Rochelle	
John R. Jungck	Tractenberg**	

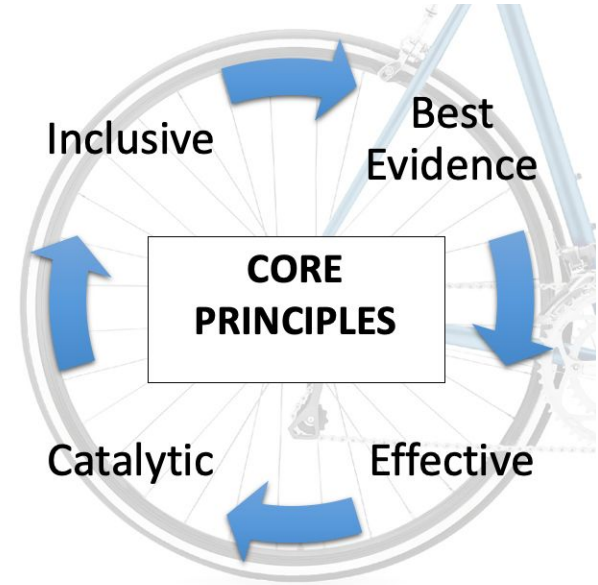
Short-format training (SFT) definition

Instruction in disciplinary skills and knowledge over a **relatively short duration** (i.e., hours, days, or a few weeks).

- Generally happens **outside of a formal degree-granting program**.
- **Content is determined by instructors** or instructional designers.
- Tends to be **stand-alone**, not requiring formal prerequisites or required subsequent SFT.
- Typically delivered to a group of learners who **enroll because of their interest** in the topic, rather than a mandate.
- Typically **developed and delivered by domain experts** outside of and separately from an institutional teaching role.

All Short Format Training should...

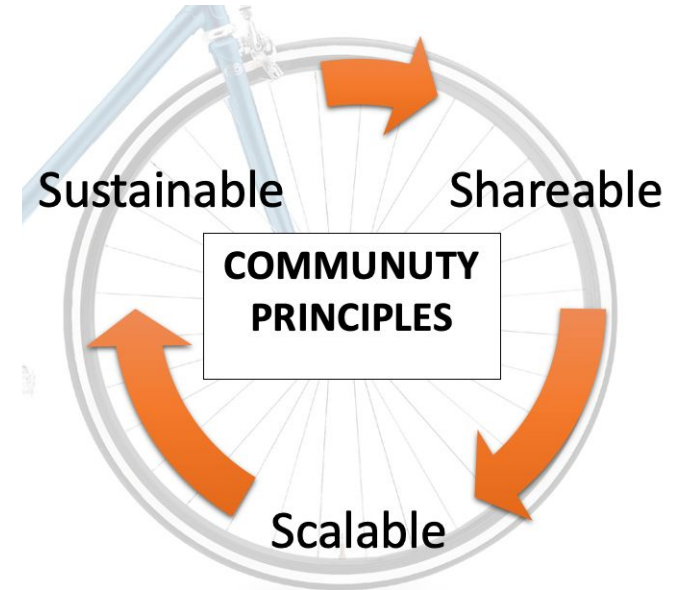
1. Use **Best Evidence**; grounded in findings from the education sciences and formally evaluated instruction.
2. Promote **Catalytic** learning; prepare learners to succeed when the application of knowledge, skills, and abilities requires further self-directed study.
3. Be **Effective**; provide evidence (i.e., from assessment, evaluation) to learners that they have made progress in achieving programmatic and learning goals.
4. Be **Inclusive**; maximize the ability of all learners to participate in and benefit from the learning experience.



