WORKSHOP

## Complex Systems: from Physics to Biomedicine

in honor of **Giorgio Parisi**Nobel Laureate for Physics 2021

May 10th 2022

TEATRO E SCUDERIE VECCHIE VILLA TORLONIA

Via L. Spallanzani 5, Rome

Organizing Committee:

Lilia Alberghina and Riccardo Zecchina

Si ringrazia la Sovrintendenza Capitolina ai Beni Culturali per la collaborazione





## PROGRAMME / TEATRO DI VILLA TORLONIA

9:15 OPENING

Corrado De Concini, President Accademia Nazionale delle Scienze detta dei XL Maria Cristina Messa, Italian Minister of University and Research Roberto Gualtieri, Mayor of Rome (TBC)

09:40 COMPLEX SYSTEMS: FROM A PHYSICIST VIEWPOINT

Giorgio Parisi, Sapienza University of Rome

10:20 SYSTEMS METABOLOMICS TO INVESTIGATE THE COMPLEXITY OF METABOLISM

AS DRIVER OF CANCER

Lilia Alberghina, University of Milano Bicocca

11:00 INTELLIGENT ARTIFICIAL INTELLIGENCE FOR HEALTH: FROM NEW THERMODYNAMICS

TO A FUNDAMENTALLY DIFFERENT APPROACH TO NETWORK DISEASES

Hans V. Westerhoff, University of Amsterdam

11:40 FROM SINGLE-CELL TO MULTI-CELLS INFORMATION SYSTEMS ANALYSIS

Barbara Di Camillo, University of Padova

12:20 GENERATIVE AND INTERPRETABLE MODELS FOR APTAMER DESIGN AND ANALYSIS OF IN VITRO

**SEQUENCE SELECTION** 

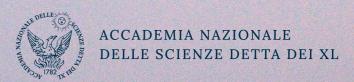
Rémi Monasson, École Normale Supérieure, Paris

13:00 -14:30 Lunch break at the Limonaia Restaurant

14:30 - 18:00 SHORT COMMUNICATIONS PARALLEL SESSIONS

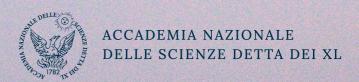
18:00 Final discussion on future perspectives chaired by Riccardo Zecchina

**19.00** Closing of the meeting



## SHORT COMMUNICATIONS PARALLEL SESSION / TEATRO DI VILLA TORLONIA

14.30	STRUCTURE FROM DISORDER AND VICEVERSA  Giovanni La Penna, National Research Council and National Institute for Nuclear Physics, Italy
14.45	NEW INSIGHTS INTO OUT-OF-EQUILIBRIUM LAWS FOR MICROBIAL GROWTH Marco Cosentino-Lagomarsino, IFOM Foundation and University of Milan, Italy
15.00	METABOLISM-DEPENDENT COMPLEX MECHANISM CONTROLLING CELL SIZE AND CELL GROWTH IN BUDDING YEAST Marco Vanoni, University of Milan-Bicocca, Italy
15.15	UNRAVELING THE INNER WORKINGS OF CELLS VIA STATISTICAL INFERENCE Andrea De Martino, Polytechnic University of Turin and Italian Institute for Genomic Medicine, Turin, Italy
15.30	NETWORK MEDICINE FRAMEWORK FOR ANALYZING DIFFERENT BREAST CANCER SUBTYPES Federica Conte, Institute for Systems Analysis and Computer Science, National Research Council, Rome, Italy
15.45	KNOWLEDGE-BASED MULTI-OMICS DATA INTEGRATION TO UNVEIL THE MANY FACETS OF METABOLIC VARIATION AND REGULATION Chiara Damiani, University of Milan-Bicocca, Italy
16.00	TARGETING LONG NON-CODING RNA H19/CELL ADHESION MOLECULES CIRCUITRY BY EPIDRUGS: NOVEL TOOLS TO INHIBIT TUMOR GROWTH AND METASTASIS IN PROSTATE CANCER Valeria Pecci, Catholic University of the Sacred Heart, Rome, Italy
16.15	THE RULES OF CELL LIFE: MULTISCALE INTEGRATION MODELING OF METABOLISM, GROWTH AND CYCLE IN BUDDING YEAST Pasquale Palumbo, University of Milan- Bicocca, Italy
16.30	METABOLIC REWIRING BY LONG NONCODING RNA MALATI-TARGETING IN PROSTATE CANCER: A MULTI-PRONGED APPROACH Sara De Martino, Catholic University of the Sacred Heart, Rome, Italy
16.45	A NOVEL AND ROBUST MOLECULAR SWITCH ACTUATING THE QUANTITATIVE MODEL OF EUKARYOTIC CDK CONTROL Matteo Barberis, University of Surrey, Guildford, UK
17.00	THREE SIMPLE MOTIFS THROUGH WHICH TO UNDERSTAND COMPLEXITY IN NEURAL DIFFERENTIATION Anna Maria Colangelo, University of Milan-Bicocca, Milan, Italy
17.15	A STOCHASTIC APPROACH TO STUDY THE ASIMPTOTIC BEHAVIOUR OF OSCILLATING BIOCHEMICAL SYSTEMS Alberto Bersani, Institute for System Analysis and Computer Science, National Research Council, Rome, Italy
17.30	RECENT TRENDS AND CHALLENGES IN MODELING AND CONTROL OF THE GLUCOSE-INSULIN SYSTEM Alessandro Borri, Institute for System Analysis and Computer Science, National Research Council, Rome and University of L'Aquila, Italy



