The origin of life on Earth and other worlds: A preparatory workshop for ESOF2020

Wednesday 24 October 2018 - Thursday 25 October 2018

ICTP Adriatico Guesthouse

Scientific Programme

Context

The origin of life is one the big questions of the mankind and one of most challenging puzzles to be solved by science. In the past 60 years a large effort has been dedicated to search for plausible chemical pathways leading to the origin of life on Earth, also considering the potential contributions of chemicals assembled in space and delivered on our planet. The detailed exploration of the Solar System and the discovery of thousands of extrasolar planets is giving a strong momentum to investigations aimed at searching for life outside Earth. As a result, times are ripe to address the question about the origin of life in a broader context, trying to understand whether or not life has emerged or can emerge in worlds other than the Earth. The lack of a commonly accepted definition of life calls for a major effort to find universal properties of life that can be used to discriminate the biological and non-biological worlds. In this general context, we believe it is appropriate to plan a ESOF2020 event on the origin of life in the universe for the following reasons: (1) the search for chemical pathways and physical conditions conducive to the emergence of life will require significant advances in hard sciences which may well lead to technological breakthroughs; (2) the search for life beyond Earth has become part of main-stream, top-technology research and is very attractive for the general public; (3) advances in our understanding the origin of life will have a strong cultural impact on all sectors of our society. The organisation of a big event on the origin of life is an ambitious task that requires the establishment of a multidisciplinary network. To this end, we plan to involve astrobiology networks already operating at the national and European level. An effort will also be made to involve the academic and research institutes present in the Trieste area, which cover a broad spectrum of cultural, scientific and technological expertise.

Specific Aims

In the framework of the origin-of-life studies, the workshop will pursue three goals. The first is to explore the scientific and technological impact that may arise from an advance of our understanding of the molecular processes involved in the origin of life. Far from being a fictional field, many open problems regarding the origin of life have strong overlap with fundamental problems in physical chemistry and chemical physics, such as surface potentials, water in different environments, or air-water interfaces. Tackling this type of problems may well lead to unexpected technological breakthroughs. To explore this technological potential we plan to involve research institutes active in the fields of synthetic biology, biotechnologies and nanotechnologies. The second goal of the workshop is to stimulate new forms of scientific collaboration. For example, we plan to encourage the application of quantum computational physics and molecular simulation techniques in studies of prebiotic chemistry which so far have been based on laboratory experiments. We also plan to expand the astrobiological scope of Solar-System and exoplanets studies, so far focussed on biomarkers and habitability, by introducing the conditions of abiogenesis as an essential ingredient of such studies. The third goal is to develop effective ideas for science-to-public events by combining the experiences of all participants. In this context, we plan to explore the application of state-of-the-art, multi-media techniques aimed at stimulating the involvement of the general public.

Thanks to the establishment of well-defined collaborations on specific projects, the proESOF and ESO2020 events will hopefully trigger long term collaborations between research groups and institutions within different European countries and national regions.