From inelastic X-ray scattering to neuroscience*

Giancarlo Ruocco

Center for Life NanoScience – Italian Institute of Technology
Dept. of Physics - Sapienza University of Rome

In the first part of this talk I will present the main steps of my research activity in the field of the physics of disordered system. Specifically, I will focus on the investigation of the high frequency dynamics of liquids, supercooled liquids and glasses, as well as its relation to the glass transition. I will also present my contribution to the development of the Inelastic X-ray Scattering technique, as well as other innovative experimental techniques (UV scattering, X-ray transient grating, Brillouin monochromator, Impulse stimulated thermal Scattering), all applied to the investigation of the dynamics in topologically disordered systems.

Then, I will concentrate on the most recent research projects, mainly devoted to the translation of the longstanding competence on spectroscopy, microscopy and statistical mechanics to neuroscience. Among the different ongoing project, I will discuss in some detail: i) a new super-resolution microscopy technique and its application to the early diagnosis of neurodegenerative diseases via protein aggregation detection in human retina; ii) the high throughput Brillouin microscopy and its application to phase (or glass) transition in protein aggregation; and, iii) the animal-based biosensors for early diagnosis of tumours, built on the measurements of the neural calcium activity of the C. Elegans exposed to human fluids.

*Condensed Matter Physics, 2019, vol. 22, No. 4, 40101