UNIVERSITIES AUSTRALIA
DISCOVER LEARN LEAD

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Our Ref: G-06-010

19 March 2012

Senator the Hon Ursula Stephens
Chair
Senate Standing Committee on Foreign Affairs, Defence and Trade
Department of the Senate
Parliament House
Canberra ACT 2600
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Dear Senator Stephens,

Defence Trade Controls Bill (2011) – Response to Questions on Notice

Universities Australia wishes to thank the Senate Standing Committee on Foreign Affairs, Defence and Trade (the "Committee") for the opportunity to present at the recent hearings of the Committee. As we mentioned in our evidence to the Committee, Universities Australia supports the broad policy goals of the Defence Trade Control Bill (2011)(the "Bill") and is keen to ensure that, through appropriate legislative provisions, the intention for the regime to have a small and restricted impact on universities and free inquiry is realised.

Having further examined the issues raised by the Bill, Universities Australia remains of the view that the draft legislation requires amendment to remove unnecessary and unintended administrative, financial and academic burdens on the University sector.

The Committee requested that Universities Australia respond to four main questions from the Committee:

- To provide more legally exact and specific advice on the impact and consequences of the Bill upon universities;
- A greater examination of similar legislation in the United States and the United Kingdom, in particular the exemptions offered in those nations for various university activities;
- Further examination of the anti-discrimination issues raised by the Bill; and
- Examples of university activity that seems "innocuous" on face value, which would require a permit application under the Bill.

The first three matters are outlined in Attachment A. In this, we have provided a more legally-focussed analysis of the impact of specific provisions of the legislation on universities. In doing so, we sought advice and guidance from the Society of University Lawyers (SOUL) who have also provided a letter of support (also attached).

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We have also undertaken further research about the operation of similar systems in the United Kingdom (UK), and the United States. Our conclusion is that the UK legislation, and to a lesser extent the United States legislation, provides a much more robust and simplified regime which would be appropriate in an Australian setting. While both the UK and US provisions deliver wide exemptions for research, teaching, learning, and supervision of postgraduate students, the UK also legislation guarantees the freedom of academic inquiry by enshrining those freedoms within the legislation rather than subsequent regulations.

In relation to the potential conflict of this legislation with anti-discrimination obligations, we examine cases where companies have sought (and received) specific exemptions from State anti-discrimination laws, because ITAR compliance obligations would have placed them in breach of those anti-discrimination provisions. Once the Bill is in force, similar situations would arise in respect of it. Further the manner in which the Bill is framed opens a considerable potential for unintended infringements of fundamental human rights to arise, which would impact on students, researchers, and research colleagues. Amendment of the Bill to address such unintended effects seems feasible.

Attachment B provides a number of case studies to demonstrate the impact on universities of the draft Bill. These case studies represent our best effort to ensure that we have accurately matched the items, substances and technology used in these case studies to the Defence and Strategic Goods List (DSGL). Given the size and detail of the DSGL, however, and without further guidance from experts, we cannot be certain that they are comprehensive nor accurate. The very process of collecting these case studies has raised awareness amongst academics of the potential impact of the Bill and has led some academics at the University of Sydney to request, through Universities Australia, an opportunity to meet with the Committee directly and provide a first-hand account of their concerns. We encourage the Committee to consider this request as we believe it would provide an excellent opportunity for the Committee to better understand the issues from the perspective of those directly affected by this legislation.

As we outlined in our initial submission and subsequent evidence to the Committee, Universities Australia supports the intention of the legislation to protect national security and, in so doing, to have only a minimal impact on the activities of Australian universities. If the Bill is to achieve this goal, this legislation must be revised to align closer with the UK legislation which includes in the primary legislation, explicit reference to the kinds of exemptions that we are seeking, and does so in order to recognise and value the freedoms associated with university teaching and research activity.

Yours sincerely

Dr Pamela Kinnear
Deputy Chief Executive

UNIVERSITIES AUSTRALIA
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Response to Questions on Notice – Part A

Following Universities Australia's evidence, 2 March 2012, before Senate Standing Committee on Foreign Affairs, Defence and Trade in respect of the
Defence Trade Controls Bill 2011

Universities Australia appreciates the opportunity to provide further information to the Committee about the impact of the Defence Trade Controls Bill (2011) upon the Australian higher education sector. We provide this information with a view to securing amendments to the legislation which will ensure that it protects national security with minimal impact on the freedom of universities to pursue ordinary research and teaching activities.

This document responds to a request by the Senate Standing Committee on Foreign Affairs, Defence and Trade (the "Committee") to provide responses to the following questions.

1. To provide more legally exact and specific advice on the impact and consequences of the Bill upon universities;
2. A greater examination of similar legislation in the United States and the United Kingdom, in particular the exemptions offered in those nations for various university activities; and
3. Further examination of the anti-discrimination issues raised by the Bill.

Below we address each question in turn.

A further request to provide the Committee with examples of university activity that seems "innocuous" on face value, which would require a permit application under the Bill is provided at Attachment B. We draw the Committee's attention to these case studies provided by the universities as they provide a useful way to understand the practical impact the Bill may have and represent only the 'tip of the iceberg' in this respect. Our experience in collecting these examples has demonstrated that it is a time-consuming exercise. The cost of replicating this exercise in research labs in universities across the country (even if there were no other problems with the Bill), would be very considerable. This has not been adequately considered as a regulatory impact.

1. Specific Impacts of the Legislation on the University Sector

In this section we canvas the specific impacts of the Bill on the university sector. This analysis has been drafted in consultation with the Society of University Lawyers (SOUL).

There are two key provisions – Section 10 (1) and (2) – which have the most significant impact the research activity of Australian universities, if the Bill is made law. Universities Australia's concerns arise particularly under section 10 (1)(a) and (b)(ii) and section 10(2).

Section 10 (1) : Criminal offences

Section 10 (1) of the Defence Trade Controls Bill 2011 provides:

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A person (the supplier) commits an offence if:

(a) the supplier supplies to another person technology relating to goods, where the technology is listed in the Defence and Strategic Goods List; and

(b) either:

(i) the supply is from a place in Australia to a place outside Australia, the supplier is a foreign person and the other person is a foreign person; or

(ii) the supplier is an Australian person and the other person is a foreign person; and

(c) either:

(i) the supplier does not hold a permit under section 11 authorising the supply of the technology; or

(ii) the supply of the technology contravenes a condition of a permit that the supplier holds under section 11; and

(d) there is no notice in force under subsection 14(1) in relation to the supplier and the supply.

Penalty: Imprisonment for 10 years or 2,500 penalty units, or both.

Section 10(2): provision of 'defence services' or 'technologies' relating to DSGL goods to 'foreign persons'

Section 10 (2) is cast in similar terms, but extends the prohibition to the provision of 'defence services' in relation to DSGL goods or 'technology relating to DSGL goods', where those services are provided to a 'foreign person' by an Australia person and received outside Australia, or received in Australia and the other person is a 'foreign person'.

'Defence services' is defined (see further detail below), without reference to traditional concepts of defence or relevant end uses in defence. Australian universities are in the business of providing educational services to foreign students, therefore, the proposed controls are likely to impact how we approach providing training and giving assistance to these students in areas of study that don't necessarily have a intended 'defence application', but could fall foul of the proposed controls.

- Section 11 enables the Minister to issue a permit for an activity otherwise prohibited under section 10.
- Secondly section 14 enables the Minister to issue a prohibition notice where he/she believes or suspects a person is about to supply technology relating to the DSGL and this would prejudice the security, defence or international relations of Australia.

Section 10(1)(a) read with (b)(ii) prohibits without a permit the 'supply' of 'technology relating to DSGL goods' by an Australian university (or a staff member employed by an Australian university) to a foreign person. The definition of technology and foreign person mean that this prohibition will apply to many of the teaching and research activities of an Australian university, particularly those undertaken in the faculties of science, engineering, medicine, pharmacy and information technology. Section 10(2) extends this prohibition to the provision of 'defence services'.

Below we further explain the definitions in these provisions that cause concern to universities.

Definition of a "foreign person"

Section 4 defines "foreign person" to mean a person who is not an Australian person. "Australian person" is defined to mean:

(a) the Commonwealth, a State or a Territory or an authority of the Commonwealth, a State or a Territory; or

(b) an individual who is an Australian citizen; or

(c) an individual who is, within the meaning of the *Migration Act 1958*, the holder of a permanent visa; or

(d) a body corporate incorporated by or under a law of the Commonwealth or of a State or Territory.

Australian universities fall within the definition of an Australian person, usually having been established by a law of a State or the Commonwealth as a body corporate. Many of the people with whom Australian universities engage and to whom they 'transfer' technology (through some means of exchange or provision of education) fall within the section 10 definition of foreign persons.

