ANU EMERITUS FACULTY 15 OCTOBER 2013

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**[IOE/ map England]**

Thanks. Yes I am going to Institute of Education at University of London. Dame Nellie Melba. My good-bye tour has one stop. This is it!

**[Weird British food]**

With some trepidation. Leaving familiar regional locations in East and Southeast Asia where I feel that I belong. The English have strange food.

**[Keep calm and carry on]**

And strange emotions. Though they are beginning to embrace diversity.

**[Panic like fuck and shit in your pants]**

And extend the notion of diversity, from emotional diversity to cultural diversity

**[Keep calm and Gangnam style]**

So maybe in London, East Asia will not be so far away.

**[Map of Australia]**

But the ANU Emeritus Faculty has not hired this expensive facility and provided me with an all-expenses paid trip to University House because you want me to poke fun at the UK You have brought me here to talk about universities in Australia. And I will do so. I will discuss the state of Australian higher education. We now have to place any such discussion of national higher education in global and Asian regional contexts.

**What’s up, doc? The state of Australian universities**

So what is the state of Australian universities? In a nutshell:

* At this point of time our universities look fairly strong when compared to other countries with per capita incomes of $35,00-45,000 USD. A significant number of universities are well ranked. How many, and how well ranked, I will discuss later. Our participation rate is above the OECD average still. But on present trends our global position will slide in the next 10-15 years. Compared to our own past—the last fifty years of higher education in Australia—it does not look good. There is no government-driven plan or program to progress higher education. No sign the new government will develop one. Politicians see higher education and research as a political management problem, not an opportunity to govern and build, in marked contrast with their counterparts in many other countries. There is no independent coordinating body. The department is interested in control so as to secure instrumental economic outcomes but timid in pursuing that agenda. TEQSA was beginning to shape an active regulatory agenda—for what purpose was never clear—and the department was egging it on to do the heavy political lifting neither minister nor department were prepared to do. But TEQSA will now be gutted. So there is no hand on the tiller at all. If anyone things that universities pursuing their own self interest adds up to the best possible policy, they are kdding themselves.
* The fiscal settings are poor. Australia is anti-tax in political temper. There is no long-term agenda in our sector. Treasury and Finance habitually rule out new investment in infrastructure, education and research, while taking every opportunity to make savings.
* The universities lack a mass constituency for high science and high quality first-degree education. They e always lacked a mass constituency for those. What makes them now weaker than before is that they lack enough of an elite constituency for the best research and education.
* In terms of system organization, we are still in the Dawkins system created in 1988-1990. We have entrepreneurial universities but institutional design and mission are uniform. We lack a division of labour between universities of different types, something most other countries find useful. One consequence is that we are unable to support our strong research universities in their efforts to be stronger. Funding support for strong research universities is seen in terms of the politics of status, not intellectual ambition or national achievement. This is a serious weakness.
* Research is not as strong as in other English-speaking countries. And it is likely to decline in relative terms
* And East Asia and Singapore rare now racing past Australia—and if this happens we will miss the opportunity enabled by the ‘Asian century’.

This evening I will focus mainly on the last two. Research is at the heart of what distinguishes universities from other organizations. Our research role is now more significant in economic and cultural terms than at any time in the past—partly because research is a currency in our relationships with the world. So the state of Australian university research is of great importance. And what is happening in the Asian region is both dynamic and strategically important.

**The funding conundrum**

Looking a little more closely at funding:

* The Base Funding review was meant to reform and stabilize public funding but its report was thrown out by Labor.
* Public investment is trending downwards to one of the low levels in the OECD. Private investment is high. The total is average and going down. Teaching funding has bourne the brunt of this but research support is now trending downwards also. The Go8 and some other universities must expand research resourcing to sustain their global position, putting further pressure on teaching resources. This cannot go on for ever.
* Labor undid most of its modest reform agenda in the last two budgets. Near full indexation survived, but the six-year phase-in of full research funding was halted. Teaching funding was cut in the final budget. The coalition will not reverse those decisions.
* There has been no significant increase in Australian Research Council basic grant programs since the Howard government’s Backing Australia’s Ability package was announced in 2001.