The "unicycle" - fine for going alone

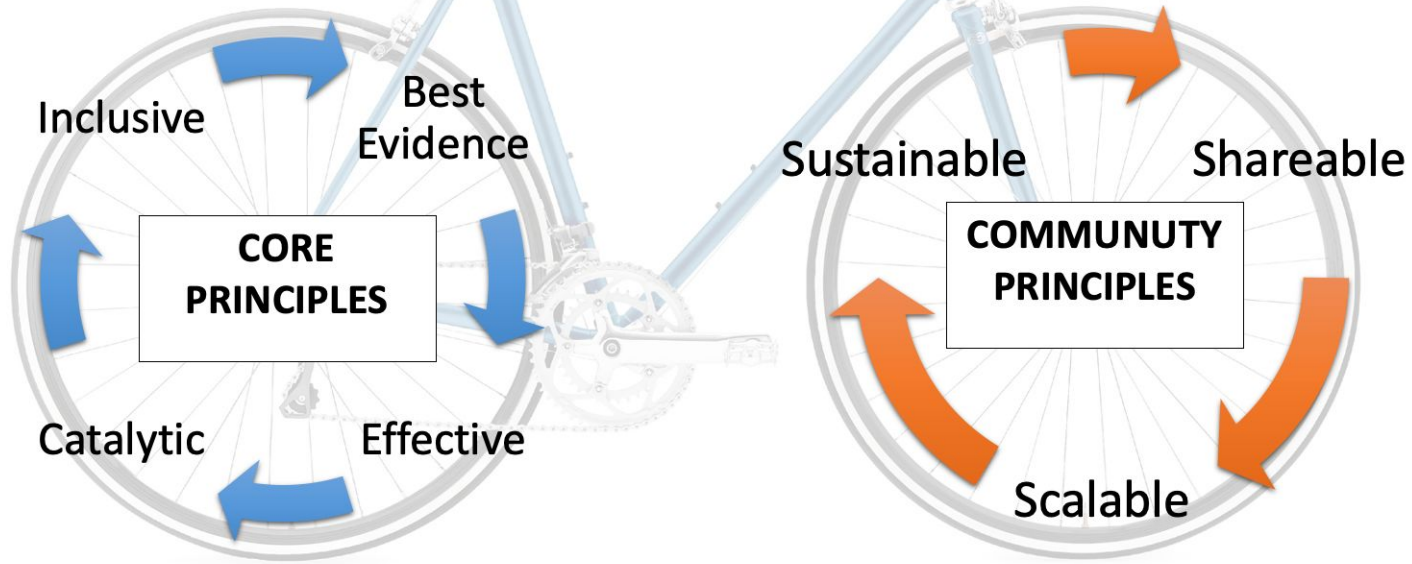
Community principles (when STF happens in)...

1. **Reach:** include new types and larger audiences of *learners*.
2. **Scale:** increase delivery of short-format training by new groups and larger numbers of *instructors and instructional developers*.
3. **Sustain:** work to maintain the availability, usability, relevance, and reliability of learning materials as well as supporting the supporting infrastructures, trainers, and communities which enable effective and inclusive training.



The "bicycle" - good for going far

“The bicycle” – good for going far



How to implement the principles in practice?

We collected a set of recommendations

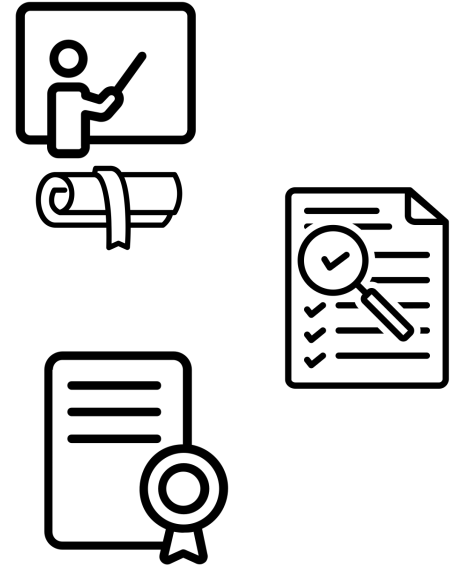
Descriptive Features

Every recommendation has six features:

- **Summary:** Expands upon what problem the recommendation tries to solve.
- **How might this work:** Brief implementation example and suggestions on evaluating success.
- **Related Principles:** Most closely related *Bicycle principles*.
- **Benefits to the learners:** How recommendation helps learners (directly or indirectly).
- **Incentives to Implementers:** Motivations for implementers to enact this recommendation.
- **Barriers to Implementation:** Obstacles that may hinder this recommendation.

