

**Continuing professional development** (CPD) of teachers is at the heart of the project. Teachers from participating schools will experience different teaching and learning styles in an environment that will allow them to develop their own strengths and capacities. It is intended that this team experience will be a shot in the arm for physics teaching that is currently at risk because of poor take-up of the subject.

**The two pilot projects** launched since October 2008, in Birmingham and Wandsworth (a third is being developed in Reading) will run for three years. Neither of the first two has its full budget but it has been judged better to start with reduced aims, capitalising on local enthusiasm, and to demonstrate that physics can be made appealing, rather than delay in the hope of securing a full budget.

**In Birmingham**, the Physics Factory is an exciting collaboration between the Local Authority and King Edward VI Five Ways School. It has grown from the need to address the shortage of specialist physics teachers in the city and to improve the quality of student experiences in physics lessons. We believe our project will improve GCSE results and encourage more students study physics beyond 16. We will address this in two ways. Firstly, by increasing our commitment to the teacher CPD programme we offer and secondly by teaching GCSE physics to visiting students alongside their teachers.

The official opening in January 2009 saw students and their teachers from five schools designing and testing wind turbines to compete in the "Windy Challenge".

Initial funding from the Ogden Trust, KE Five Ways School and Birmingham LA enabled a room to be refurbished with the potential to become a 'centre of excellence'. LA funding has also paid for approximately one third of the capital equipment needed. Further funds have been secured from the LA and KE Five Ways School to enable the project to employ teaching and technical staff. The intention is to have staff in post for September 2009, so that the physics GCSE curricular work can be taught to visiting school students. Some GCSE sessions will be run by the Science Team during the summer term 2009.

There is currently no funding guaranteed for the third year of the project.

To date almost 100 teacher-CPD days have been delivered by the LA Science Team to Birmingham teachers and plans are in place for further training e.g. a two week course for teacher trainees.

*We seek to work more closely with the regional and national science learning centres in the near future and gain their support for our work. In the longer term we envisage our pilot project being replicated across the city and perhaps beyond.*

**John Booth, Senior Science Adviser, Birmingham Education Authority**

**In Wandsworth**, the Physics Factory is based around the successful physics department at Graveney School and is concentrating initially on the extension of A-level provision both in Graveney and the other participating schools in Wandsworth. By providing inspirational lectures and hands on events, we hope to inspire more students to take physics further and encourage them to consider physics and related subjects as degree choices at university. Working with recent graduates and undergraduates we run a weekly problem solving session after hours to give AS students the impetus to push hard for top grades. Working with the Mastering Physics virtual learning environment supplied by Pearson and with the help and advice of the Wandsworth Senior Science Adviser we are building a network of physics teachers who can benefit from this project. The next phase of the project will be to explore the strengthening of the provision of GCSE physics teaching in Wandsworth Schools. This will help schools meet the government's target to increase the uptake of separate sciences at GCSE. A key component of the project is to strengthen teaching in all Wandsworth schools with the aim of ensuring both retention and recruitment of good physics teachers across the borough.

**David Perks, Head of Physics, Graveney School**

**In Reading**, a dedicated laboratory will be available to schools for students to undertake extended project work as part of their A – level, offer supervised hands-on activities for younger students as part of Physics Theme Days and, working in conjunction with the Institute of Educations support teachers in their CPD. There will also be the opportunity for students to undertake 10 day work experience placements to find out what working in science research is all about. Unique Interactive Screen Experiments, developed by the University of Reading, will also be available to promote experimental skills

**Prof Averil Macdonald, Dept of Physics, University of Reading**

All pilot projects will put an emphasis on **experiment** and will give students access to the best resources. Crucially, for a project that involves inter-school co-operation,

physics will not stop at the Physics Factory door. Students will have access to new on-line materials, developed by Pearson, which will allow them to check on and reinforce their understanding at their own schools or at home.

The **results** we seek from the pilot projects will be an increased take up of physics at GCSE and A-level; improved grades; and greater percentages opting for physics at university level. But above all, an increased interest in and enthusiasm for physics in schools.

**Costs and funding...**

The combined full cost of the two current projects together has been estimated at £533k pa for year 1, with slightly lower amounts for years 2 and 3:

£,000 pa	YEAR 1	YEAR 2 & SEQ
<b>Birmingham pilot (GCSE level)</b>	<b>316</b>	<b>229</b>
<b>Wandsworth pilot (A-level)</b>	<b>196</b>	<b>196</b>
<b>Central admin costs</b>	<b>21</b>	<b>21</b>
<b>TOTALS</b>	<b>533</b>	<b>446</b>

**...and where we are now**

from the outset, **The Ogden Trust, Pearson** and **Birmingham City Council** have given generous support, both financial and in kind. In Birmingham we have approximately two thirds of the estimated budget. In Wandsworth, the figure is about one third but will rise significantly if the prospect of government funds to match those raised privately is realised.

***But we need more and hence this approach.***

**Potential benefits to sponsors**

For companies or foundations with an interest in the state of science in the UK, involvement with this project offers the possibility of:

- being associated with a grass roots attempt to address a real national problem - harnessing local enthusiasm and empowering local teachers;
- attaching a corporate name to the entire project or an element of it;
- contributing to growing a network of Physics Factories in the UK.

**Something in it for everyone**

A condition for the success of a Physics Factory is that all stakeholders should stand to gain from participation. Thus

STUDENTS – are intrigued, inspired, excited by their experience of physics; achieve better results; have better careers and HE prospects;

TEACHERS – become part of a network with scope for individual initiative;

SCHOOLS – have better resources and results; more motivated students;

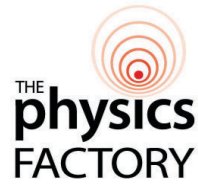
LA'S & GOVERNMENT – achieve better results; increased take-up at university;

PROFESSIONAL BODIES - Physics Factories complement other initiatives and support national objectives;

SPONSORS – are associated with a popular effort to remedy a real problem. Clearly defined time frame, financial commitment and measures of success.

