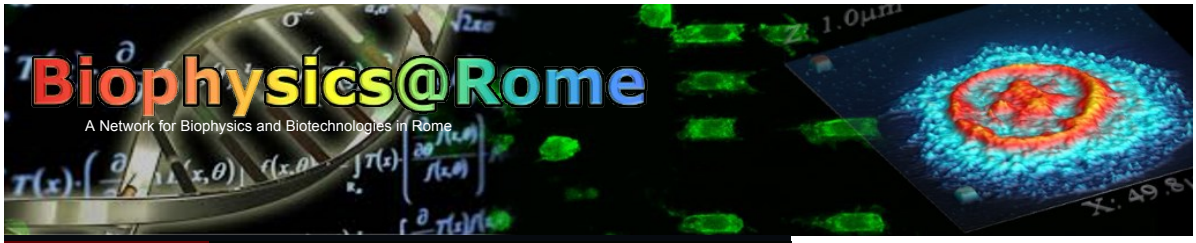

Biophysics@Rome 2019

Biophysics across scales: from nano to macro

15 &16 May 2019 (Free Admittance upon registration)

www.biophysicsatrome.org

>>>(how to get there?)<<<

NEW Deadline for Abstract Submission **April 14th** 2019

"When I think of new fields in science that have been opened, I don't think of interdisciplinary teams combining existing skills to solve a defined problem - I think of single interdisciplinary people inventing new ways to look at the world." **Prof. Sean R. Eddy**

This 4th Edition of Biophysics@Rome aims to keep on creating a fertile ground for the emergence of "interdisciplinary people", putting together skills and expertise coming from different intersecting fields. To this purpose, 2019 edition will be devoted to explore four different levels of living matter organization:

MOLECULAR, CELLULAR, TISSUES and ORGANISMS&SYSTEMS

Topics and subjects:	Invited Speakers:
Microfluidics *Microscopy and Spectroscopy* *Sensors and Devices* *Lab-on-Chips* *Complexity* *Novel Materials* *Regenerative Medicine* *Laser Processing* *Soft Materials* *Computational Biophysics* *Molecular Biophysics* *Bioinformatics and System Biology* *Biochemistry* *Models* *Medical Physics* *Quantum Effects*	Giorgio Colombo *Chemistry Department, Pavia University* Enrico Gratton *Laboratory for Fluorescence Dynamics* *University of California, Irvine* Odeta Limaj *European Research Council Executive Agency* Francesco Loreto *Director of Department of Biology, Agriculture and Food Sciences, CN* Cristiano Viappiani *SIBPA president* *Department of Mathematical Physical and Computer Sciences - Univer of Parma*

Abstract Deadline: ***Extended to April 14th, 2019*** Abstract should be submitted online using the above menu Abstracts must be prepared according to the conference template and will be chosen as oral or poster presentation accordingly to the author requests and the editorial board evaluation. Presentations can include: • Oral presentations (abstract max 600 words) • Posters (abstract max 600 words) **Registration Deadline:** ***April 18th, 2019***	**contact: info (at) biophysicsatrome.org** **Francesca Bertani** **0641522245** **Valentina Mussi** **064993 4166/4768** **Luca Businaro** **0641522265**

Please submit (template) your best images or pictures for the IMAGE CONTEST: "BiophysicART"

The best images will be awarded during the Meeting (submission deadline ***May 8th, 2019***)

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May 15th

Poster Presentations

1st session - 10:45 - 11:15 (during coffee break)

- **Maria Rosa Loffredo** ***(Sapienza University of Rome, Dept of Biochemical Sciences)*** Biophysical and antimicrobial investigations of D-PMAP23 affinity to bacterial membranes
- **Martina Nicoletti** ***(Campus Biomedico University of Rome)*** Hodgkin-Huxley models of ***C. elegans*** neurons: from ion currents to complex neuronal dynamics
- **Francesca Sciolla** ***(CNR-ISC and Sapienza University of Rome, Dept of Physics)*** Interaction of Isoniazid with unilamellar liposomes
- **Letizia Chiodo** ***(Campus Biomedico University of Rome, Dept of Engineering)*** Human α7 nicotinic receptor in active and inactive conformations: a molecular dynamics
- **Fabio Mangini** ***(Fondazione Santa Lucia)*** Effects of Spinal Cord vascular geometry on the BOLD-fMRI contrast

2nd session - 13:00-14:15 (during lunch)

