

# Preparing the next generation of scientists

## A TARGETED CURRICULUM DEVELOPED BY THE COMPUTATIONAL BIOLOGY DEPARTMENT

In 2016, upon request from the General Board of Directors, the Hub of bioinformatics and biostatistics in collaboration with the Image Analysis Hub developed a training program dedicated to PhD students. According to their background, students are strongly encouraged to validate the statistical modules, and choose additional bioinformatics and image analysis modules.

## A CORE FOUNDATION AND THE OPTION TO SPECIALIZE

Common core courses are mandatory for all IP PhD students. They include an introduction to reproducible research, experimental design and good scientific conduct. Each student then chooses a track of additional modules— R Programming and Statistics, Bioinformatics or Image Analysis—according to their background and field of research. We strongly encourage students who are not familiar with R or statistics to follow the corresponding modules.

## INSTITUTIONAL RECOGNITION

This PhD program has been acknowledged by the doctoral schools CdV, FIRE, SDSV and Bio SPC.



## MORE INFORMATION

### COURSE WEB PAGES

Updated information on the courses, as well as course content and descriptions are available on the main web-page:

<https://research.pasteur.fr/fr/course/bioinformatics-program-for-phd-students-2021-2022/>

Course material, attendance sheets and other practical information will be made available on Moodle:

<https://moodle01.hosting.pasteur.fr/>

### CONTACT

Get in touch with the Institut Pasteur Department of Computational Biology about education and training at: [bioinfo-program@pasteur.fr](mailto:bioinfo-program@pasteur.fr)

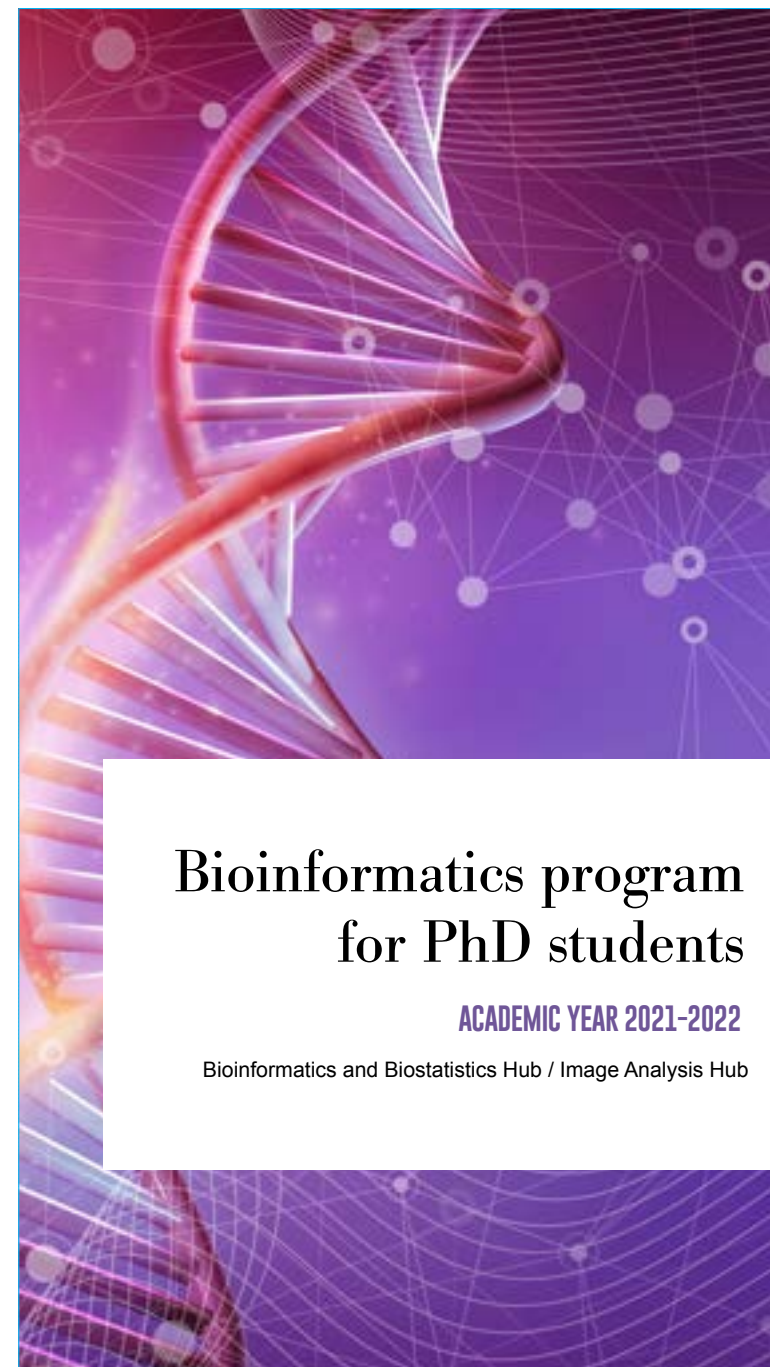
### TEACHERS

M. Almeida ; T. Bigot ; P. Campagne ; T. Chaze ; C. Chica ; S. Dallongeville ; A. Davidović ; R. De Rosa ; C. Duitama Gonzalez ; A. Dumoulin ; A. Ghazlane ; Q. Giai-Gianetto ; J. Guglielmini ; V. Guillemot ; B. Jagla ; H. Julienne ; B. Lelandais ; F. Lemoine ; B. Li ; Y. Loe-Mie ; H. Lopez-Maestre ; M. Louveaux ; N. Maillet ; C. Malabat ; M. Matondo ; S. Mella ; O. Mirabeau ; D. Mornico ; T. Obadia ; A. Pain ; E. Permal ; E. Perthame ; N. Pietroseoli ; R. Planel ; S. Rigaud ; V. Saint-André ; M. Thomas-Chollier ; J. Tinevez ; H. Varet ; A. Vaysse

