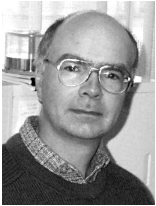


THE ANZAAS MERCURY

ANZAAS: Empowering the Community with Science

Issue No. 30, September 2006

Editor's Edict



In this issue we report on the necessity of conserving biodiversity hotspots as a front line response to halt global extinction (ANZAAS Debate), the Earth's top eight challenges (News and Analysis) and celebrating the life of Diana Temple, who recently passed away. Also see Peter Toomer's exciting ANTENNA.

-Duncan Rouch

Murray's Matters



Comment From The Chair
By Mike MURRAY

Rebuilding ANZAAS

Here I intend to continue to address the ANZAAS vision; what the Executive and Council are doing in the short term, and plans for the medium term.

The vision is to fashion a National grass-roots Association working 'religiously' to imbue and maintain a culture of science throughout the community. Our appeal must be to young and old, and we must work closely with all like-minded groups, such as the Academies, Societies, Universities, and Governments. We should not be exclusive, and we need to measure our membership in terms of thousands, and not just hundreds. We need numbers and focus to create the cultural momentum, or social dynamic, to provide the personal enlightenment that makes Membership worthwhile and at the same time gives foundation and impetus to the knowledge economy on which the whole world is coming to depend.

In a recent private correspondence a well known Academician and long term Member of ANZAAS wrote emphatically of ANZAAS, 'IT HAS A ROLE AND SHOULD BE SUPPORTED'. We need to build on this statement.

At the last Council meeting it was agreed to form a Publications Sub-committee to advise the Council on matters relating to the Website, Mercury, and Antenna. This Sub-committee is now functioning, with me as Chairman, together with David Drury (our Webmaster), and Duncan Rouch (editor of Mercury). We also have the power to co-opt further members as we see necessary. The Committee's first task will be to create a greatly improved website; up-to-date, informative, easy to read, easy to navigate, and easy on the eye. Each State Division has been asked to nominate a Webpage Manager responsible to both his/her respective Divisional Committee and to the Webmaster. The Webpage Managers will look after the display of information particular to their respective Divisions.

By early August all out-of-date material will have been removed from across the website (archived where necessary) and new information will begin to be posted. We aim to have the newly formatted website operational early in 2007.

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At this point in time the Publications Sub-committee will turn its attention to making proposals for improvements to our hard copy issues.

It is envisaged that in due course the Council will create further Sub-committees to oversee other changes that need to be made to suit our future operational and financial requirements. What would please me most of all is that these Sub-committees (the composition of which will be posted prominently on the website) should be bombarded with comments and suggestions from the broader Membership.

Only by having a lively interaction with, and across, the Membership can we appropriately shape our vision for the future and make confident steps towards it.

I'd be happy to hear from any Member about where you see the future of ANZAAS, how you'd like to receive extra value from your Membership, and indeed any other aspect you'd like to have raised. I'll even brook a few complaints!

Mike Murray
(chair@anzaas.org.au)

ANZAAS News

Diana Marmion Temple AM

1925-2006



Diana Temple, multi-talented scientist dedicated to support the wider community.
Source: *WISENET Journal*, vol. 50, February, 1999.

Wednesday 6th September was one of those glorious spring mornings which Sydney does so well – brilliant blue sky, wattles in all their splendour making golden splashes across the landscape. It was a sad, but not sombre, occasion as many friends and colleagues of Diana Temple gathered at the Northern Suburbs Crematorium to celebrate her rich and varied life. Not only were the surroundings appropriate for remembering Diana's

deep and abiding love of the bush, but the building with its architectural elements in the Spanish Missionary style has echoes in the campus of the University of Western Australia, of which Diana was such an illustrious alumnus.

Diana was born in Kalgoorlie, in the Western Australian goldfields, where she first developed her love of the Australian bush and landscape. After graduating in Chemistry from the University of Western Australia she moved across the continent in 1947 to take up a Teaching Fellowship at the University of Sydney where she also studied for her MSc. During this time she was an adventurous explorer of the sandstone landscapes around Sydney. Moving to England she worked as a research chemist in the Scientific Civil Service first at Teddington and then at the Atomic Energy Establishment at Harwell. It was in England that she met Richard Temple, himself a distinguished scientist, and they married in 1952, moving to Washington DC, where Richard held a position at the British Embassy. After travelling in North America and Europe the family returned to Australia in 1957, when Diana worked as a research chemist at Sydney University and took out her PhD.

She migrated from Chemistry to Pharmacology, pursuing an active research and teaching career and publishing prolifically, making major advances in the field of respiratory pharmacology.

