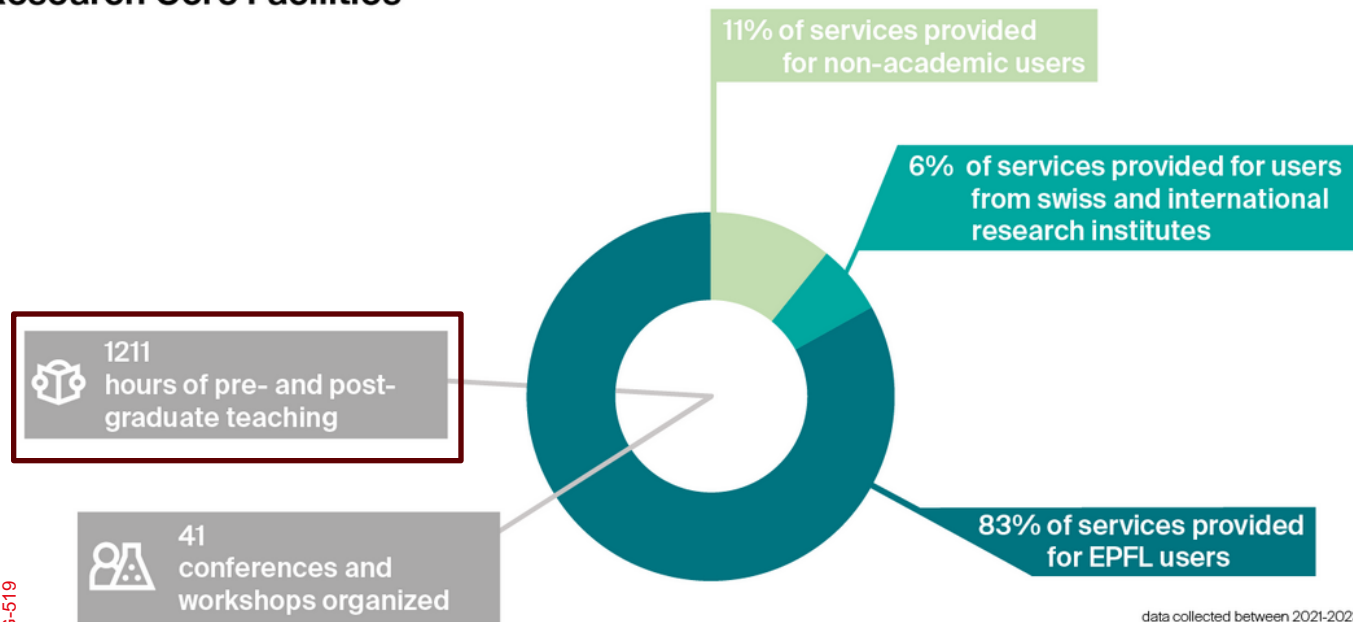


OMICS in Biomedical Research

BIOENG-519

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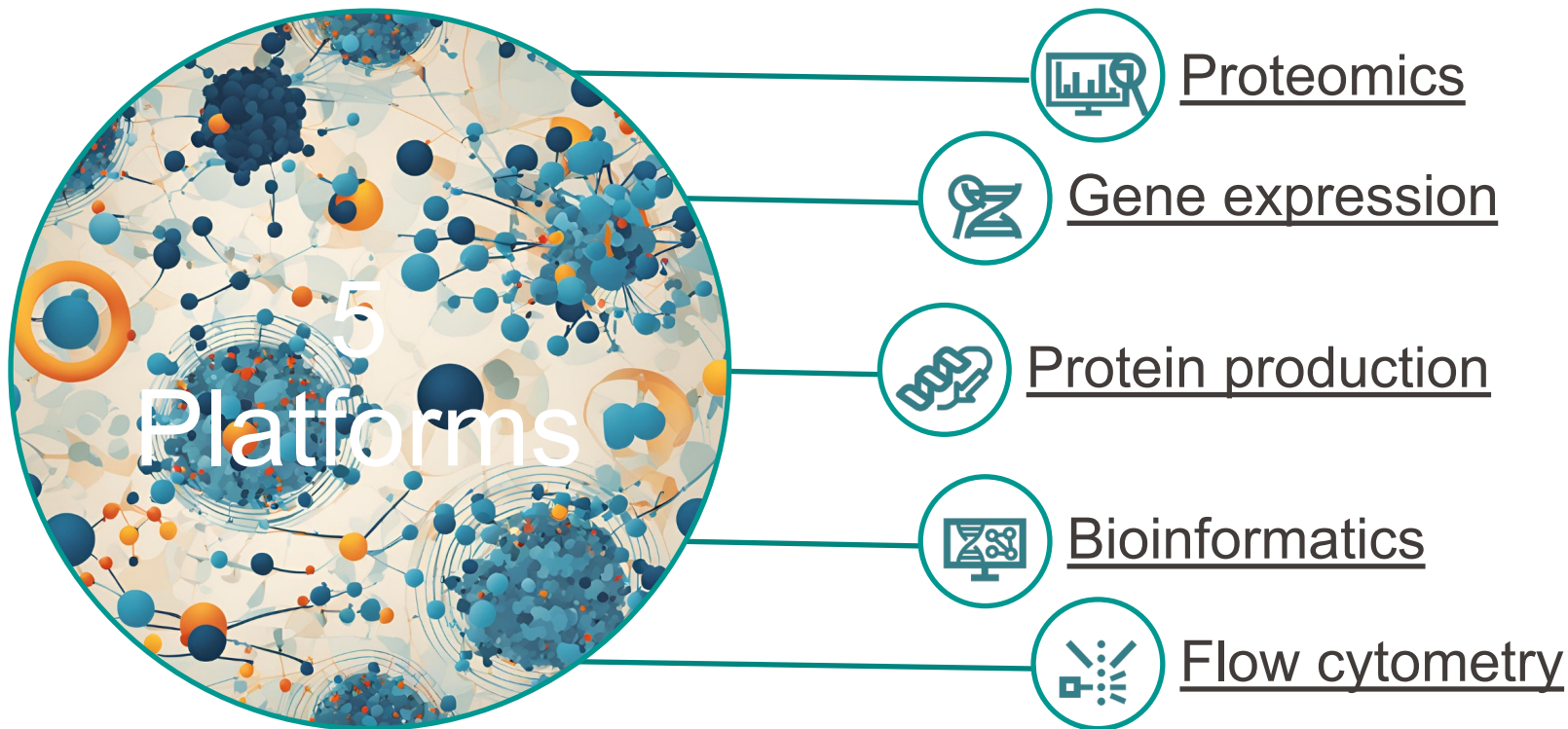
Research Core Facilities



data collected between 2021-2023



Dr. Roman Chrast,
coordinator of RCF

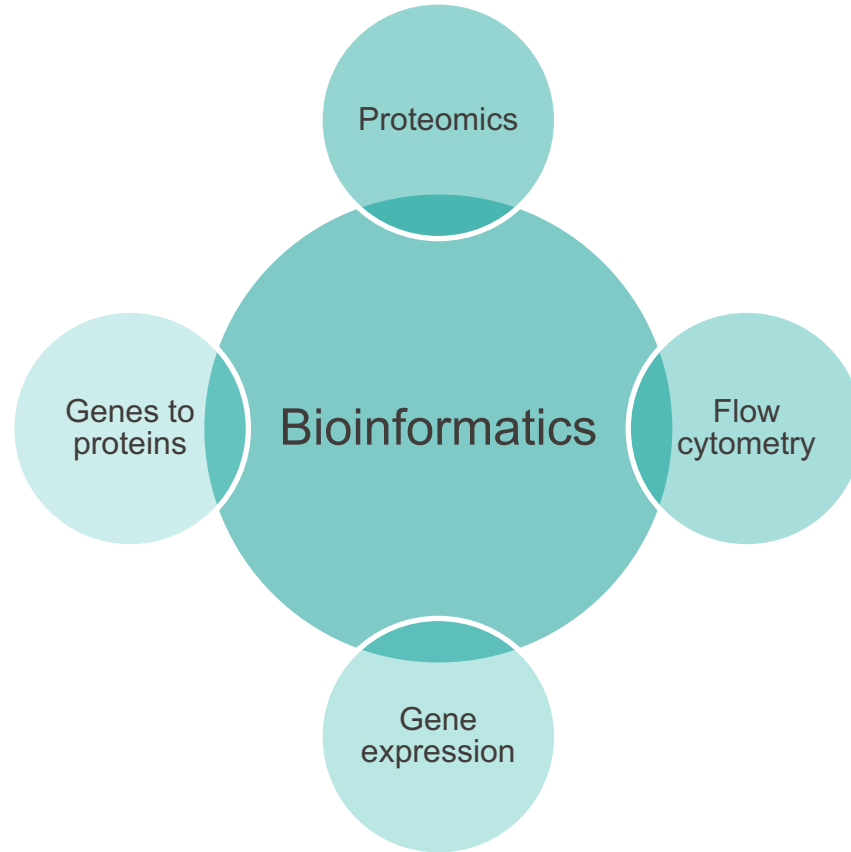


- ✓ Course will be held in person (no Zoom - no recordings)
- ✓ Practicals are mandatory
- ✓ Exam
 - 40% - reports covering 4 lab rotations (the format of the evaluation will be communicated to you by participating platforms)
 - 60% - written exam during official exam session (for the written exam, each of the covered topics will count 1/5)
- ✓ Course material will be available via Moodle
- ✓ Contact for general course organization related questions: roman.chrast@epfl.ch

