Virtual BSC RS: Multidimensional biology: from time-resolved structural biology to phenotypic medicines

Objectives

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Abstract:

Prof Giuseppe Battaglia
Department of Chemistry, and Institute for the Physics of Living Systems, University College London,University College London, UK.
Institute for Bioengineering of Catalunya (IBEC), The Barcelona Institute of Science and Technology, Barcelona (Spain).
Catalan Institution for Research and Advanced Studies (ICREA), Barcelona, Spain.

I lead a group split between the IBEC in Barcelona and UCL in London. Our group comprises chemists, physicists, mathematicians, engineers, biologists working together to design bionic units that mimic specific biological functions and/or introduce operations that do not exist in Nature. We apply a constructionist approach where we mimic biological complexity in the form of design principles to produce functional units from simple building blocks and their interactions.? We called such an approach: Molecular Bionics. In doing so, we learned to apply and develop physical tools to the study of biology, today I'll show two stories originated in my group where we combine computational and experimental approaches to address specific biological questions.
In the first part of my talk I'll show how to image proteins in liquid water using liquid-phase electron microscopy and how we can extract four-dimensional profiles of the proteins to show their conformational space.
In the second part of my talk, I'll show our developments on the of design phenotypic medicine, i.e. multivalent constructs capable of interacting with cells as a function of their phenotypic composition of receptors.

Relevant references:
Rodriguez-Arco *et al Biomaterials* 2019, 192, 26-50
Marchello *et al* arXiv:1907.03348 [q-bio.BM]
Tian *et al. Science Adv.* 2020, 6, 4, eaat0919
Tian *et al. Science Adv.* 2020 (in the press, preprint in 10.1101/2020.04.04.025866)
Liu *et al. Nature Comm.* 2020 11, 4836

Short biography:

 Giuseppe, or as most people call him, Beppe, Battaglia is an EPSRC Established Career Fellow and 2018 ERC-CoG investigator, the Chair in Molecular Bionics in the Department of Chemistry and Honorary Professor of Chemical Engineering at the Department of Chemical Engineering at the University College London (UCL). Beppe is part of the Institute of Physics of Living System at UCL and he is the director of the EPSRC/Jeol Centre for Liquid Phase Electron Microscopy. In 2019, Beppe was awarded a prestigious Catalan Institution for Research and Advanced Studies (ICREA) chair to join the Institute of Bioengineering of Catalunya (IBEC) part of the Barcelona Institute of Science and Technology. Beppe will divided his time between UCL and BIST for the next 5yrs. Prior to joining UCL, Beppe held positions as Lecturer -2006, Senior Lecturer -2009 and Professor -2011 in the Departments of Materials Sci. Eng. (2006-2009) and Biomedical Science (2009-2013) at the University of Sheffield. Beppe has published over 120 research articles, reviews and book chapters and he is named inventor in 12 patents. Beppe is co-founder and serves as Chief Scientific Officer of two start ups, SomaServe ltd and SomaNautix ltd. Beppe was awarded the 2009 HFSP Young Investigator Award jointly with Prof A. Engler from UCSD, the 2011 APS/IoP Polymer Physics Exchange Award Lecture, the 2011 GSK Emerging Scientist Award, 2011 ERC Starting Grant, the 2012 Award for special contribution to Polymer Therapeutics, the 2014 RSC Thomas Graham Award Lecture, 2015 SCI/RSC McBain Medal for Colloid Science and the 2016 Anhui 100 Foreign Talent Award.

Speakers

Giuseppe Battaglia, EPSRC Established Career Fellow and 2018 ERC-CoG investigator, the Chair in Molecular Bionics in the Department of Chemistry and Honorary Professor of Chemical Engineering at the Department of Chemical Engineering at the University College London (UCL)

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