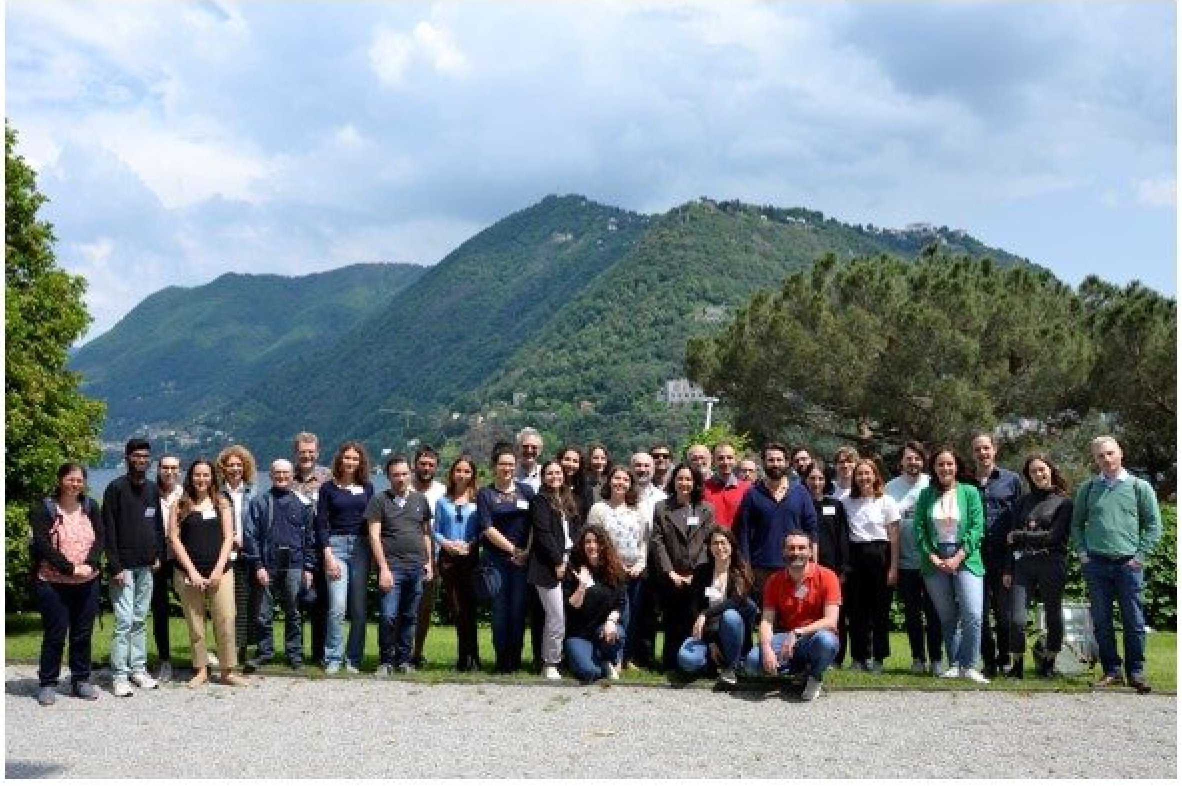
Como School on Cancer Evolution

Lake Como School of Advanced Studies, 23-26 May 2023



Home

Cancer is a multi-factorial disease caused by the malfunction of the bio-molecular machinery that regulates the body's "checks and balances". This leads to the uncontrolled growth of certain cell subpopulations selected by evolutionary pressure, which ultimately threatens the host's survival.

In the last 15 years, countless algorithmic, statistical, and mathematical modelling strategies have greatly aided in understanding the disease's intricacies, especially by leveraging the vast and increasing amounts of omics data generated from cancer samples. Importantly, new experimental paradigms, such as those on patient-derived models are delivering the first exciting results.

In this lively field, the **Como School on Cancer Evolution** (**CSCE 2023**) brings together researchers from both dry- and wet-labs to explore the challenges posed by cancer as a an evolutionary disease.
The School will allow the participants to gain expertise on state-of-the-art concepts, methods and applications from both cancer biology and computational sciences, especially data science and artificial intelligence, and to get a glimpse into the vision of pioneers in the field of cancer evolution.

Participants are encouraged to present their work in two presentation sessions that will be held during the workshop. All the attendees will receive a certificate of completion of the School.

