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Institute *of* **Physics** in Ireland

National Skills Strategy Research Study

Response from the Institute of Physics in Ireland

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The Institute of Physics in Ireland (IOPI)* is the professional organisation for physics in Ireland, both Northern Ireland and the Republic. It is a key educational stakeholder and welcomes the opportunity to contribute to the National Skills Strategy Research Study.

In the recent government report, *Strategy for Science, Technology and Innovation*[1], there is a clear recognition that the future economic direction of the country needs to be targeted on strengthening and developing the knowledge based economy. The Institute strongly concurs with this and accepts much of the analysis of the skills challenges arising. The IOPI is particularly pleased to note in the report a recognition that ' *attempts to build a system of applied research without a base of excellence in the underpinning sciences are not sustainable over time'* . Hence the importance in supporting the skills base in the physical sciences.

Physics is used to solve problems and understand how the world works in every detail at the deepest level. An understanding of physics helps to solve environmental, social, health and technological challenges. Those who study physics develop a highly valued set of skills: training in logical thinking, the ability to understand complex and abstract concepts and problem solving. Frontier research in science now requires that scientists communicate and share their knowledge and understanding with colleagues across the range of physical and biological sciences hence both communications and entrepreneurial skills are also developed.

While warmly welcoming the increased funding for research and the proposal to double the output of Ph.D. graduates by 2013, there is a high level of concern about the feasibility of this without sustained and determined action to increase the numbers studying the physical sciences at

second and third level. Currently 14.7% of the Leaving Certificate cohort (i.e. approximately 8000 students) take physics while annually only around 200 students graduate in the subject. The focus of this response is therefore directed towards this specific issue.

1. Support for Schools

The Institute strongly supports the aspiration of the Strategy to support the teaching of science at school through curriculum reform with emphasis on hands-on investigative approaches and investment in teacher professional development. To complement this, the IOPI would seek the immediate implementation of the following as recommended in the 2002 report of the Task Force on Physical Sciences[2]

(i) Approval of science technician positions for schools, and

(ii) Appointment of *ex-quota* physical science teachers to schools where the uptake of physics/chemistry is low or where either subject is no longer offered at Leaving Certificate level.

In addition, it is noted that the Strategy report calls for the development of teachers' networks to improve teaching and learning in science. The Institute currently employs on a part-time basis three network co-ordinators in Ireland. These are physics teachers who specifically assist schools and teachers in networking activities in physics. Their work includes:

- individual meetings with teachers
- providing detailed practical support on teaching methods
- laboratory demonstrations
- teaching resources such as booklets, CD ROMS, websites,
- workshops
- conferences
- school competitions
- careers materials
- distributing information on relevant physics activities and much more.

They are particularly anxious to reach the increasing body of teachers who do not have a primary qualification in physics but who are teaching the subject.

The Institute has certainly been in regular contact with all schools which teach physics and the co-ordinators have provided very specific individual assistance to over 500 teachers over the past three years. The Institute would be very pleased to work with an appropriate government body to extend this highly successful support system.

2. Support at Third Level for Physics

In common with many developed economies, Ireland has a problem in attracting students to study the physical sciences at third level. This is despite significant outreach efforts from the universities and colleges, which are widely appreciated by schools. The scale of this difficulty far exceeds the problem at second level. It should be noted that annually over 1100 students are awarded an A1 or A2 in physics in the Leaving Certificate yet only around 200 students go on to graduate each year in physics. It is precisely these high ability students who would be most suited to postgraduate studies yet they are choosing not to continue with the subject after school. There are probably a number of reasons for this but chief amongst these is a widely held view that physics is not a prestige subject. Two factors contribute strongly to this perception.

i. The supply/demand nature of the points system – low demand leads to low entry points which devalues the subject to high ability students. In addition, students entering physics courses on low points may not be suited to the demands of the subject.

ii. Salaries for physics graduates are not high compared with other subjects. A recent Forfás report[3] noted that median starting salaries for physics graduates came 37th out of 42 subject areas (figures from 2004, median salary for physics graduates, € 19,900). While lifetime earnings of physics graduates are good and the situation improves somewhat with postgraduate qualifications the initial impression is poor. In addition, there is an uncertain career progression for researchers, which significantly adds to this problem.

In light of this, and the government' s clear acknowledgment of the importance of attracting students into this area, the Institute believes that financial supports/incentives should be made available to third level students. This year the Institute is introducing a number of bursaries worth Stg£1000 annually for each year of study to students taking IOP accredited physics degrees. In 2006 18 such bursaries will be made available to students in Ireland. The Institute calls on the government to provide additional awards, which should be targeted at high ability students with the clear potential to carry on to postgraduate level.

Another area of concern for third level physics departments is the adequate funding of teaching laboratories. Significant and welcome funds are now being made available for research through Science Foundation Ireland and PRTLI. However, high quality undergraduate teaching labs are essential if students are to be taught properly and to have a good experience at degree level. Such labs are costly in terms of both equipment purchase and maintenance and also in staff time.

The Higher Education Authority have recently introduced a direct funding link to weighted student numbers in specific areas with lab based subjects having a weighting of 1.7 compared with non-lab

based subjects. This is based on the English university funding model. However, in a recent Institute of Physics study[4] of the finances of the physics departments in England it was noted that despite physics and chemistry receiving a weighting of 2.0 in their funding formula, this was still perceived to be inadequate to reflect the very strong emphasis on laboratory experience in undergraduate physics and chemistry teaching compared with other laboratory-based subjects.

Finally, the current system of funding departments based solely on numbers on courses, while wholly understandable leaves departments reluctant to take risks in attracting students. For example, should a department decide to raise the minimum entry standard for a course in order to attract high ability students it is likely that numbers would fall initially for a number of years but rise thereafter. However in the intervening period the loss of income would certainly deter any department from taking this route. The IOP would be very willing to work with government agencies to examine creative pilot projects which could be undertaken without significant financial risk to already hard pressed departments.

If any further information on the points raised in this response is required, the Institute would be very pleased to elaborate further.

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***The Institute of Physics in Ireland**

The Institute of Physics in Ireland (IOPI) is the professional and scholarly organisation for physics in Ireland, both Northern Ireland and the Republic. It represents over 1700 physicists active in education, research, industry, the public service and commerce in Ireland. It is a branch of the London-based Institute of Physics, a leading international body and learned society with over 37,000 members in Ireland, the United Kingdom and elsewhere, which promotes the advancement and dissemination of a knowledge and education in the science of physics, pure and applied.