- **Alice Battistella** ***(CNR-IOM)*** AFM Investigation of the Mechanical Properties of Mouse Oocytes
- **Giorgio Gosti** ***(IIT, Center for Life Nanoscience)*** Phase Transitions in the Self-Organization of Neural Rosettes
- **Marco Lazzarino** ***(CNR-IOM)*** Microfabricated cantilevers for parallelized cell-cell adhesion measurement
- **Federico Giove** ***(Fondazione Santa Lucia IRCCS)*** Development of a Pipeline for the Analysis of Human Spinal Cord fMRI Data Series
- **Laura Andolfi** ***(CNR-IOM)*** An evaluation of the application of the aperture scanning near-field optical microscopy for ultra-structures analysis of anomalous human spermatozoa
- **Alessandro Bentivoglio** ***(University of Edimburgh)*** Stochastic Model of Supercoiling-Dependent Transcription
- **Luca Burratti** ***(University of Rome Tor Vergata)*** Fluorescent silver nanoclusters as potential tool for bio-applications
- **Francesca Ceccacci** ***(CNR-ISB)*** Design of novel cationic liposomes for brain delivery
- **Ines Delfino** ***(Università della Tuscia Dipartimento di scienze ecologiche e biologiche)*** Characterization of X-ray irradiated cell culture media by means of Surface-Enhanced Raman Spectroscopy
- **Maya Dimova Lambreva** ***(CNR-IC)*** Probing the interaction of nanotubes and photosynthetic complexes
- **Francesco Brasili** ***(University of Rome Tor Vergata)*** In vitro analysis of the mechanical and biological effects induced by the ultrasound-cell interaction

3rd Session - 16:00-16:45 (during coffee break)

- **Michael Di Gioacchino** ***(Università degli Studi Roma Tre)*** Protection of Trehalose Against Dehydration for Model Peptide
- **Emiliano De Santis** ***(University of Rome Tor Vergata Dept of Physics & INFN)*** Styrene-Dopamine receptor affinity: a Molecular Dynamics study
- **Aishwarya Dhar** ***(University of Rome Tor Vergata)*** Aβ peptides and β-sheet breakers. A coarse grained molecular dynamics approach using GO-Martini
- **Giuseppina Rea** ***(CNR-IC)*** Functional dynamics of photosynthetic cells useful for biosensor development
- **Giovanna Boumis** ***(Sapienza University of Rome, Dept of Biochemical Sciences "A. Rossi Fanelli")*** Targeting de novo thymidylate synthesis nuclear complex
- **Blasco Morozzo** della Rocca ***(University of Rome Tor Vergata, Dept of Experimental Medicine)*** Synthesis and properties of a new benzamide-containing nitrobenzoxadiazole endowed with high stability to metabolic hydrolysis
- **Marina Carbonaro** ***(CREA Council for agricultural Research and Economics, research Centre for Food and Nutrition)*** Cytochrome c-based films and fibril superstructures as protein biomaterials: a SEM and IR spectroscopy investigation
- **Francesca Cardamone** ***(University of Cagliari, Dept of Physics)*** Characterization and identification of Ampicillin and Amoxicillin binding sites within the multidrug transporter MexB of P. Aeruginosa
- **Alessandra Camarca** ***(CNR-ISA)*** Effect of substrate binding on the E. coli MNM deamidase structure
- **Alice Romeo** ***(University of Rome Tor Vergata, Dept of Biology)*** Molecular modeling, molecular docking and molecular dynamics simulation techniques applied to the design of a novel APC/C inhibitor
- **Silvia Franco** ***(SBAI & CNR-ISC)*** Rheology and phase behavior of multi-responsive soft microgels
- **Isabel Nogues** ***(CNR-IRET)*** One-carbon metabolism enzyme Serine Hydroxy Methyl Transferase and salt tolerance in the cyanobacteria Aphanothece halophytica

Cytochrome c-based films and fibril superstructures as protein biomaterials: a SEM and IR spectroscopy investigation

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Keywords: (cytochrome c, fibrils, biomaterials, SEM, IR)