School directors

- **Marco Antoniotti** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)
- **Riccardo Bellazzi** (LabMedInfo, University of Pavia, Pavia, Italy)
- **Alex Graudenzi** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)
- **Bud Mishra** (Courant Institute of Mathematical Sciences, NYU, New York, NY, USA)
- **Andrea Sottoriva** (Computational Biology Research Centre, Human Technopole, Milan, Italy)

Local Organization

- **Gianluca Ascolani** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)
- **Francesco Craighero** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)
- **Alessia Donato** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)
- **Lucrezia Patruno** (Data and Computational Biology Lab, University of Milan-Bicocca, Milan, Italy)

Institutions

- Data and Computational Biology Lab (DCB Lab), University of Milan-Bicocca, Milan, Italy
- Lake Como School of Advanced Studies, Como, Italy
- Fondazione Alessandro Volta, Como, Italy

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Speakers

Charles Cantor

Professor Emeritus
Biomedical Engineering
Boston University, Boston, USA

Francesca Granucci

Professor of General Pathology
Department of Biotechnology and Biosciences
University of Milano-Bicocca, Milan, Italy

Iuliana Ionita-Laza

Professor of Biostatistics
Medicine and Center for Precision Medicine and Genomics
Columbia University, New York, USA

Dan Landau

Associate Professor of Medicine, Division of Hematology and Medical Oncology
Associate Professor of Physiology and Biophysics, Weill Cornell Medicine, New York, USA
Core Member, New York Genome Center, New York, USA

Bud Mishra

Professor
Computer Science, Engineering & Mathematics
Courant Institute, New York University, New York, USA

Robert Murphy

Professor Emeritus
Biological Sciences
Carnegie Mellon University, Pittsburgh, USA

Pier Giuseppe Pelicci

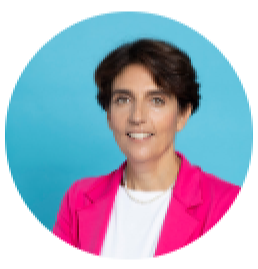
Director
Molecular Mechanisms of Cancer and Aging Unit
Istituto Europeo di Oncologia, Milan, Italy

David Posada

Professor
Genetics Center for Biomedical Research
Universida de Vigo, Vigo, Pontevedra, Spain

Daniele Ramazzotti

Tenure Track Researcher
Department of Medicine and Surgery
University of Milano-Bicocca, Milan, Italy



Maria Rescigno

Professor
Pathology
Humanitas University, Milan, Italy

Ewa Szczurek

Associate Professor
Faculty of Mathematics, Informatics and Mechanics
University of Warsaw, Poland

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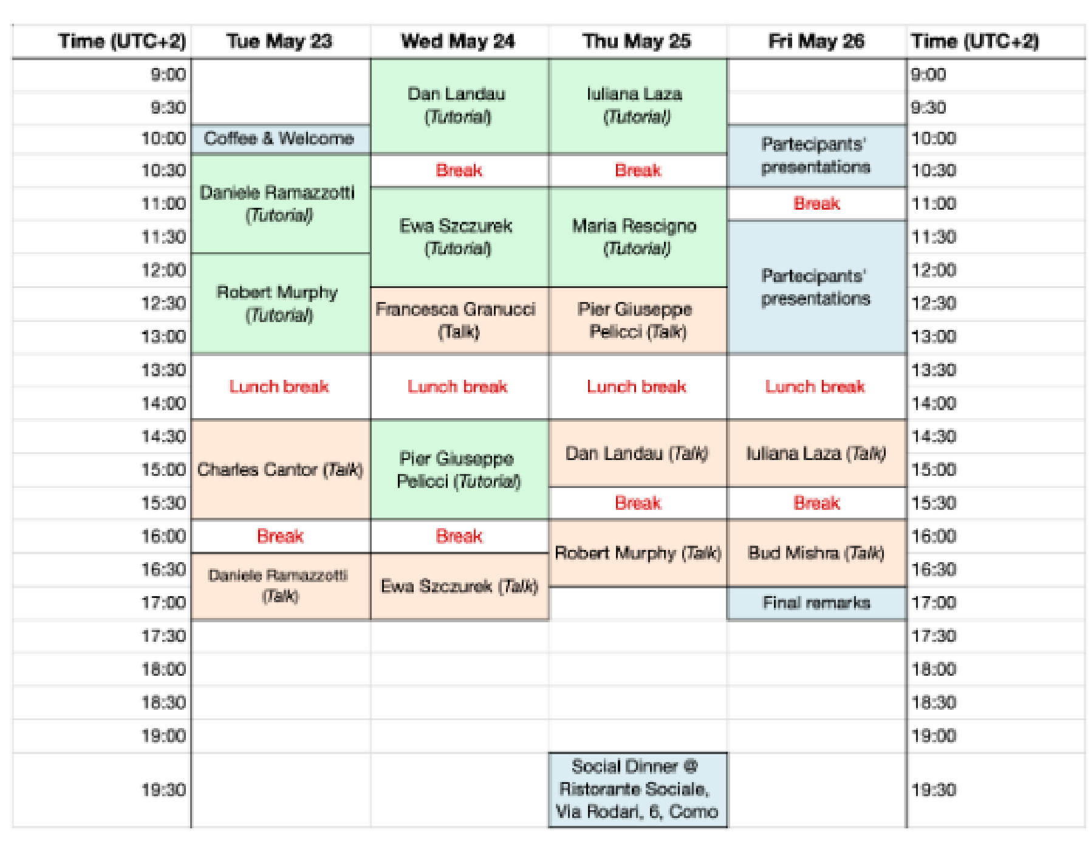
Program