Recommendations

- A. **Professionalize** the training of short-format training **instructors and instructional designers**
- B. **Centralize infrastructure** for short-format **training assessment** and evaluation
- C. Support **microcredentialing** of short-format training instructors



Institutional role in certifying training

Recommendations

- D. Operationalize equitable and inclusive practice in short-format training as an **ethical obligation**
- E. Deploy short-format training to **counter inequity**
- F. Make the Bicycle Principles **actionable for funders**



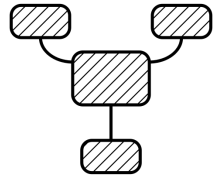
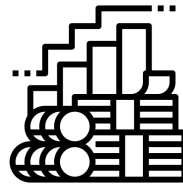
An ethical approach to training



Outreach to funders

Recommendations

- G. Clarify the **economic models** that enable short-format training
- H. **Document models** for high-fidelity reaching, scaling, and or sustaining of short-format training
- I. Apply **FAIR principles** to training materials



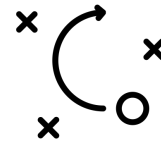
Planning (at all levels)

Recommendations

- J. Encourage interoperable short-format training **registries**
- K. **Communicate standards of instruction** through badging
- L. Develop an **implementation strategy** for Catalytic Learning



Institutional role (again!)



Make learning useful

Recommendations

- M. Support **integration of diagnostic assessment** into short-format training
- N. Encourage **evidence-based guidance** to support career-spanning learning



Feedback



Best evidence

One example of
recommendation:

Apply FAIR principles to
training materials

- **Summary:** The value of training materials increases [...]
- **How might this work:** [...] Specialized computational tools [...]
- **Related Principles:**
 - a. Core: Inclusive
 - b. Community: Reach, Scale, Sustain
- **Benefits to the learners:**
 - a. easier to find
 - b. more learners to be reached by training
 - c. adapt and customize materials to their needs
- **Incentives to Implementers:**
 - a. For Instructors and Instructional Designers
 - i. easier to locate and reuse
 - ii. credited by others
 - iii. collaboration and co-development
 - b. For Funders and Organizations
 - i. reducing effort duplication
- **Barriers to Implementation:**
 - a. mindset change needed, training and information resources may help
 - b. extra effort when designing materials, templates and clear guidelines may help
 - c. Institutional guidelines may prohibit application of FAIR

My personal summary

- Essential **role of the institution** to facilitate this process
- Assess what makes learning **effective and inclusive**



Where does this work continue

GitHub

Home ▾

- The need for a community-driven principle-based framework
- The Bicycle Principles for short-format training
- The Principles and this website
- Banbury Working Group
- Citations and publications
- Funding

► Recommendations and Surveys

Glossary and Definitions

Community Feedback and Next Steps

Introduction to the Recommendations [Next >](#)

The Bicycle Principles for Effective, Inclusive, and Career-spanning Short-format Training

Improving Professional Development in the Life Sciences and Beyond

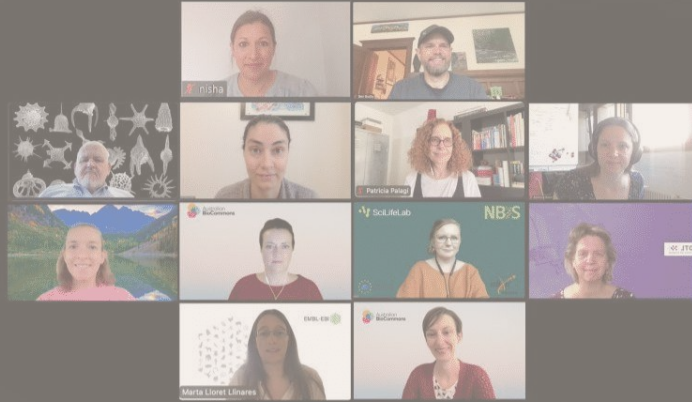
Announcement

November 2022

We're collecting feedback: Let us know what you think about the recommendations to improve short-format training. We will be conducting surveys and focus groups from now through February 2023. **Participants will be compensated for their time.**

- Let us know if you are interested by leaving your contact information on [this form](#).
- Visit the [feedback forum](#) to ask questions and start conversations. Join this low-traffic [mailing list](#) for updates.

