

13/10/2021 – 15/11/2021:

FUNDAMENTALS 2 (engineering molecular systems – bottom-up approaches)

ASSEMBLY & SYNTHESIS (I) + **TOOLS (I)** + **FRONTIERS**

Day	Lectures / Activities	Teachers
	Lectures ASSEMBLY & SYNTHESIS I (in black) Lectures TOOLS 1 (in blue)	
	L1 (10:00-11:00) L2 (11:15-12:15) L3 (12:30-13:30) L4 (afternoon sessions - OPTIONAL) MOST F2 LECTURES WILL BE AT CIB (EXCEPT THOSE AT IQFR, AS SHOWN IN THE CALENDAR) (*) Online	
11/10/21	NON LECTIVE	
12/10/21	HOLIDAY	
13/10/21	10:00 – 10:30: Introduction to FUNDAMENTALS 2 MOLECULES OF LIFE AND THEIR INTERACTIONS 10:45 – 11:45: Macromolecules and small molecules. Molecular recognition. 12:00 – 13:00: Non-covalent interactions. 15:00 – 16:00: Basis of the Chemical Biology	G Rivas (CIB) S Martín-Santamaría / R Pérez (CIB)
14/10/21	10:00 – 11:30: Nucleic acids (natural and synthetic) 12:00 – 13:30: Lipids – essential concepts & assembly (membranes) 15:00 – 16:00: Carbohydrates – molecular recognition	C González (IQFR) I López Montero (UCM) FJ Cañada (CIB)
15/10/21	10:00 – 11:30: Molecular interactions in the test tube and the living cell: implications for synthetic biology research 12:00 – 13:30: Bottom-up biology: a biophysical approach	G Rivas (CIB) I López - Montero (UCM)

Day	Lectures / Activities	Teachers
18/10/21	Session on minimal cells (*) 16:00 – 16:45: J Pelletier's talk - <i>Genetic requirements for cell division in a genomically minimal cell</i> (*) 16:45-17:30: Round-table (*)	J Pelletier (UCM) C Danelon (TU Delft) R Gil (I2SysBio-UVA)
19/10/21	ESSENTIAL CELLULAR PROCESSES 10:00-11:00: Information processing - replication 11:15-12:15: Information processing – transcription 12:30-13:30: Information processing - translation (*)	R Bermejo (CIB) CF Tornero (CIB) M Valle (BioGune)
20/10/21	10:00 – 12:00: Protein folding and assembly 12:30 – 13:30: Protein modifications	D Laurents (IQFR) D Pérez-Sala (CIB)
21/10/21	10:00 - 11:00: Organization – cytoskeleton / cell division 11:30 – 13:00: Organization – cytoskeleton / intracellular traffic 15:00 – 16:00: Organization – signaling and cell adhesion	G Rivas (CIB) MA Peñalva (CIB) D Lietha (CIB)
22/10/21	10:00 – 11:00: JOURNAL CLUB 0	

Day	Lectures / Activities	Teachers
25/10/21	INTEGRATED STRUCTURAL BIOLOGY (1) 10:00 – 11:00: Introductory remarks (*)	CF Tornero (CIB)
26/10/21	INTEGRATED STRUCTURAL BIOLOGY (2) <u>Sessions at IQFR Main Hall</u> 10:00-10.45: Fundamentals of X-ray Crystallography: from molecules to crystals and beyond” Short application notes (20 min + 10 min for discussion) 11:00-11:30: Membrane Maintenance at Contact Sites 12:00 12:30 Glyco-Synthetic Biology 12:30 13:00 Conformational Versatility in Protein Complexes (*) 14:30-16:30 Practical session: Crystallization, data collection and structure solution	JA Hermoso (IQFR) A Albert (IQFR) J Sanz (IQFR) C Vega (CIB) L Infantes et al(IQFR)
27/10/21	INTEGRATED STRUCTURAL BIOLOGY (3) <u>Morning sessions at IQFR Main Hall</u> 10:00 - 11:00: NMR – fundamentals 11:15 - 12:15: NMR - Nucleic acids 12:30 - 13:30: NMR - Proteins 15:30 - 16:30: NMR – practical session <u>Afternoon session at CIB-Margarita Salas</u>	F Blanco (CIB) C González (IQFR) J Oroz (IQFR) FJ Cañada (CIB)
28/10/21	INTEGRATED STRUCTURAL BIOLOGY (4) 10:00 - 11:00: EM – fundamentals 11:15 – 12:15: EM – reconstructing cellular machines (1) 12:30 - 13:30: EM – reconstructing cellular machines (2) (*) 15:00 - 16:30: EM – practical workshop	E Arias (CIB) CF Tornero (CIB) JM Valpuesta (CNB) F Escolar & R Núñez
29/10/21	MOLECULAR INTERACTIONS: <u>Computational approaches</u> 10:00-11:00: Fundamentals 11:15-12:15: Applications 12:30-13:30: Practical cases	S Martín-Santamaría (CIB)

Day	Lectures / Activities	Teachers
01/11/21	HOLIDAY	
02/11/21	MOLECULAR INTERACTIONS: Biophysical approaches 10:00-11:00: AUC, light scattering 11:15-12:15: Fluorescence spectroscopy 12:30 – 13:30: Calorimetry (ITC), circular dichroism 15:00 – 16:30: Molecular interactions - practical workshop	JR Luque (CIB) S Zorrilla (CIB) B Monterroso (CIB) JR Luque et al
03/11/21	CHEMICAL BIOLOGY 10:00 – 12:00: Chemical biology tools – chemical systems and probes 12:30 – 13:30: Protein Engineering: making α -helices (*)	R. Pérez (CIB) M. Eugenio Vázquez (CiQUS – USC)
04/11/21	IMAGING (1) 10:00-12:00: Confocal and multi-D microscopy	MA Peñalva (CIB)
05/11/21	10:00 – 12:00: JOURNAL CLUB 1	

Day	Lectures / Activities	Teachers
08/11/21		
09/11/21	HOLIDAY	
10/11/21	PROTEIN PRODUCTION SESSION (*) 10:00-10:45: Fundamentals of protein production tools (*) 11:00-11:45: Membrane protein production (*) 11:45-12:30: Antibody production in cell-free systems (*) <i>Lunch break</i> 15:00-15:45: In vitro reconstitution of cell-mimicking systems (*) 15:45-16:30: Protein structural domains: evolutionary significance and biotechnological applications (*)	C Vega & A Albert C Vega (CIB) D Lietha (CIB) FJ Fernández (Abvance) C Fernández (I2SysBio) Julio Polaina (IATA-CSIC)
11/11/21	MICROFLUIDICS in Synthetic Biology 10:00 – 11:00: Fundamentals in microfluidics design (*) 11:15 – 12:15: Microdroplets in microfluidics 12:30-13:30: Microfluidics – Practical session	J Buceta (I2SysBio) B Monterroso (CIB) B Monterroso / S Zorrilla (CIB)
12/11/21	BOTTOM-UP BIOLOGY 10:00 – 11:00: Assembling a minimal cell (C Danelon) (*) 11:00 – 11:30: Colloquium of Danelon with the students (*) 12:00 – 13:00: Synthetic cells – the novo assembly with DNA technology (K Göpfrich) (*) 13:00 – 13:30: Colloquium of Göpfrich with the students (*)	Coord.: G Rivas C Danelon (TU-Delft) K Göpfrich (MPI-Heidelberg)
15/11/21	IMAGING (2) 10:00 – 12:00: Single-molecule and super-resolution tools (*)	M Nollmann (CBS-Montpellier)