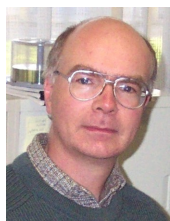


# THE ANZAAS MERCURY

## ANZAAS: To Create a Scientifically Literate Society

Issue No. 51, Dec 2011

### Editor's Edict



Please enjoy this issue, which includes a report by Malcolm Jenkins, our new Chair leader, on reinventing ANZAAS, p1. Also see 'Girls for Engineering?' (ANZAAS Debate, and 'reinventing ANZAAS for the 21<sup>st</sup> C' (Special Report), and don't forget Victor Bien's expert media report on the back page. -*Duncan Rouch*



### Malcolm's Matters

Report From The Chair  
By Malcolm JENKINS

#### Reinventing ANZAAS

I would like to begin by thanking my predecessor Mike Murray for all his hard work as chairman over the past 6 years. Under Mikes guiding hand ANZAAS has begun to re-invent itself and regain some of its relevance as an organisation. I joined ANZAAS at the same time as Mike to help out with the planning of Youth ANZAAS 2003 and have been with the organisation ever since. Youth ANZAAS 2003 was a very successful event and became a template for other Youth ANZAAS events. As chairman I hope to continue to build upon these and the other successes of the past few years and maintain and even build upon the momentum that has already been achieved. Charles Darwin said "Survival is ultimately dependent on the ability to change and evolve". To this extent, the path forward for ANZAAS is one of collaboration. A decade or more ago the expression in corporate circles was "partner or perish", the modern imperative of the Darwinian "adapt or die". The partnering process is already well underway with the New Zealand Royal Society putting meaning back into the name Youth ANZAAS. Youth ANZAAS 2012 will be held in Dunedin again, next July, an outcome not possible if ANZAAS were still going it alone.

Another milestone on this path was the ANZAAS Victoria / YSA (Young Scientists of Australia) dinner held on Tuesday 29 November, a very successful event with a strong turnout and an interesting mix of young and veteran scientists and hopefully the first of many. In my conversations with YSA committee members that night, there was much enthusiastic discussion over further possible areas of collaboration and I am very optimistic of a close and ongoing relationship with YSA in the future.

Another alliance that we hope to forge this year lies at the other end of the demographic spectrum where Mike Murray continues his work for ANZAAS with U3A. Although on the surface this might appear to be some form of corporate vertical integration, it is driven by a strong overlap of interests and match of skill sets.

Throughout these and other changes our goal remains the same, to assist the general public in being more understanding of science, its methods and its implications. I believe this can be done without sacrificing the strong history and identity that is a core ANZAAS legacy. I wish to help create an

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organisation that once again plays an active and visible role in science and carve a strong and sustainable niche for itself within the community.

I would like to conclude by thanking members for their continued support of ANZAAS over 2011 and invite everyone to participate in and enjoy any and all ANZAAS events in 2012 and help make this the best year yet in the 21st Century for the organisation.

Wishing all ANZAAS members a very merry Christmas and a prosperous New Year and looking forward to an exciting year for ANZAAS.

Malcolm Jenkins  
Chairman, ANZAAS Council (chair@anzaas.org.au)  
Dec 2011

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# ANZAAS

The Australian and New Zealand Association for the  
Advancement of Science

**Open to all Australians to join**

***Purpose:***

Promotion of science and its many applications  
to the whole community  
as a cornerstone of our culture

***Vision:***

A scientifically literate society

Not-for-profit Association for volunteers

# The ANZAAS Debate – Girls for Engineering?

By Duncan ROUCH

The astounding gender imbalance in engineering and technology fields, along with the shortage of engineers in the Australian economy, are both profound issues that warrant urgent attention.

Only 9.6% of engineers in Australia are women (1), and the rate of women in engineering degree courses has remained around 14% since the 1990s. This is against the backdrop of an ever-increasing shortage of qualified engineers, with Engineers Australia estimating that 70,000 engineers will have retired in the five years leading to 2011, with just 45,000 graduates to take their places. As recently as December 2010, Prime Minister Julia Gillard noted, “skills shortages in the engineering profession are of serious concern, holding back investment and productivity growth.” (2).

A comprehensive review of engineering education coordinated by the Australian Council of Engineering Deans in 2008 included as two of its six key recommendations to improve public understanding of engineering, particularly in schools, and to attract more women into the field (3). The report author, Emeritus Professor Robin King, said that underpinning the current engineer shortage, “the underrepresentation of women in engineering is something which has continually concerned us. We thought we’d taken measures in the 90s to improve the situation and undoubtedly we have, but the incremental growth in the participation of women has plateaued or may be slightly negative.” (4).



