Unlocking the Future

The Institute of Physics
Strategy 2019 – 2023
Message from IOP President, 
Professor Dame Julia Higgins DBE FRS FREng CPhys Hon.FInstP

‘Science, technology, engineering and mathematics (STEM) play a fundamental role in our society and economy. The knowledge and ingenuity of scientists and engineers have helped to transform society, energise our economies and improve our health and our quality of life.

‘In the years to come, we will depend more on knowledge and skills from physics and other disciplines to address the challenges facing us, whether through diagnosis and treatment in healthcare, living more prosperously and sustainably, addressing significant disparities in access to water and food, addressing our energy needs or protecting our biodiversity. In all these ways, and others, physics has the potential to improve our lives. Our motivation is to maximise these benefits for society.

‘We have listened to our members and leading figures from inside and outside of our community and have identified three urgent priorities that we must now tackle head-on. They are:

• ensuring that our profession reflects the diversity of our society, making sure all young people have access to world-class physics education and training, investing in critical technical skills and closing the growing STEM skills gap;

• making sure that the UK and Ireland are able to realise the full benefits of the next technological and industrial revolution; and

• supporting informed debate so that citizens can participate in discussions and decision-making about issues that affect them.

‘This is an ambitious agenda for the IOP but we are not starting at the very beginning. Over the years, we have gained knowledge and experience by working closely with schools to strive for excellence in our education system; created opportunities for researchers, entrepreneurs and businesses to innovate; brought physics to life for the public; and provided evidence to help inform policy across the UK and Ireland. In all these areas, and others, we have made significant progress but I am confident we can do more by being open to new ideas and new ways of working.

‘In 2020, we will mark the 100th anniversary of the founding of the original Institute of Physics as a body to grow and develop the profession. In 1960, the organisation merged with the Physical Society, a learned society, to form the modern-day IOP. Our anniversary is an opportunity to celebrate the profession of physics and invest in many of the ideas that will help us to realise the ambitions we have set out here.

‘The fact that we are able to embark on such an ambitious journey is testament to our heritage and the commitment and hard work of many people over the period of the past strategic plan. This has allowed us to create a permanent home, a strong reputation and solid financial foundations.

‘In the next five years, we will build on these foundations and focus our efforts on a set of deep-rooted challenges facing physics that will impact on our society. We will work with our members and our networks in the UK, Ireland and internationally to use our combined expertise to help solve these problems. We will also develop new ways of working, build strong alliances within and beyond the sciences and concentrate our resources by creating a £10 million Challenge Fund to invest in innovative ideas and programmes and engender and accelerate large-scale change.

‘We embark on our new strategy at a time of great opportunity tensioned by momentous political, social and economic change. The work ahead is challenging but I firmly believe that as physicists, we have a responsibility to explain, promote and deliver the benefits that physics offers to society when our profession and discipline are strong and healthy.’

Regards,

Julia
The Institute of Physics
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Our place in the world

We are entering a new industrial revolution powered by science, engineering and technology. Governments all over the world recognise the potential of these developments to shape the social and economic futures of their countries. This is driving investment in education, skills, research and innovation to help improve our health and quality of life and increase our understanding of the universe.

Ambitious targets for increased investment in research and development have been set in both the UK and Ireland and sweeping changes have been made to education and research systems to help create and capture more of the societal benefits that will come from higher levels of research and innovation. These commitments reflect the importance of science and innovation in boosting productivity and long-term economic growth more than a decade after the global financial crisis. The STEM community has the talent, skills and knowledge to capitalise on these investments and fuel far-reaching scientific, technological, social and economic change. The UK and Ireland boast world-class institutions, a reputation for excellence in science and engineering and a track record of ground-breaking discoveries. Our research and innovation base is the envy of much of the world, making us highly-valued partners internationally. Physics is a recognised engine for discovery and innovation and a significant contributor to our economy.

Three major challenges facing physics

We have never been in a better position to capitalise on the opportunities that the current environment presents. Over the next five years we will focus on three challenges that we think present the greatest barriers to unlocking the potential of physics and on increasing the impact of physics in society.

1. Diversity and skills:
Physics has a diversity issue, often driven by deep-seated stereotypes, and faces acute shortages of skills. We must ensure our profession better reflects the diversity of our society and offers all young people, no matter their background or where they live, those opportunities afforded by world-class physics education and training. Not only must we ensure that individuals can thrive in a supportive educational and working environment, we must invest in critical skills and close the growing STEM skills gap.

