

IOP Institute of Physics

An Overview of the Aims and Interests of all IOP Groups

Applied Mechanics Group

The Group represents all interests concerned with the experimental, analytical and numerical analysis of static and dynamic behaviour of mechanical systems.

Astroparticle Physics Group

Astroparticle physics is highly multidisciplinary; the Group's interests include topics such as direct and indirect detection of dark matter, high energy cosmic ray studies, neutrinoless double beta decay, cosmological neutrinos and nuclear astrophysics.

Atomic and Molecular Interactions Group

The Group promotes the growth and exchange of ideas on the physics of the interaction of atoms, molecules, photons, electrons and their antiparticles. More generally we are interested in the experimental and theoretical study of the dynamics of many-body quantum systems for which the collision energy can range from ultracold to relativistic.

Biological Physics Group

The Group supports the UK research community in all fields of biologically inspired physics. This includes the study of systems that are either biological in origin or serve as informative models thereof. As such these vary in scale from the molecular to whole ecosystems. Nonetheless they share a common theme: the application, and development, of physical techniques and conceptual models to the living world.

BRSG: Magnetic Resonance Group

The Group is concerned with the development of magnetic resonance techniques, and their application to the study of all states of matter.

British Carbon Group

The interests of the Group cover the diverse applications of carbon and graphite in modern technology and the variety of different textures and structures that can be given to the material 'carbon'. The discovery of the world of the fullerenes and nanotubes has, added a further dimension to the Group's activities. The breadth of research efforts generated by the industrial importance of these materials is such that it spans many branches of science, engineering and technology.

The Group is a joint Group of the IOP and Royal Society of Chemistry.

Combustion Physics Group

The Combustion Physics Group provides a forum for the discussion of the physical aspects of flames, ignition, detonation and related topics. It is concerned with these issues both at a fundamental level and in the context of the practical use of wanted combustion processes in engines, boilers and other systems and unwanted combustion in the form of fires and explosions.

Computational Physics Group

Computational physics can be broadly defined as 'the science of using computers to assist in the solution of physical problems, and to further physics research'. Some examples of the Groups interests in the use of computers are, large scale quantum mechanical calculations in nuclear, atomic, molecular and condensed matter physics; simulation and modelling of complex physical systems such as those that occur in condensed matter physics, medical physics and industrial applications and experimental data processing and image processing.

Dielectrics and Electrostatics Group

The Dielectrics and Electrostatics Group is dedicated to the development and dissemination of dielectrics research, application, measurement and interpretation in a wide range of non-metallic solids, liquids and gases; including biological and pharmaceutical systems. The interests of the Group are also devoted to Electrostatics, which is at the same time both a well-defined subject and a very ill defined area of research and technology; this is mainly due to the multidisciplinary nature of the subject. Electrostatics is everywhere, from the macro scale in the atmosphere to the nanoscale in the interactions between molecules and atoms. Examples the areas it covers include atmospheric electricity, aerosol technology, bioelectrostatics, MEMs and surface interactions.

Electron Microscopy and Analysis Group

The interests of the Group include the use of electron beams for microscopy, lithography, structural and chemical analysis as tools in physics, biology, chemistry, metallurgy, materials science, medicine, mineralogy and electronic engineering. Group members are not only those in academic establishments but also from government research organisations and industry. The last named are both users of microscopes and manufacturers or developers of microscopes and ancillary equipment.

Energy Group

The Group is interested in matters where physics and physicists have a role to play in areas such as those relating to, power generation technologies (conventional, renewable, and nuclear); the efficient use of energy; the exploitation of resources for energy use; security of supply; materials for energy applications and energy use in the built environment.

Environmental Physics Group

Environmental Physics is the application of the principles of physics to problems in the natural environment. The interests of the Group span areas as diverse as geomagnetism and agriculture.

Gravitational Physics Group

Gravitation lies at the boundary of particle physics and cosmology. New insights into the relationship between gravitation and other forces will almost certainly change our view of the early moments of the Universe as well as the fundamental structure of matter. The Group reflects the scientific and public focus on these issues and covers both theory and experiment, providing a venue for discussion between these two scientific communities.

High Energy Particle Physics Group

The Group spans many areas, from the huge and extraordinary experiments at the LHC, to the smaller complementary experiments measuring the properties of particles to fantastic precision, and many in between, all of which have the potential to make revolutionary discoveries. Group

membership encompasses students, postdocs, researchers and academics, as well as retired physicists, educators and those who have a connection with the field in other ways.

Higher Education Group

The Group is concerned with issues such as the use of project work in teaching, the MPhys and Europe, assessment strategies in physics, outreach and recruitment in schools and physics education research.