Diana was passionate about many things, but particularly about the importance of science for society and of the need to

promote the active involvement of women in science. She was a long standing and active member of ANZAAS, both on the national scene and in the NSW Division. She served on Council, and was General Secretary for a number of years, subsequently being elected an ANZAAS Fellow. She played a major role in the organisation and running of the Centenary Congress in Sydney in 1988 – the last really large (and successful) general festival of science in Australia. To encourage women to embark on scientific careers, and to mentor their progress, she was one of the founders of WISENET (Women in Science Enquiry Network) and was instrumental in the establishment of its journal. She remained an active participant in both WISENET and the NSW Division of ANZAAS until the respiratory illness which so severely affected her last months made involvement impossible.

Diana Temple was awarded a richly deserved AM in 1999 for her 'service to medical and scientific research, particularly in the field of respiratory pharmacology, as an advocate for the role of women in science and in promoting an understanding of science by the general public'.

As well as being involved with the national science community Diana played an active role in the life of the University of Sydney, including a period in which she shouldered the heavy burden of Departmental Headship during a difficulty period in the Department's history, as well as in the broader community. Throughout her life she maintained her concern for the environment, but also for society as a whole (the economic rationalist approach to society was certainly not her agenda).

Diana Temple was an adornment to civilized society, widely knowledgeable, an intellectual explorer, a spirited personality and, without drawing attention to herself, deeply imbued with dedication to service to the broader community. The virtues she so amply displayed may be regarded by some as old fashioned, but contemplation of the contributions that Diana Temple made over her rich life shows that her example is one which we should all strive to emulate.

On behalf of ANZAAS we extend our deep sympathy to Richard Temple and to Diana's family as well as her friends and admirers.

Associate Professor Paul Adam
Immediate Past-Chairman

The ANZAAS Debate - Conserving Biodiversity Hotspots: Act Now or Face Global Extinction?

Life on Earth faces a crisis of historical and planetary proportions. Unsustainable consumption in many northern countries and crushing poverty in the tropics are destroying wild nature. As biodiversity is dangerously besieged, Duncan Rouch responds to the question, 'how do we reverse the critically serious damage to our planet?'

Extinction is the gravest aspect of the biodiversity crisis: it is irreversible. While extinction is a natural process, human impacts have elevated the rate of extinction by at least a thousand, possibly several thousand, times the natural rate. Mass extinctions of this magnitude have only occurred five times in the history of our planet; the last brought the end of the dinosaur age.

In a world where conservation budgets are insufficient given the number of species threatened with extinction, identifying conservation priorities is crucial. British ecologist Norman Myers defined the biodiversity hotspot concept in 1988 to address the dilemma that conservationists face: what areas are the most immediately important for conserving biodiversity?

The biodiversity hotspots hold especially high numbers of endemic species, yet their combined area of remaining habitat covers only 2.3 percent of the Earth's land surface. Each hotspot faces extreme threats and has already lost at least 70 percent of its original natural vegetation. Over 50 percent of the world's plant species and 42 percent of all terrestrial vertebrate species are endemic to the 34 biodiversity hotspots.

Hotspots Defined

A seminal paper by Norman Myers in 1988 first identified ten tropical forest "hotspots" characterized both by exceptional levels of plant endemism and by serious levels of habitat loss. In 1990 Myers added a further eight hotspots, including four Mediterranean-type ecosystems. Conservation International adopted Myers' hotspots as its institutional blueprint in 1989, and in 1996, the organization made the decision to undertake a reassessment of the hotspots concept, including an examination of whether key areas had been overlooked. Three years later an extensive global review was undertaken, which introduced quantitative thresholds for the designation of biodiversity hotspots:

To qualify as a hotspot, a region must meet two strict criteria: it must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and it has to have lost at least 70 percent of its original habitat.

In the 1999 analysis, published in the book *Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*, and a year later in the scientific journal *Nature* (Myers, et al. 2000), 25 biodiversity hotspots were identified. Collectively, these areas

held as endemics no less than 44 percent of the world's plants and 35 percent of terrestrial vertebrates in an area that formerly covered only 11.8 percent of the planet's land surface. The habitat extent of this land area had been reduced by 87.8 percent of its original extent, such that this wealth of biodiversity was restricted to only 1.4 percent of Earth's land surface.

A second major reanalysis has now been undertaken and published in the book *Hotspots Revisited*.

In total, this updated analysis reveals the existence of 34 biodiversity hotspots, each holding at least 1,500 endemic plant species, and having lost at least 70 percent of its original habitat extent. Overall, the 34 hotspots once covered 15.7 percent of the Earth's land surface. In all, 86 percent of the hotspots' habitat has already been destroyed, such that the intact remnants of the hotspots now cover only 2.3 percent of the Earth's land surface.

