



Physics - V.P. POSITION

DESCRIPTION OF THE PHD PROGRAM

The PhD program in Physics is divided into three areas, corresponding to major groups of disciplines of Physical Sciences covered by the research activity of the Department of Mathematical Physical and Computer Sciences: Condensed Matter and Materials Physics, Theoretical Physics, Biophysics and Applied Physics. The scope of the PhD program in Physics is to provide a highly specialized scientific training that opens professional carriers in academic institutions and research laboratories, either public or private. A committee composed by 25 scientists, active in the areas listed above, is in charge of offering advanced courses. The research activity of each PhD student during the three-years research project, is supervised by an expert member of the committee.

The “Statistical Physics and Complex Systems” Group, part of the committee, has a strong research background in statistical physics and in dynamical and complex systems. The expertise of the group is focused on network theory and on topological modelling of complex networks and on out-of-equilibrium dynamics in complex systems, with particular interest in interdisciplinary approaches in biological systems and neural networks.

The group has received several fundings from MIUR and INFN in the last few years and actively collaborates with foreign Institutions from France, Spain, Germany, UK and US.

Raffaella Burioni has been awarded in 2014 with the fellowship of the ISI - Institute for Scientific Interchanges.

DESCRIPTION OF THE SCIENTIFIC FIELD & VISITING PROFESSOR PROFILE

Thanks to recent technological advances, an increasing amount of accurate data are now available on neuronal maps at very different spatio-temporal scales. The brain is inherently multiscale and multivariate in nature, and understanding each part of the hierarchy and their interconnectedness is vital to understanding brain structure, function and cognition. Yet, we are still far from understanding the principles and the mechanisms behind the function and dysfunction of the brain. Recently, studying the brain as a Complex System, with methods developed in the field of Statistical Physics and Network Theory, offered the opportunity to utilize new quantitative methods to uncover patterns that are not apparent with more traditional methods. These methods not only refine the outcomes of existing techniques, but also typify a paradigm shift for representing brain structure and dynamics.

The candidate will have a strong expertise in Statistical Physics and Complex Systems with an interdisciplinary profile on Neural Networks modelling, neural dynamics and in neuroimaging and biological data analysis.

DESCRIPTION OF THE DIDACTIC ACTIVITIES OF THE VISITING PROFESSOR

Topics within the Ph.D. in Physics:

- Out of equilibrium Statistical Mechanics and its interdisciplinary applications
- Complex Dynamics in Neuronal Networks
- Network reconstruction of Biological and Neural systems

The courses will be interdisciplinary, with possible access from other Doctorates of Biological/Neuroscience area.

Presence at the University of Parma: At least 3 weeks per year.