

## ORIGIN, ROLE AND STRUCTURE OF THE INSTITUTE OF PHYSICS

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The Institute of Physics is a scientific charity devoted to improving the practice, understanding and application of physics. It has a worldwide membership of over 36 000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.

The Institute of Physics (IOP) can trace its origins back to the formation of the Physical Society in 1874. This original organisation was formed by the initiative of Frederick Guthrie, a professor of physics at the Royal College of Science in South Kensington, London. Together with his assistant, William Barrett (later Sir William Barrett FRS), he proposed setting up a "Society for physical research", by sending an initial circular to 30 physicists. The initial emphasis was on practical and experimental science.

By 1917, the Council of the Physical Society had begun to explore ways of improving the professional status of physicists, along with the Faraday Society, Optical Society and the Roentgen Society. The Institute of Physics was formed and held its inaugural meeting in April 1921; its first president was Sir Richard Glazebrooke.

Having long shared administrative arrangements, the two bodies merged in 1960, adopting the name The Institute of Physics and the Physical Society. This was shortened to the organisation's current name on the award of a Royal Charter in 1970. Although a Royal Charter was once the sole means of incorporating an organisation (*i.e.* changing it from a collection of individuals into a single legal entity), grants of a new charter are now reserved for eminent professional bodies or charities.

Today, the Institute of Physics defines its mission as: advancing physics in order to further the understanding of the physical world and its application for economic and social benefit; promoting interest and participation in physics across society as a whole; and supporting and involving physicists throughout their education and careers.

IOP has grown over the years and now has about 36 000 members, mainly from the UK and Ireland but also distributed right across the world. It is governed by an elected Council of 25 trustees, who control the affairs of the Institute and meet four times a year. The council is headed by a president (see box, below) who is elected



Posters that the Institute has placed on buses in several cities.

to serve a term of two years, along with the immediate past-president or president-elect and an honorary secretary and treasurer who together make up the IOP's senior officers. Council is advised by a number of boards and committees, to which it delegates some of its responsibility as trustees. These include the education board, the science board, the business & innovation board and the external engagement committee. IOP engages professionally with its membership through over 50 subject groups, which enable members to work together to take forward their specific fields of research or pursue physics-related interests. These range across the full discipline of physics and also the interfaces with other fields and areas of application. Groups organise conferences, produce newsletters, and award prizes in their field. During 2009, the Institute's groups also awarded more than 100 bursaries to postgraduate students via the Research Student Conference Fund. Members can now join as many groups as they wish free of charge, and more than 30% of members belong to at least one of them.

All IOP members living in the UK or Ireland are automatically assigned to one of 13 national or regional branches. These represent a grass-roots link between members and the Institute. They undertake a range of activities from lecture programmes, to schools outreach. Recent examples include high-level policy-related presentations by senior government scientists in London, talks on soap bubbles as part of the Manchester Science Festival, and demonstrations of the physics behind toasting marshmallows and the principles

of buoyancy given at a regional "County Show" in the South West. The branches, along with regional officers in England and national officers for Ireland, Scotland and Wales, who are Institute staff, work towards IOP's goals locally, on national and regional policy issues.

## 1 Membership

The Institute of Physics has a growing, diverse membership, which ranges from university students to internationally renowned researchers. It also includes many people who have a physics degree, or simply an interest in the subject, and do not necessarily work professionally in the field. IOP is intended to be a "natural home" place for any physicist or person interested in physics where they can come to develop themselves and/or form positive connections with others who share their fascination with physics.

Membership is offered in several categories depending on qualifications and experience. Affiliate membership is for anyone with an interest in physics who wants to support the Institute's objectives and be part of a learned society, but does not have a formal physics background. Associate membership is for recent graduates of degrees in the physical sciences or engineering, or an equivalent. Members have at least three years of post-degree experience during which professional skills have been acquired (the degree being in the physical sciences or engineering or an equivalent). Fellowship indicates a very high level of achievement in their

profession. The latter three levels of membership entitle the member to use the post-nominal letters AMInstP, MInstP or FInstP respectively.

