Italian National Conference on Condensed Matter Physics (Including Optics, Photonics, Liquids, Soft Matter)

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BOOK OF ABSTRACT

Editors

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Dear colleagues,

it's a great pleasure for me to welcome all of you at FisMat 2015, the Italian conference on condensed matter physics and related fields. After the first edition in Milan two years ago this year the conference is held at the University of Palermo.

The first edition, after ten years, gathered the whole Italian community working in the field of condensed matter physics and related fields. The initiative demonstrated the relevance of organizing an event like this and the strong need to have such an inclusive meeting.

This year the conference takes place in Sicily, in the beautiful city of Palermo. It will be a great event as testified by the large number of oral contributions received, larger compared to the previous edition.

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[1] A. Benedetto, et al. J. Phys. Chem. B, 2014, 118, 12192.
[2] A. Benedetto, et al. J. Chem. Phys., 2015, 142, 124706.

#239 - New insight into the function of bacterial amyloids

Véronique Arluison - University Paris Diderot

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Accumulating evidence indicates that RNA metabolism components assemble into supramolecular cellular structures to mediate functional compartmentalization within the cytoplasmic membrane of the bacterial cell. This cellular compartmentalization could play important roles in the processes of RNA degradation and maturation. These components include Hfq, the RNA chaperone protein, which is involved in the post-transcriptional control of protein synthesis mainly by the virtue of its interactions with several small regulatory noncoding RNAs. The *E. coli* Hfq is structurally organized into two domains. An N-terminal domain that folds as strongly bent b-sheets within individual protomers to assemble into a typical toroidal hexameric ring. A C-terminal flexible domain, that encompasses about one-third of the protein, seems intrinsically unstructured. RNA binding function of Hfq mainly lies within its N-terminal core, whereas the function of the flexible domain remains controversial and largely unknown.In this paper, thanks to the structural studies with biochemical and biophysical methods, we demonstrate that the Hfq C-terminal region has an intrinsic property to self-assemble into long amyloid-like fibrillar structures *in vitro*. We show that normal localization of Hfq within membrane-associated coiled structures *in vivo* requires this C-terminal domain. This finding establishes for the first time a function for the hithertopuzzling C-terminal region, with a plausible central role in RNA transactions.

#240 - Protein and hydration water dynamics in folded and intrinsically disordered proteins

Giorgio Schirò - CNRS Institut de Biologie Structurale

Hydration water is the natural matrix of biological macromolecules and is essential for their activity in cells. The coupling between water and protein dynamics has been intensively studied, yet it remains controversial. We combined protein perdeuteration, neutron scattering and molecular dynamics simulations to explore the nature of hydration water across the so-called protein dynamical transition [1], in the intrinsically disordered human protein tau and the globular maltose binding protein. We generalized the notion that the translational diffusion of water molecules on a protein surface promotes the large-amplitude motions of proteins that are required for their biological activity [2]. We also studied the dynamics of hydration water at the surface of fibers formed by the full-length human tau, one of the pathological hallmarks of Alzheimer disease. We found that water is more mobile in tau fibers than in nonaggregated tau, thus corroborating that methodologies sensitive to the diffusion of water, such as diffusion magnetic resonance imaging, could be used to diagnose Alzheimer patients in an early stage of the disease [3].

[1] G. Schirò et al. (2012) *Phys. Rev. Lett.* 109: 128102.
[2] G. Schirò et al. (2015) *Nature Commun.* 6: 6490
[3] Y. Fichou, G. Schirò et al. (2015) *PNAS* 112: 6365.

#241 - MediaChrom: a new class of versatile polarity-sensitive dyes for imaging applications

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Modern biological research needs a continuous development of new fluorescent dyes, to be used as markers or probes, characterized by improved performances.These molecules should allow a highly specific and sensitive monitoring for a wide range of biological processes. A particular class of dyes, called environment-sensitive dyes, are able to change their spectroscopical properties in response to the change of physico-chemical features of their environment. Among them, polarity-sensitive dyes (also called solvatochromic dyes) have the unique feature to display a different emission maximum as a function of the environment polarity. This property makes them the ideal probes to monitor the local properties of particular cell districts, as well as different types of biomolecular interactions (e.g., peptide-nucleic acid, protein-protein, and peptide-lipid interactions).
Several polarity-sensitive dyes have been developed, but most of them are far to meet simultaneously all the optimal spectroscopic requirements for biological applications, i.e., a strong solvatochromism, absorption in the visible range, high extinction coefficient, high quantum yield, good photostability.
We designed a new class of polarity-sensitive dyes, named MediaChrom, that absorb and emit light in the visible range with good extinction coefficient and quantum yield. MediaChrom proved to be highly sensitive to the environment polarity and easily conjugated to proteins and peptides for directing them to defined biological targets.