**Management and Accountability**

The Physics Factory Project as a whole will be overseen by a Project Board made up of representatives of major stakeholders. Each (largely autonomous) pilot project will have a project manager accountable to the Project Board for the use of funds. The statutory position of the Physics Factory Ltd is as a Company Limited by Guarantee - a not-for-profit arrangement whereby all income must be used for the purposes for which the company has been established. Management costs will be held at a minimum commensurate with achieving good control and accountability.



The Physics Factory Project is a grass roots movement that aims to take action on the decline of physics in British schools and universities with its resulting damage to Britain's competitiveness in a technological world.

The Physics Factory will increase the appeal and take up of physics in schools and help vulnerable physics departments to a more secure future.

The core idea, which has drawn widespread support, is to concentrate high quality resources in one place, the 'Factory', for the benefit of all schools in the area. The siting of a 'Factory' is critical. It needs to be within easy reach of a number of schools where there exists the drive to increase the appeal of physics and a readiness to cooperate.

Two pilot projects have started, one in Birmingham and one in London. A third is being developed in Reading. The most urgent need now is to put the funding for these on a more substantial footing.

Core principles that underpin the project:

FIRST, each Physics Factory is largely autonomous (on the principle that top down initiatives rarely work) with local enthusiasts responding to local needs and pressures in the way that seems best;

SECOND, participating schools will be strengthening the capacity of their departments and teachers, not denuding them;

THIRD, teachers will be part of a team - supported and not undermined;

FOURTH, the 'factory' will complement other initiatives rather than compete with them;

FIFTH, the project will support national educational priorities.

***This note is an invitation to become involved.***

### Acknowledgements

The Physics Factory project has evolved considerably since first mooted. Many people from academia, industry, Westminster and elsewhere have given their time and advice freely and generously and without them nothing approaching a workable project would have emerged. Too numerous to list here, they are named on our website ([www.physicsfactory.org.uk](http://www.physicsfactory.org.uk)), and we gratefully acknowledge their contribution.

### For further information visit

[www.physicsfactory.org.uk](http://www.physicsfactory.org.uk)

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### SECOND EDITON

## What people say about the Physics Factory

I never dreamt that the Today programme I presented from The Royal Society some 30 months ago would have spawned the Physics Factory movement. This grass roots initiative that excites both teachers and children is exactly what we need to counter the drift to soft subjects. Physics and other 'hard' subjects are far too important to be abandoned as lost causes. The Physics Factories deserve to succeed and deserve our support: financial and, dare I say it, political.

**JOHN HUMPHRYS, BROADCASTER**

The Physics Factory Project is an imaginative and innovative concept for addressing the current shortage of specialist physics teachers in many schools. We now need it piloted over two to three years to see if it works. I hope it does.

**Lord Rees, Astronomer Royal and President of the Royal Society**

The Institute supports the Physics Factory because it represents an exciting and innovative experiment in attracting more students to study physics in the short term and in the long term developing good teachers which is the key to ensuring the future of physics in schools.

**Dr Robert Kirby-Harris, Chief Executive of the Institute of Physics**

The Physics Factory is exactly the sort of grass roots initiative we want to encourage. It harnesses the enthusiasm and ability of physics teachers, and it holds out the prospect of a better understanding of physics amongst students that our country so badly needs.

**Nick Gibb MP, Shadow Minister for Schools**

for us ... this is the right idea at the right time...We are keen to share our expertise. We have the space and motivation, and have already overcome most of the logistical problems inherent in getting neighbouring schools to co-operate. We work hand in glove with these schools and believe we can make a real difference to the perceptions children have of physics

**David Wheeldon, Headmaster, King Edward VI Five Ways School, Birmingham**

Developing the Physics Factory at Graveney is already part of our strategy for Building Schools for the Future and is a key component

of our plans to strengthen our offer at A-level. We relish the opportunity to expand our capacity and become a lead player in the project to revitalise physics teaching nationally.

**Graham Stapleton, Principal, Graveney School, Wandsworth**

Pearson are acutely aware of the problems surrounding physics – and, together with MIT in the United States, we have produced some innovative self access materials to address the problem there. We applaud this important experiment and are delighted to be involved with the pilot schemes.

**Sir David Bell, Director of Pearson and Chairman of the Financial Times**

The concept of a Physics Factory based at the KE Five Ways School has our whole hearted support. The potential benefits of such a facility for a wide range of students across the city can not be overstated...

The scheme has the potential to engage and raise the aspirations of many young people each year; at the same time helping Birmingham science teachers to deliver inspirational physics teaching in their own schools.

**The Birmingham LA (Local Authority) Science Team**

An idea like The Physics Factory is long overdue. It is a bold and innovative way of focusing the limited but precious resources available for physics teaching in order to ignite the flame of scientific curiosity in the next generation of students. Without an increase in the numbers of students studying physics, I genuinely fear or the future of our economy. The Physics Factory deserves and has my strongest possible support.

**Professor Brian Cox, Professor of Particle Physics, University of Manchester, Broadcaster and CERN Researcher**

Students in schools need to see physics as relevant to their own lives and potentially offering them a future career direction rather than simply a collection of facts to be learnt and regurgitated for exams. A Physics Factory can fill that gap.

**Professor Averil Macdonald, Professor of Science Engagement, University of Reading**