ABOUT IBF

IBF's staff currently comprises 54 research scientists, 26 technical staff members and 14 accounting & secretarial staff members. Furthermore, 42 research associates collaborate with the Institute.
IBF plays an important role in research training: numerous grants are assigned each year to **young researchers (currently about 30 people)**, who gain experience within specific projects, and many IBF research scientists are involved in the tutoring of PhD and undergraduate students.

In 2016, IBF research scientists authored **111** scientific papers (provisional data), published or currently in press in leading international journals. The institute's activity was also disseminated at numerous prestigious scientific congresses held in Italy and abroad. IBF's **average impact factor** for 2016 is **3.8.**

IBF research scientists have a long-standing tradition of **international liaising**: strong relationships are maintained with teams located in various European and third countries. Cooperation links are also well established within Italy, particularly with research teams in Italian universities and research centres.

In 2016, IBF was involved in **five projects** funded by the European Union/international institutions. Several projects within the framework of bilateral science agreements are currently in progress and over **20 national projects** funded by both public organizations and private companies are also underway.
IBF's 2016 revenue from external funding bodies totalled approximately **1.121k€.** The main funders of IBF activities were the European Union, Government departments, private research foundations and local authorities. under specific research programmes.

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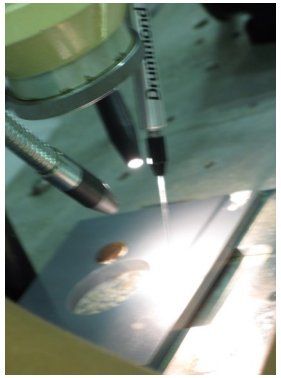
Research Areas at IBF



The Biophysics Institute (IBF) is part of Italy's National Research Council (CNR). Its mission is to investigate biological systems using methods that are typical of the physical sciences. A wide spectrum of subject areas are covered at IBF by a research staff including physicists, physiologists, molecular biologists, chemists and biochemists.

Membrane communication within and between cells

Cell to cell communication mediated by membrane proteins regulating signal transduction pathways. Transport of physiological and xenobiotic ions in cells and organelles. Physiopathological role of Cl- channels and receptors in animal and plant cells. Channel and receptor interaction with metals and peptide toxins from bacteria, plants, insects and higher animals. Transporters of sugar, nutrients and metals and their interactions with eucaryotic channels.

Biomolecular aggregation processes

Mechanisms of biomolecular aggregation (crystallization, glass transition, etc.). Mechanisms of formation of amyloid fibrils (conformational changes, nucleation, elongation, role of solvent). Thermodynamic and conformational stability of proteins in solution (common pathways leading to different biologically relevant structures, role of phase transitions and critical fluctuations). Molecular Dynamics studies of molecular interactions (molecular recognition, conformation and dynamics of biopolymers). Mechanism of biopolymeric gelation (relation between gelation mechanism and mechanical properties, control and characterization of biopolymeric materials). Drug delivery systems (relation between structural and release properties in biopolymer structures).

Modelling of structure and dynamics in complex systems

Biophysical mechanisms underlying memory, learning processes and neural synchronization phenomena. Modelling of calcium dynamics. Nonlinear analysis of biological signals; modelling of stem cells population. Study of ventricular tachyarrhythmias from patients with implantable cardioverter defibrillators. Development of an information theory based on geometric and topologic methods with applications to optics. Meromorphic continuation and interpolation of complex functions. Complex angular momentum in physics.

Plant bioenergetics and molecular biology

Characterization of native and reconstituted photosynthetic complexes. Thermodynamics of photosynthesis; role of structure, antenna size and inter-chlorophyll-complex interaction on the rate of photochemistry. Analysis of mutants of respiratory and photosynthetic electron transport. Photoinhibition. Regulation of Ca2+ATPase and H+ATPase in the plasma membrane: molecular mechanisms and physiological role. Molecular basis of barium blockage in Kcv potassium channel; measurement and analysis of Kcv single-channel current; purification of Kcv membrane protein. Biotechnology applied to biodiversity preservation; plants as bioreactors. Control of biogenesis of organelles during embryo development

Protein structure and dynamics

Photophysics of the triplet state of tryptophan (and red-absorbing analogs) and development of novel spectroscopic approaches for examining structure-dynamics-function relationships in enzymatic proteins, membrane transporters and proteins. Influence of the environment (homogeneous solutions, additives, interfaces, biomedical devices), chemical modification and extreme conditions of temperature, pressure and water activity (ice, dehydration) on the native structure and biological activity of these macromolecules.

Molecular mechanisms of membrane permeability

Ion channels and transporters are studied at the cellular level in native cell preparations, as well as at the single molecule level in heterologous expression systems. Major focuses are: the neuronal glutamate receptor, the major excitatory CNS channel; the epithelial Cl- channel CFTR, that is mutated in cystic fibrosis; CLC Cl- channels and Cl-/H+ antiporters, which are mutated in several diseases. Chief methods employed are patch clamp recording, fluorometry, mutagenesis, biochemical purification and analysis, and molecular modelling.

Biomolecules and biodevices

Primary photoevents in photoreceptive processes: the case of algae; isolation and over expression of photoreceptive proteins of algae for the fabrication of biomolecular electronic devices. Digital Microscopy: set-ups and applications; probiotics for diabetes and cardiovascular diseases; heavy metal screening in water bodies by means of microalgae.

Biophysics and molecular biology in environmental processes

Carbon cycle in the ocean with special emphasis on dissolved organic matter, which plays an important role in regulating carbon concentration in the atmosphere; in-situ analysis and validation of radar altimeter data to monitor water level from space; molecular response to biotic and abiotic stress in plants through the characterization of genes involved in ROS scavenging; cellular mechanisms that regulate absorption, accumulation and toxicity of heavy metals, with the purpose of identifying biomarkers useful for environmental risk assessment.

Biological membranes, macromolecular complexes and biomolecular imaging

Pore-Forming Toxins and AntiMicrobial Peptides, are mainly bacterial toxins relevant for human health, and constitute the weapons for attack or defence. They are excellent archetypal model systems of understanding the key aspects of protein-protein and protein-lipid interactions. Molecular imaging is a new integrative discipline that enables non invasive investigation of cellular functions and molecular processes *in vivo* under physiological or pathological conditions. We focus on the development of new biosensors for monitoring selectively specific cellular functions and pathways. Photosensory biophysics of microbial, visual and nonvisual opsins. The main goal is to identify and characterize new types or mutants of channelrhodopsins, a new family of proteins acting jointly as photoreceptors and ion channels, for optogenetic applications. Superstructural organization of polysomes - the most common and complex eukaryotic cytoplasmic machinery related to the translational control in gene-expression - is carried out by using different nanoresolution imaging approaches to reveal the structural and functional details of translation.