Many s**cholars and students will be caught by the definition of "foreign persons".** The foreign persons would generally fall in 3 categories:

1. The thousands of students taught by Australian universities who are not Australian citizens or permanent visa holders. Teaching of such students may take place within Australia, where many student visa holders come to the Australian campuses of Australian universities. The teaching may also take place outside Australia, where a significant number of Australian universities teach students at their overseas campuses or through teaching collaborations entered into with universities located outside Australia.

2. By reason of the international mobility of the academy, Australian universities employ or host a significant number of foreign persons in teaching and research positions, being staff and academic visitors. These persons are neither Australian citizens nor permanent visa holders, having secured a working visa.

3. Australian universities engage with government, industry and academic institutions throughout the world as part of their extensive research programs, contracted research and research collaborations which, by their very nature, commonly involve persons who are not Australian citizens or permanent visa holders.

Definition of 'technology'

As presently drafted, the Bill defines technology extremely broadly so as to cover the transfer of knowledge which is inherent in the teaching and research activities conducted by Australian universities. Section 4 provides:

> ***technology*** relating to goods means:
>
> (a) information relating to the design, development, production, manufacture, assembly, operation, repair, testing, maintenance, or modification of the goods (including information in the form of blueprints, drawings, photographs, plans, instructions, specifications, algorithms or documentation); or
>
> (b) software relating to the goods;
>
> other than information specified in an instrument under subsection (2).

Section 4 also provides:

> ***defence services***, in relation to goods or in relation to technology relating to goods, means the giving of assistance (including training) in relation to the design, development, engineering, manufacture, production, assembly, testing, repair, maintenance, modification, operation, demilitarisation, destruction, processing or use of the goods or technology.

Proposed exemptions from the definition of technology by the Minister

Subsection (2) of section 4 enables the Minister to specify by legislative instrument technology that will not be covered by this definition. It is understood from the Explanatory Memorandum (EM) to the Bill that the legislative instrument will specify three matters relevant to a university to narrow the impact of the Bill:

1. Information that is in the public domain, where this refers to information, technology or software that has been made available without restriction upon its further dissemination (though copyright restrictions do not remove information, technology, or software from being in the public domain for

the purposes of these regulations). If information, technology or software is transferred to the public domain in order to undermine this legislation, this exception will not apply: see footnote 15, EM.

2. Basic scientific research, where this refers to the experimental or theoretical work undertaken principally to acquire new knowledge of the fundamental principles or phenomena, or observable facts, not primarily directed towards a specific practical aim or objective: see footnote 16, EM.

3. Information required for patent applications.

Given the importance of the university sector to the national economy and future direction of Australia, Universities Australia is concerned firstly to see that protection for the freedom of teaching and research activity currently enjoyed by Australian universities be enshrined in legislation. Under the Bill any protection for the sector will be relegated to a legislative instrument issued by the Minister under section 4(2) of the Bill, with limited Parliamentary oversight and scrutiny of its content.

Universities Australia is also concerned that the proposed exceptions to the technology covered by the primary offences set out in section 10 be cast sufficiently widely so as not to impede the conduct of ordinary teaching and research activities. Currently the proposed exceptions would operate so that ordinary teaching and research activities involving a foreign person and a DSGL good will require a permit to continue. The three proposed exceptions are, respectively, too narrow because:

1. *Information in the public domain* does not extend to academic and student research activity prior to publication in the public domain. Academic research activity is generally undertaken with the objective that findings are published in a refereed journal or at an academic conference. Student research activity is undertaken with the objective of qualifying for the award of a degree, most relevant here a doctoral degree (PhD). To qualify for publication or for the award of a doctoral degree, the research findings must add to the body of what is known. That is, make findings about matters not yet known and so *not yet* in the public domain. Under the Bill, such pre-publication research activity involving the transfer of knowledge about a DSGL good to a foreign person to develop publishable findings will, require a permit.

2. *Basic scientific research* is defined to exclude research "not primarily directed towards a specific practical aim or objective". Research in the science and technology fields is expensive (because of the cost of scientific equipment and consumables) resulting in most of this research activity being funded by research grants. To secure a highly competitive research grant, the grant application needs to set out the "practical aim or objective" of the proposed research activity. These practical aims vary significantly. Real life examples include: to develop a microscopic motor for use in neurosurgery, to develop a virus capable of carrying targeted bacteria to diseased organisms in the body as treatment for life threatening disease, to develop water additives capable of cleaning up a contaminated waterway, and to develop new materials to construct buildings to withstand earthquakes. Neither is this basic research in ordinary meaning of this phrase, nor is it research without a specific objective as this term is defined in the EM. The narrow scope of the exception would necessitate securing a permit where these sorts of research activities involved the incidental transfer of knowledge about a DSGL good to a foreign person. The case studies provided as Attachment B further illustrate such impacts.

3. *Patent applications* are made by universities after the university level research has completed. A patent application is the first step in a commercialisation process, a process generally handed over by universities to third parties given the costs involved. The university research activity leading to a patent application is usually completed by the time a decision is made to make a patent application. Commonly years of research has taken place prior to a decision to apply for a patent. This research would not be covered by this exemption and so groundbreaking research leading to a patent application that involved the transfer of knowledge about a DSGL good to a foreign person would require a permit.

We also note that there is an exemption for technology embodied in medical equipment. *Medical equipment,* however, represents only one form of medical technology and would leave bodies of research seeking to make medical breakthroughs subject to the requirement for permits. The case studies provided at Attachment B also illustrate this point.

Universities Australia believes the legal impact of the Bill is that:

1. The university sector has no statutory protection for the continuation of its teaching and research activities involving a foreign person in the science and technology fields, where these fields make up more than half the research activity of many Australian universities.

2. Australian universities face the need to carefully identify all DSGL items held (of which universities have extensive holdings) and their uses where a foreign person is involved (irrespective of whether that foreign person is an employee of the university, a student of the university, an often prestigious academic visitor to the university, or an often prestigious collaborating research institution or researcher) to consider whether each activity will require a permit.

3. Australian universities will need to consider how academic staff and students can lawfully publish their research findings to the world (and therefore to foreign persons) where the findings relate to a DSGL good. This is likely to require permits to publish in a referred journals or academic conference (both international and in Australia), or to make student theses available in university libraries.

The explanatory memorandum accompanying the Bill acknowledges that exemptions are required for the higher education sector, but suggests that these exemptions will be addressed in a statutory instrument. Thus far Universities Australia has not received any material that fulfil this undertaking.

Moreover, it is our strong view that relegating protections against these serious matters to a statutory instrument is inadequate. The principles that are at stake are not such as are appropriate for burial in subordinate legislation. The delegation of a power should not extend to matters of principle on which a decision of Parliament ought to be taken.[1] The principles involved concern basic human dignity and those freedoms of the free communication of ideas and information that have been a hall mark of the innovation underpinning Australian prosperity and security. It is for reasons such as these that the UK approach, in embedding the freedoms that the Parliament wishes to protect, in the Act itself, is sound, and the current position of the Bill, which leaves such foundational matters to future executive discretion, is not.

2. Comparisons with overseas universities, put Australian universities at a serious disadvantage

This section addresses the limits on export control regulations as they impact on universities in the United Kingdom and the United States. Although it focuses on the exclusions, it should be appreciated that both countries have robust export control arrangements that apply to institutions of higher learning where the exemptions are not available.

The United States

The Defence Trade Control Bill adopts concepts of nationality as a test for controlling transfers of military and dual use. In this respect it is similar to the U.S. position, which also approaches the issue on the basis of controlling the flow of information to non-nationals.

However, an examination of the position of institutions of higher learning in the United States indicates that they are not subject to the degree and extensiveness of controls proposed for Australia in the Defence Trade Control Bill.

Institutions of higher education in the United States benefit from four exclusions and exemptions which apply in most circumstances:

(a) exclusion for fundamental research (including basic and applied research)
(b) exclusion for information in the public domain
(c) exclusion for educational instruction in catalog courses

[1] Sir Courtenay Ilbert, *Legislative Methods and Forms,* p 310.

(d) exclusion for disclosures to bona fide full-time employees (subject to some conditions).[2]

Harvard University has adopted a detailed institutional policy explaining to its academics how the ITAR regime impacts on teaching and research. Most pertinently they note:

> "Much of the controlled technology [that is controlled by military and dual-use schemes] that our international students and scholars have access to on campus at Harvard will not require licensing ***because of the exceptions contained in the regulations for "fundamental research" or "educational information" under the relevant regulations.*** If the on-campus teaching of "basic and applied research" is free from restrictions on publication and involves information that is not subject to any access or dissemination controls, it generally qualifies for the "fundamental research" exemption. The information is ***deemed to be in the public domain, and no license is necessary for access to this information by foreign nationals.***
>
> Similarly, there is an exception for educational information that is released by instruction in catalog courses and associated teaching laboratories of U.S. academic institutions. ***Thus, we do not need to secure a licence from the government to share information with our international community on campus if the information is provided through instruction in the classroom or in our laboratories on campus in the United States. "***[3] [emphasis added]

The points made in the Harvard policy suggest that the U.S. regime, although applying to non-nationals, as far as academic institutions are concerned (in light of exemptions applicable to them), generally only applies if an activity involves a 'real' export of technology outside the United States.