2. Unlocking capability:
We are on the cusp of a new industrial era, powered by science, technology and engineering. To make sure the UK and Ireland are able to realise the full societal and economic benefits of this scientifically inspired revolution, our STEM community needs to be world-leading. That means strengthening our research and innovation ecosystem and building more productive ties between universities, research institutes, businesses and government. Our community is closely intertwined with international networks, infrastructures, facilities and investment streams so, to stay at the forefront of scientific discovery and innovation, we must ensure that we maintain a strong presence in international networks, partnerships and programmes and that our nations remain open and attractive to talented researchers and innovators.

3. Public dialogue:
In a mature and healthy democracy, every person in the country, from every walk of life, should be able to participate in well-informed discussion about the choices and challenges that affect us all. We want to make sure that the physics of everyday life is appreciated and that people can participate in informed debates about public funding and policy issues such as new treatments and diagnostics in healthcare; decarbonising our economies; and cyber security and recognising the important role that physics will play in these.
Impacts and responses

While these challenges are focussed on physics and the role of physicists, we cannot address them in isolation or limit our engagement to the physics community - or even just the sciences. Instead, we want to build strong partnerships with others and work hand-in-hand with a diverse range of organisations to achieve maximum impact.

The three challenges are closely connected and interdependent and progress in one area may have beneficial impacts in the others. We will therefore aim to achieve the widest possible impact by fostering more effective collaboration between the IOP's own teams and by working with partners in the design and delivery of our programmes.

Our responses to these challenges will draw upon evidence; our own experiences of working in some of these areas for many years; expertise from within our community including our membership; and from consulting with others. In some areas we know that our evidence base is incomplete and we will fill these gaps where we know additional knowledge can help to guide and shape our work. We will build a programme that is agile and responsive and can evolve as our understanding of the challenges we face develops.

Diversity and skills: our impact

We will champion diversity, campaign to combat barriers to inclusion and challenge stereotypes about physics and physicists in schools, further and higher education and in business. We will ensure that the UK and Ireland have world-class physics education provision that offers diversity of choice, where career opportunities are clear and working environments are welcoming and inclusive.

• Alongside other organisations, we will confront and break down the barriers to entry into our field created and perpetuated by these stereotypes, and ensure physics as a discipline is more inclusive and seen as a rewarding choice for study or employment. A diverse and inclusive physics community – supported by a clear articulation of the varied educational routes, training and career opportunities afforded by physics – will also help us to close the skills gap and meet the growing demand for physicists in the workplace.

• We will transform the levels of recruitment and retention of physics teachers, providing them with the support, confidence and resources they need to engage young people in the classroom. In support of this, we will embed high quality professional teaching in schools by working with teachers and Continuing Professional Development (CPD) leaders within the IOP and from partner organisations to improve and quality assure physics teaching and CPD in schools.

• We will lead the way in championing pedagogical research to build on and promote the evidence base for education and learning; this will support governments in building world-class physics education systems.

• We will ensure that all researchers, regardless of background and circumstances, have an equal opportunity to publish with us and have their work recognised by their peers.

• We will challenge the notion that "physics is hard" and therefore only an option for the most able. In support of this we will provide innovative and far-reaching resources on careers in physics and we will join with partners across STEM to showcase the many and varied career options physics can unlock. These resources will highlight both the academic and vocational routes into educational and employment opportunities in physics. We will work with partners to grow the uptake of science apprenticeships and vocational qualifications at all levels in physics and engineering.
Unlocking capability: our impact

We will advocate for more public and private sector funding to be invested in groundbreaking research in physics, cutting edge innovation, skills development, facilities and infrastructure; such investment being a well-proven route to economic growth, increased productivity and value creation in society. We will help our members navigate our research and innovation ecosystem, to exploit synergies within and between research fields, and to turn new ideas and discoveries into high value innovations. We will ensure there is a supportive economic and regulatory framework for our business community, particularly for small and medium-sized enterprises (SMEs) who drive growth and innovation, and we will support robust and innovative links between physicists in research and development (R&D) in our large businesses, SMEs and our universities.