Date / Time	Sept 13 th	Sept 20 th	Sept 27 th	Oct 4 th	Oct 11 th	Oct 18 th	Oct 25 th	Nov 1 st	Nov 8 th	Nov 15 th	Nov 22 nd	Nov 29 th	Dec 6 th	Dec 13 th	Dec 20 th
8:15-10:00	Intro	Protein production	Gene expression	Platform rotations			FREE	Platform rotations					Bioinformatics		
10:15-12:00	Intro	Proteomics	Flow cytometry												

■ CO 120

CO 120



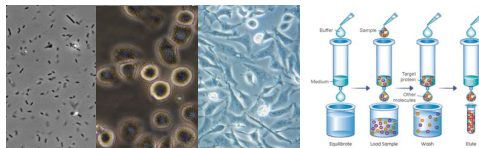


Lecture

How has the production of recombinant proteins revolutionized our lives

Strategies for production of recombinant proteins in different hosts

- Purification of proteins by affinity tags and other chromatography techniques
- State-of-the-art biophysical methods to ensure quality of purified proteins



Week 1: Purification of recombinant proteins by affinity

Week 2: Protein Quality control (QC) using biophysical techniques such as 2MP and DLS

Covered topics:

- Hands-on experience and expertise in the most advanced techniques used in the production and purification of recombinant proteins.
- Strategies to optimize protein production and ensure high-quality outputs.

Practicals



PCF

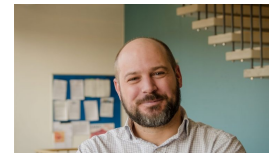
Lecture

Introduction in Proteomics

Mass Spectrometry-based
Proteomics WorkflowsWeek 1: In-gel digestion and basic
mass spectrometry principlesWeek 2: Database search and
protein annotation principles**Covered topics:**

- Bottom-up mass spectrometry-based proteomics (from sample preparation to data analysis)
- Mass spectrometer hands-on experience

Practicals

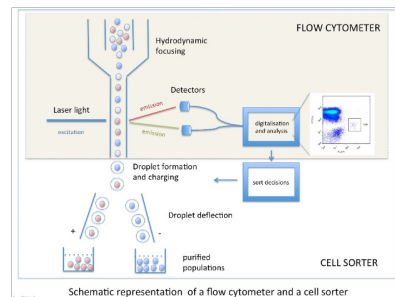


Lecture

Introduction to Flow Cytometry & Cell Sorting

How it works

Examples & applications



Week 1: Acquisition of stained cells on instruments

Week 2: Sorting demo & analysis +
Wrap up and discussion/conclusion

Covered topics:

- Instrument set up & QC
- Acquisition settings
- Data analysis and QC
- Standardization
- Cell Sorting

Practicals



Lecture

The NGS toolbox

Gene expression analysis (single cell and bulk)

Week 1: quantification and quality control of nucleic acids

Week 2: single cell transcriptomics

Covered topics:

- Methods for quantification of RNA/DNA
- Methods for QC of RNA/DNA
- 10X Genomics single cell transcriptomics experiment and downstream data QC

Practicals

Bioinformatics- Christian Iseli and Nicolas Geux



BICC

Lecture & Practicals

Week 1: Analysis of flow cytometry data

Week 2: Analysis of RNAseq data

Week 3: Analysis of proteomics data

Covered topics:

- Mission of a bioinformatic facility
- Experimental design and sample nomenclature
- Protein, transcript and genome reference databases, nomenclature
- Biological function knowledge, protein and gene annotations
- Data QC, mapping, analysis and visualization
- Data clustering and its applications: theory and practice
- Data formats and handling
- Variant calling, peak calling, quantification, GSEA
- Evaluation of genetic mutation impact

Quiz

- ✓ Your group is working on a new blood disease which affects one type of white blood cells, the eosinophils while all other white blood cell types (neutrophils, basophils, monocytes, T cells and B cells) are not affected. A mouse model which mimics the human pathology exists and your initial characterization of this model showed that eosinophils in adult mutant mice (2 months old) present an increased accumulation of eosinophil granules.
- ✓ You would like to understand the molecular mechanism(s) underlying the disease. Think about samples that you will need, methods that you will use to analyse them and finally the way you will treat the data (results) that you will generate.
- Prepare a 10 minute presentation to sell it to a panel of investors that are deciding if they will spend their money on your project.

Ground rules:

- No internet research allowed
- When working on your strategy, you can ask questions to anyone in the room
- You can use PowerPoint and/or white-board to present your approach
- You can decide who will be presenting your project (it can be 1 person or a group of persons)

Cellular structure, receptors and mediators of wild-type eosinophils