The MIT Office of Sponsored Programs maintains information concerning export controls on that institution. It notes:

> "Several common exclusions and an exemption may remove University research from the application of export control restrictions … As used in the export control regulations, **fundamental research** includes basic or applied research in science and/or engineering at an accredited institution of higher learning in the United States, where the resulting information is ordinarily published and shared broadly in the scientific community."

The exemption will not apply if the publication of information resulting from the research is subject to any controls other than a limited pre-publication review by a research sponsor to ensure proprietary information is not compromised; or MIT has accepted specific controls on publication when the research is federally funded. This point is of such significance that the University of California cautions its researchers to ensure that they do not accept funding under conditions that would restrict publication (and therefore result in the application of the export control regime).[4]

Software, physical goods, encryption and research conducted outside the United States do not gain the benefit of this exemption.

MIT notes the additional exclusion for publicly available information:

> Information that is **published and generally available to the public,** as well as publicly available technology and software, is outside the scope of the export control regulations. This latter exclusion does not apply to encrypted software or where there is a reason to believe the information may be used for weapons of mass distribution, or where the US government has imposed access or dissemination controls as a condition of funding.

Referring to the educational instruction exemption, it notes that 'export controls do not apply to information released in academic catalogue-listed courses or in teaching labs associated with those courses.' The practical importance of this exemption is that a teacher does not have to enquire as to the nationality of their students.[5]

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[2] Exclusions and Exemptions MIT Office of Sponsored Research http://osp.mit.edu/compliance/export-controls/research/exclusions-and-exemptions

[3] Harvard Export Control Compliance Policy http://www.provost.harvard.edu/policies_guidelines/Export%20Control_Compliance_Policy%20Statement_6-19-07.pdf

[4] UC's Export Compliance Plan http://www.universityofcalifornia.edu/compaudit/researchcomp/exportctrls/ucexport.html

[5] Exclusions and Exemptions MIT Office of Sponsored Research http://osp.mit.edu/compliance/export-controls/research/exclusions-and-exemptions

The final exclusion relating to full-time employees, similarly removes an invidious situation where an employee will be denied access to research collaboration simply because they are a non-national. Given that research depends on attracting the world's brightest minds and the scientific community is one that has always transcended national boundaries, this is essential. The US exemption applies where a person's permanent abode during the employment is the United States. Such a rule would capture researchers who may be working within an Australian university on temporary work visas.

It is important to note that even such a regime raises considerable practical difficulties in those areas that might be particularly impacted (for example space research). A 2008 briefing for the Congressional Export Control Working Group by Frederick Tarantino, President and Chief Executive Office of the Universities Space Research Association outlined some of those difficulties. He notes the potential adverse security implications of impeding fundamental scientific research. In the context of such a Bill one may unconsciously fall into the assumption that the benefits of transfer of technology are one way. This has never been the case, and the potential reduction of scholarly interaction with foreign researchers in particular could result in Australian technology falling behind, and consequently Australian security being imperilled.

> An unfortunate consequence of both the uncertainties over implementation of ITAR and of the costs in time and money to comply with ITAR requirements is that we are seeing a reverse brain drain. That is, international interest in partnering with U.S. scientists is being diminished, and foreign scientists, particularly in space research, are looking towards opportunities to collaborate elsewhere (e.g. in China, Russia, and India) where policies for collaboration are less burdensome and onerous. This trend reduces U.S. access to foreign expertise and opportunities to benefit from foreign contributions to expensive space initiatives. Furthermore, other countries are not sitting still when the U.S. will not work with them. They are developing cutting-edge (often leapfrogging) technologies to which we will not have access. These situations illustrate how ITAR can compromise national security rather than enhance it.

In respect of the practical and cost implications for universities, he observes as follows:

> Many of the best foreign students opt to stay in the U.S. after their academic training is completed, and they become valuable members of the U.S. high-tech workforce. If our universities can not give them a full education, they will not be properly qualified to enter the workforce. Furthermore, I have been told that uncertainties about ITAR compliance and the burdens that accompany the ITAR approval process also are leading some very able young faculty members to avoid fields such as space research where the uncertainties and burdens seem most acute. The real cost of ITAR compliance at universities is significant and is not often covered within allowable overhead accounts. The costs include covering training for contract administrators and faculty about ITAR requirements, documenting university attempts to work within the limits afforded under the fundamental research exclusion, applying for rulings and/or approvals from the Department of State for activities that may be controlled by ITAR, and the costs resulting from time delays in research projects while pursing ITAR approvals.

As with the case of the UK, Australian institutions of higher education would not enjoy a comparable position to their US colleagues, disadvantaging Australian innovation. Surely, as a key object of the Defence Trade Control Bill is to establish equivalent controls to ITAR, the Australian regime should not be any more onerous on universities that the situation that applies in the United States.

The United Kingdom

The Export Control Act 2002 (UK) is described by its administering government department, the UK Department of Business, Innovation and Skills, as "the main UK legislation on export controls on military and dual-use goods".[6] The Export Control Order 2008 made under this Act sets out in its provisions controlling the export of goods and technical assistance in relation to military and dual use goods specified in the Order.

[6] Export Control Act 2002 Business Link, Department of Business, Innovation and Skills Linkhttp://www.businesslink.gov.uk/bdotg/action/layer?r.i=1078157247&r.l1=1079717544&r.l2=1084228483&r.l3=1078151991&r.t=RESOURCES&topicId=1084561899

In a parallel to developments in Australia, Universities UK was only able to avoid serious damage to the UK higher education sector after raising their concerns in regard of provisions of the UK Bill with the UK House of Lords, which amended the Export Control Bill to take account of the concerns of the sector.[7]

In terms of detailed implementation, the UK Department of Business, Innovation and Skills has released a comprehensive guide to the university sector on implementation of the Act and associated UK export controls for items listed on a control list, or under an 'end use' control regime (WMD purpose): *Guidance on Export Control Legislation for academics and researchers in the UK March 2010*.[8]

It is clear from this description that the UK regime operates significantly differently to the proposals in the Defence Trade Control Bill and the draft regulations to that Bill. For example *Guidance for Academics* at page 10 in relation to items which fall under the relevant controls on 'end use' grounds (WMD purpose) states:

> No licence would be required simply by virtue of the subject being studied, the nationality of the recipient of the information , nor any combination of these generic issues – the new end-use controls are only triggered by specific reasons to believe, that the software or technology being transferred is intended for 'WMD purposes' outside the EU. For example, article 10 would not be triggered simply due to a student being from a country of proliferation concern. However they could apply if a tutor came to be aware, through specific evidence, that one of their students intended to make use of their studies for a WMD program outside the EU – regardless of their nationality….

The guidance goes on to note that the new 'end use' controls, do not necessarily work in the same way as similar controls in other countries (e.g. the US), which operate by regulating transfers of technology to non-citizens, regardless of potential use. Rather these UK controls are based on specific end-use. They then gave an example that a SARS researcher attending symposium in Hong Kong would only be subject to controls if they 'knew' or was 'informed by the government' that at an attendee at a symposium intended to use the information for 'WMD purposes'.[9] A number of case studies in this guidance further illustrates the relative practicability of the 'end use' controls regime for the UK education sector as in most cases students and researchers are able to operate within the legislative exemptions.

- A medicine student would not be caught in respect of their undergraduate studies, as the information is likely in the public domain. If the student undertakes research 'not freely available' a licence would only be required if the tutor was aware that the technology being taught was intended for 'WMD purposes' or was informed by the government that it may be so intended, and knew or was informed that it was intended to be used outside the EU.
- Similarly a student engaged in higher degree study or research involving microchips would only require a licence to *export* the technology (under EU level controls), and face to face teaching within the UK would not be caught unless the teacher knew of the intended WMD related use.
- A further example is given of a UK researcher exporting 'technology' concerning an advanced flight control system to a fellow researcher in Norway. Again the researcher need only be concerned if they knew or were informed of the intended end-use.[10]

These detailed arrangements are unlikely to be conformable specifically to the framework of the Defence Control Bill, and to some extent operate in other domestic legislation which addresses WMD programs and controls. Further the UK situation is complicated by the direct application of EU level arrangements in UK law. Nonetheless, the framing of the UK control regimes, which are said to respect the activities that fall under the protected freedoms in section 8 of the UK Export Control Act, potentially illustrates disadvantage to Australian institutions of higher learning as compared to their UK counterparts, if our Bill is adopted unamended. Further it is important to note that adoption of section 8 of the UK Export Control Act (or an equivalent) into our legislation, would not mandate that Australian

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[7] ***UUK speaks out against bill that 'curtains freedom'*** http://www.timeshighereducation.co.uk/story.asp?storyCode=167371&sectioncode=26 22 Feb 2002***; Baroness Warwick speaks up for academic freedom*** http://www.universitiesuk.ac.uk/Newsroom/Media-Releases/Pages/MediaRelease-286.aspx 3 may 2002***; Export bill changes secure academic freedom*** http://www.guardian.co.uk/education/2002/jul/23/highereducation.uk5 22 July 2002

[8] Guidance on Export Control Legislation for academics and researchers in the UK March 2010 http://www.bis.gov.uk/assets/biscore/eco/docs/guidance-academics.pdf

[9] At page 11.

