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Submission to the Review of Australian Higher Education

The Australian Institute of Physics (AIP), established in 1964, is a broad-based professional society of more than 1300 members that promotes the role of physics in research, education, industry and the community. As the President of the AIP, I am making this submission to the Higher Education Review based on the AIP policies that have been developed over many years and have the support of all members.

We will comment only on the third area of term of reference:

What are the appropriate mechanisms at the national and local level for ensuring higher education meets national and local needs for high level skills? What is the role of state and territory governments in this area?

Based on AIP policies on Higher education, we make the following comments:

1. Tertiary Education

Introduction: Physics training at the tertiary level is fundamental to the support of high technology industry and Physics based research in Australia. It is also an increasingly important aspect for the support of traditional industries, where scientific advance has increased reliance on technology. Without healthy Physics and other science and engineering programs, Australia must return to a 19th century agricultural economy supplementing its national income from mining and tourism without recourse to local technological support. This is a poor option for the nation. The AIP therefore supports the development of industry and technology in Australia and the training of qualified people to support the development of industry. The AIP also recognises the wider experience gained by university graduates in obtaining an education. The personal ties forged in the universities, the broader skills learned, the development of problem solving abilities and the social interaction that occurs, help to create whole people, educated in life skills as well as a science discipline. These aspects of a Physics education are also to be encouraged.

The AIP recognises that there is a general decline in support for the discipline of Physics and for all the enabling sciences. We therefore support the maintenance and strengthening of Physics as a discipline within the University environment.

2. Government funding

The AIP promotes an increase of core funding for Physics education.

Reason: The amount of money available for the operation of Physics departments has declined over the last decade which impacts on the ability of Physics departments to operate properly. Academic staff numbers in Australian Physics Departments have consequently declined from > 350 staff in 1994 to < 250 staff in 2002¹. This is despite an increase in year 12 secondary school enrolments in Physics over much the same period to 1999,² and a recent, 2002, increase in University third year Physics enrolments, which has brought the number of these students back up to 1994 levels.³ University student numbers for commercial and economic courses have grown to the point where there is an oversupply of these graduates. Yet those areas continue to receive high university funding under the present funding schemes. Strategic planning for the needs of Australia, such as that recommended by the STAWA report,⁴ shows that there is a great need for science graduates. Hi-tech industries require people with physics qualifications, for instance, personnel for the opto-electronics industry are currently being provided by Physics departments in Australia. Medical physics personnel are also being trained by Physics departments. The AIP supports the concept of university funding that reflects the strategic needs of Australia for the future.

3. Employment and Training

The AIP supports the provision of targeted research training places and scholarships in the enabling sciences.

Reason This policy will help to improve student numbers in areas that are strategically important to Australia's development as an industrial nation.

4. HECS

There should be no differential HECS for science-based degrees.

Reason: A student who obtains a science degree, taking 3 to 4 years, and then a diploma of education will have a much greater HECS burden than a student who undertakes a Bachelor of Education to become a teacher at the outset. This is a disincentive for high quality Physics graduates to move into teaching. This is also a

¹ Statistics collected by AIP past President Prof. John O'Connor (University of Newcastle, Physics Department) on behalf of the Institute.

² J. R. De Later and J. Dekkers, *Physics Enrolments in Australian Secondary Schools at the End of the 20th Century*, *The Physicist* Vol. 38 no. 4 (July/Aug 2001) 86.

³ P. Jennings, J. R. De Later and G. Putt, *Physics Enrolments in Australian and New Zealand Universities 1997-2002* *The Physicist* Vol. 40 no.1 (Jan/Feb/Mar 2003) 18.

⁴ *Review of the Quality and Supply of Science Teachers*, A report by the Science Teachers' Association of Western Australia (2000).

recommendation of a recent report by the Science Teachers' Association of Western Australia.⁵

There should be HECS bursaries provided to students undertaking teacher education programs in priority areas that involve enabling sciences.

Reason: There is a shortage of teachers in the enabling sciences (chemistry, mathematics and Physics)⁶. This policy provides some financial incentive for science students to take teacher training.

4. Laboratory Resources

The AIP supports the renewal of laboratory infrastructure for tertiary Physics teaching.

Reason: The maintenance of Physics teaching laboratories is a high cost for Physics departments but is an essential part of maintaining a healthy Physics program. Students are provided with real world training through their experience with Physics training labs.

5. Role of State Governments

The AIP believes that state governments should be providing teachers with physics qualifications to teach physics at the senior years.

Reason: Currently departments of education do not keep records of teacher actual qualifications. Rather there is a requirement that teachers have appropriate teacher training and 1-2 year experience teaching a subject to become a teacher in the subject area. For example, I have a Diploma in Education with a major in physics. If I were to obtain the equivalent of 12 months teaching of Japanese by obtaining intermittent casual teaching, I would after the accumulated 12 months of teaching be a designated Japanese teacher even though I have no formal Japanese qualifications. The reason for this approach is the emphasis on pedagogy rather than content in the current teaching professional philosophy. While the AIP fully supports the need for excellent pedagogical skills and the ability of teachers to teach over a broad range of subjects, content should also be regarded as a key requirement as well.

State governments need to improve the provision of careers counselling at schools with up to date and relevant information on careers in science and other some what non traditional professional careers.

Reason: many schools are not able to see the career path of a scientist and so do not encourage students to undertake careers in science. Provision of appropriate information and knowledge of careers in science and investing in developing materials or information sites to provide appropriate information would assist.

Dr Cathy Foley

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⁵ *Review of the Quality and Supply of Science Teachers*, A report by the Science Teachers' Association of Western Australia (2000).

⁶ January 2002 *Physics Teacher Supply* report of the U. K. Institute of Physics.