**Robogals runs robotics workshops for school girls to introduce them to engineering.**  
Photo (9)

either advanced or intermediate maths”. Loss of rates for physics and chemistry study are similar (5).

‘Engineering’ is rarely articulated for school students and for many, especially young women, is not part of their vocabulary, let alone considered as a career option (6). Part of the reason for this is that unlike many other areas of study such as maths, science or literature, engineers rarely become schoolteachers. Also, there are three education myths which halt girls from entering engineering careers, which include:

- **Myth:** Boys are better at maths and science than girls.  
**Reality:** There is no difference in learning ability for maths and science between boys and girls.
- **Myth:** Competitive activities are the best way to motivate students to learn.  
**Reality:** Girls (and many boys) often respond better to cooperative/collaborative learning experiences than to competition.
- **Myth:** Girls don’t like technology.  
**Reality:** Girls are very interested in technology, but cultural differences in the way boys and girls are raised typically limit the experiences girls have with different technologies.



**We must encourage girls to take on careers in engineering to solve the incoming crisis in shortage of engineers.** Photo (9)

It is therefore important for engineers to present themselves to the school students directly through outreach programmes (7).

## Robogals

Robogals targets girls in grades 5-7 with fun, educational robotics workshops that aim to introduce ‘engineering’ into the girls’ vocabulary, and show that it can be fun and exciting. Teachers have reported an

increased interest in engineering among their students following visits from Robogals:

“In addition to the programming, the Robogals also discussed career pathways with the girls, and since the workshop many have discussed the possibility of studying engineering and technology with their teachers and friends. As a teacher of IT, I would strongly recommend the Robogals workshops”, says Nathaniel Bradshaw, Discipline Area Coordinator of IT, Caroline Chisholm Catholic College.

By conducting these activities in a girls-only environment, the classroom dynamic is such that the girls are able to participate fully in the robot building and programming. As noted by one educator who runs a similar programme in the United States, “At the age ranges we offer classes to, 12 to 14 year olds, girls (more cautious and calculating) appear to employ different problem solving techniques than boys (heavy emphasis on trial and error), which creates a classroom dynamic dominated by the boys, since they enthusiastically jump at every opportunity to get their hands on something even before they know what to do with it or how it works.” (8). A similar dynamic has also been observed by girls in co-ed classrooms here.

Finally, Robogals has recently started to target high school girls with engineering career talks at the age when they are making choices regarding later-year school subjects and tertiary courses. The first cohort of grade 6 girls visited by Robogals (in Melbourne in 2008) will be in year 9 this year (2011), and Robogals intend to visit them again but this time to talk about careers in engineering and stories from successful female engineers.

By taking this systematic approach, it is hoped that in coming years the full impact of the programme will be more clear. A key focus area in 2011 was trying to improve the effectiveness of the programme.

## References:

1. Engineers Australia Statistical Overview 2009
2. 'Scoping Our Future: Addressing Australia's Engineering Skills Shortage', Australian National Engineering Taskforce, December 2010
3. 'Addressing the supply and quality of engineering graduates for the new century', Emeritus Professor Robin King, ACED, March 2008
4. *ibid.*
5. Engineers Australia chief executive Peter Taylor, quoted in 'Australia facing shortage of engineers', NineMSN, 6 August 2008
6. 'When engineers don't teach and teachers don't engineer', Betty J. Jacobs, University of Technology Sydney, 2007, p. 3
7. *ibid.*
8. Erik Dreyer, Pasadena Educational Foundation
9. Robogals. <http://www.robogals.org/>

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# Special Report

## Reinventing ANZAAS for the 21<sup>st</sup> C\*

By Mike MURRAY

### From the ashes

When I first arrived as Chairman of ANZAAS just six years ago ANZAAS was still struggling to survive following the collapse of 1997, when an attempt was made to wind it up. The last of the great ANZAAS Congresses was held that same year. So, I inherited an organisation much impoverished compared with its years of power and influence in the mid-20<sup>th</sup> Century.



Mike Murray,  
Chair  
ANZAAS  
2006-2011

Most of the cash reserves had long since disappeared, the Congresses were confined to history and the membership had dwindled. However Youth ANZAAS had not missed a year since it began in 1997.

Paul Adam, my predecessor, ably supported by Robert Perrin, Hon Secretary, picked up the pieces after

1997 and gave ANZAAS a chance of survival and in particular kept Youth ANZAAS going, the jewel in the ANZAAS crown by then.