Preliminary Schedule



Time (UTC+2)	Tue May 23	Wed May 24	Thu May 25	Fri May 26	Time (UTC+2)
9:00		Dan Landau (*Tutorial*)	Iuliana Laza (*Tutorial*)		9:00
9:30					9:30
10:00	Coffee & Welcome			Partecipants' presentations	10:00
10:30	Daniele Ramazzotti (*Tutorial*)	Break	Break		10:30
11:00		Ewa Szczurek (*Tutorial*)	Maria Rescigno (*Tutorial*)	Break	11:00
11:30				Partecipants' presentations	11:30
12:00	Robert Murphy (*Tutorial*)				12:00
12:30		Francesca Granucci (Talk)	Pier Giuseppe Pelicci (*Talk*)		12:30
13:00					13:00
13:30	Lunch break	Lunch break	Lunch break	Lunch break	13:30
14:00					14:00
14:30	Charles Cantor (*Talk*)	Pier Giuseppe Pelicci (*Tutorial*)	Dan Landau (*Talk*)	Iuliana Laza (*Talk*)	14:30
15:00					15:00
15:30			Break	Break	15:30
16:00	Break	Break	Robert Murphy (*Talk*)	Bud Mishra (*Talk*)	16:00
16:30	Daniele Ramazzotti (*Talk*)	Ewa Szczurek (*Talk*)			16:30
17:00				Final remarks	17:00
17:30					17:30
18:00					18:00
18:30					18:30
19:00					19:00
19:30			Social Dinner @ Ristorante Sociale, Via Rodari, 6, Como		19:30

Download Program PDF

Preliminary Talks and Tutorials Titles

Charles Cantor

Talk Title: "Liquid Biopsies to Manage Cancer Treatment and Inform our Understanding of Cancer Biology"

Francesca Granucci

Talk Title: "Role of calcineurin in cell differentiation"

Ionita-Laza Iuliana

Tutorial Title: "Statistics for Knockoff Studies"
Talk Title: "Knockoff-based Statistics for the Identification of Putative Causal Loci in Genetic Studies"

Dan Landau

Tutorial Title: "Machine Learning Guided Ultra-sensitive Cancer Monitoring with cfDNA whole Genomes"
Talk Title: "Defining Somatic Evolution with Single-cell Multi-omics"

Robert Murphy

Tutorial Title: "Automated Science: Introduction to Active Machine Learning"
Talk Title: "Learning Complex Spatial Relationships Among Cells and Organelles"

Pier Giuseppe Pelicci

Tutorial Title: "Challenges in Precision Oncology"
Talk Title: "Cutting edge research: Clonal Evolution in Leukemias and Breast Cancer"

Daniele Ramazzotti

Tutorial Title: "Challenges and Best Practices in Mutational Signatures Analysis of Cancer Genomes"
Talk title: "Leveraging Machine Learning to Understand the Stochastic Evolutionary Process of Cancer"

Maria Rescigno

Tutorial Title: "Studying the microbiota"
Talk Title: "The Microbiota Composition as a Marker for Tumor Diagnosis and Treatment"