[10] Pages 11 et seq

controls would need to operate in precisely this fashion. What would be 'necessary' and 'only necessary' would be matters the Minister would determine in the context of the overall legislative regime in Australia.

3. Anti-Discrimination and Human Rights Considerations

Australian universities need to be careful not to breach Federal, State and Territory anti-discrimination laws, and discrimination of course refers to discrimination in the observance of *fundamental human rights.* It is assumed, that Parliament would intend that the Bill be framed so as to avoid (or where unavoidable – minimise) any discriminatory effect or breach of human rights principles in accordance with the Human Rights (Parliamentary Scrutiny) Act 2011 ('the HR Scrutiny Act'), notwithstanding that the Defence Trade Control Bill was introduced into parliament before the entry into effect of the HR Scrutiny Act.

Universities speak for all their staff, visitors and students and are concerned that the end result of this legislation not be one that either requires universities or its scholars to discriminate against some of the members of university communities, or requires universities to participate in the violation of their human rights. We are certain that it is not the intent of Parliament to create such impacts, nonetheless we are concerned that such impacts would arise given how the Bill is framed.

Non-discrimination under domestic law

Anti-discrimination laws apply at State/Territory level and at Federal level. These laws make it unlawful on the basis of race to refuse to employ or educate a person, or to place conditions or limitations on a person's access to benefits of employment or education, or to otherwise subject an employee or student to a detriment. State laws typically include a prohibition on discrimination on the grounds of nationality.

Real examples of the need for such exemptions are provided by participants in the airline industry responding to trade restrictions under US ITAR laws: see for example application for a temporary exemption from anti-discrimination laws in *Boeing Australia Holdings Pty Ltd (Anti Discrimination Exemption)* [2007] VCAT 532. The Victorian Civil and Administrative Appeals Tribunal held (at para 25) that discrimination against a non-citizen in employment for the purposes of ITAR compliance amounted to discrimination on the grounds of nationality for the purposes of the Victorian Equal Opportunity Act 1995. The Tribunal further held that Boeing was required to comply with the state legislation, notwithstanding that Commonwealth law (the Racial Discrimination Act 1975) might not prohibit discrimination on the basis of "nationality" or citizenship (at para 49). The Tribunal references similar precedents in other state jurisdictions (at paras 37-39). The relevant test applied as to whether the exemption would be granted in these cases (consistently with the anti-discrimination law), was limited to actions *reasonably necessary* to comply with the requirements of US law (at para 1).

Yet the Bill requires Australian universities to stop the transfer of knowledge to a foreign person where it relates to a DSGL good without a permit, which permit may be refused when applied for. To implement such restrictions lawfully, universities may need to apply for a temporary exemption under the anti-discrimination laws (available under State and Territory laws for up to 3-5 years, and not available under the Racial Discrimination Act 1975 (Cth)).

Alternatively the Federal Act may be so drafted as to implicitly override State anti-discrimination laws. However the question before the Senate is whether Parliament would wish to have this effect in this context, and moreover whether such an effect is in any way *necessary.* The passage of the Human Rights (Scrutiny of Bills) Act 2010 would suggest that Parliament would wish to avoid such impacts if it were practicable.

Human Rights Compatibility

It would be ironic if in seeking to bring about compliance with a bilateral treaty, Australia were to become non-compliant with multilateral treaties which are equally binding on it (viz the human rights treaties it has ratified.)

As defined in the HR Scrutiny Act 2011, human rights refers to human rights as defined in international instruments such as the International Convention on All Forms of Racial Discrimination, the International Covenant on Civil and Political Rights ("ICCPR") and the International Covenant on Economic Social and Cultural Rights ("ICESCR").

In the context of this Bill, the primary human rights questions that arise are whether the proposed mechanisms which limit the free transmission of knowledge or which address the transmission of such knowledge to non-citizens may violate the human rights standards in those treaties.

The following specific human rights and principles appear relevant to these questions include:

(a) The principle that all human beings are equally entitled to human rights without discrimination on grounds *such as* race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status. States are obliged to observe this principle of non-discrimination (article 2 of the ICCPR and article 2 of ICESCR).

(b) The right and freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through other media of his choice. (Article 19.2 ICCPR). Helpfully, this article explicitly describes those limited circumstances in which the transmission of ideas and information may be limited being "only those provided by law and are necessary … for the protection of national security or of public order, or of public health or morals".(c) The right to enjoy the benefits of scientific progress and its applications (article 15(b) ISCECR) whereby states commit themselves to 'respect the freedom indispensible for scientific research and creative activity.' (article 15 .3 ICESCR).

(d) The right to education and particularly the principle that higher education shall be made equally accessible to all (article 13(c))

Human rights such as these may only be subject "to such limitations as are determined by law only in so far as this may be compatible with the nature of these rights and solely for the purpose of promoting the general welfare in a democratic society." (Article 4 ICSESCR).

Discrimination Against Non-Citizens

It is quite clear that one's citizenship does not determine one's human rights, which are founded on the premise that all human beings (simply by virtue of their membership in the human family) are endowed with fundamental human rights. These rights are (in addition to being set out in the international treaties) declared in the Universal Declaration of Human Rights.

In considering the application of the International Covenant on Civil and Political Rights, the Human Rights Committee, the treaty body charged with interpreting its provisions and applying them in individual cases has observed that "the rights set forth in the Covenant apply to everyone … irrespective of his or her nationality … Thus the general rule is that each one of the rights of the Covenant must be guaranteed without discrimination between citizen and aliens. Aliens receive the benefit of the general requirement of non-discrimination in respect of the rights guaranteed in the Covenant. … Exceptionally, some of the rights recognized in the Covenant are expressly applicable only to citizens (art. 25)". General Comment No. 15 (1986) Human Rights Committee.

Relevantly, the treaty committee charged with similar responsibility in respect of the International Covenant on the Elimination of All Forms of Racial Discrimination made a number of recommendations to States in its General Comment 30 (also on the issue of discrimination against non-citizens), including that they:

- Ensure that any measures taken in the fight against terrorism do not discriminate, in purpose or effect, on the grounds of race, colour, descent, or national or ethnic origin
- Remove obstacles that prevent the enjoyment of economics, social and cultural rights by non-citizens, notably in areas of education, housing, employment and health …
- Avoid … different standards of treatment being applied to non-citizens on grounds of race, colour, descent, and national or ethnic origin in elementary and secondary school and with respect to access to higher education.

There are limited exceptions to the principle of non-discrimination. As a key publication of the United Nations High Commissioner for Human Rights titled *The Rights of Non-citizens,* puts it: "Exceptional distinctions, for example between citizens and non-citizens, can be made only if they serve a legitimate State objective and are proportional to the achievement of that objective."[11]

[11] The Right of Non-citizens, Office of the United Nations High Commissioner for Human Rights, 2006 HR/PUB/06/11, prepared by Professor David Weissbrodt, Special Rapporteur on the rights of non-citizens

The Bill seeks to pursue its objectives by drawing a distinction between "Australian person" (which term includes individual Australian citizens and individual holders of a permanent visa) and "foreign person" (being non-Australian persons, as defined).

The relevant discriminations to which a "foreign person" may be subjected arise from exclusion from goods and technologies (knowledge or information) that may be pertinent to their education or their participation in science.

Transfers of knowledge/information and goods from "Australian persons" to "foreign persons" are prohibited without a permit, which the Minister may or may not grant on a fairly open discretion. As currently drafted the Bill makes no reference to any principle that may prevent unintended infringement of human rights arising.

In practice this may include:

- A lecturer or tutor sharing knowledge with a foreign student – either in Australia itself or at an overseas campus - without a permit to do so
- An Australian researcher sharing knowledge/information or goods with a "foreign person", for example a research collaborator or a colleague who is working down the corridor, across town, interstate or overseas

By such effects the Bill intrudes into personal relationships between colleagues and between teacher and pupil. Its impact is potentially profound, and its potentially chilling effect on the freedom of discourse and inquiry fundamental to higher learning is a risk which cannot be ignored.

An Acceptable Derogation the Freedom to Communicate Ideas and Knowledge

The brief review above of applicable human rights principles seems to us to reinforce the conclusion that the Bill requires amendment. The changes proposed by Universities Australia both render the constraints of the Bill *necessary* and *proportional* to its legitimate objectives. The approach taken by the UK Export Control Act 2002 has precisely this effect as it prohibits the placement of a control on freedom of communication of information in the course of ordinary scientific research (for example) *unless the interference … is necessary (and no more than necessary)*, moreover requiring the Secretary of State to consider 'the need to respect the freedom to carry on that activity' before the order is made.