Student membership is available to those who are enrolled on a full-time physics-related undergraduate course, and is free for students taking courses recognised and accredited by IOP. Similarly, youth membership is available to 16–19-year-olds studying physics in schools or colleges before entry to university.

The Institute recently introduced an electronic affiliate membership – free to physicists from countries on the World Bank's list of low-income economies, or for an annual fee of £10 to those from middle-income economies. This new type of membership works with national physical societies where they exist, and allows access to all of the Institute's services that are delivered through the web, as well as allowing these online affiliate members to receive discounted rates for professional courses delivered online, and to attend conferences in the UK at members' rates.

One of the benefits of belonging to the Institute is that it allows members to achieve chartered status as either a Chartered Physicist, which is unique to IOP, or Chartered Engineer, which is maintained by the Engineering Council UK. Chartered status is the aspiration of members engaged at the leading edge of all fields of physics and its applications, and it stands for the highest standards of professionalism, up-to-date expertise, quality and safety, and for capacity to exercise leadership and undertake independent practice. As well as competence, the title denotes commitment to keep pace with advancing knowledge and with the increasing expectations and requirements for which any profession must take responsibility.

Members are kept up-to-date on the Institute's activities via the members' newspaper *Interactions*, and on developments in physics through the internationally acclaimed members' magazine *Physics World*. They can subscribe at discounted rates to up to three journals published by the Institute's subsidiary company IOP Publishing (see below); benefit from support and advice through mentoring facilities; and use the IOP's professional-development services, which include low-cost, online transferable skills courses and company accreditation of training schemes. The Institute of Physics Careers Service was recently awarded the Matrix Standard, the national quality standard for any organisation that delivers information, advice and/or guidance on learning and work. Accreditation required an assessment involving meeting all eight elements of the standard: four focused on delivery of service and four focused on management of that service.

The Institute's commitment to utilising new methods of communication led to the development of *MyIOP*, a web-based social network that allows members anywhere in

the world to establish links with colleagues who share their interests, and to exchange views on any topic – current discussion forums range from climate change to research funding. More than 12 000 physicists are already using the network to communicate with each other and with IOP.

One major area of Institute activity relating to members is the organising of conferences. During 2009, conferences organised by the Institute attracted 2770 participants. Examples included the conference on Optical Fibre Sensors 20 which was held at Heriot-Watt University, Edinburgh in October and attended by 376 international physicists, and the Condensed Matter and Particle Division's conference at the University of Warwick in December which had 380 participants.

## 2 Communications, publications and outreach

Communication has always been at the heart of scientific research, and the Institute is a leading communicator in the physical sciences. Its journal-publishing arm, the subsidiary company IOP Publishing, is based in Bristol, with other sites worldwide, including Philadelphia, Washington DC, Tokyo, Beijing, Moscow, St. Petersburg, and Munich. It collaborates with partners including the International Atomic Energy Agency, the US Department of Energy and CERN to disseminate leading-edge scientific research. IOP Publishing also works with the American Astronomical Society, Turpion-Moscow and the Chinese Academy of Sciences to showcase its journals to an international audience.

The publications list contains more than 60 high-quality journals, including the prestigious *Journal of Physics* series; and 32 of the company's journals are published in cooperation with international partners, such as the *New Journal of Physics*, published jointly with the German Physical Society. IOP Publishing now has 108 consortia contracts in 68 countries, with 2395 institutions benefiting from access through these agreements. As part of the IOP's commitment to developing nations, free or low-cost access to its published content is available for researchers in these areas.

Two new publications were launched during 2009, and the publishing programme grew with almost 30 000 articles being published. Journals published or produced by the company are read in more than 180 countries, and journal articles were downloaded more than 18 million times last year.