History of Physics Group

The main aims of the Group are to secure the written, oral and instrumental record of British physics for posterity and to explore ways in which history can be used more effectively in the understanding, teaching and general communication of physics.

Instrument Science and Technology Group

The Group promotes the exchange of ideas on all aspects of instrumentation among physicists working in industry, universities, health services and government establishments. The primary focus of the Group's activities is on sensors, particularly the physical principles underpinning new sensor technologies.

Ion and Plasma Surface Interactions Group

The Group has interests in all topics relating to the interaction of charged or neutral particles with a solid including the fabrication of materials and devices by plasma, ion and atom beam methods, the equipment for producing these species and the diagnostics for controlling the processes.

Liquids and Complex Fluids Group

The Group aims to advance research into the liquid state of matter, complex fluids, and soft condensed matter by fostering collaborations between experimentalists, theorists and computer simulators working in these fields. Its scope encompasses both structure and dynamics from microscopic to mesoscopic and macroscopic length scales in systems ranging from 'simple' liquids to all kinds of complex fluids and soft materials such as polymers, emulsions, gels, foams, colloids, liquid crystals, and their biological counterparts.

Low Temperature Group

The Group is concerned by a wide variety of topics linked by the common theme of low temperature physics including, superfluidity, the techniques relevant to the production and maintenance of low temperatures, thermometry, milli-Kelvin and micro-Kelvin techniques and the study of the electrical, thermal and magnetic and mechanical properties of solids and fluids at low temperatures. The Group also has interests in systems operating at low temperatures - for example, infrared detectors, devices based on the Josephson effect, cryopumps and superconducting magnets.

Magnetism Group

The Group aims to promote and support physical science research in magnetism, magnetic materials and spintronics. Research in magnetism is broad ranging from theoretical and experimental work in fundamental physics to applications of magnetic materials.

Materials and Characterisation Group

The Group has a wide range of interests, both industrial and academic, for example the principles and applications of various techniques, such as thermal imaging, spectroscopic techniques, electromagnetic and magnetic methods of NDT and ultrasonics.

Mathematical and Theoretical Physics Group

The Group is interested in the development of interdisciplinary activity in various branches of mathematical physics, especially in general relativity, quantum field theory and statistical mechanics.

Medical Physics Group

The Group's interests relate to all areas of physics with potential for medical applications to the diagnosis and treatment of disease. These include conventional imaging modalities (x-ray, radionuclide imaging, ultrasound, MRI etc.), therapeutic interventions (radiotherapy, ion beams, proton therapy, targeted radionuclide therapy etc.) and dose distribution calculations as well as research and current developments in areas such as Nanomedicine, molecular imaging, new drug delivery mechanisms, image-guided and adaptive radiotherapy, radiobiology, personalised medicine and emerging imaging techniques and technologies.

Molecular Physics Group

Molecular Physics is a flourishing interdisciplinary field of research encompassing theoretical and experimental activity. The Group has interests in areas such as molecular reaction dynamics, laser chemistry/physics, spectroscopy, quantum chemistry, surfaces, and solid state physics.

Nanoscale Physics and Technology Group

The Group is concerned with all issues related to the physics and applications of nanotechnology and nanoscale structures, including research, technology and public awareness.

Neutron Scattering Group

The use of neutron scattering as a means of studying the structure and dynamics of systems has grown continuously since neutrons became available in reasonable quantities from research reactors and accelerator based sources. The Group supports scientists interested in the use of neutron scattering for the study of condensed matter.

The Group is a joint Group of the IOP and Royal Society of Chemistry.

Nonlinear and Complex Physics Group

The Group aims to stimulate interest and advance progress in the study of nonlinear processes and complexity in the physical sciences and its application to other disciplines.

Nuclear Industry Group

The Group supports physicists involved with or interested in the nuclear industry and is concerned with all aspects of the industry - including both the civil and defence-related sectors, and aims to reflect the diverse roles that physicists play within it.

Nuclear Physics Group

The Group is interested in all areas relating to nuclear physics.

Optical Group

The Group concerns itself with matters relating to the science and technology of optics, photonics, and its applications. This includes, but is not restricted to, biomedical optics, electro-optics, holography and diffractive optics, imaging, interferometry, lasers, microscopy, optical devices and instrumentation, polarization, spectrometry, infrared, UV and X-ray optics.

Particle Accelerators and Beams Group

The Group aim to promote the professional standing of workers in the field of particle accelerators, through exposure, events, outreach and increased academic profile. Interest areas include accelerator technology; applications of accelerators, especially medical and industrial; beam dynamics; high energy hadron accelerators, instrumentation for accelerators; radiation light sources, including free-electron lasers.