**4.3 million foreign tertiary students, 2011: world market shares (OECD data)**

Australia continues to hold 6 per cent of the global share of cross-border students. Our intake continues to take the form of mass first degree and coursework Masters education, skewed towards business studies provided at medium quality level. The international program has a modest commitment to doctoral students because we provide few scholarships. So while we draw many skilled migrants form international education, we draw few with first class research talent, compared to the US and UK. We are badly over-exposed in the international student market. 17.5% of university income in Australia is from education exports. Income has been stagnant since 2009. We are struggling to regain momentum for growth in China. We now know that when international revenues drop the government will not increase public funding to compensate.

**Components of a national innovation system**

I want to turn now to university research and look at it in both regional and global contexts. All national research systems are now also part of the global knowledge system. Most innovations in technology and product development are sourced wholly or partly from global sources. Countries partly disengaged from the global science system, are increasingly penalized. They lack full access to knowledge and cutting edge expertise from elsewhere. Because they do not contribute freely their scientists lack profile and fail to build international relationships, based on continuous exchange and collaboration, that allow them to anticipate new knowledge as it emerges. They do not draw strategic talent from other countries and their best people leave to work at the cutting edge. In other words, you get out of the global research system what you put into it.

**Countries with 1000+ science papers per year are increasing**

The growth of research is sustained by collaborations and the globalization of knowledge within one-world English language science. It also takes the competitive form of an economic arms race in R&D and innovation in which global research rankings signify the competitive position. Research science was once largely confined to the Atlantic countries, Germany, the Soviet Union and Japan. That has now changed. All nations now need developed capability in education, science and technology—though not all can pay for it—just as they need clean water, stable governance and globally viable finance. They need universities that participate in the global knowledge network on an equal basis. In 2009 48 countries produced more than one thousand journal papers a year, a proxy indicator for research systems at least partly self-reproducing. The new research players include Romania, Slovenia, Serbia, Iran, Thailand and Chile.

**R&D as a proportion of GDP, 2010**

This graph shows investment in R&D as a proportion of GDP, not just in universities but in all sectors. You can see that the English-speaking nations have been passed by Scandinavia and some Post-Confucian countries in East Asia. South Korea, Japan and Taiwan are well ahead of us. Singapore would be also if its GDP was not so high. Singapore is one of the very richest countries with a per capita income more than 40 per cent higher than Australia on the latest figures.

**Total R&D spending 2000 & 2010 ($s bill.)**

This graph compares spending on R&D in 2010 with 2000. Australia is 11th on this table, 20% behind Taiwan, which has almost exactly the same population. Taiwan has especially strong R&D in industry. Note the increase in investment over the ten year period in China and South Korea.

**Journal papers 2009**

That was funding inputs to R&D. Now lets look at the output of journal papers in science. These figures include only basic and applied science and selected social science, the contents of ISI-Thomson’s Web of Knowledge. Disciplines that do not form part of the comparable global pool of research, the humanities and part of the social sciences and professional disciplines, are excluded. Australia is 11th on this table because Russia, which spends more than Australia on R&D, is weak in English-language published science. Taiwan is also behind Australia at this stage.

**Citations per paper 2001-2011 (%)**

Australia is 11th in the quantity of journal papers but in the quality of journal papers as measured by citations per paper, Australia is less strong—17th in the world, having been passed by a number of smaller European systems including Denmark, Sweden, Finland, Switzerland, Belgium.

**Australia’s comparative citation performance, by research field**

A study of comparative citation counts for the Chief Scientist’s Office early this year found that Australia is above world average in citation rates in 17 out of 22 disciplines. But the world average is not a high bar in research. The European average is a higher bar. Worryingly, only five disciplines were above the European average: veterinary science, energy, engineering, earth and planetary science, and medicine. There were also two disciplines below the world average. The UK is above the European average in all disciplines, Canada in most of them.

**Shanghai Academic Ranking of World Universities top 200, 2013**

Let’s turn now at the position of individual Australian universities in the university ranking tables. First, the Shanghai Academic Ranking of World Universities, perhaps the most important ranking worldwide. This ranking includes winners of Nobel Prizes and Fields Medals in Mathematics, and it is a fairly conservative ranking in that most of its indicators are slow to pick up the effects of recent changes. Australia has a few Prize winners. The ARWU news is mostly good. Australia has seven universities in the world top 200: Melbourne, ANU, Queensland, WA, Sydney, Monash, and New South Wales. We are just behind Canada with eight, though Canada has two universities in the world top 40., Toronto and UBC. Australia has none. Note that the English-speaking countries still dominate the ARWU and the East Asian presence is still modest. China had only one university in the top 200 two years ago, Tsinghua. It now has five universities: Tsinghua, Peking U, Fudan, Shanghai Jiao Tong and Zhejiang.