Figuratively speaking Paul and Robert prepared the ground for the future ANZAAS. I like to think that over the last six years I have helped lay the foundation for the new ANZAAS.

### New ANZAAS

I have worked on the principle that the new ANZAAS should build on the best bequeathed to it; namely Youth ANZAAS. I have also worked on the principle that ANZAAS had to become less isolated and more collaborative. No longer was ANZAAS the peak body in science and its former territory had become filled with new organisations. The Congresses had long ago ceased and ANZAAS did not have the resources to reinstate them.

I did not wish to force a revolutionary approach to the change necessary but preferred a more evolutionary one. In the event evolution has proved to be both long and frustrating. Nevertheless change has occurred. The Constitution has been amended so that we now have the two science Academies represented on our Council together with YSA and ASTA. I hope that at our 2011 AGM we shall also make room on the

Council for the President of the Australian Council of Deans of Science (ACDS). The importance of this move I shall address shortly.

One area where we have significantly failed in the last six years is in establishing the sort of sponsorship that would allow ANZAAS to create a central professional secretariat. Without a central professional office the long term prognosis for ANZAAS is poor indeed.

However Governments and sponsors will react positively to new ideas that clearly have merit when made by organisations (most probably in collaboration with others) that have the judgement and determination to bring those good ideas to fruition. Being an icon is not sufficient; being an icon demonstrably rejuvenated already brings a measure of uniqueness.

ANZAAS cannot compete in the science communications business *per se*. This space is well served largely by professional media outlets. Also the science advocacy 'space' is well filled by all sorts of groups doing all sorts of things to serve different perceived community needs. All are well intentioned, some are better than others but overall this 'space' is busy, fragmented and large proportions of it ephemeral.

Part of an ANZAAS future is in acting as a 'glue' to assist some of the better advocacy protagonists to survive and flourish. ANZAAS needs to create a structure that will help these largely local groups to maintain momentum and to act as an archive to retain the results of their efforts; just as ANZAAS maintains an archive of all its congress papers presented in over 100 years.

### Future activities

While we may have generalist views of ourselves we must involve ourselves in unique enterprises as stepping stones to future and broader success. I see two projects that can give the new ANZAAS a good platform for building into the future; both of which when successful will bring significant benefits to Australia's scientific stature through a better scientifically informed political electorate.

The first of these projects is the National Community Science Dialogues (NCS D). This proposed project makes ANZAAS a link between University Science Departments and the membership of the University of the Third Age (U3A). U3A began in Australia over 20 years ago. It has an Australia-wide membership of some 100,000 and is still growing quite rapidly. The proposal is that ANZAAS set up a data base of eminent researchers from Universities and Institutes who are willing to make presentations to U3A Groups and for the U3A Groups then to make selections from the data base on whom they would like to play host to. Negotiations are proceeding between U3A and several Deans of Science and it is expected that an NCS D trial will start in Victoria early in the second quarter of 2012.

With the establishment of NCS D it is conceivable that in the longer term ANZAAS might set up a structure to coordinate hands-on Community Science groups across Australia that could involve Youth Ambassadors from Youth ANZAAS, retired mentors, science teachers, University staff and even local companies. The media will **tell** communities about the **'what'** of science but ANZAAS should **engage** communities in the **'how'** of science – the road to real understanding.

The other project that I'd like to see implemented by ANZAAS is an Australian component of the international Genetically Engineered Machines (iGEM) competition for students. We have already run early trials with iGEM and sent some students overseas to compete.

Both of the above projects, NCS D and iGEM require close relationships with University Science Faculties through the Deans of Science. Indeed this relationship is a key feature in my mind to the ANZAAS of the future; so much so that I have suggested to the President of the ACDS that ANZAAS might be in effect the working arm of the ACDS in matters pertaining to the public and the new ANZAAS website 'Portal-to-the-People' would be the central exchange for communication.

I have much hope for science in Australia and for the new role for ANZAAS in the scheme of things.

## Thanks

There are a few words of special thanks; to Paul Adam and Robert Perrin for ensuring that there was an ANZAAS for me to become Chairman of; to David Vaux who has had in particular a huge influence in finding people to assist me and in many other tasks as well; to Peter Kemeny, as Deputy Chair, who helped with Constitutional issues in particular; to Phil Poronnik as Hon. Secretary who has been central to the policy of aligning ANZAAS with the Science Deans; to Gabi Poronnik, our Administration Coordinator who has been crucially helpful in moments of difficulty with her orderly filing behind the scenes, especially recently with the unexpected departure of our previous Hon. Treasurer; to Jim Vaux for accepting, at very short notice, the Hon Treasurer's position at a very difficult moment in the audit cycle.