*IOPscience*, the new online platform for distributing journal content, provides access to more than 130 years of leading scientific research and now hosts more than 350 000 journal articles dating from 1874 to the present day. *IOPscience* was recognised by the 2009 PROSE awards with an Honorable Mention in the Best Website or Platform category. More than 40% of IOP Publishing's journals achieved an

impact factor of two or more during the last year, and there are now five journals with an impact factor over 5.

As well as its journal-publishing activities, the Institute communicates with key stakeholders and the general public to develop awareness of the central importance of physics, respond to political issues that impact on the health of the subject, and exert the greatest possible influence in support of physics research, education and application.

IOP commissions reviews on policy issues affecting physics research and its application in the UK and Ireland, compiling evidence and issuing authoritative reports on issues such as the contribution of physics to the economy, the finances of university physics departments, or the status and impact of research in different disciplines of physics. One recent report commissioned by the Institute of Physics in Scotland showed physics graduates from Scottish institutions “punch well above their weight” in terms of their contribution to the local economy, accounting for 4% of the workforce but delivering 10% of Scotland’s Gross Value Added.

As well as these activities, the Institute publishes “vision papers” highlighting exciting new areas of physics research, and their potential impact. From fundamental areas such as the forces of nature to the security applications of terahertz radiation, they show how physics pervades all areas of science and makes a key contribution to society and the economy.

One example, [Physics for an Advanced World](#), a series of case studies showing how technologies from MRI scanners to optical fibres are dependent on physics and often arise unexpectedly from pure research, was launched with an event in the Houses of Parliament attended by almost 100 people; the report was very well received as a powerful demonstration of the value of investing in science.

Public seminars, often organised in partnership with other learned societies, showcase the importance of physics in areas as diverse as geoengineering and international development, and IOP also responds to consultations by government and lobbies proactively in support of the physics community at both national and regional level.

For the general public, the Institute runs its [Physics in Society](#) programme, with a range of innovative outreach activities aimed at inspiring people of all ages, who are not normally exposed to physics, about the subject and engaging them in meaningful debate on scientific topics. The programme includes physics “busking” – demonstrating physics-related experiments – at festivals throughout the UK, organising [Spooky Science](#) shows at Butlins holiday camps, and advertising campaigns using posters on buses and distributing beer-mats designed to engage the public – the latter reaching around 4000 people in the north-east of England last year.

The Institute provides support and resources to physicists

who take physics into their communities through training workshops and grants for public-engagement activity – 26 projects were funded in this way during 2009. The Physics in Society website [physics.org](#), which has undergone a redesign, is a collection of the best physics resources available; and its search technology allows users to match their question, age and knowledge to a range of hand-picked and refereed websites.

[IOP’s Lab in a Lorry](#) is a fleet of three mobile science labs staffed by volunteer physicists. Run on a regional basis depending on funding, the lab takes hands-on physics experiments into the community with the aim of getting young people excited about science, encouraging them to consider careers in physics and engineering, and giving them face-to-face contact with real scientists. Since its launch in 2005, it has reached more than 110 000 students and benefitted from the expertise of more than 530 volunteers. The programme depends on generous sponsorship from business and the public sector. For example, the lorry in Scotland recently received funding from Opito – the Oil & Gas Academy, to contribute towards its operations over the next three years.

### 3 Schools programmes

The future of physics depends on attracting new generations of people into the field. Equally, IOP believes that all students deserve an opportunity to benefit from a physics education: gaining a deeper understanding of our world, obtaining an essential step in training for many science and engineering disciplines, and providing an open door to a wide variety of careers in which analytical skills are at a premium. Through its educational programmes, the Institute aims to increase the number and diversity of those who choose to study physics. Along with the [Science Learning Centres](#), IOP has formed a partnership to establish and run a support network for physics teachers and pupils in England, the [Stimulating Physics Network](#). The project is funded by the UK government’s Department for Children, Schools and Families until March 2011, and aims to provide an inspiring, coherent and sustainable programme of lessons, activities and continuous professional development in order to achieve a significant change in the teaching of physics in English secondary schools.