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**Institut Pasteur**  
25-28, rue du Docteur Roux  
75724 Paris Cedex 15



# Bioinformatics program for PhD students

**ACADEMIC YEAR 2021-2022**

Bioinformatics and Biostatistics Hub / Image Analysis Hub

# Mandatory common core

This seven-hour course is required for all PhD students. The following topics will be covered:

- Description of the courses, the Department of Computational Biology, and the Hub of Bioinformatics and Biostatistics, and the Hub of Image Analysis
- Computer science 101
- Introduction to experimental design
- Good practices and reproducibility
- Ethics, good scientific conduct, and plagiarism

Between lectures, students will have the opportunity to assess their R programming and statistics level to help them choose which module to attend.

SESSION 1: October 21, 22, 2021 (morning: 9h30-13h00) - Teams

SESSION 2: February 4, 2022 (all day: 9h30-13h00 and 14h00-17h30) - ~~Département François Jacob, room 28-01-01A~~ - Teams

# R Programming and Statistics (RS)

Knowledge of R Programming and Statistics is strongly recommended for all Institut Pasteur PhD students. Students already proficient in any one of these topics can skip any or all modules in this track.

## RS1 Introduction to R and Statistics

FR SESSION 1 (12h): November 2-5, 2021 (mornings) - Teams  
SESSION 2 (18h): April 4-6, 2022 (all day) - rooms 2 and 3

## RS2 Hypothesis testing (12h)

FR SESSION 1: November 8, 9, 10, 15, 2021 (mornings) - Teams  
SESSION 2: April 7, 8, 2022 (all day) - rooms 2 and 3

## RS3 Linear models (12h)

FR SESSION 1: November 17, 18, 19, 22, 2021 (mornings) - Teams  
SESSION 2: April 11, 12, 2022 (all day) - rooms 2 and 3

## RS4 Multivariate analyses (12h)

FR SESSION 1: November 23, 24, 25, 26, 2021 (mornings) - Teams  
SESSION 2: April 14-15, 2022 (all day) - rooms 2 and 3

# Bioinformatics (B)

In this track, we propose modules covering a wide range of bioinformatics tools used to treat and analyze -omics data. Please check the prerequisites before registering.

## B1 Unix basic commands (12h)

February 17-18, 2022 (all day) - room 5

## B2 Introduction to sequence analysis (12h)

February 24-25, 2022 (all day) - room 6

## B3 Proteomics data analysis (12h)

February 28 and March 1, 2022 (all day) - room 6

## B4 Refresher on utilities for HTS data analysis (6h)

March 3, 2022 (all day) - room 6

## B5 Basic concepts in HTS data analysis (6h)

March 4, 2022 (all day) - room 6 Prerequisite: B4

*B4- and B5-dependant modules:*

## B6 Expression, quantification, differential analysis (6h)

March 21, 2022 (all day) - room 6 Prerequisites: B4 + B5

## B7 Variant calling (6h)

March 22, 2022 (all day) - room 6 Prerequisites: B4 + B5

## B8 Genotype data and association studies (6h)

March 23, 2022 (all day) - room 6 Prerequisites: B4 + B5

## B9 ChiP-seq data analysis (6h)

March 24, 2022 (all day) - room 6 Prerequisites: B4 + B5

## B10 Metagenomics (6h)

March 25, 2022 (all day) - room 6 Prerequisites: B1 + B4 + B5

*B6-dependant modules:*

## B11 Single cell analysis (12h)

March 28-29, 2022 (all day) - room 6 Prerequisites: B1 + B6

## B12 Functional analysis (12h)

March 30-31, 2022 (all day) - room 6  
Prerequisites: RS1 + B5 + B6

## B13 Advanced UNIX commands (12h)

May 19-20, 2022 (all day) - room 6 Prerequisite: B1

# Image Analysis (IA)

This track serves as a practical introduction to the common tools of Biome Image Analysis. It is designed for students with no prior knowledge in image analysis.

## IA1 Getting started in Biome Image Analysis with Fiji (6h)

SESSION 1: January 11, 2022 (all day) - ~~room 5~~ - Teams  
SESSION 2: May 31, 2022 (all day) - room 6

## IA2 Using Icy for Biome Image Analysis (3h)

~~SESSION 1: January 12, 2022 (morning) - room 5 - CANCELLED~~  
SESSION 2: June 1, 2022 (morning) - room 6

## IA3 Advanced Icy features: scripting and protocols (3h)

~~SESSION 1: January 12, 2022 (afternoon) - room 5 - CANCELLED~~  
SESSION 2: June 1, 2022 (afternoon) - room 6

## IA4 Reconstruction of super-resolution images (3h)

SESSION 1: January 13, 2022 (morning) - ~~room 5~~ - Teams  
SESSION 2: June 2, 2022 (morning) - room 6

## IA5 Using Machine Learning for Biome Image analysis (3h)

~~SESSION 1: January 12, 2022 (afternoon) - room 5 - CANCELLED~~  
SESSION 2: June 2, 2022 (afternoon) - room 6

## PRACTICAL DETAILS

### Language

Courses are taught in English except when marked with the FR symbol, in which case they are held in French.

### Times for RS, B and IA modules

Morning = 9h30 - 12h30 (9:30am-12:30pm)

Afternoon = 14h00 - 17h00 (2-5pm)

All day = 9h30-12h30 and 14h00 - 17h00 (9:30am-12:30pm and 2-5pm)

### Locations

Rooms 2, 3, and 6 are in the Education Center. Room 5 is in the "module" below the cantine.