**Australia in the Shanghai ARWU top 500**

Australia has 19 universities in the ARWU top 500. This is a very good result for a nation of Australia’s size. We are comparable to Canada and the Netherlands in having a broad spread of capacity—this is not so much because government has invested generously; rather it is the legacy of the one-size-fits-all system settings and of commercial imperatives in the international education sector, coupled with regional politics. The promotion of all universities as mass international educators requires them all to be positioned as research universities. Perhaps thirty universities have bona fide research status and are within striking distance of the world top 500. Three post-1986 universities have reached the top 500 Swinburne, Curtin and UTS. Pre-1986 Murdoch and UNE have dropped out..

**Australia in the Shanghai ARWU top 500, 2004-2013**

Also interesting to see that over ten years the number of Australian universities in the Shanghai ranking has increased and especially that the number in the top 100 has jumped significantly. Australian universities are more managed than most and on the whole performance cultures are more uniform and have more bite. Executive leaders and deans have learned to focus on the key ARWU indicators that they can influence: articles in *Nature* and *Science*, high citation researchers, making sure all publications are included in the citation count.

**Australian universities in the Shanghai Jiao Tong top 100 ranking, 2004-2013**

Let’s look now at the trajectories of the Australian universities in the top 100. You can see that three of the five have improved their positions. Melbourne has moved from 82 to 54, helped by a Nobel Prize and a more disciplined approach to the designation of publications from affiliated Medical Research Institutes as ‘University of Melbourne’ publications. Queensland and Western Australia entered the top 100 recently and are moving up. Sydney is jogging along near the bottom of the top 100. ANU has fluctuated, with the Nobel Prize helping in 2012.

**Leiden University ranking top 12**

Perhaps the best ranking from the point of view of social science is produced by Leiden University Centre for Science and Technology Studies. Like the ARWU it is exclusively focused on research. We do not have internationally comparable data on teaching quality or the learning achievement of students in higher education. Leiden supplies separated rankings of universities, each based on single indicators, including the volume of science papers, volume of citations of those papers, citations per paper, the number of papers in the top 10 per cent of their field by citation rates, and the proportion of the university’s papers in the last category. The citation data are provided in both raw form and on a field-normalized basis, whereby the Leiden group adjusts the raw data to accounts for different rates of publication and citation in the various research fields. The table shows Leiden’s world top 12. The columns show total journal papers, average cites per paper on the field normalized basis, the number of papers in the top 10 per cent of the research field on the basis of citations, and the proportion of all papers than are placed in the top 10 per cent of their field. The bottom line has MIT’s figures. MIT is much smaller than Harvard but has highest citation quality.

**Australian universities in Leiden 2008-11**

Here are the 15 Australian universities in the Leiden top 500 on paper volume. Note that Sydney and Melbourne have about the same number of papers as MIT but less than half as many of these papers are top 10 per cent papers, and Melbourne’s average citation rate is just over half that of MIT. Note also that ANU is equal second with Queensland on average citation rate.

**[Map of Asia]**

Let us turn now to higher education and research in the Asian regions most important for Australia, the long arc of sea-facing countries from Pakistan to Japan. East (meaning Northeast) Asia, Southeast Asia and South Asia. Let’s reflect on the systems that share a common heritage in Chinese culture, those that combine a Confucian heritage and other indigenous factors with Western modernization in the economy, science and technology and the university. China, Hong Kong SAR, Taiwan, South Korea, Japan, and Singapore. There are many differences between them, but they share the comprehensive, responsible and centralizing Sinic state, different to the limited liberal state of John Locke and Adam Smith, and the Confucian educational tradition in the home.

**[racist pictures]**

The idea of Post-Confucian power has not always played well in Australia. Even now the rise of universities in China, Korea and Singapore evokes some concern in Australian universities. This is a serious mistake. We should be concerned about our capacity to respond, but we should not be concerned about rising East Asia in itself. First, the rise of the East Asian societies inverts 200 years of Western domination and creates a more pluralized global power structure and all that is very good.