Thank
you



bikeprinciples.org

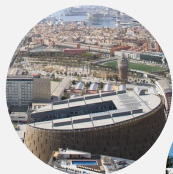


The Bio-IT project: one example of bottom-up initiative that gained institutional recognition



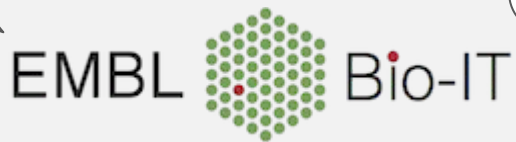
* Disclaimer: I manage the project and believe in its value, hence I am biased

Bio-IT: what, who, where



European Molecular
Biology Laboratory

Community initiative to build,
support and promote
computational biology
research at EMBL



The Project Managers:

Renato Alves



Lisanna Paladin

+ *The community!*



The project structure: four pillars



- Training
- Community
- Infrastructure / Resources
- Information



Courses and events

catalogue.bio-it.embl.de

Bio-IT Training Catalogue Skills & Topics Statistics

Bio-IT Portal

Training Catalogue

This site hosts a catalogue of the past training events offered by Bio-IT.

Browse recent events or use the **search** feature to find events according to your desired search parameters. Results will populate the table below. Click on a Course or Event title to learn more.

Search Catalogue

Keyword

Location

- EMBL Hamburg
- EMBL Barcelona
- EMBL-EBI Hinxton
- EMBL Heidelberg
- EMBL Rome
- EMBL Grenoble
- Online
- IPMB - Heidelberg University

Trainers

Internal/External

Start Date

Event Format

Experience Level

Internal/External

Skills

- Benchmarking bioinformatics tools
- Biological modelling
- Biological networks analysis
- Cloud computing
- Cluster computing (HPC)
- Command-line computing
- Computational workflow management
- Data management and curation
- Exploratory data analysis and visualisation (EDA)
- GPU computing
- Image analysis
- Programming languages
- Software project management
- Statistics and machine learning
- System administration
- Text mining
- Using specialised research software
- Web technologies

Topics

- Bioimaging
- Cancer genomics and personalised medicine
- Genomics and comparative genomics
- Instructor training
- Metabolomics
- Metagenomics and other meta-omics
- Multi-omics and single-cell integrative analysis
- Neurobiology and neuroinformatics
- Open Science
- Proteomics and protein analysis
- Structural biology

Version Control with Git

Course Overview

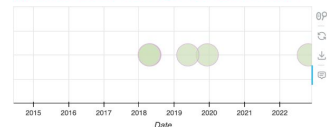
Description

Do you struggle to keep track of the changing versions of your scripts/programs? Have you ever made changes to a file, only to wish shortly afterward that you could easily get back the old version? Do you want to learn how to harness the awesome features of GitLab for collaboration, issue tracking, software publication, etc? This course aims to teach good practice in version control, using git in conjunction with the EMBL GitLab system. Participants will learn: how to maintain a history of changes with Git and how to compare differences between versions; how to restore old versions of files; how to synchronise local versions with a remote repository; how multiple developers can collaborate effectively on a project, and how to resolve conflicting changes; how to manage a project through the GitLab interface; how to choose the right license for a project; how to work with Git directly within your development environment (e.g. RStudio). The course will provide an introduction to Git via three different interfaces: the command line, a graphical client, and GitLab.

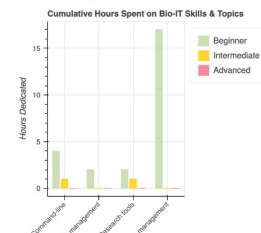
By the Numbers

Events Offered	5
Course Attendance	Minimum 11
	Maximum 37
	Total 124
Course Duration (Days)	Minimum 1
	Maximum 2
	Total 6

Timeline of Course Offerings (2018 to Present)



Curious how your time will be spent?



Interested in attending this course?

Click the button below to indicate your interest and join the mailing list for upcoming instances of the course.