## SHORT COMMUNICATIONS PARALLEL SESSION / LIBRARY OF ACCADEMY, SCUDERIE VECCHIE DI VILLA TORLONIA

14.30	CRITICAL BEHAVIOR AND MEMORY FUNCTION IN A MODEL OF SPIKING NEURONS WITH A RESERVOIR OF SPATIO-TEMPORAL PATTERNS Silvia Scarpetta, University of Salerno, Italy
14.45	NUCLEOPORIN 153 DEFICIENCY IN ADULT NEURAL STEM CELLS DEFINES A PATHOLOGICAL PROTEIN-NETWORK SIGNATURE AND DEFECTIVE NEUROGENESIS IN A MOUSE MODEL OF AD Alessia Bertozzi, Institute for System Analysis and Computer Science, National Research Council, Rome, Italy
15.00	A NEW MATHEMATICAL MODEL OF THE HUMAN THYROID  Marcello Pompa, Catholic University of the Sacred Heart, Rome, Italy
15.15	A NETWORK-BASED ALGORITHM FOR IDENTIFYING DRUG-REPURPOSING OPPORTUNITIES ALONG WITH ITS APPLICATION TO SARS-COV-2 INFECTION  Giulia Fiscon, Sapienza University of Rome and Institute for System Analysis and Computer Science, National Research Council, Rome, Italy
15.30	SARS-COV-2 MULTI VARIANT RAPID DETECTOR BASED ON GRAPHENE TRANSISTOR FUNCTIONALIZED WITH AN ENGINEERING DIMERIC ACE2 RECEPTOR Daniele Di Marino, Polytechnic University of the Marches, Ancona, Italy
15.45	STATISTICAL MECHANICS FOR THE ANALYSIS OF IMMUNOGENIC MOTIFS IN SARS-COV-2 Andrea Di Gioacchino, École Normale Supérieure, Paris, France
16.00	PHASE TRANSITION IN THE NUCLEUS OF CELLS  Mario Nicodemi, University of Naples 'Federico II' and National Institute for Nuclear Physics, Naples, Italy
16.15	EXPLORING CHROMOSOME THREE-DIMENSIONAL ORGANIZATION IN HEALTHY AND PATHOGENIC GENOMES WITH POLYMER PHYSICS  Andrea M. Chiariello, University of Naples 'Federico II' and National Institute for Nuclear Physics, Naples, Italy
16.30	FROM THE BIRTH OF MEDICAL PHYSICS TO ITS CONTRIBUTION TO MOLECULAR IMAGING Alberto Del Guerra, University of Pisa and National Institute for Nuclear Physics, Pisa, Italy
16.45	GAMES OF LIFE, COMPUTER SIMULATION AND BIOLOGICAL HOMOCHIRALITY Savino Longo, University of Bari "Aldo Moro" and Institute for Plasma Science and Technology, National Research Council, Bari, Italy
17.00	THE BOOLEAN SATISFIABILITY PROBLEM IN CLIFFORD ALGEBRA: A BRIDGE BETWEEN CONTINUOUS AND DISCRETE?  Marco Budinich, University of Trieste and, National Institute for Nuclear Physics, Trieste, Italy
17.15	KINETICS OF ENVIRONMENTAL BIOCOMPLEXITY: EXPERIMENTS, QUANTUM CHEMISTRY, TRANSITIVITY THEORY AND MACHINE LEARNING Valter H. Carvahlo-Silva, University of Brasilia, Brazil