Physical Acoustics Group

The Group is interested in the many aspects of physical acoustics and ultrasonics that contribute to fundamental science and its applications.

Physics Communicators Group

The Group aims to raise the profile of physics through high quality public engagement resources, events and activities.

Plasma Physics Group

Plasmas are ionized gases in which long-range electrical and magnetic interactions involving charged particles dominate over collisions between neutral species. Wide ranges of particle energies and particle densities are involved: from the tenuous interstellar medium to dense ablation plumes around the focal spots of high power, short-pulse lasers; from around a hundred million kelvin associated with nuclear fusion reactions to a few thousand kelvin in maintaining the electrical conduction in gases. The Group has interests in all of these areas.

Polymer Physics Group

The interests of the Group cover all aspects of the physical properties, structure and dynamics of polymers (both synthetic and naturally occurring) in the form of semi-crystalline solids, glasses, elastomers, gels, melts and solutions. Fundamental phenomena are of interest along with applications of polymers in technologies, such as optoelectronics, photovoltaics, coatings, composites, medicine, foods and pharmacy.

The Group is a joint Group of the IOP and Royal Society of Chemistry.

Printing and Graphics Science Group

The Group's areas of interest include inkjet and other printing and deposition processes and their use novel applications such as visual displays, flexible electronics, smart packaging, lighting and photovoltaics based on organic and polymer electro-optic materials.

Quantum Electronics and Photonics Group

The Group provides a forum for burgeoning interests in lasers and their applications, coupled with related areas such as nonlinear optics, photon statistics and coherent/quantum optical phenomena.

Quantum Optics, Quantum Information and Quantum Control Group

The Group covers a broad spectrum of topics, from the foundations of quantum physics and information theory, through the investigation and control of fundamental physical and chemical phenomena, to new types of quantum technologies, metrology and standards.

Semiconductor Physics Group

Semiconductor physics is recognised as one of the major areas of condensed matter science and forms the core of modern solid-state device technology. Group members have a broad range of backgrounds often extending beyond physics to electronics, chemistry, and materials science. The Group is interdisciplinary in outlook and is concerned with issues such as the preparation of complex multilayer semiconductor structures by techniques such as molecular beam epitaxy and metal organic chemical vapour deposition and in the development and application of scientific methods to probe the physics of these structures.

Shock Wave and Extreme Conditions Group

The Group is interested in the novel aspects of the fundamentals and applications of science, engineering and technology, in all forms of matter, applicable to areas such as, static high pressures, shock waves, blast, energetic materials, high pressure or high-rate materials synthesis, development of equations of state and constitutive models and high-speed transient phenomena.

Structural Condensed Matter Physics Group

The Group is concerned with both the theory and practical applications of crystallography. Since crystallography is an interdisciplinary subject and impinges on many fields of scientific work, the Group's interests cover a very wide range of topics, for example magnetism, diffuse scattering, incommensurate and modulated phases and physical properties and their relationship to crystal growth.

The Group is a joint Group of the IOP and British Crystallographic Association

Superconductivity Group

The Group is interested in all aspects of superconductivity.

Theory of Condensed Matter Group

The Group exists to support the UK research community in the field of condensed matter theory. This includes those working in the areas of electronic structure, correlated systems and many-body theory, and the statistical mechanics of solids and liquids.

Thin Films and Surfaces Group

The Group aims to stimulate and support the study of the properties of thin films, surfaces and interfaces. Some general fields of interest include, the electronic, vibrational and structural aspects of clean surfaces and of surfaces with thin adlayers; the preparation and growth of thin films and

multilayers, and the study of their structural, physical and chemical properties; development and evaluation of new techniques, and the extension of existing ones, for the characterisation of thin films and surfaces; reactions at surfaces, including molecule surface interactions, adsorption/desorption phenomena, surface dynamics and chemical reactions.

Tribology Group

Tribology, which broadly covers the field of friction, wear and lubrication of surfaces in relative motion, is an interdisciplinary subject drawing on knowledge from the fields of physics, chemistry, metallurgy and engineering. The Group provides a forum for the discussion of current developments in fundamental aspects of interacting surfaces.

Vacuum Group

The Group brings together those engaged in the production and improvement of vacuum equipment with those concerned with its application in such diverse areas as medical physics, large machines for research in the physical sciences, industrial process control and the electronics and semiconductor industries.

Women in Physics Group

The Group aims to reflect the varied careers of women physicists in industry, commerce, academia, teaching and research and provides support to members in progressing their careers by encouraging professional development and participation in Institute activities. Issues of interest to the Group include education at primary, secondary and tertiary level; women in research and academia - especially those on short-term contracts; career breaks and career management workshops.