Further, the UK regime minimises any discriminatory impact by avoiding basing its structure on nationality as the Export Control Act 2002, unlike similar regimes in other jurisdictions, is explicitly not founded on transmission of information or technology to non-nationals. Rather, controls are based on the concept of *export* beyond national frontiers.

Conclusion

For these reasons Universities Australia seeks a broad statutory protection for Australian universities teaching and research activity by the inclusion in the Bill of a recognition of the importance of this freedom that it be cast sufficiently widely to enable these teaching and research activities. Universities Australia has identified section 8 of the *UK Export Control Act 2002* as an example. Universities Australia endorses the breadth of section 8 which extends exemptions to protect communication in the ordinary course of scientific research and by making information generally available to the public and by setting a hurdle for any interference with this freedom to what is "necessary (and no more than is necessary)".

Specifically Universities Australia seeks a provision to be inserted into the Bill that:

- Protects as fundamental freedoms:
    - The communication of information in the ordinary course of scientific research;
    - The communication of information in the course of teaching in an accredited course of a higher education provider;
    - The communication of information that is generally available to the public;
    - The communication of information to an employee, officer or other person holding an appointment with a higher education provider; and

- Limits any interference with these fundamental freedoms to where it is necessary (and only to the extent necessary) to protect national security and only after considering the following factors:
    - The circumstances prevailing at the time the order is made; and
    - The reasons for seeking to control the supply or provision; and
    - The need to preserve, wherever possible, the fundamental freedom specified above; and
    - The importance of not subjecting Australian innovation to greater restriction than may apply in respect of similar controls in other jurisdictions.

- In the event of any interference with the fundamental freedoms, on a case by case basis the Minister may issue a permit to allow a particular activity;

- That record keeping obligations pursuant to the permit be limited to having the permit and a list of persons to whom technology was transferred pursuant to the permit;

- For the avoidance of doubt 'ordinary scientific research be specified to include fundamental and applied research and higher education provider be given the same meaning as in section 16-1 of the Higher Education Support Act 2003.

Universities Australia commends this approach to the Committee.

UNIVERSITIES AUSTRALIA
DISCOVER LEARN LEAD

Response to Questions on Notice – Part B (Case Studies)

Following Universities Australia's evidence, 2 March 2012, before Senate Standing Committee on Foreign Affairs, Defence and Trade in respect of the
Defence Trade Controls Bill 2011

Universities Australia appreciates the opportunity to assist the Committee in understanding the impact of the Defence Trade Controls Bill (2011) upon the Australian higher education sector. We provide this information with a view to securing amendments to the legislation which will ensure that it protects national security with minimal impact on the freedom of universities to pursue ordinary research and teaching activities.

This document responds to a request by the Senate Standing Committee on Foreign Affairs, Defence and Trade (the "Committee") to provide the Committee with examples of university activity that seems "innocuous" on face value, which would require a permit application under the Bill.

The document provides examples collected from a number of academics across various universities, as well as examples submitted by the University of Sydney. In relation to the latter, we stress that the University of Sydney has requested, through Universities Australia, an opportunity for some of their researchers to meet directly with the Committee to further explain their examples and set out their specific concerns.

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Case Studies from Various Universities

EXAMPLE 1

The research activity

The project investigates powder metallurgy processing of titanium alloy for aircraft and other aerospace applications. While this is not directly of military application, it clearly could be as the research involves development of materials for aerospace application.

Involvement of non-Australians

Researchers at an international company, based outside Australia are involved in the planning and execution of the work. A non-Australian PhD student is currently engaged in the research. It is likely that two yet-to-be-appointed Research Fellows will be non-Australian.

Listed materials

Commentary:

> Identifying whether all criteria are met prior to commencing work is problematic because the nature of research is such that there will be some properties that will not be known until the research is undertaken. It may also be the case that inadvertent/unknown breach could occur because a particular property has not been measured during the project and might only emerge at a later date. This example also illustrates the complexity of determining whether a project falls under the auspices of prohibited services or goods.

The titanium powder that is the subject of our research falls under section 1C002 (page 78 ff) section c ("Metal alloy powder"), part 1c ("Titanium Alloys Ti-Al-X or Ti-X-Al"), part 2 ("Made in a controlled environment…").

However, these materials must also meet some property specifications listed in the previous section: 1C002 section b, part 2b: Titanium alloys made according to section c with "a low cycle fatigue life of 10000 cycles or more at 723K (450˚C) at a maximum stress of 400MPa. This is where we are not able to predict beforehand whether these properties will be met. I can hazard a guess that we might meet these because the aim of the project is to achieve properties the same as or better than conventional Ti-64, which according to Mil-Handbook 5 (2003) ought to meet the above specification. At the same time, we might not even test this property at that temperature under those conditions.

Connection between the non-Australian and the listed good

An overseas company funds the project and will commercialise the project outcomes. Funding is contributed from Australian partners for a return on commercialisation.

Example 2

Research Activity

This research studies the effect of various bowel related diseases, in particular, the effect of bacteria on the bowel and antibiotic resistance. The research will also examine the genome of a healthy bowel in order to better understand how bowel related diseases can be reduced or cured by developing a more healthy microflora, or made more resistant to invasion by pathogenic organisms. According to the ABS, in 2001 the most common newly diagnosed cancer was bowel or colorectal cancer with 12,844 new cases. This research is not only for the Australian public good, but continues Australia's research tradition in discoveries to benefit the international community.

Involvement of non-Australians

A Bangladesh research lab is the major source of pathogenic bacteria in this research. Furthermore, the Bangladesh research lab provides access to some specific containment laboratories, as well as consultation opportunities with research staff.

Listed materials

This NHMRC funded research would require a permit application as it uses the following Defence and Strategic Goods List item from section C351(c):

- 5 – Chlamydia psittaci
- 6 – Clostridium botulinum
- 10 – Salmonella typhi
- 12 – Vibrio cholerae
- 14 – Clostridium pefringens epsilon toxin producing types
- 15 – Enterohaemorrhagic Escherichia coli, serotype O157 and other verotoxin producing serotypes.

EXAMPLE 3

The research activity

ARC LIEF grant funding to purchase a Hot Isostatic Press (HIP), awarded to a consortium of universities. The equipment is intended to support a broad range of research in aerospace materials over many years and is a significant capital investment.

Involvement of non-Australians

Multiple non-Australian Research Fellows and PhD students are likely to use this equipment. Research will be undertaken in collaboration with international firms.

Listed materials

Commentary:

This illustrates the potential for inadvertent breach of the potential legislation.

A call for tender for supply of the LIEF-funded equipment has been put out that specifies a 300MPa working pressure and diameter of 150mm.

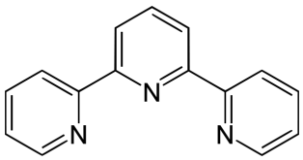
The strategic goods list specifies (2B204, page 120) Isostatic presses having both of: a maximum working pressure of 69MPa or greater, and a chamber cavity with an inside diameter in excess of 152mm. [No mention is made of an elevated temperature capability in this section, although it is in others.] The first (working pressure) criterion is easily met by any HIP that meets the tender requirements. It is envisaged a situation in which a tender comes back with an offer of a 152.4mm container simply because that could be a standard size for a US manufacturer: it's six inches in imperial measurements. Without knowing the (prospective) legislation this tender could easily be accepted.

EXAMPLE 4

Research activity

Synthesis of terpyridine complexes for protein separation and purification. This research is being conducted as a green chemistry initiative and involves a current overseas PhD student.

Terpyridine (terpy) is an organic molecule that is capable of binding a range of metals, particularly transition metals. Its structure is shown below.



Metal complexes with this ligand are depicted by the general formula $[M(terpy)_2]^{n+}$ and are common. They have been commonly used for protein purification in especially designed supports (column packings) employing metal ion affinity chromatography. The properties of the molecule and hence its effectiveness in affinity chromatography can be modified by substituting the hydrogens on the rings with other groups such as halogens (e.g. Cl, Br) and alkoxyl groups (OCH3). Research involving this ligand has been conducted by several groups in chemistry over a number of years.

Some of the organic transformations steps used in this work employ ***phosphorus pentachloride*** and ***phosphorus oxychloride***. These are reagents that are commonly used in organic synthesis and commonly found in the chemistry. These are also listed in the Defence and Strategic Goods list (Section 1C350).

Involvement of non-Australians

Numerous non-Australian PhD students and research staff are likely to be periodic users of phosphorus pentachloride and phosphorus oxychloride.