Latest Course Resources:

Bio-IT Record (2022-10-24): <https://bio-it.embl.de/events/version-control-with-git-git-embl-de-git-week-basic-module/>

Git Repository (2022-10-24): <https://github.com/swcarpentry/git-novice>

Reference materials (2022-10-24): <https://pad.bio-it.embl.de/sd2Mk8YVSbuMg3Ki-nL6yA>

Events Offered

Version Control with Git & git.embl.de I Git week, basic module

Bio-IT Record: <https://bio-it.embl.de/events/version-control-with-git-git-embl-de-git-week-basic-module/>

Git materials: <https://github.com/swcarpentry/git-novice>

Reference materials: <https://pad.bio-it.embl.de/sd2Mk8YVSbuMg3Ki-nL6yA>

Start Date	2022-10-24
Course Duration (Days)	2
Course Attendance	27
Instructor(s)	Lisanna Paladin, Renato Alves
Location(s)	EMBL Heidelberg Online
Reach	Internal
Course Level	Beginner
Hours per Skill	Beginner Command-line computing: 3 Beginner Software project management: 3 Beginner Using specialised research software: 2

Coding clubs

EPUG Inactive	A bi-weekly meeting for Python users at EMBL.
emblr Inactive	A bi-weekly meeting for R users at EMBL.



python™









Grassroots



Name	Expertise	channels
Martin Larralde Updated	Using specialised research software, Programming languages, Cluster computing, Command-line computing, Cloud computing, Data management and curation, Software project management, Text mining, Benchmarking bioinformatics tools, Web technologies, Metagenomics and other meta-omics	-
Matthias Monfort Updated	Programming languages, Cluster computing, Computational workflow management, Software project management, Web technologies, System administration Nextflow & Galaxy (for NGS Workflow management), Javascript (front-end development e.g. eith Vue), Apache (web server setup), R/Rstudio setup, Unix	-
Nicolas Descostes Updated	Using specialised research software, Exploratory data analysis and visualisation, Programming languages, Cluster computing, Command-line computing, Computational workflow management, Software project management, Transcriptomics NGS Analysis, R, Galaxy	E-mail, Video Call on request
...		

 Welcomebot **BOT** 3:06 PM





Awesome! I've added you to the following channels:

- Bio-IT  Bio-IT channel for general bioinformatics, computational support
- Bio-IT-announce  Bio-IT channel for course/workshop and Bio-IT activity announcements
- cluster  EMBL Heidelberg HPC cluster support
- GBCS  Genome Biology Computational Support channel
- Mathematical Modelling  Genome Biology Computational Support channel
- STOCKS  Support channel for STOCKS EMBL's -GBCS electronic lab and data management system


You may also be interested in the following (click their name to join):

- Folding / AlphaFold  A channel to discuss protein folding with AlphaFold and related technologies
- How could be done better  A channel to discuss scientific figures and other kinds of scientific output in a constructive way



Awesome! I've added you to the following discussion channels for different programming related technologies:

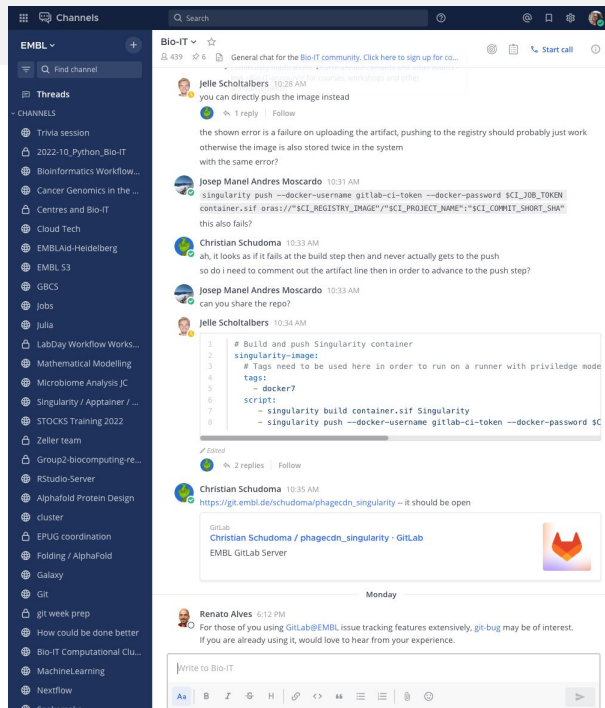
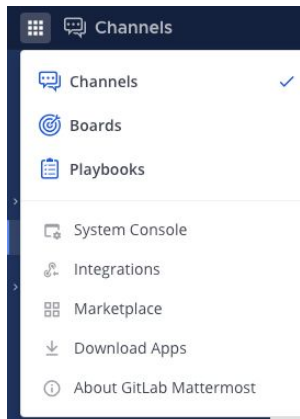
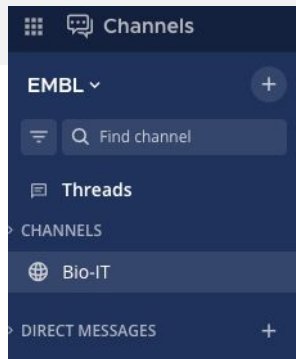
- Git  Git and EMBL's GitLab
- Julia  Julia
- MachineLearning  For classic and deep learning discussions
- Python  Python
- R_and_statistics  R and statistics
- RStudio-Server  RStudio EMBL server (by -GBCS)

Awesome! I've added you to the following support channels:

- Galaxy  Galaxy@EMBL (by -GBCS)
- Nextflow  Nextflow workflow manager
- Snakemake  Snakemake workflow manager
- Singularity / Apptainer / Docker  Singularity containers

Awesome! I've added you to the following channels:

- Jobs  Announce jobs and other opportunities in or outside of EMBL.
- marketplace  General trading, buy&sell, giveaways, lost&found, ...
- EMBLAid-Heidelberg  EMBLAid channel for Heidelberg (see also channels for other sites).



EMBL centers

Centre for Biomolecular Network Analysis

The mission of the Centre is to disseminate expertise, know-how and guidance in the field of biological network integration and analysis throughout computational biologists and experimentalists alike. For expert users embedded in experimental groups and spread around the Research Units, it will serve as a platform to share resources, exchange and learn about advances and new approaches in the computational analysis of networks. At the same time the Centre also offers support to experimentalists with less computational expertise, who wish to pursue large scale or to place small-scale mechanistic experiments in the context of networks. The education and training of EMBL researchers in the field of data integration and network analysis is a high priority of the Centre.

Centre for Bioimage Analysis

The Centre for Bioimage Analysis (CBA) supports scientists in extracting quantitative information from images acquired with light- or electron-microscopy.

Support is provided on various aspects of image analysis, such as

- image data handling
- quantitative image interpretation and visualisation
- image registration
- object segmentation and tracking
- morphological and intensity quantifications.

The CBA closely collaborates with the Advanced Light Microscopy Facility (ALMF) and the Electron Microscopy Core Facility (EMCF) in order to ensure optimal image acquisition modalities for downstream quantitative analysis.

Together with ALMF, EMCF and EMBL's IT department



Centre for Biological Modelling

The mission of the Centre for Biological Modelling (CBM) is to support interested EMBL scientists in adopting mathematical modelling techniques, and to foster the interchange of existing modelling expertise throughout EMBL. The services offered by the CBM are open to EMBL scientists of all career levels. Just write me an email or drop by at the Centres Office (Room 118 in Building 1E).

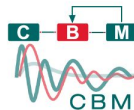
Please use the menu in the right hand side column of the page (scroll down to EMBL CENTRES) to explore the CBM and the different resources.

The CBM provides consultation appointments, performs collaborative modelling tasks, trains EMBL members in relevant programming languages and software tools and will foster collaboration and interactions between EMBL researchers using seminars, journal clubs as well as interdisciplinary retreats.

You have the data and the in depth knowledge of the system you are investigating and you know which question you want to answer. The CBM can provide you with guidance on modelling approaches and tools to support your attempts to answer your questions. Typically questions that can be tackled by modelling are:

- Is your current understanding of the systems mechanisms in accordance with your data?
- If not, what additional mechanism could improve consistency between data and what you believe is the process that leads to these data?
- Given your data, which of your hypotheses on how the components of your system interact is the most likely one?
- What is a quantitative measure of the effect of your experimental perturbations on your read out?
- Given your knowledge of the system you are studying, are there experiments that make more sense than others?
- Are there any feedback interactions in your system which are not obvious from the schematic representation?

