

# IOP Institute of Physics

## Institute of Physics submission to the Economy, Jobs and Fair Work Committee inquiry into the gender pay gap

17 March 2017

1. The Institute of Physics (IOP) is a leading scientific membership society working to advance physics for the benefit of all. We have a worldwide membership, from enthusiastic amateurs to those at the top of their fields in academia, business, education and government. Our purpose is to gather, inspire, guide, represent and celebrate all who share a passion for physics. And, in our role as a charity, we're here to ensure that physics delivers on its exceptional potential to benefit society. Alongside professional support for our members, we engage with policymakers and the public to increase awareness and understanding of the value that physics holds for all of us.
2. The IOP welcomes the opportunity to submit evidence to the Committee. The IOP operates a number of programmes in Scotland that aim to increase the representation of women in physics and of the participation of girls in physics at school. This submission outlines the rationale for these projects, details their approaches and impacts, and how they can help address the gender pay gap in Scotland.

### The gender gap in physics

3. One of the features of the gender pay gap highlighted by the committee in its call for views is the differential levels of employment in highly-paid sectors such as those related to science and engineering<sup>1</sup>. This is particularly true in physics. While graduate earnings surveys consistently places physics well above the average<sup>2</sup> and physics based businesses in Scotland support a significant number of very high productivity jobs,<sup>3</sup> physics education and employment is well below average when it comes to gender parity: in 2016, girls represented 27% of entries for Higher Physics and 21%<sup>4</sup> for Advanced Higher Physics, and entries have been at similar levels for decades.
4. Women's participation at physics undergraduate degree level across the UK is relatively stable year on year at around 20%; at PhD level female participation has

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<sup>1</sup> HESA, EngineeringUK data

<sup>2</sup> DELHE <https://www.hesa.ac.uk/data-and-analysis/students/destinations>

<sup>3</sup> *The role of physics in supporting economic growth and national productivity in Scotland*. IOP & CEBR (2017) [http://www.iop.org/publications/iop/2017/file\\_68806.pdf](http://www.iop.org/publications/iop/2017/file_68806.pdf) The report shows that 199,000 people are directly employed in physics-based businesses in Scotland, representing 7.9% of the workforce, and that the sector indirectly generates a further 323,000 jobs. Physics-based industries in Scotland generate £43.5 bn in turnover, which rises to £94.6 bn when indirect effects are considered. A person employed in physics-based industries contributed an average of £77,725 a year in value added. This is markedly above both the manufacturing and construction sectors' average labour productivity levels, which averaged £66,437 and £45,061.

<sup>4</sup> Scottish Qualifications Authority Attainment Statistics <http://www.sqa.org.uk/sqa/63001.html>

remained stable at around 25% for many years. This figure declines further at each stage of education and into employment: 19.8% of lecturers, 11.2% of senior lecturers and 6% of professors in Scottish physics departments are female.<sup>5</sup>

5. A recent survey<sup>6</sup> of physics graduates from Scottish universities found that male physics graduates are more likely to earn a higher salary than females: 49% of male respondents reported earnings more than £50,000 compared with just 22% of female respondents. The survey also found that female respondents were more likely to be working in the services sector, schools, and healthcare. The sectors with the lowest female representation were telecoms, aerospace and electronics, electrical, and IT.

## Reducing the gender pay gap

6. The gender pay gap has a number of causes and a number of solutions, but one area where progress can be made is in increasing the level of female participation in subjects such as physics in schools. Roles requiring expertise in physics and mathematics are becoming increasingly important. Physics is one of the top 'facilitating subjects'<sup>7</sup> and is a gateway to higher education.<sup>8</sup> It should also be noted that if the level of female participation on STEM subjects were brought up to the same level as current male participation levels, the STEM skills gap would essentially disappear.
7. In order to tackle the gender gap in physics and STEM (science, technology, engineering and mathematics) education, the IOP has set up an Improving Gender Balance (IGB) project in partnership with Skills Development Scotland and Education Scotland. IGB Scotland is a 3 year pilot project running in 6 school clusters through Scotland, working to identify and tackle the challenges facing pupils due to gender stereotypes. The project works with education practitioners, careers information and guidance staff, and other educational and government bodies to help schools identify and address issues around gender and subject choice.
8. IGB Scotland builds on the findings of two previous IOP studies: *It's Different for Girls*<sup>9</sup> and *Closing Doors*<sup>10</sup>, both of which highlighted the effect of the different experiences and influences that girls and boys are subject to during their time in education on their subject choice. It is also linked to similar programmes successfully run in England<sup>11,12</sup> which have demonstrated the benefits of working with the whole school environment to challenge bias and stereotyping.

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<sup>5</sup> HESA staff data

<sup>6</sup> *Physics in Scotland: the brightest minds go further*, IOP (2014)

[http://www.iopscotland.org/policy/consultations/file\\_48571.pdf](http://www.iopscotland.org/policy/consultations/file_48571.pdf)

<sup>7</sup> *Informed Choices: a Russell Group guide to making decisions about post-16 education*, Russell Group (2013)

<sup>8</sup> *Degree-Course Destinations of Accepted Applicants with Physics and Maths A-level or Scottish Higher 2006-11*, IOP (2012)

<sup>9</sup> *It's Different for Girls: The influence of schools. An exploration of data from the National Pupil Database looking at progression to A-level physics in 2011 from different types of school at Key Stage 4*, IOP (2012) [http://www.iop.org/education/teacher/support/girls\\_physics/file\\_58196.pdf](http://www.iop.org/education/teacher/support/girls_physics/file_58196.pdf)

<sup>10</sup> *Closing Doors Exploring gender and subject choice in schools*, IOP (2013)

[http://www.iop.org/publications/iop/2013/file\\_62083.pdf](http://www.iop.org/publications/iop/2013/file_62083.pdf)

<sup>11</sup> *Evaluation of the Improving Gender Balance Programme Final Qualitative Report For The Institute of Physics and National Science Learning Centre*, James Lambley and Associates (2016) [http://www.iop.org/education/teacher/support/girls\\_physics/improving-gender-balance/file\\_67904.pdf](http://www.iop.org/education/teacher/support/girls_physics/improving-gender-balance/file_67904.pdf)

9. By working with early years centres, primary and secondary schools the IGB project aims to achieve an embedded and sustainable approach to tackling gender imbalance in subject uptake and education pathway choice, with a particular focus on STEM subjects. The programme is currently entering the final year of its pilot phase and is seeking further funding to be able to expand the project across the rest of Scotland.
10. The IOP is also active in addressing gender disparities in physics in higher education through the Juno project,<sup>13</sup> which is complementary to the aims of the Athena SWAN Charter. Juno has been successful in recognising and rewarding physics departments in universities that can demonstrate they have taken action to address the under-representation of women in university physics.

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<sup>12</sup> *Improving Gender Balance Results and recommendations from the IOP's work in schools*, IOP (2017) [http://www.iop.org/education/teacher/support/girls\\_physics/reports-and-research/file\\_68898.pdf](http://www.iop.org/education/teacher/support/girls_physics/reports-and-research/file_68898.pdf)

<sup>13</sup> IOP Project Juno <http://www.iop.org/policy/diversity/initiatives/juno/index.html>