Listed materials

Commentary: Phosphorous pentachloride and phosphorous oxychloride are commonly used in organic synthesis. A quick check in just two labs in chemistry showed that these materials were present and stored appropriately. There is no strict pattern or way that one can identify how often and when they might be used. These are "ingredients or reagents" that a synthetic chemist might choose when needing to undertake a particular chemical transformation. The same would apply to many other chemicals listed in Schedule 1.

Hence, any synthetic project would need a permit for all foreign HDR students and researchers to cover when and if a reagent might be used.

The use of dual use equipment such as a Mass Spectrometer, has the same implications.

THE UNIVERSITY OF SYDNEY

DEFENCE TRADE CONTROLS BILL 2011

The University of Sydney sample case studies

The University of Sydney is pleased to provide Universities Australia and the Senate Defence, Foreign Affairs and Trade Committee with the following four case studies as examples of the potential impact of the Bill on the day to day activities of researchers in three disciplines – Quantum Physics, Cancer Research (Melanoma), Infectious Diseases and Photonics.

For further information about these specific examples, the Committee should feel free to contact the authors of the case studies, Dr Michael J Biercuk, Professor Graham Mann and Professor John Canning directly through the contact details provided.

If it would assist the Committee, the University would welcome the opportunity to have academic staff from various disciplines appear before the Committee to describe their work, and the likely implications of the legislation on their education and research activities.

We would indeed be more than happy to host a visit by the Committee to the University if that was considered an effective way to facilitate such dialogue. Cognisant of the Committee's tight deadline for finalising its report, we would be happy to organise such a visit at short notice.

Please do not hesitate to contact me if the Committee requires further assistance with this inquiry from the University of Sydney.

Sincerely

Tim Payne
Director, Policy Analysis & Communication
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CASE STUDY 1 QUANTUM PHYSICS

DEFENCE TRADE CONTROLS BILLL IMPACT TEMPLATE

Name: Michael J. Biercuk
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A description of the education/research/research training that is being done and its significant to Australia and internationally

Quantum Science constitutes a new frontier in research that aims to understand, control, and exploit quantum phenomena to create revolutionary new science and technology.

The world on the atomic scale is very different from the world around us. The simple principles that govern the behaviour of our classical world – principles elucidated by the likes of Newton and Maxwell – break down and give way to a new set of rules provided by quantum mechanics. To date, quantum mechanics represents our most accurate and widely applicable scientific theory, providing deep insight into the fundamental nature of light and matter.

Quantum mechanics has captured our imagination more than any other physical theory because of the intrinsic strangeness of many of its principles – particles as waves, light as particles, hidden correlations between systems separated by huge distances. These phenomena, however, are not manifested in our daily existence and have largely been inaccessible due to the barrier between the classical and quantum worlds.

A new discipline – Quantum Science – is opening a door between our world and that of the quantum, allowing classical systems access to the most exotic quantum mechanical phenomena. The various subfields within Quantum Science are unified by the theme of "coherently" manipulating individual quantum systems – i.e. controlling them in such a way as to preserve their full quantum mechanical character. The past two decades have seen an explosion in the number of systems that have been able to provide access to the quantum realm: from superconducting circuits and semiconductor nanostructures, to trapped atoms and single-photon optics. With these developments it has become possible to directly observe and harness individual quantum systems in the laboratory.

This research has tremendous implications for commercialization and industry. The importance of quantum physics to modern technology cannot be overstated – it shapes our daily lives. Without quantum mechanics there would be no computers and no internet, no lasers and no MRI. Today's technologies, however, involve only the most basic quantum mechanical phenomena, and brush aside the eccentricities of quantum theory.

Quantum Science is promising to deliver a new class of technologies that use the most exotic phenomena in the quantum world as resources to enable fundamentally new technologies. Much of the field is focused on applied science, striving to address problems in computation, communications, and metrology.

Dr. M.J. Biercuk is the Director of the *Quantum Control Laboratory*, at the University of Sydney, funded both as part of the Australian Research Council Centre of Excellence for Engineered Quantum Systems and through major US Government grants. The ARC Centre of Excellence for Engineered Quantum Systems explicitly and specifically seeks to build and craft new quantum technologies unlike anything the world has seen before. Efforts represent the absolute cutting-edge of capability in quantum physics, quantum control and quantum systems engineering.

Dr. Biercuk's group specifically focuses on driving advances in precision measurement and quantum technology using trapped atoms. Potential applications of our group's work range from developing new kinds of sensors of interest to the mining industry and new kinds of atomic clocks needed by the radioastronomy community, to the production of next-generation quantum computers. Research in the Quantum Control Laboratory and others like it is outcome-driven, and has the potential to radically transform technology in the 21st century.

The importance of this work was recognized by major domestic and international funding streams, as well as major scientific awards such as the 2011 National Measurement Institute (NMI) Prize for Excellence in Measurement Research from the Department of Innovation, Industry, Science and Research (DIISR) to the Principal Investigator, and selection of this group's work as a finalist in the 2011 Australian Innovation Challenge, sponsored by Shell and The Australian newspaper.

An example, or examples, of the specific goods or technology on the Defence Strategic Goods List that you routinely use or refer to in the course of your education/research/research training activities.

The complexity of experiments in most quantum science laboratories mandates the use of high-performance electrical and optical systems as supporting technologies, derived from both commercial sources and custom in-house engineering. The exact mix of required supporting technologies depends on the core quantum technology being studied (e.g. trapped atoms or semiconductor devices), but generally includes radiofrequency and microwave sources, atomic clocks, high-power electronic amplifiers, and high-speed electronic control systems that enable experiments to be carried out on relevant physical timescales.

Many of these systems push the limits of technical capability in order to access the physical phenomena of interest to our researchers. Due to the range of civilian and other uses of these

technologies and systems they appear on the internationally agreed list of controlled goods known as the Defence Strategic Goods List (DSGL). Without access to these technologies our research cannot continue.

Below we detail specific line-items in the DSGL covered by research in the *Quantum Control Laboratory*:

1C230: This item covers the metallic element that is used as an atomic species of interest in ion trapping experiments. We fabricate custom Beryllium "ovens" to serve as a source of atoms for our experiments. This atom is chosen for its intrinsic properties including its mass, charge (when ionized), and electronic level structure. Experimental infrastructure is centred around this choice of metal and cannot be adjusted for a different atomic species.

3A001.a.5: These electronic elements represent the high-speed/high-resolution circuits used to apply varying voltages to different parts of an experiment under computer control, or to measure voltage outputs using a computer. Experiments require the highest performance achievable using commercially available hardware, due to timing constraints during experiments and the need for extreme precision.

3A001.b.2.a-f: Atomic physics experiments use lasers whose frequencies are shifted, and output power modulated using elements called Acousto-Optic and Electro-Optic Modulators. These devices require the input of a high-power, low-noise radiofrequency signal to drive active elements. These high-power radiofrequency signals are generated using power amplifiers such as those classified here. Any atomic physics lab will have a dozen or more such amplifiers, needed to control multiple beamlines. These are a workhorse of nearly any atomic physics laboratory.

3A001.b.10a-b Experiments in quantum control utilize specialized microwave frequency synthesizers in order to efficiently and accurately control quantum systems – for instance the quantum spin of an electron on a trapped ion. One of the most important characteristics of the control system is the stability of the output frequency relative to the qubit's frequency. This is measured by the "phase noise" of the source, and we work to realize precision frequency sources with phase noise as low as possible. The specifications listed here limit the available phase noise specifications and negatively impact all of our research by restricting high performance sources required for our work.

3A002.g: Experiments in our laboratory require precise synchronization over long periods. This is accomplished using so-called "atomic clocks" or "atomic frequency standards" that are both custom engineered and commercially available. The most common source for a high-stability frequency reference is Hydrogen in the form of a Maser, a decades-old technology. This item in the DSGL restricts all atomic frequency standards except those based on Rubidium, and may impact access to all but the worst standards and consequently all research in our laboratory. Additionally, a major component of our research seeks to produce new atomic frequency standards using Ytterbium ions. This restriction would impact all ongoing research in this field from occurring in Australia.

3A201.b: Our experiments use superconducting magnets for experiments in ion trapping (in the form of a so-called "Penning Trap"). A key enabling technology is wide-bore, high-homogeneity (field-uniformity in space) solenoid magnets, largely derived from research in medicine (whole-animal MRI). This item in the DSGL exempts medical systems, but NOT analytic NMR or other physics research applications, thus curtailing our access to these magnets, generally custom-manufactured and imported from foreign manufacturers, and commercially available.

6A005.c-d: A major research challenge in atomic physics is producing tunable lasers with the "correct" colors, as set by particular transitions in the atoms we trap. One way to achieve the necessary optical colors is to start with one color which can be produced at very high power, and convert it to other colors matched to our needs through a "nonlinear" optical process. This mandates the development, and customized use of high-power, long-wavelength lasers near telecom wavelengths (1050-1550nm and above), technologies controlled under these items of the DSGL. Limiting access to these goods would inhibit the development of novel solid-state optical sources for cutting-edge research in the field of ion trapping and atomic physics

A summary of the types of 'intangible transfers' and 'services' carried out in the normal course of your education/research/research training activities that are likely to be captured by the legislation as currently proposed.

