

Scientific program

Subject: Many metabolic pathways are involved in host cell response to infection, such as glycolysis, TCA cycle, pentose phosphate pathway, amino acid synthesis, fatty acid synthesis and oxidation, lipidome and proteome changes. The aim of the school is to shed light on fingerprints of the cellular metabolic pathways perturbed by infection and drug-response by exploiting complementary approaches and fostering their integration. Hints of techniques for the preparation of biological substrates will be also given. Theoretical lessons will introduce the practical sessions on high-throughput screening by cell imaging, IR chemical imaging, UV-resonant Raman chemical imaging and AFM biomechanical imaging and data analysis, with the aim to build a multi-dimensional reference space for host-pathogen interaction. Each module will be taken care of by the staff involved in the PRP@CERIC project. For each module, selected Invited Speakers will introduce the theoretical session offering a perspective of the field.

The school consists of 7 modules divided into two sessions (session I from 14 to 25 October and session II from 18 to 29 November) including theoretical lessons and practical/hands-on.

Phenotypic Fingerprinting school

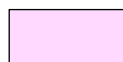
Session I

(14-25 October 2024) – 9 days

Module	Location	Duration	Description
1. Host-pathogen interaction models and HTS imaging	Area-Padriciano, ICGEB Labs	2 ½ days	<p><u>Theoretical lessons:</u> Principles of HTS-based drug discovery approaches with a focus on cell-based assay development for high content imaging screening: model cell and organoid systems, readout strategies, image acquisition, image and data analysis.</p> <p><u>Practicals:</u> Hands-on HTS on a model assay: from library preparation to data analysis.</p>
2. Genomics Single-Cell RNA-Seq Workshop	Area-Padriciano	3 days	<p><u>Theoretical lessons:</u> Through a blend of informative lectures participants will acquire the knowledge and proficiency needed to produce, handle, analyze, and integrate single-cell data using widely-accepted tools and methodologies.</p> <p><u>Practicals:</u> Hands-on Single-Cell RNA-Seq library preparation including library automatization, library QC, and NGS sequencing. The Workshop is crafted to offer a comprehensive introduction from production to analysis of single-cell RNA sequencing data.</p>
3. Atomic Force Microscopy (AFM) biomechanical imaging	Area-Basovizza, Elettra Labs	3 days	<p><u>Theoretical lessons:</u> Principles of AFM imaging and Force spectroscopy in liquid environment; high speed AFM; quantitative biomechanical mapping. Examples on: single molecules; cell membranes; individual cells; organoids and tissues.</p> <p><u>Practicals:</u> Hands-on AFM fast topographic imaging and quantitative biomechanical imaging, in physiological environment, with temperature/humidity control.</p>
4. Data analysis, data integration and data management	Area-Padriciano	½ day	<p>This module will be devoted to multiple-techniques data analysis, and in particular to the correlation of integrated data analysis, applied to the study of pathogen-host interaction.</p>

Phenotypic Fingerprinting school

Timetable		October 2024 (session I)											
		Mon 14	Tue 15	Wed 16	Thu 17	Fri 18	Sat 19	Sun 20	Mon 21	Tue 22	Wed 23	Thu 24	Fri 25
09:00	10:00	Lunch	Practicals	Practicals	Theory	Practicals			Data analysis and integration	Invited speaker	Practicals	Practicals	Data management
10:00	11:00												
11:00	12:00												
12:00	13:00												
13:00	14:00	Lunch	Lunch	Lunch	Lunch	Lunch			Lunch	Lunch	Lunch	Lunch	Lunch
14:00	15:00	Theory	Practicals	Invited speaker	Practicals	Practicals			Invited speaker	Practicals	Practicals	Practicals	
15:00	16:00												
16:00	17:00												
17:00	18:00												



1. **Host-pathogen interaction models and HTS imaging** (ref. Luca Braga, ICGB)



2. **Genomics** (ref. Danilo Licastro, Area Science Park)



3. **Atomic Force Microscopy (AFM) biomechanical imaging** (ref. Loredana Casalis, Elettra Sincrotrone)



4. **Data analysis, data integration and data management** (ref. Stefano Cozzini, Area Science Park)

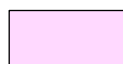
Session II

(18-29 November 2024) – 9 days

Module	Location	Duration	Description
1. Micro- and nano-machining for biology	Area-Basovizza, CNR-IOM Labs	3 days	<p><u>Theoretical lessons:</u> Basics of Micro- and Nanofabrication, principles of etching and thin film deposition, soft-lithography and replica moulding, microfluidics; materials and processes compatibility with biological samples.</p> <p><u>Practicals:</u> Hands-on clean room environment, UV-lithography for patterning, replica moulding processing, PDMS sealing of microfluidic devices, sample characterization.</p>
2. Infrared (IR) chemical cytology (cellular imaging)	Area-Basovizza, Elettra Labs	2 ½ days	<p><u>Theoretical lessons:</u> Basics of FTIR microspectroscopy; Far-field and near-field IR chemical approaches; Basics on data analysis and on the interpretation of IR cellular spectra.</p> <p><u>Practicals:</u> Hands-on imaging of the cellular models as produced in Module 1 with FTIR chemical imaging and O-PTIR imaging</p>
3. UV-Raman chemical cytology (cellular imaging)	Area-Basovizza, Elettra Labs	3 days	<p><u>Theoretical lessons:</u> Theory of Raman and UV Resonance Raman scattering, principles of Raman instrumentation (including micro- and macro- sampling mode), examples of Raman spectra of biological samples, data processing and interpretation.</p> <p><u>Practicals:</u> Hands-on Raman imaging of the cellular models with Raman spectroscopy exploiting off-line (laser) sources. UV-IR correlated data analysis.</p>
4. Data analysis, data integration and data management	Area-Padriciano	½ day	<p>This module will be devoted to multiple-techniques data analysis and data integration and management, and in particular to the spatial and temporal correlation of integrated data from chemical cytology by means of IR and UV-Raman analysis, also with AFM tissue biomechanics and classical histology (by immunofluorescence). Such an integrated, spatially-resolved immune-chemical-biomechanical approach will be applied to the study of pathogen-host interaction.</p>

Phenotypic Fingerprinting school

Timetable		November 2024 (session II)											
		Mon 18	Tue 19	Wed 20	Thu 21	Fri 22	Sat 19	Sun 20	Mon 25	Tue 26	Wed 27	Thu 28	Fri 29
09:00	10:00	Lunch	Practicals	Practicals	Practicals	Practicals			Practicals	Invited speaker	Practicals	Practicals	Data management
10:00	11:00												
11:00	12:00												
12:00	13:00												
13:00	14:00	Lunch	Lunch	Lunch	Lunch	Lunch			Lunch	Lunch	Lunch	Lunch	Lunch
14:00	15:00	Invited Speaker	Practicals	Practicals	Invited Speaker	Practicals			Data analysis and integration	Practicals	Practicals	Data analysis and integration	
15:00	16:00												
16:00	17:00												
17:00	18:00												



1. **Micro- and nano- machining for biology** (ref. Simone Dal Zilio, CNR-IOM)



2. **IR chemical cytology (cellular imaging)** (ref. Lisa Vaccari, Elettra Sincrotrone)



3. **UV-Raman chemical cytology (cellular imaging)** (ref. Barbara Rossi, Elettra Sincrotrone)



4. **Data analysis, data integration and data management** (ref. Stefano Cozzini, Area Science Park)