Thanks too to our Editors: Duncan Rouch, Editor-in-Chief, for his constancy in producing our quarterly (now on-line) Newsletter, *Mercury*, and Rachel Morison for all that she has done in recent years to so greatly improve our student publication (now also on-line), ANTENNA.

I'd also like to make special mention of all those in the Divisions who have worked to keep the Youth ANZAAS heart functioning without missing a beat; although I have to say that my heart and those of several others have missed quite a few beats in the process.

I'd like to thank the Councillors, and indeed all the members of ANZAAS for their loyalty above all else. I'd like to thank too the Advisory Panel for much advice and assistance bringing to bear on our problems the weight of their knowledge and experience. In this context I must particularly mention John Swan for a continuing stream of advice including introducing me to the potential value of U3A as a collaborator and opening up the prospect of commencing the NCS D project.

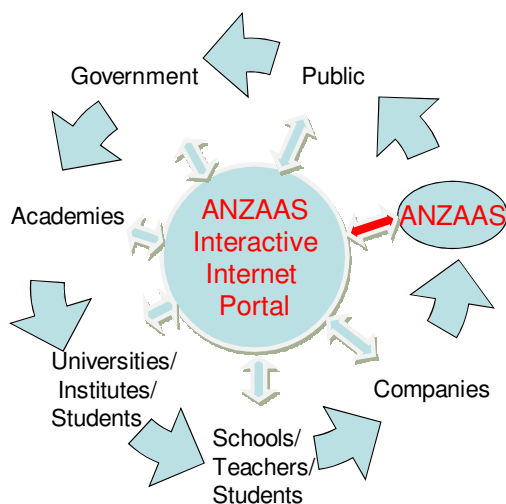
And, without naming them all, I thank on behalf of ANZAAS collectively the many sponsors who have seen our vision and objectives as worthy of support.

Some Members think that I have tried to impose change too harshly; some think that I have been over ambitious. Fleetingl y I thought they might be right when I seemed destined to be the last Chair of ANZAAS. But then perhaps I save the biggest vote of thanks for Malcolm Jenkins who has shown amazing courage in agreeing to be my successor and in so doing ensured that ANZAAS has three excellent Officers on the Executive Committee. I am sure that under this circumstance the Deputy Chair too will soon be filled. I implore the Council and Membership to give the new Executive Committee every assistance in the task ahead.

I like to think that we have spent six years building a firm foundation. Now the superstructure (the more visible part of the edifice) can emerge. I wish ANZAAS well! And to those who really think that there should be more Congresses (or Festivals), be patient; don't forget that what goes around comes around!

\* Chairman's report to the 2011 ANZAAS AGM, by Mike Murray. Chairman, ANZAAS Council (2006-2011)

# ANZAAS completes a Virtuous Circle of Connectivity



# World carbon dioxide emissions: China speeds ahead of the rest

By Duncan ROUCH

A reduction in global greenhouse gas emissions is not only the goal of environmentalists but also of pretty much every government in the world. Currently 192 countries have adopted the Kyoto protocol. One of the aims is to reduce greenhouse gas emissions by 55% of the 1990 levels by 2012. The simplest and most widely cited way to compare the emissions of countries is to add up all the fossil fuels burned in each nation and convert that into CO<sub>2</sub>. By region the highest production of CO<sub>2</sub> occurs in the Asia and Oceania area 13,264.09 million tonnes (43.6%), followed by North America, 6,410.54 million tonnes (21.1%) and Europe, 4,310.30 million tonnes (14.2%), Table 1.

Region	2008, mil tonnes	2009, TOTAL, mil tonnes (%)	2009, per capita, tonnes	% change, 2008 to 2009
Asia & Oceania	12,338.41	13,264.09 (43.6)	3.53	7.5
North America	6,885.07	6,410.54 (21.1)	14.19	-6.9
Europe	4,628.98	4,310.30 (14.2)	7.14	-6.9
Eurasia	2,595.86	2,358.03 (7.8)	8.32	-9.2
Middle East	1,658.55	1,714.09 (5.6)	8.22	3.3
Central & South America	1,228.65	1,219.78 (4.0)	2.57	0.7
Africa	1,157.71	1,121.59 (3.7)	1.13	-3.1
World	30,493.23	30,398.42 (100)	4.49	-0.3

Table 1. Carbon dioxide emissions by region (2,3)

Data from the US Energy Information Administration at 2009 was shown for 217 countries. China, United States and India are the top three emitters. Australia is ranked 15<sup>th</sup> for total carbon dioxide production, while New Zealand is ranked further down at 69<sup>th</sup>.