The current expertise of the centre resides in first principles modelling using Ordinary, Random and Stochastic Differential Equations, Constraint-Based Modelling such as Flux Balance Analysis as well as Boolean and Mixture Modelling approaches. Nevertheless, inquiries concerning any kind of modelling are always welcome.



Bio-IT

The Bio-IT community initiative provides support to computational biology research through training, courses, consulting, networking opportunities, and computational resources and tools.

Contacts: Renato Alves and Lisanna Paladin (bio-it@embl.de)
Stop by our Drop-In Sessions Tuesdays 10am-12pm



Centre for Bioimage Analysis (CBA)

The CBA supports you in extracting quantitative information from images acquired with light- or electron-microscopy.

Contacts: Christian Tischer, Sebastian Gonzalez, and Arif Khan (image-analysis-support@embl.de)
Send a mail to schedule a consultancy session.



Centre for Biological Modelling (CBM)

The CBM aims to support you to adopt mathematical modeling techniques into your everyday research.

Contact: Eva Geissen (eva.geissen@embl.de)
Write me an email to request an appointment or come over to Room 118.



Centre for Statistical Data Analysis (CSDA)

The CSDA helps you to use adequate statistical methods throughout your research project, from the planning phase to data analysis.

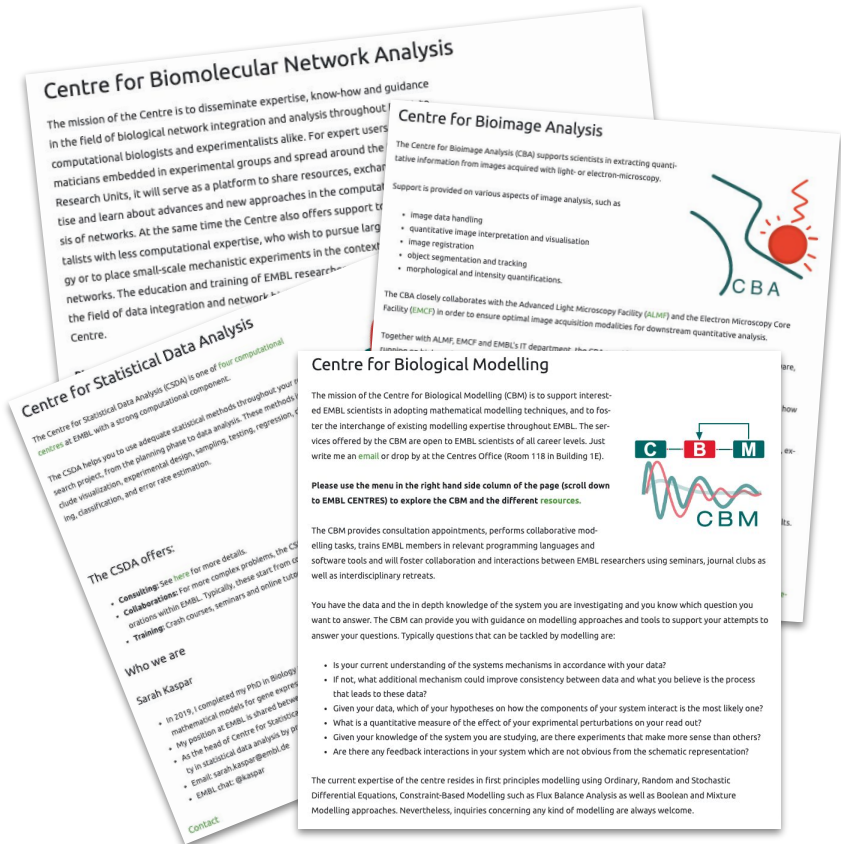
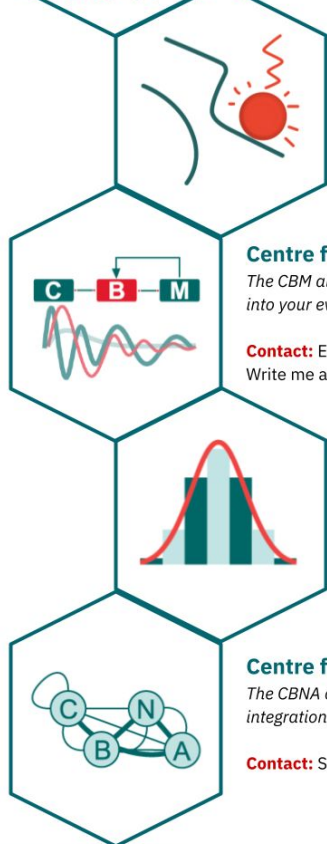
Contact: Sarah Kaspar (sarah.kaspar@embl.de)