Ewa Szczurek

Tutorial Title: "Inferring Clone Composition and Evolutionary Trees from Bulk and Single Cell Data"
Talk Title: "Inferring clone composition and evolutionary trees from single cell data using SIEVE and CONET"

Slides and Video Presentations

1ST DAY	2ND DAY	3RD DAY	4TH DAY
video 1920×1080 mp4	video 1344×768 mp4	video 1920×1080 mp4	video 1920×1080 mp4

- **1st day**
  - Daniele Ramazzotti
    Talk: "Leveraging Machine Learning to Understand the Stochastic Evolutionary Process of Cancer",
    slides
  - Robert Murphy
    Talk: "Learning Complex Spatial Relationships Among Cells and Organelles",
    slides
  - Charles Cantor
    Talk: "Liquid Biopsies to Manage Cancer Treatment and Inform our Understanding of Cancer Biology",
    slides
  - Daniele Ramazzotti
    Tutorial: "Challenges and Best Practices in Mutational Signatures Analysis of Cancer Genomes",
    slides
- **2nd day**
  - Dan Landau
    Talk: "Defining Somatic Evolution with Single-cell Multi-omics", slides
  - Ewa Szczurek
    Talk: "Inferring clone composition and evolutionary trees from single cell data using SIEVE and CONET",
    slides
  - Francesca Granucci
    Talk: "Role of calcineurin in cell differentiation",
    slides
  - Pier Giuseppe Pelicci
    Talk: "Cutting edge research: Clonal Evolution in Leukemias and Breast Cancer",
    slides
  - Ewa Szczurek
    Tutorial: "Inferring Clone Composition and Evolutionary Trees from Bulk and Single Cell Data",
    slides
- **3rd day**
  - Iuliana Ionita Laza
    Tutorial: "Knockoff-based Statistics for the Identification of Putative Causal Loci in Genetic Studies",
    slides
  - Pier Giuseppe Pelicci
    Tutorial: "Challenges in Precision Oncology",
    slides
  - Dan Landau
    Tutorial: "Machine Learning Guided Ultra-sensitive Cancer Monitoring with cfDNA whole Genomes", slides
  - Robert Murphy
    Tutorial: "Automated Science: Introduction to Active Machine Learning",
    slides
- **4th day**
  - Iuliana Ionita Laza
    Tutorial: "Statistics for Knockoff Studies",
    slides
  - Bud Mishra
    Talk:
  - Biddau
    Presentation: "Sensitivity analysis of chemical reaction networks modelling G1-S phase of physiological and mutated colorectal cells",
    slides
  - Borgato
    Presentation: "Dissecting the origin of drug tolerance to anti-EGFR therapy in metastatic colorectal cancer through single-cell RNA-seq",
    slides
  - Brunet
    Presentation: Just-right Wnt activity in APC-driven colorectal cancer,
    slides
  - Buscaroli
    Presentation: "Bayesian multi-lineage inference in gene therapy assays",
    slides
  - Cavinato
    Presentation: title
    slides
  - Costa
    Presentation: "Uncovering the Activity of Master Kinases in Cancers by System Biology approaches",
    slides
  - D'Antona
    Presentation: "Phenome-wide investigation of genetic correlations and genetically informed causal inference in colorectal cancer",
    slides
  - Guasch
    Presentation: //
  - Labon
    Presentation: "Evolution of metastatic melanoma: insights from a post-mortem study",
    slides
  - Markowska
    Presentation: "CONSET – joint CNA and SNV tree inference with single cell data",
    slides
  - Pallikonda
    Presentation: "Evolutionary histories of lethal Uveal Melanomas",
    slides
  - Parker
    Presentation: "Simultaneous single-cell methylomics, transcriptomics and clonal evolution in patient-derived organoids with SmartRRBS",
    slides
  - Privitera
    Presentation: "A multi-omics machine learning approach to find reliable signatures for TNBC patients' prognosis prediction",
    slides
  - Ryhiner
    Presentation: "Quantitative Modeling of BRCA Deficiency as a Radiosensitizing Strategy for Personalized Cancer Therapy",
    slides
  - Santacatterina
    Presentation: "Bayesian learning of cancer population dynamics from longitudinal observations",
    slides
  - Scanu
    Presentation: "Coordinated inheritance of multiple extrachromosomal DNA species in human cancer cells",
    slides
  - Volpatto
    Presentation: "Mathematical model for cancer clonal evolution using advanced branching process",
    slides

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Contact

Lake Como School of Advanced Studies

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