## Emissions per capita

Comparing nations can be misleading, given their vastly varied sizes and populations. To get a more meaningful picture, it's essential also to consider emissions on a per-person basis. From this perspective, the list is topped by small countries with energy-intensive industries such as Qatar and Bahrain, and the large developing nations such as India and China look significantly less polluting. Australia is ranked 13<sup>th</sup> for carbon

dioxide production per person while New Zealand is ranked 47<sup>th</sup>.

## Carbon tax

At the centre of the Australian Federal government's policy on climate change is pricing carbon. Many commentators and politicians have referred to this as a "carbon tax". The idea is that polluters will pay per tonne of carbon they release into the atmosphere. This cost will initially be set at \$23, and increase gradually until 2015, when it will shift to a trading scheme that will let the market set the cost. This is widely thought of as the most effective and least costly mechanism to reduce carbon output and reduce the level of climate change that is occurring.

The carbon tax will also be internationally useful. At some point in the next few years the EU is likely to impose general sanctions on those nations that don't measure up to its standards on carbon control (1). Economic superpowers like the US and China will either muscle-up, impose their own retaliatory sanctions, or simply make life so difficult that Brussels comes to an arrangement that accommodates their raw power. Smaller and middle power players, like our country, without carbon control schemes, however, would get bent over the negotiating table for some rougher than usual handling.

## References

1. Birmingham, J (2011) No carbon tax? Europe will make us pay instead. SMH: <http://www.smh.com.au/opinion/blogs/blunt-instrument/no-carbon-tax-europe-will-make-us-pay-instead-20110530-1fcu9.html>
2. Data Source: International Energy Statistics, <http://tonto.eia.doe.gov/cfapps/ipdbproject>
3. Guardian UK, <http://www.guardian.co.uk/news/datablog/2011/jan/31/world-carbon-dioxide-emissions-country-data-co2>

# Poronnik's Points

NOTICES TO MEMBERS FROM  
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# Media Report

By Victor BIEN

## Crumbling support for science



Here are stories about the interaction of science with society, not just about science stories, of which there is a vast amount - one only has to listen to Robyn Williams's Science Show, read Cosmos magazine or Australasian Science and with just those there is a lot to keep up! I focus on what gets reported in the general media to try to get a feel for whether and how science

is getting through to the general mind, particularly politicians and other decision makers. It's a bit hard to back track to what happened after the event!

One which caused me to take note was an item on 09.09.11 ABC RN AM program last item featured a new finding about early human origin. This was such a sensational scientific coup that it made it to the ABC's premier morning current affairs program. Why? The topic was about our human origin answering questions of our deepest curiosities, but that would not be enough to get it to this show. It was also the absolute solidity of the science. The fossils were dated to 1.98 million years ago with extraordinary small error range of plus or minus 3000 years. That's an accuracy of 0.15%! Even that would not be enough. The fossil find was at least five complete skeletons in a place now called the "cradle of civilisation".

Here are a selection of paragraphs from the transcript, the whole of which you can read at

<http://www.abc.net.au/am/content/2011/s3313709.htm>

PETER CAVE: Scientists have dated the remains of what could be our oldest known human ancestor. The fossils from South Africa are 1.98 million years old.

LIZ HOBDDAY: Dr Andy Herries from La Trobe University is part of a team that has accurately dated fossils found near Johannesburg in South Africa. He's found some of the fossils are 1.98 million years old, give or take a mere 3,000 years.

ANDY HERRIES: People are going to debate exactly what it all means for a very, very long time but the point is that it is so rare to find fossils that are this complete.

LIZ HOBDDAY: The fossils predate the earliest uncontested evidence for early humans.

ANDY HERRIES: They share traits that are like early human ancestors that are still sort of very, very ape like but they stand upright. They are bipedal but they still have relatively small brains and they share a lot of anatomical feature that is a lot more like us so a lot more like what we would define as the beginnings of more human people, sort of the beginnings of what we call the genus Homo.

LIZ HOBDDAY: The fossils were from part of the Malapa cave site, first discovered in 2008, in the world heritage site known as the cradle of civilisation.

It was initially thought the fossils were too young to represent the beginnings of early humans, but Andy Herries and his colleagues used a combination of uranium lead dating and paleo-magnetic analysis, to find out the age of the sediment surrounding the fossils and they discovered, they were deposited during a brief period of 3,000 years, when the earth's magnetic field had reversed itself by 180 degrees.

There could be more than five separate individual skeletons in the site the scientists are working on including males and females, babies and juveniles.

A series of papers on the project were published in the academic journal Science.