**[Santa Clauses]**

Second, them folks are just like us folks. At times rather too much so perhaps.

**Asian middle class 2009-2030 (millions)**

Thirdly, as the Henry report was at pains to point out, them folks are carrying a lot of cash. And will have more in the next generation. With the process of accelerated urbanization and the progressive absorption of the pre-capitalist rural sectors, the middle class in Asia—mostly in China and India—grows to six times its previous size in only 21 years. Middle class families want higher education and use technology.

**Since 1990 China, Taiwan, South Korea and Singapore have transformed their research and higher education. How?**

Since 1990 China, Taiwan, South Korea and Singapore have transformed their research and higher education. What are the key elements in this transformation?

* Economic growth and shared public/private funding
* Focused state policy—invests growing resources, sets clear ambitious targets, achieves these, moves on to new targets
* Strong Confucian commitment to education in the family
* World leading student achievement in PISA maths and science
* Advance in tertiary participation towards universal levels
* Coherent tertiary system design, World Class Universities
* Internationalization—open doors, publishing in English, collaboration, going abroad, attracting diaspora, paying global salary rates, drawing on ideas for institutional design

I will look at some of this in more detail.

**Gross National Income per head 2011**

Apart from Mainland China the Post-Confucian societies all enjoy per capita incomes akin to Western Europe. China is much wealthier in the Shanghai region, the East and Southeast and the Beijing region, than the country as a whole.

**Top ten school systems OECD PISA 2009**

Public and private investment in schooling, combined with parental focus on student achievement, state reform programs and the pressure of examinations, prepares Post-Confucian students for tertiary education at an advanced level. The 2009 OECD Program of International Student Assessment (PISA) found that in mean student scores in mathematics, the top five systems in the world were Shanghai (600), Singapore (562), Hong Kong SAR (555), South Korea (546), and Taiwan (543). Post-Confucian systems performed almost as well in the PISA science, with five of the top six systems, including Japan in fifth place, and in PISA reading with four of the top five systems.

**Superior in STEM (Science, Technology, Engineering and Mathematics)**

All of the Post-Confucian systems place special importance on developing national capacity in Science, Technology, Engineering and Mathematics. They share with Germany and Finland, more so than the English-speaking countries, a longstanding educational commitment to advanced performance in mathematics and a relatively large output of graduate engineers. All of them emphasize contrasting objectives at the same time: breadth in STEM and depth in STEM. They aim to bring scientific capability to all students—‘science for all’ is a popular policy goal—while at the same time widening and deepening the high performance STEM track and rapidly growing the number of doctoral graduates in science, engineering and technology. China has compulsory mathematics until the end of school. In the Post-Confucian countries at tertiary stage, engineering is especially strong in both human capital and in research. Engineering plays a generic role in the labour market. Many engineering graduates do not become professional engineers, entering business or government service.

**Gross Tertiary Enrolment Ratio, 2010**

All of the Post-Confucian countries are moving towards universal participation at tertiary level. The Gross Enrolment Rate exceeds 85 per cent in South Korea and Taiwan—essentially those systems are already universal Macau SAR is at 65 per cent and Japan and Hong Kong SAR are both at 60 per cent. In China, participation was less than 5 per cent in 1990. It was 26 per cent in 2010, has now reached 30 per cent and the target for 2020 is 40 per cent, which would bring the nation close to the OECD average. In most of these countries there is a strong system of technical-vocational institutions alongside the orthodox academic stream, at secondary and tertiary levels.

**Journal papers 1995-2009, seven nations**

Ths graph shows the evolution of journal papers in the Post-Confucian countries, comparing that with India and Auatralia in the black lines. The advanceof Chinese science is extraordinary China was the world’s twelfth largest producer in 1995. It was second in 2009. Since 2000 annual output has grown by 17 per cent per year. When the world’s largest nation expands research at unprecedented rates over a prolonged period, global knowledge flows are decisively changed. In future much of human knowledge will come from China. The growth of science has been almost as rapid in South Korea, where annual output has now passed that of India though India has thirty times the population of South Korea. Journal paper output has also ballooned in Singapore and Taiwan. In 1995 India produced more research papers than China but growth has begun to quicken only in the last half decade, stimulated by central government funding of R&D. Japan’s science system matured in the 1970s and 1980s and the annual number of papers is now falling. Note that Australia began in 1995 as the largest research producer after Japan. In 2009 it was fifth, behind China, Japan, South Korea and India.

