

Module 4 / FISABIO Summer School in Biomedical Research and Public Health: Microbial Genomics & Metagenomics Workshop

Dates: July 20th – July 24th 2026

Organizer: M. Pilar Francino

The workshop is addressed to students and professionals of biology, biomedical research, the health sciences and related fields who are interested in learning and sharing concepts, tools and research results in genomics, metagenomics and the human microbiome. The workshop will train participants in state-of-the-art analytical methods in this area, by means of theoretical lectures and seminars as well as practical hands-on sessions in bioinformatics and biostatistics. Several sessions will be devoted to training in the use of the Integrated Microbial Genomes system (IMG), a database and analysis platform developed at the U.S. DOE Joint Genome Institute (Berkeley, California) for comprehensive studies of genomes and metagenomes. The IMG system will be presented by Dr. Mateus Fiamenghi and Dr. Rheka Seshadri from the JGI's Microbiome Data Science Program, the group responsible for IMG development. In addition, Dr. Vanessa R. Marcelino (Institute of Agrochemistry and Food Technology IATA-CSIC) and Dr. Kshitij Tandon (University of Melbourne) will introduce concepts and methodologies of metabolic reconstruction for single genomes and bacterial communities.

Instructors:

Giuseppe D'Auria, PhD. Scientist, FISABIO-PUBLIC HEALTH, Genomics and Health Area and CIBERESP. Coordinator of FISABIO Sequencing and Bioinformatics Service (giuseppe.dauria@fisabio.es).

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Mateus Fiamenghi, PhD. Scientist, JGI, Microbial Genomics & Metagenomics Scientific Program (MBFiamenghi@lbl.gov).

David Páez, PhD. Associate Director of Discovery Informatics at Mammoth Biosciences (davi@anciliabio.com).

Mariana Reyes, PhD. Scientist, FISABIO- PUBLIC HEALTH, Bioinformatician at the Sequencing and Bioinformatics Service (mariana.reyes@fisabio.es).

Vanessa Rossetto Marcelino, PhD. Scientist, Institute of Agrochemistry and Food Technology (IATA-CSIC) (vrmarcelino@iata.csic.es).

Rekha Seshadri, PhD. Scientist, JGI, Microbial Genomics & Metagenomics Scientific Program (rseshadri@lbl.gov).

Kshitij Tandon, PhD. Postdoctoral Researcher, University of Melbourne (k.tandon@unimelb.edu.au)

Module program:

Monday July 20th:

- 09:00 - 10:00 Welcome and Overview of the Workshop by Dr. M. Pilar Francino, Dr. Rekha Seshadri and Dr. Mateus Fiamenghi.

- 10:00 - 11:00 Features and Diversity of Microbial Genomes by Dr. M. Pilar Francino.

Break

- 11:15 - 13:15 Microbial Communities, the Human Microbiome and its Relationship to Health by Dr. M. Pilar Francino.

Lunch

- 15:00 - 16:30 Introduction to the Analysis of Bacterial Communities by Dr. M. Pilar Francino.

- 16:30 - 18:00 DNA Sequencing: History and Recent Technologies by Dr. Giuseppe D'Auria.

Tuesday July 21st:

- 09:00 - 11:00 Informatic Processing, Quality Control, and Assembly of Sequencing Reads by Dr. Mariana Reyes.

Break

- 11:15 - 12:15 Introduction to the Integrated Microbial Genomics System by Dr. Rekha Seshadri.

- 12:15 - 13:15 Introduction to Functional Annotation and Comparative Genomics in IMG by Dr. Rekha Seshadri

Lunch

- 15:00 - 16:00 Isolate Comparative Genomics Case Study: Live Demo by Dr. Rekha Seshadri

- 16:00 - 18:00 Hands-on Exercise, Review and Discussion of Solutions (student work and supervision by Dr. Rekha Seshadri and Dr. M. Pilar Francino).

Wednesday July 22nd:

- 09:00 - 10:00 Introduction to IMG/M Metagenome Analysis by Dr. Mateus Fiamenghi

- 10:00 - 11:00 Metagenome Comparisons Case Study: Live Demo by Dr. Mateus Fiamenghi.

Break

- 11:15 - 13:15 Hands-on Exercise, Review and Discussion of Solutions (student work and supervision by Dr. Mateus Fiamenghi and Dr. M. Pilar Francino).

Lunch

- 15:00 - 18:00 CRISPR Analyses and Uncovering the Earth's Virome by Dr. David Páez-Espino.

Thursday July 23rd:

- 09:00 - 11:00 Preparation of student analysis projects: students form groups, choose their genome or metagenome analysis project and start carrying it out (student work and supervision by Dr. Rekha Seshadri, Dr. Mateus Fiamenghi and Dr. M. Pilar Francino).

Break

- 11:15 - 13:15 Preparation of student analysis projects: students complete their genome or metagenome analysis project and prepare a presentation (student work and supervision by Dr. Rekha Seshadri, Dr. Mateus Fiamenghi and Dr. M. Pilar Francino).

Lunch

- 15:00 - 18:00 Presentations of genome or metagenome analysis projects by student groups (student work and supervision by Dr. Rekha Seshadri, Dr. Mateus Fiamenghi and Dr. M. Pilar Francino).

Friday July 24th:

- 09:00 - 11:00 Introduction to metabolic models of microbial communities by Dr. Vanessa R. Marcelino and Dr Kshitij Tandon

1) Introduction.

2) Genome-scale Metabolic Modeling: Live Demo.

Break

- 11:15 - 12:45 3) Expanding Genome-scale Metabolic Modeling to Bacterial Communities: Hands-on Exercise.

- 12:45 - 13:15 Workshop Summary and Discussion by Dr. M. Pilar Francino