• We will build the first network connecting physics-based innovation centres and facilities in the UK and Ireland, and ensure our community has wide access to the opportunities that this creates. Through this network we will bring universities, public research laboratories and businesses together to inspire innovative new ideas and practices.

• Given that we operate in a highly competitive international environment, any disconnect from international research programmes, or weakening of international relationships, may put our competitiveness at risk. We will be a valued partner to, and strengthen relationships with, other countries (including the US, China, India and Japan), thus helping to build markets for our SMEs, ensuring our community has access to world-class facilities, and helping our universities and businesses to remain attractive and open to international talent.

• Many of the challenges and opportunities facing our community have their roots in, or are magnified by global trends so we will represent and actively promote the interests of the UK and Ireland physics community in international forums.

• We will champion and amplify the investment needs of our community by conducting the largest engagement programme yet with our membership and scanning the horizons of physics to identify new and emerging research areas, technologies and issues to help underpin advocacy for sustainable, high-impact funding in physics.

• We will continue to inform and shape the future and sustainability of the science publishing landscape by ensuring our publishing programme is world-class and serves the needs of the international science community. Working with research funders and universities, we will significantly increase the proportion of articles published in our journals on an open access basis. Through our scientific publishing we will describe and monitor key developments in physics research and innovation, promote collaboration within our community and between disciplines, and strengthen the exchange of knowledge between researchers and innovators, demonstrating how research benefits and influences society, culture, our environment and the economy.

Public dialogue: our impact

We will remove barriers to participation and create opportunities for people of all backgrounds and ages to engage with physics and its connection to the world around us in a meaningful and sustainable way. We will work with partners to deliver these activities and, through them, inspire people to become ambassadors and advocates for physics, helping us to achieve and sustain national impact in the UK and Ireland.

• We will enable public-led discussions and conversation by asking questions and sharing knowledge about the role and value of physics in all our lives. Through advocacy campaigning we will highlight and showcase the contributions physicists make to society. We will build a rich and engaging set of case studies to detail the journey from research, through innovation to social impact.

• We will establish ourselves as a convenor of public debates and use this platform to encourage informed discussion on topics and issues that show how physics affects our everyday lives. In this way we will help to amplify the public voice in discussion about science and society.

• We will create physics events across the UK and Ireland for diverse audiences of different ages and backgrounds. These events will offer fun, interesting and thought-provoking opportunities to make and continue a connection with physics, and to understand who physicists are and where they work.
How we will measure our success

We will measure the impact of our work against these long-term aspirations and indicators.

- Every secondary school pupil in the UK and Ireland will have access to a specialist physics teacher.
- Girls will make up at least 30% of those taking physics at age 16-19 and there will be double the current number of young people from black and minority ethnic and lower socio-economic backgrounds.
- There will be clear roadmaps and funding commitments from the UK and Irish Governments that propel research and development investment towards the Organisation for Economic Co-operation and Development average of 2.4% of Gross Domestic Product.
- Double the current number of people will be employed in technical roles in physics-based and engineering businesses and the number of those on physics-based science apprenticeships will have increased by a factor of 100.
- Our publishing services to the worldwide physics community will have further improved such that the number of scientists publishing their research in our journals will grow by 25%.
- 10% of the population (as a demographically representative sample) will have a meaningful engagement with a physics-based public event and 1% will have sustained contact with physics.

The targets we will set ourselves in order to achieve this change will be laid out in our strategy roadmap.

Building an evidence base

To increase our influence and address these primary challenges, we will strengthen our evidence base. We will also strengthen our relationships with governments across the UK and Ireland so that we become the trusted and valued voice and the go-to organisation for contributions on physics, its connection with the wider STEM agenda and with society.

In support of this, we will draw together a comprehensive set of data, information and evidence-based analysis of the UK and Irish physics communities. We will use this asset to underpin a valued, respected and proactive policy programme on which governments and research funders will depend for high quality, independent information and advice when making decisions.

Where we work and who we will work with to address these challenges

To address these strategic challenges, we will work with our members and our stakeholders, including our international networks, to capitalise on our community’s expertise and knowledge.

We will use our convening power to engage new audiences, many of them beyond science, and build strategic alliances where they will help us to extend our reach and influence. We will build and strengthen relationships with partners (including funding partners), opinion formers and decision makers in the education system, in the research community, in business and in government.