Cytochrome c (cyt c) is an evolutionarily conserved heme protein of ~12 kD and 104 amino acids residues, with a primary function in electron transfer between complex III (ubiquinol:cyt c reductase) and complex IV (cyt c oxidase) in the respiratory chain in mitochondria. In addition, cyt c is a key component in activation of apoptotic cell death signals, as well as a ROS scavenger in healthy cells [1]. Native structure of cyt c consists of four α-helices forming a compact core around the covalently attached heme moiety. Despite its stable structure, dysfunction of cyt c may be involved in oxidative stress in mitochondria and trigger mechanisms linking apoptosis to amyloidogenesis. Amyloidogenic proteins have the capability of creating highly specific non-covalent contacts, leading to self-assembling into β-sheet linear aggregates [2]. Besides to be associated to a wide range of degenerative diseases (Alzheimer's and Parkinson's diseases) [3], amyloid fibrils can be useful as building blocks for protein-based functional materials, with applications in optoelctronics, gas sensing and edible coatings. As biomaterial, cyt c was employed to create porous nanostructures for toxic vapor gas sensing and self-assembling polypeptide fusion proteins with cyt c allowed to achieve high densities of metalloporphyrins on amyloid fibrils [Baldwin 2006][3]. Despite its relevance, fibrillation of cyt c has not been deeply addressed and both mechanism of polymerizaton and structural information on oligomers are partially known [4]. Scanning electron microscopy (SEM) and infrared (IR) spectroscopy are powerful tools in the identification of morphological properties and modifications in secondary structure that underly fibril formation either in the development of neurodegenerative disorders or in fibril-based novel biomaterials. In this study, polymerization and fibril formation of cyt c were studied in alkaline conditions at pH values below (Tris-HCl buffer, pH 9) or above (NaOH, pH 13) the isoelectric point of the protein (pH~10). The effect of base type and protein concentration was analyzed. Characterization by SEM, ThT fluorescence and IR spectroscopy, together with PCA analysis of the IR spectra, was carried out to elucidate morphology and secondary structure of polymers/fibrils from cyt c. The results provided evidence that a one-step kinetic control of the fibril morphology was obtained as a function of pH of the medium. IR spectroscopy indicated that fibril elongation utilized either ordered (Tris-HCl) or disordered (NaOH) structures. Cyt c polymerization could be directed towards the achievement of fibrils superstructures or extended films with amyloid-like nature, prevalence of one or the other final structures being dependent on protein concentration and incubation time.

[1] V.P. Skulachev FEBS Lett. 423 (1998) 275-280.
[2] M. Carbonaro et al. Int. J. Biol. Macromol. 115 (2018) 1157-1164.
[3] A.J. Baldwin et al. J. Am. Chem. Soc. 128 (2006) 2162-2163.
[4] S. Hirota et al. Proc. Natl. Acad. Sci. U. S. A. 107 (2010) 12854-12859.

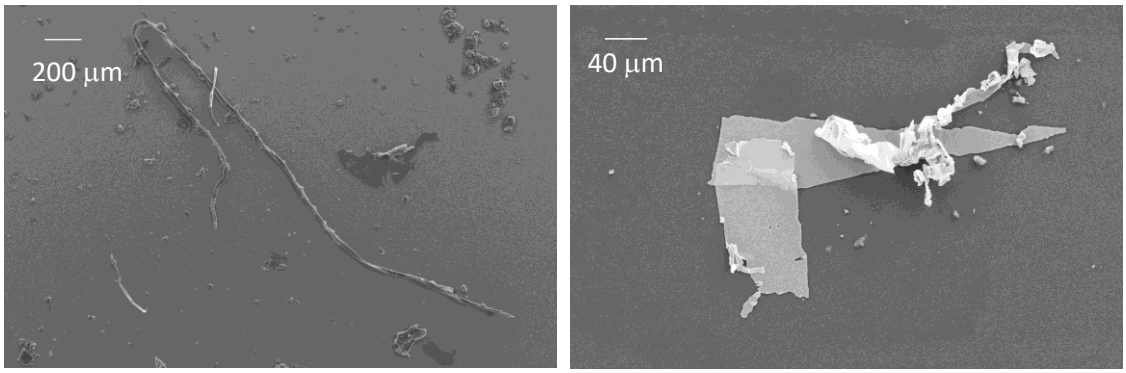

Figure 1 *SEM micrographs of samples of cyt c aggregated via Tris-HCl (left panel) or via NaOH (right panel).*

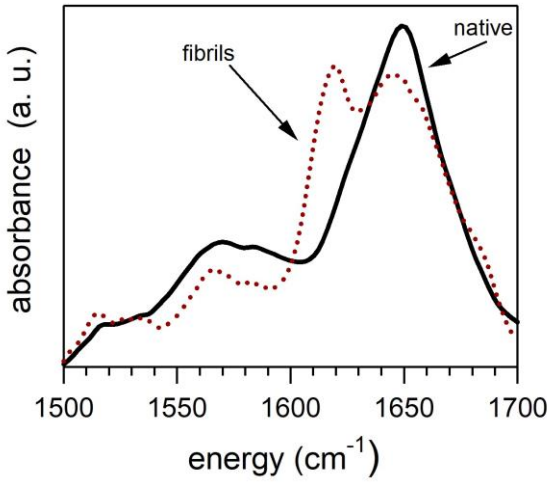

Figure 2. *Infrared absorption spectrum of cyt c (90 μM) in TRIS-HCl buffer (50 mM, pH 9) in the amide I region. Continuous spectrum refers to the native state of the protein, the dashed spectrum to protein after two-hours incubation. Red shift and enhancement of the β-sheet contribution indicates formation of amyloid fibrils.*