Research undertaken in our laboratory involves hundreds of international collaborators, and regular visits from foreign researchers for training and to engage in projects, as well as training of foreign students, the discussion of technical developments at international scientific conferences, and the publication of material relating to new research outcomes and experimental techniques. Hardware maintenance is performed in house, as is repair and testing. Laboratories maintain records of their technology development as well as instructions for new students and staff members.

Our research is generally conducted with a particular aim in mind – for instance, realizing new technology for quantum computation or building a new kind of atomic sensor and therefore is not covered by the "basic scientific research" exemption.

A summary of the involvement of foreign persons (students or other collaborating academics or employees) in your education/research/research training activities;

We currently employ two international students with others circulating through the research group all the time. Two international researchers have been recruited from the best academic institutions in the US to participate in our research efforts. Foreign visitors come through our laboratory at least once per month to discuss particular scientific techniques and developments. We publish research results and techniques via oral and written presentations, a minimum of 5-10 times per year, generally with a diverse audience including foreign scientists.

A summary of what compliance with the requirements of the legislation as currently proposed would mean for you/your area practically in terms of its ability to continue to carry out its education/research/research training activities

We use dozens of the controlled items in one laboratory (e.g. high power RF amplifiers), and constantly revise and rebuild our equipment and experimental systems to meet new and evolving needs. Software is constantly being developed to control this hardware, and foreign students, staff, and visitors move through our group routinely. Segregation of foreign persons is neither practicable nor in the spirit of performing open academic research.

Person-by-person and item-by-item licensing may result in hundreds of licensing applications every year - as technologies are acquired and evolve, new software is developed, and new personnel join and depart (e.g. 25 technologies per year times 5 new students).

This also does not capture the influence of licensing delays that may result from the regulatory requirements. We often determine a new piece of technology is needed in response to rapidly developing experimental discoveries. Any delays in implementing new ideas may mean we miss significant research outcomes, and possibly lose downstream commercial opportunities.

A summary of what the consequences for Australia could be if as result of this legislation, your normal education/research/research training activities were impeded

Quantum science research – and specifically atomic physics research – is at the cutting edge of both science and technology development internationally. These disciplines are core Australian strengths with funding for two ARC Centres of Excellence. The field has built a reputation for Australian science and has attracted top international researchers to Australian Universities. New spinoff companies such as Poseidon Scientific have already emerged from research in the field, and the potential for new industries emerging is enormous.

An onerous regulatory regime, requiring allocation of significant resources to monitoring and managing the requirements that would otherwise be devoted to the research will have a significant negative impact. First, as my group has in total only about 10 researchers, we would be overwhelmed by management of the required compliance process. Administrative responsibility for compliance would fall exclusively on primary investigators such as myself. Next, top researchers would be reluctant to work in this environment, and high-achieving students may be turned away in order to reduce regulatory burdens.

The attractiveness of Australia as a destination for top researchers would be tremendously diminished under such a regime. I was brought to Australia from the US to build a research effort in this area, and I have attracted top international talent who would likely be forced to depart Australia in order to continue their work. Other top scientists would be unlikely to migrate given these restrictions.

A decrease in Australian strength in this and other related research areas would prevent the nation from capitalizing on its long-term investment in quantum science. A new generation of specially trained students would fail to materialize, Australian research prominence would decrease, and novel industries would be stopped from budding before they could emerge (these industries would require access to the same kinds of technology).

CASE STUDY 2 CANCER - MELANOMA

The University of Sydney
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A description of the education/research/research training that is being done and its significant to Australia and internationally

Melanoma is one of Australia's most important cancers, with a particularly heavy toll on young adults. NHMRC, ARC and Cancer Institute NSW fund a multidisciplinary program of research into melanoma at the University of Sydney, University of Newcastle and Queensland Institute of Medical Research. The Program's objectives are to solve practical challenges in the causes, prevention, diagnosis and treatment of melanoma. Aspects of the program have the character of basic research, but even these are strategic. The program is strongly linked to the world's largest melanoma treatment facility, in which all patients are managed with the support of a research database, and many contribute tissue for research analysis. It is considered a world leader in melanoma research.

An example, or examples, of the specific goods or technology on the Defence Strategic Goods List that you routinely use or refer to in the course of your education/research/research training activities.

There is no clear boundary between basic and applied research, nor between equipment, materials or processes being developed as part of research, and those applied in routine clinical care. A wide variety of instruments (mass spectrometers, imaging, radiation therapy-related equipment) would need to be assessed to determine whether or not they were controlled.

Among the human toxins listed are some that are used in cell biology research because of their signalling properties. For example IC351 (d) 13 cholera toxin is a principal mitogen of melanocytes, the precursor of melanoma. All research internationally on melanocytes relies on this substance, and while that knowledge is in the public domain (and therefore exempt), modifications and adaptations to the use of cholera toxin to achieve other results with melanocytes would not be and would require a permit.

A summary of the types of 'intangible transfers' and 'services' carried out in the normal course of your education/research/research training activities that are likely to be captured by the legislation as currently proposed. Relevant definitions and proposed exemptions are provided below*

Potentially imaging, mass spectroscopy and certain cell culture and biochemical techniques.

A summary of the involvement of foreign persons (students or other collaborating academics or employees) in your education/research/research training activities;

The melanoma program has hundreds of international collaborators and hosts regular visits from foreign researchers for training and to engage in projects.

A summary of what compliance with the requirements of the legislation as currently proposed would mean for you/your area practically in terms of its ability to continue to carry out its education/research/research training activities

First there would be a laborious process to identify all controlled technologies and materials in the program, and to review this periodically. Second, assuming at least some were found, new processes would be needed to manage and seek approvals for the contact of foreign citizens with our research activity. This would affect every aspect of the program, reducing productivity and inevitably reducing the contribution of labour and expertise that we derive from foreign students and researchers.

A summary of what the consequences for Australia could be if as result of this legislation, your normal education/research/research training activities were impeded

There would be a chilling effect on participation by foreigners in our biomedical research, and the probability that important research in human biology and medicine might never be done. There would be increased compliance costs, with resulting reduced effectiveness of Commonwealth research infrastructure funding, reduced effectiveness of private funding to independent research institutes, and slowing of research. In the health research sector it has been robustly demonstrated that investment saves lives and increases welfare, so a reduction of investment through increased costs, or non-approval of research, will have a real and potentially quantifiable cost in lives and human welfare.

CASE STUDY 3 – INFECTIOUS DISEASES

Name: Graham Mann
Title: Professor
Faculty/School/Centre etc: Sydney Medical School
Discipline/Research Area: Infectious Diseases
Email: graham.mann@sydney.edu.au
Phone number: 0404 741 308

A description of the education/research/research training that is being done and its significant to Australia and internationally

The University has substantial research strength in microbiology and infectious diseases medicine, funded through various NHMRC mechanisms, including a Centre of Research Excellence in Critical Infections. It is also a regular recipient of strategic funding targeting emerging infections and related biosecurity threats. It hosts the **Sydney Institute for Emerging Infections and Biosecurity (SEIB) and a related Research Network** with the following goals: to facilitates cross-disciplinary research into emerging and re-emerging infectious diseases, assist capacity development within Australia and Asia Pacific nations to detect and respond to infectious disease outbreaks in humans and animals and to inform and assist in the development of policies and strategies to prevent, contain and control emerging and re-emerging infectious diseases.

An example, or examples, of the specific goods or technology on the Defence Strategic Goods List that you routinely use or refer to in the course of your education/research/research training activities.

Current or proposed Federally-funded research at the University includes agents from 1C351 – 1C354, such as Salmonella typhi, Bartonella quintana, Hendra virus, H5 influenza, and uncharacterised viruses such as SARS which may be the subject of calls by NHMRC for funding of urgent research. Technical development of new vectors might be caught up in relation to the

genetic elements and genetically modified organisms controlled in 1C353.

Facilities and apparatus for containment of high-level biohazards are explicitly controlled in 2B352. However a variety of other instruments and facilities used in infectious diseases research would need to be assessed to determine whether or not they were controlled, such as mass spectrometers, imaging technologies, and .

A summary of the types of 'intangible transfers' and 'services' carried out in the normal course of your education/research/research training activities that are likely to be captured by the legislation as currently proposed. Relevant definitions and proposed exemptions are provided below*

Engagement in research intrinsically involves sharing of knowledge and techniques among team members and collaborators. To the extent that research on the listed, or future listed agents are controlled then the entire core of that research would be captured.

A summary of the involvement of foreign persons (students or other collaborating academics or employees) in your education/research/research training activities;

The research referred to above would routinely include participation by foreign postgraduate students, locally-based or visiting researchers, or overseas collaborators. Regional and other international engagement in research and public health implementation is a fundamental strategy to reduce risk to Australians from infectious disease.
Our researchers in microbiology and infectious diseases are highly connected internationally and particularly in our region.