**Shanghai ARWU top 500 Chinese systems, 2005 & 2013**

The number of top 500 ARWU universities from Mainland China has grown from 8 to28, in only eight years.

**The patterns vary by discipline (1)**

In the Post-Confucian systems, research quantity has moved ahead of research quality, and the patterns are uneven by discipline. In 2010 China published 7.5 per cent of all papers but only 3.6 per cent of the top 1 per cent papers by citation rate.. The US produced 27.8 per cent of papers and 48.9 per cent of the top 1 per cent papers.. The strengths of Post-Confucian research systems are in physical science-based disciplines that underpin transport, communications, energy, urban construction and infrastructure. In engineering, chemistry, computer science, physics and mathematics, China’s share of published research is relatively high. For example in engineering China had 12.5 per cent of all papers and 12.3 per cent of the top 1 per cent

**The patterns vary by discipline (2)**

However, in medicine and biological sciences China generated less than 1 per cent of the top papers in 2010.

**R&D in China by field, 2010**

And when we look at the pattern of investment in research by discipline we can see why engineering dominates the outputs and medicine is weak.

**Rapid improvement in China and Asia-8: Share of world’s top 1% most cited papers, Chemistry, 2000 & 2010**

Perhaps the most striking table is this one. Research quality is improving rvery rapidly. In 2000 China had 0.6 per cent of the top 1 per cent most cited chemistry papers; in 2010 it had 10.6 per cent. By 2013 that number will be higher.

**Leiden University data for 2008-11: Asia-Pacific universities: largest number of journal papers**

Let’s now put together the Australia universities with those from East Asia and Singapore. The Go8 in regional context. Using the Leiden data for the period 2008-2011, there are ten regional universities that produced more journal papers than Sydney and Melbourne: four Japan, three China, and one each Singapore, South Korea and Taiwan—all the leading national universities. They have benefitted from decades of research concentration policies.

**‘Quantity of quality’ in science papers: Number of papers in top 10% in field by cite rate, Asia-Pacific 2008-11**

This table lists the number of papers in the top 10 per cent by citation rate, prepared by each university. This is a useful measure of the scientific firepower of research universities – their quantity of high quality science. There is one regional university in the world top 30, NUS in Singapore at 29th. On this measure Australia’s strongest university is Melbourne at 41st in the world and third in the region. I have also prepared a regional top 30 using this measure. The group is too large to list here, but there are 12 Mainland Chinese universities in the top 30, plus three from Hong Kong. There are six from Australia: Melbourne, Queensland, Sydney, Monash, NSW and ANU.

You can see the challenging context in which Australian universities now operate. Both Singapore institutions are large research producers with a high percentage of top 10 per cent papers—13.7 per cent in each case, more than any Australian university. NUS in Singapore also produces more papers by volume than any Australian university. On these indicators NUS is as strong as almost any European universities aside from Oxford and Cambridge China’s Tsinghua and Peking University have citation rates comparable to leading Australian universities of equivalent size, though global English is not China’s native language. In the region there is an interesting group of small to medium sized S&T specialist universities. Nankai and the University of Science and Technology in China both have better citation rates than Melbourne. Hong Kong University of Science and Technology, and Postech in Korea which are both too small to figure in the table. KAIST in Korea is also strong.

**What’s up, doc? The state of Australian universities**

All the regional universities, except those in Japan, are on the receiving end of specific funding programs designed to build global research capacity and performance. In ten years they will be much stronger. They will be well ahead of our universities unless there is a dramatic change of policy here. Another group will have moved up alongside ANU, Melbourne and Queensland. It all raises two issues. How to build our capacity so we can function as equal partners. And what areas of collaboration are likely to be mutually beneficial. The rise of East Asia and Singapore is not at all a bad news story for Australian universities, providing that we rise to the challenge. As it stands, in 2013, we are not rising to the challenge. We face increasing marginalization. What policies are most likely to dig us out of the hole? Lets talk about that in discussion.