IOP has also run the [Stimulating Physics Programme](#), a two-year initiative funded by the Higher Education Funding Council for England (HEFCE) aimed at addressing government concerns about the number of students opting for physics. With similar projects for chemistry, engineering and maths after the age of 16, it has become part of the National HE STEM programme led by Birmingham University, with funding of £1.6 m for three years.

The Institute supports both teacher recruitment, working with a number of teacher-training centres to help them recruit more trainee physics teachers, and provide continuous professional development to teachers. With funding from the Gatsby Charitable Foundation, IOP provides mentoring support for participants in two key government programmes designed to help science graduates whose specialism is not physics to train as physics teachers, and to help teachers who do not have degrees in physics or chemistry to teach these subjects more effectively.

IOP is committed to promoting an inclusive environment for everyone who studies or works in the field of physics, regardless of gender, ethnicity, social background, or disabilities. Current initiatives include the [Girls in Physics Programme](#) to help teachers improve the engagement of girls in the physics classroom, [Project Juno](#) to address employment inequality in university physics departments, advice on improving access for disabled students, and a pilot project to look at ways to encourage minority ethnic students to continue studying physics at university level.

#### 4 International development

Internationally, the Institute's Physics for Development programme is aimed at promoting the economic and social benefits that physics can deliver in the developing world, including support for educational opportunities. IOP works towards these aims by providing practical equipment, running teacher-training courses and workshops on entrepreneurial skills. The Institute recently set up a mechanism to send used or donated equipment to Africa to encourage science at school level, in collaboration with charities such as LabAid and BookAid, and also developed an online entrepreneurship curriculum covering how to understand the entrepreneurial process, the potential of physicists and engineers to contribute, and the steps involved in turning an invention into a product.

#### 5 The future

Future plans for the Institute include finding ways to exert influence on EU-wide issues, launching a new [Business Forum](#) to engage high-technology companies, and providing new ways for teachers and others interested in education to contribute in depth to the Institute's education policy and activities.

IOP also intends to organise the first [National Physics Day](#), and to negotiate agreements with India and China to promote membership of the IOP to scientists in their countries.

Through these, other new initiatives and the continuation of IOP's flagship programmes, the Institute believes that it is in a strong position to achieve its purpose of improving the practice, understanding and application of physics.



#### The President

Members elect the president of the Institute of Physics, who holds the position for two years. The current president is Prof. Jocelyn Bell Burnell DBE FRS FInstP.

"Physics is an inspirational endeavour. I have been lucky enough to work in the field of astrophysics for most of my career, and to experience at first hand the excitement of pushing back the frontiers of knowledge. As President of the Institute of Physics, I am proud to help communicate the work of leading edge researchers around the world, and celebrate their achievements. However, in the UK at least, physics remains dominantly the preserve of white, middle-class men, and we need to encourage more diversity. By attracting more girls, and more students from different social and ethnic backgrounds into physics we will open up a range of exciting opportunities for the individuals concerned, as the same time as ensuring the long-term health of the discipline. I am absolutely committed to supporting IOP's activities in this field."

Professor Jocelyn Bell Burnell DBE FRS FInstP  
President of the Institute of Physics

#### Dr Robert Kirby-Harris CPhys CSci FInstP

Robert (Bob) Kirby-Harris is the Chief Executive of the Institute of Physics (IOP) with responsibility for the strategic management of one of the world's leading physical societies. Prior to taking over at IOP, Bob Kirby-Harris has directed several educational and scientific organisations, having spent two years as the operations director of the Royal Botanic Gardens Kew, 12 years as a deputy vice chancellor of two universities, and five years running the consultancy & applied research company of a polytechnic. Prior to this he served in the Royal Navy for eight years as a lecturer and also taught physics and mathematics in a secondary school. He also has a deep interest in sustainable development arising out of 7 years work in Southern Africa promoting the role of universities in building capacity and transforming their societies. He spearheaded the development of science and engineering, and of distance learning to meet the needs of disadvantaged urban and outlying rural communities.