A summary of what compliance with the requirements of the legislation as currently proposed would mean for you/your area practically in terms of its ability to continue to carry out its education/research/research training activities

Participation by foreign students and researchers in some research might not be approved. This would disrupt existing teams and collaborations and inhibit the forging of new links essential to effective regional or international research efforts against emerging and pandemic infections.

Even if this did not occur there would be a laborious process to identify all controlled technologies and materials in the program, and to review this periodically. Second, assuming at least some were found, new processes would be needed to manage and seek approvals for the contact of foreign citizens with our research activity. This would affect every aspect of the program, reducing productivity and inevitably reducing the contribution of labour and expertise that we derive from foreign students and researchers.

A summary of what the consequences for Australia could be if as result of this legislation, your normal education/research/research training activities were impeded or in a worst case scenario – blocked (new)

There would be a chilling effect on participation by foreigners in our biomedical research, and the probability that important research in human biology and medicine might never be done. There would be increased compliance costs, with resulting reduced effectiveness of Commonwealth research infrastructure funding, reduced effectiveness of private funding to independent research institutes, and slowing of research. In the health research sector it has been robustly demonstrated that investment saves lives and increases welfare, so a reduction of investment through increased costs, or non-approval of research, will have a real and potentially quantifiable cost in lives and human welfare. In the realm of emerging infections, disincentives to prompt, open and efficiently targeted research by a nation with high capacity and expertise such as Australia would do serious damage both to us and to our neighbours and allies.

CASE STUDY 4 – Photonics

Name: John Canning
Title: Australian Research Council Professor
Faculty/School/Centre etc: Science/Chemistry/iPL
Discipline/Research Area: Photonics, materials
Email: john.canning@sydney.edu.au
Phone number: 612 9351 1934

A description of the education/research/research training that is being done and its significant to Australia and internationally

We are recognised world leaders in the following:

(1) Photosensitivity (hypersensitisation, regeneration, photosensitivity generally, cofounder of Redfern Optical Components)
(2) Optical waveguides and fibres (Fresnel fibres, photonic crystal fibres, waveguide processing, cofounder of Redfern Integrated Optics, Centaurus Technologies)
(3) Photonics more generally (Elected SPIE Fellow 2012 by US colleagues)

We supply gratings and photonic crystal fibre, offer laser processing of overseas components, for research collaborations worldwide.

An example, or examples, of the specific goods or technology on the Defence Strategic Goods List that you routinely use or refer to in the course of your education/research/research training activities.

From a quick scan only of the DSGL, the following are the main areas of concern to optics and photonics identified on a quick scan only. There would be many other technologies and systems in electronics and quantum science, for example, that would also be covered :

- Page 142 (3A001.a.6) covers electro-optic and "optical integrated circuits", designed for "signal processing" and having all of the following: one or more than one internal "laser" diode; one or more than one internal light detecting element; and optical waveguides.
- Page 172 (5A001.c) covers optical fibre communication cables, optical fibres and accessories, as follows:
    1. Optical fibres of more than 500 m in length and specified by the manufacturer as being capable of withstanding a "proof test" of 2 x 10^9 N/m^2 or more;
    2. Optical fibre cables and accessories, designed for underwater use.
- Page 174 (5B001.b) covers:

    b. Equipment and specially designed components or accessories therefore, specially designed for the "development" of any of the following telecommunication transmission or switching equipment:

    1. Equipment employing digital techniques designed to operate at a "total digital transfer rate" exceeding 15 Gbit/s;
    Technical Note: For switching equipment the "total digital transfer rate" is measured at the highest speed port or line.
    2. Equipment employing a "laser" and having any of the following:
        a. A transmission wavelength exceeding 1750 nm;
        b. Performing "optical amplification" using praseodymium-doped fluoride fibre amplifiers (PDFFA);
        c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques); or
        d. Employing analogue techniques and having a bandwidth exceeding 2.5 GHz;
    Note: 5B001.b.2.d. does not control equipment specially designed for the "development" of commercial TV systems.
    3. Equipment employing "optical switching";
    4. Radio equipment employing Quadrature-Amplitude-Modulation (QAM) techniques above level 256; or
    5. Equipment employing "common channel signalling" operating in non-associated mode of operation.

- Page 176 (5E0001.c.3) covers equipment employing “optical switching”;
- Page 185 describes hydrophones.
- Page 197 covers all sorts of mirrors
- Page 199 *et seq* describes all sort of lasers
- Page 201 describes lasers with wavelength greater than 1555nm and CW power greater than 1W. I imagine that would be of concern to quite a few AOS members.
- Page 214 covers any nonlinear optical material with third order susceptibility (chi 3) of 10^-6 m^2/V^2 or more and a response time of less than 1 ms.
- Page 214 has a catch-all description of glasses with ppm impurities, 10^-4 RI variations.

A summary of the types of ‘intangible transfers’ and ‘services’ carried out in the normal course of your education/research/research training activities that are likely to be captured by the legislation as currently proposed.

Our research involves large numbers of international collaborators and hosts regular visits from foreign researchers for training and to engage in projects. This results in educational exchanges, international impact, international prestige for Australia; new research alliances, collaborations; and in turn allows us to access leading expertise that is not available in Australia The need for international visibility is essential to have access to international information.

My principal fear is that if we put protectionist legislation in place, which at the end of the day is what the Defence Trade Controls Bill is, we will end up impeding much research where the potential public good benefits far outweigh the national security risks.

Australia simply does not have the critical mass in its research community to sustain internationally competitive levels of discoveries and outputs over the longer term. The best way to deal with the national security issues of concern is to ensure that we train our young scientists to be aware of the risks and to learn how to best handle them so that the net gain for Australia is positive and to terminate quickly any relations which are not so.

Furthermore, we have to provide the foundation for exploiting our genius and turning it into industry here. With the exception of some programs like the Cooperative Research Centres (CRCs), there is very little in the way of this here in Australia. This is another important issue that we need to address.

A summary of the involvement of foreign persons (students or other collaborating academics or employees) in your education/research/research training activities;

We host many overseas staff and students. For example, at present I have one student coming from Brazil who will spend a year here doing course work and research work; two University of Sydney China Science Council students from China (one to arrive later in the year) and an Endeavour Fellow also from China. In 2011 I hosted one China Science Council funded student, 1 Endeavour Fellow from Sweden.

A summary of what compliance with the requirements of the legislation as currently proposed would mean for you/your area practically in terms of its ability to continue to carry out its education/research/research training activities

If this legislation goes ahead, the supply of research gratings may become compromised and difficult to do. There is a real chance that the collaborative research activities that are vital to our research effort will be impeded. This would cripple research across Australia as the country is not big enough to sustain quality research of this kind in this way and need international exchange and genuine global access in research.

A summary of what the consequences for Australia could be if as result of this legislation, your normal education/research/research training activities were impeded

Australia does not do world class research in isolation. The international linkages in technology research are built up through real collaboration and interaction. Leading researchers and top students come here because of what we do and what they can access by collaborating with us.

They do not come to give up their own resources and skills in a one way exchange. Everything is reciprocal.

Australia also no longer has the critically sized workshop capacity that it used to have decades ago. That which is available is prohibitively expensive for full completion of work. As a result, much of the technological development for genuine applications can only occur overseas where we need to access resources, often free through collaboration and our willingness to share our knowledge and information. We need to ensure that we implement these proposed trade controls in a way that does not restrict our capacity to participate in, contribute to, and benefit from cutting edge international research collaborations that underpin advances in knowledge and its application for public benefit.

SOUL

Society of University Lawyers

Senator Stephens
Chair
Senate Standing Committee on Foreign Affairs, Defence and Trade
Department of the Senate
Parliament House
Canberra ACT 2600

19th March 2012

Dear Madam,

Re: Defence Trade Controls Bill (2011)

I write in my capacity as President of the Society of University Lawyers (SOUL), which represents over 200 lawyers, who are employed to provide legal advice and services to Australia's 40 Universities.

SOUL and its members agree with, and support, the views expressed by Universities Australia in its submission to the committee on the matter of the Defence Trade Controls Bill (2011). We also agree strongly that the matters raised with the Committee are of significant importance to the University sector and we urge the Committee to consider carefully the information which has been provided by Universities Australia.

SOUL's members have reviewed the draft Defence Trade Control Bill and it is our view that if it is allowed to proceed in its current form, this legislation will seriously impact on the operation of Universities in the manner detailed in the Universities Australia submission.

Accordingly we urge the Committee to recommend the amendment of the Bill along the lines of section 8 of the Export Control Act 2002 (UK) and we otherwise support the recommendations made by Universities Australia.

Yours sincerely

Saveria Dimasi
President
Society of University Lawyers
http://soul.edu.au