Between them, the hotspots hold at least 150,000 plant species as endemics, 50 percent of the world's total. The total number of terrestrial vertebrates endemic to the hotspots is 11,980, representing 42 percent of all terrestrial vertebrate species.

Reptiles and amphibians, are more prone to hotspot endemism than are the more wide-ranging mammals and birds, but the overall similarity between taxonomic groups is remarkable. Overall, 22,022 terrestrial vertebrate species call the hotspots home, 77 percent of the world's total. With rapid increases in data quality and synthesis, we can now derive species lists for each hotspot, above and beyond estimated species numbers. The current analysis also includes the first assessment of inland fishes across all hotspots. Although most current statistics are likely underestimates -- because almost 200 freshwater fish species are discovered each year -- the hotspots already hold 29 percent of the world's freshwater fish species as endemics, with 55 percent of species occurring.

While the 34 hotspots clearly hold astounding levels of species endemism, this is not sufficient to describe the extent to which they represent the history of life. This is important because it could be argued that measures of biodiversity at higher taxonomic levels than the species better represent evolutionary potential, ecological diversity, and the range of options for future human

use. In the current analysis, we therefore measure hotspot endemism at the higher taxonomic levels of genera and families, and find an extremely high concentration of biodiversity at these levels, even compared to what we would expect based on their levels of species endemism.



Australia's biodiversity hotspot: The forest, woodlands, shrublands, and heath of Southwest Australia are characterized by high endemism among plants and reptiles. Its unique vertebrate species include the numbat, honey possum, and the red-capped parrot. The western swamp turtle, which hibernates for nearly eight months of the year in response to dry conditions and hot temperatures, may be the most threatened freshwater turtle species in the world, although a successful conservation program has allowed its numbers to increase. The primary cause of habitat loss in Southwest Australia has been agricultural expansion, which is accentuated by extensive fertilizer use. A major threat for the native fauna has been the introduction of invasive alien species like foxes and cats.

Three major conclusions emerge from this updated hotspots analysis. First, it is clear that the hotspots concept is solidifying. This update results in few major modifications to the broad global picture of hotspots. Second, the amount of biodiversity contained in the hotspots is extremely high. More than half of the planet's species are endemic to only 16 percent of its land area. Based on the evidence from terrestrial vertebrates, it seems that the overall number of species occurring in the hotspots is much greater—approaching four-fifths. If we consider only the extent of remaining habitat—2.3 percent of the planet's land surface—these numbers are even more remarkable. Finally, and most importantly, hotspots provide us with the real measure of the conservation challenge. Unless we succeed in conserving this small fraction of the planet's land area, we will lose more than half of our natural heritage.

Impact Of Hotspots



Nearly 80 percent of the plant species in Southwest Australia are found nowhere else in the world, including many of the brightly-colored members of the genus *Banksia*. *Banksia coccinea* is pictured here.

The impact of the hotspots concept has been astounding. Searching the Web yields numerous scientific papers that use the word “hotspot” to refer to biodiversity conservation, and analyzing these citations over time reveals a clear pattern of increase. More importantly, the impact of the hotspots concept in terms of investment in conservation has been dramatic. Conservation International adopted hotspots as its central strategy in 1989, and in the same year, the John D. and Catherine T. MacArthur Foundation implemented the hotspots as its primary global investment strategy.

In 2000, the World Bank and the Global Environment Facility joined CI in establishing the Critical Ecosystem Partnership Fund (<http://www.cepf.net/xp/cepf/>). The MacArthur Foundation became a partner in 2001 and the Japanese Government joined the partnership in 2002, bringing the total investment to \$125 million. The \$100-million Conservation International Global Conservation Fund (<http://www.conservation.org/xp/gcf/>), supported by the Gordon and Betty Moore Foundation, also uses hotspots (along with high-biodiversity wilderness areas) to guide its investments. In total, more than \$750 million is estimated to have been devoted to saving hotspots over the last 15 years, perhaps the largest financial investment in any single conservation strategy. The hotspots concept has also entered the mainstream as a tool for private sector businesses. For example, Office Depot explicitly gives preference to pulp and paper vendors that protect natural forests in the biodiversity hotspots and high-biodiversity wilderness areas.

