

# GETTING MORE PEOPLE TO DO PHYSICS, AND DOING IT BETTER

## Duncan Chamberlain Strategic Director, the Physics Factory

There is a shortage of physicists in the workforce. There is a shortage of physicists at university. There is a shortage of teachers of physics to inspire and guide a new generation of physicists. Though it is of interest to explore why this has happened, why the UK is experiencing this more than competitor countries and why there isn't more action to reverse the trend, the situation is so perilous that we need to act now. Too much time, and resources, can be taken by reports and investigations.....but these too often lead to more reports and investigations. This paper contends that much more needs to be actually done to:

- i) get more people doing physics
- ii) get people doing physics better.

### THE PROBLEM

In stark figures, here is the problem:

- In the UK only one in seven pupils does A-level physics
- The UK is short of 4000 teachers of physics
- 500 schools in England are without a physics graduate on their staff
- There are Government recognised shortages in a myriad of occupations that require high levels of physics literacy, for example Reactor Physicist, Civil Engineering and Mechanical Engineering

- In the current SET for Britain competition for Early Stage Researchers run in Parliament, which is open to physicists, chemists, bioscientists and engineers, only 11% of entries in 2012 were from physicists compared to 16% from chemists, 43% from bioscientists and 30% from engineers.

In addition, despite the recent popularisation of physics through the prominence of Professor Brian Cox, physics maintains a reputation as being a 'difficult' subject for school pupils, and suffers from an image problem as requiring much hard work but having few financially rewarding career paths. Too few physicists wish to enter teaching and so the shortage will be perpetuated and too few young people understand what physics is and the career paths it can lead to. Whatever the truths of these perceptions, they are sustained.

### THE SOLUTION

Successive governments have attempted top down solutions with varied success. The Institute of Physics, amongst other organisations, does much admired work in developing the teachers of the future and in trying to engage with, and attract, some of the brightest and best of our young people to physics. How best can these efforts be supported? Here are some examples from the front line, of a small group of dedicated professionals, who seem to have made substantial progress in:

- i) raising awareness of physics
- ii) breaking down barriers to participate in physics
- iii) raising confidence amongst teachers of physics
- iv) raising confidence amongst school pupils to learn about physics
- v) raising performance and results in physics.

This group is, indeed, getting more people to do physics and doing it better.

Bartley Green in Birmingham may seem an unlikely place for physics revolution. One of the most disadvantaged parts of the West Midlands, its status as a deprived outer suburb, dominated by social housing and physically remote from Birmingham's city centre, do not readily indicate scientific innovation. But it is here that The Physics Factory movement started and now flourishes. With its origins in 2009, the Physics Factory movement is now a registered charity and trading social enterprise. It has grown in size to have now three centres (two in Birmingham, one in London) and has thought through plans for further expansion. The charity's aim is for a national, grass roots movement of Physics Factories that can identify and solve local problems with local solutions.

### WHAT THE PHYSICS FACTORY DOES

The Physics Factory is at pains to emphasise that it offers not a 'franchise' solution, a 'one size

fits all' solution but instead a methodology and approach that itself is evolving and can be shared with others and used to varying extents. Localism is the key to the regeneration of physics. The Physics Factories in Birmingham have a very direct approach:

1. The Physics Factory is a centre of physics excellence which is hands on and direct: Physics Factory staff teach pupils; Physics Factory staff teach teachers to teach physics better; Physics Factory staff work with non specialist physics teachers to make them more confident and effective in teaching physics in their schools; Physics Factory staff offer to go to schools to teach pupils in their own schools; Physics Factory staff raise awareness of physics related careers direct with pupils and teaching staff; Physics Factory staff work in the community, building the roots for a longer term recovery of physics as well as shorter term.

2. Physics Factories have specialist and/or designated laboratory and teaching space.

3. Specialist physics teachers teach pupils from schools from across Birmingham. Indeed, 59% of Birmingham secondary schools have sent pupils to be taught GCSE and A Level by the specialist physics staff, which accounts for over 3000 pupils from over 40 schools. This is direct classroom teaching to bridge the gap in terms of the shortage of physics teachers.



4. More young people are doing physics – five schools are offering physics who otherwise wouldn't have been able to, totalling 250 extra pupils studying physics; in 2011-2012 seventy pupils have started A Level physics courses who otherwise would not have.

5. Young people are doing physics better – in 2011, 46% of pupils taught by the Physics Factory exceeding their target grade; number of pupils achieving A\*/A grade at GCSE was 16% higher through the Physics Factory than the national average and 3% higher for pupils achieving grades A-C.

6. More staff are teaching physics better and developing their confidence to teach in their own schools. 550 staff have attended the Physics Factories' professional development courses and 99.8% of delegates rate the courses as 'good' or 'very good'.

### **EXPANDING THE PHYSICS FACTORY**

The Physics Factory works. More people are doing physics and doing it better. More school pupils are doing physics, more staff are being upskilled. More schools are offering physics. The Physics Factory, a registered

charity, is a sustainable organisation which has benefited greatly from the renowned Schools of King Edward VI in Birmingham Foundation and Birmingham City Council. The Physics Factory has also received support from the Institute of Physics, Richard Hardie of UBS, and broadcaster John Humphrys, amongst others. It is also building relationships with other organisations in the field, such as the IPEM, the University of Warwick and the University of Birmingham. There is a model here that can be shared, than can lead to action on the ground, that is cost effective and

meets demand. It is a model in the tradition of localism and grass roots, and with a business head on it.

The Physics Factory may well be the next stage of the fight back, to assist and drive the recovery of physics. It works.

If you are interested in knowing more, in visiting the Physics Factory, in helping set up a Physics Factory in a new location, please contact the Physics Factory via its Strategic Director, Duncan Chamberlain ([duncan.chamberlain@bridgingtothefuture.co.uk](mailto:duncan.chamberlain@bridgingtothefuture.co.uk)).