The scale of the challenges and their impacts on society mean that we must also promote better engagement with the public, not only through our programmes but also by harnessing the power of digital technology in more innovative ways.

To drive our strategic ambition both with and through other organisations, we will create a £10 million Challenge Fund to invest in innovative responses and solutions to our three strategic challenges over the next five years. The Challenge fund will support groundbreaking new programmes but will also provide a competitive funding stream that is open to our community in the UK and Ireland as well as those that work in partnership with them. To be funded, projects will have to be well-evidenced, innovative and show potential for high impact and scale.
Our international role

The physics communities in the UK and Ireland are enriched by talented people from all over the world. In 2017, 27% of academic staff in UK physics departments were from non-UK EU countries and 18% were from non-EU countries. More than half of physics postdoctoral researchers were from outside of the UK. In 2017/18, 35% of full-time postgraduate physics students in Irish universities were from outside of Ireland and Northern Ireland. 

Openness to talent and ideas has allowed us to build strong international ties, valuable and productive research collaborations and world-class shared infrastructure. Ensuring that we remain open and attractive to talented physicists, have access to international research programmes and infrastructure and are able to build international partnerships and support strong physics communities in Europe and further afield will be key to our future success.

Changes in the political and economic landscape in Europe and the rest of the world, highlight the importance of our support for UK and Irish physicists to develop relationships and collaborations with colleagues in Europe and around the world.

We will focus on strengthening relationships in key countries including China, Japan, India and the USA. We will work with physical societies and other international organisations to address issues of common concern and, by doing so, ensure that physicists play a prominent role in the international community.

IOP Publishing works with researchers and institutions from around the world. Our approach to publishing supports a vibrant and collaborative international community and allows high quality research to be published in high quality journals no matter where that research is carried out. We will use our scientific publishing, and the international relationships it supports, to help increase our global reach and further our strategic aims.

To deliver all of this we need to develop as an organisation

To meet these ambitions we will capitalise on the knowledge, talent and resources available to us and invest in critical new capabilities when and where necessary.

- We will have a strong, coherent and engaging member offer so our community not only appreciates the value of membership but also of actively participating, and we will be ready to help focus and support this volunteer effort.
- We will maintain and develop rich and productive relationships with our key stakeholders and partners such that we can have a stronger voice and increase the scale and reach of our impact.
- We will be an organisation that values our workforce. We will motivate and engage our staff, ensure that they are well-led and managed, have the skills and competencies they need to succeed, and invest in their training and development.
- Our digital platforms will provide the physics community across the world with the tools and applications to extend their reach to different audiences, delivering information in a way that allows users to stay connected to physics on an international scale.
- We will maintain a strong balance sheet position and continue to diversify our income through more sustainable funding partnerships with those organisations and individuals who share our ambitions and values and support our programmes of work.
Our purpose and values

The IOP’s purpose, as set out in its Royal Charter, is to promote the advancement and dissemination of knowledge and learning in pure and applied physics for the benefit of all.

As the champion of physics in the UK and Ireland, we fulfil this purpose in five ways.

• As a membership organisation we serve all those who share our passion for physics. We inspire people to develop their interest in physics, whether in the classroom, in colleges and universities, in businesses or at home. Furthermore, we recognise and celebrate members of the physics community who, through their work, have made a real difference to physics and to society. We help to create a stimulating environment that encourages physicists to work across traditional boundaries and in which innovation can thrive.

• As a professional body, we open up opportunities to choose and pursue a career using physics, and we promote high quality continuing professional development in the workplace, setting the standards that physics professionals should attain.

• As a learned society, we bring together the physics community to share its knowledge and advance its thinking, and to play our part in ensuring the continuing strength of the core discipline.

• As a publisher, we work with researchers in all physics disciplines in all parts of the world to help them communicate their findings effectively, efficiently and to the widest possible audience.

• As a charity, we ensure that physics delivers on its exceptional potential to benefit society. We promote the benefits that physics offers us in our everyday lives, the contribution physics makes to our economy and to tackling some of the biggest challenges we face in society and as a global community.

Our values are an expression of what we believe and how we behave as an organisation.

We strive to:

• be objective, led by evidence

• be rewarding, open and engaging to partner with

• confront barriers to inclusiveness and participation wherever we encounter them

• and exemplify the very highest standards in all that we do.