Centre for Biomolecular Network Analysis (CBNA)

The CBNA disseminates expertise, know-how and guidance in network integration and analysis throughout EMBL.

Contact: Santhust (santhust@embl.de), Room 118



Newcomers guide

Bio-IT Newcomers Guide

Note that several linked pages in this document can be accessed only from inside the EMBL network

Table of contents

- [About Bio-IT Project](#)
- [Members of the Bio-IT Community](#)
- [Computational Resources](#)
- [Technical Setup](#)
- [Events](#)
- [Contacts](#)

About this document

This document is developed to help newcomers to learn all about computational systems at EMBL-HD, Bio-IT, and (almost) everything that will help them intergrate with the bio-computational community of EMBL Heidelberg.

The information in this guide overlaps with the material contained in the other documents useful for newcomers to EMBL. We also recommend that you check out the following resources:

- [Bio-IT EMBL website](#) for general information about Bio-IT activities.
- [EMBL website](#) for general information about EMBL.
- [EMBL newcomer's booklet](#) including information about first day best practices, housing, banking, medical service, childcare and family care, transportation, free time activities, additional informaton about Germany.
- [EMBL Staff Association website](#), including SA events calendar, forums and working groups and initiatives for the EMBL-ites' well being.
- [Heidelberg city guide](#), featuring city tour and events announcements.
- [Szilard library guide](#), including the catalogue and access information.

If you can't find the information that you were looking for, please go ahead and directly interact with the EMBL-ites via the [EMBL chat](#).

Acknowledgments

This guide borrows heavily (with permission) from the newcomers guides previously developed in the Zaugg and Huber Labs at EMBL. We thank the authors of those documents for their efforts and help.

Several sections also link out to the excellent [Netherlands eScience Center Guide](#).

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In summary: #collaboration



* The next slide was presented at the CW22

THE CONTEXT

European Molecular
Biology Laboratory

- Intergovernmental organisation
- 6 sites in EU, international staff
- Dynamic research context
- Open Science policy



TRAINING



INFORMATION



TOOLS



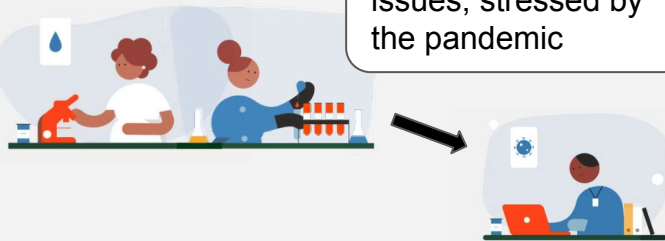
COMMUNITY



Community initiative to build,
support and promote computational
biology research at EMBL

THE PROBLEM

Context-related
issues, stressed by
the pandemic



- Remote work highlighted some challenges and opportunities
- Distributed nature of the institute
- Synergising experts' knowledge
- Standardisation of the training process
 - Identification of needs and design of training
 - Advertisement and delivery

THE SOLUTION

Platform to support computational training,
remote collaboration, community building



CHAT



SHARE
CODE



SHARE
INFO

and others...

- Allow people to communicate & train
- Allow people to work together
- Structured and accessible information

VISION

Structure a platform to
support collaboration,
building on what exists



bio-it.embl.de



bio-it@embl.de



@EMBL_BioIT