Biodiversity conservation efforts in hotspots often require the ability to withstand and adapt to a rapidly changing socio-political climate. While it can be tempting to write off high-risk

areas, experience demonstrates both the importance and the potential for maintaining a conservation presence in hotspots that are undergoing political difficulties. Madagascar, one of the most important hotspots, was almost abandoned by conservationists in the early to mid-1980s, and again during 2001 and 2002. Fortunately, several conservation (Conservation International, the World Wildlife Fund, and the Wildlife Conservation Society) and funding (USAID and the World Bank) organizations persevered with their investments in the country. This resolve paved the way for the new President, Marc Ravalomanana, to give conservation a high priority in his government's development plans. In September 2003, President Ravalomanana committed to tripling the country's protected area network over the next five years, and just five months after this pledge he announced the establishment of 14 new protected areas, increasing coverage by 65 percent. This provides an excellent illustration of the conservation return on investment produced by the hotspots strategy.



Norman Myers, leading conservationist and creator of the biodiversity hotspot challenge.

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Picture sources:

Australian Hotspot, Banksia:
<http://www.biodiversityhotspots.org/xp/Hotspots/australia/index.xml>
 Norman Myers:
<http://www.voices.nu/Voices%20Web/Norman%20Myers.html>

This article is based on information at the 'Biodiversity Hotspots Conservation International' web-site
<http://www.biodiversityhotspots.org/xp/Hotspots/>



Recycling Water

By Paul ADAM

The failure of the Toowoomba referendum on the use of recycled water will have continuing repercussions, not only for Toowoomba, but for other towns and cities around Australia.

Many parts of Australia are currently experiencing drought, and in the case of South East Queensland and much of New South Wales water storage levels are at historic lows. Although nationally the amount of water used directly for human consumption is small it is nevertheless essential, and in storages the human use component is not separated from water for other uses.

Drought is an inevitable fact of Australian life, and as the population grows, securing supplies will become an increasingly pressing issue. Innovative science and technology will be necessary components of future strategies, but greater reuse and recycling are inevitably going to be part of the long term solution.

In this regard the failure of the Toowoomba referendum is disappointing. The 'no' vote campaign was skilful and emotive and relied heavily on the 'yuck' factor of opposition to 'drinking sewage'. This wasn't what was proposed, rather it was for treated water (derived from sewage, but not in itself sewage) to be used to augment the existing supply. The no case did not point out that water recycling already occurs in many parts of Australia. Although many examples of use for many years of water recycling in the supply to major cities overseas (such that many of us will, probably without giving it a moments thought, have cheerfully drunk recycled water on our travels) were pointed out the message does not appear to have sunk in.

The 'no' case will be a classic for the study of an effective grass roots political campaign. While it might be argued that much of the case was based on highly selective use of information, and in case instances even distortion or misinformation, the outcome has to be accepted has democracy in action (as has been suggested before – democracy is the worst basis for governance – except for the alternatives!).

A particularly worrying aspect of the no case – whose implications go far beyond the particular circumstances was the extent to which many supporters were proud to proclaim that they were anti-science. The very fact that in the yes case, scientific evidence was used in support was, in itself, sufficient to damn it without any serious attempt to address the issues raised.

Anti-scientific sentiment is growing in the western world, and when politically expedient even gains encouragement from national leaders. One of the major challenges for the education system and for practicing scientists is to mount an effective defence of science, both in schools and the mass media. To date science has been caught flat footed and has either not mounted a defence or has engaged in hyperbolic rhetoric which is as indefensible as the utterances of the anti-science brigade.

Earth's Top Eight Challenges

By Norman MYERS

Once again, the main news is that we face an enormous environmental crisis, of water shortages. The worst news of all, however, is that if we continue with our present lifestyles, economies, etc., we shall not recover from the environmental debacles for at least 50 years, and more like 500 years in the case of global warming (even 5 million years in the case of mass extinction of species).

The better news is that the final disaster has not overtaken us yet, and that it need never overtake us at all, provided we move smartly and immediately to change our lifestyles, our economies, etc. The supremely best news is that if we shift to another track for our lifestyles, our economies, etc., we shall surely find we prefer it to our present track. In many ways it will be more enjoyable, less frenetic, more fulfilling all round-- and it will often put money into our pockets.

1. Population growth

The population explosion is still pretty explosive. Within the next 40 years our over-crowded world is due to take on another three billion people, half as many again as today. Note the environmental pressures of simply too many people. During the two decades 1990-2010 global population will likely increase by one third, and fish catch will hopefully expand by one fifth, but purely because there will be so many more mouths to feed, the amount of fish per person will decline by one tenth. We can say much the same about other vital natural resources such as croplands and forests.

2. Global warming

The biggest "strictly environmental" problem right now stems from our use of fossil fuels with their carbon dioxide emissions bringing on half of that most dreaded future, a globally warmed world. The world's climate is certainly warming up-- just as the debate about it is cooling down because there is hardly any more scientific dispute. During the past ten years the Intergovernmental Panel on Climate Change has produced one set of reports after another, each more forceful than before. To cite the latest, "Climate change will have adverse consequences undermining the very foundation of sustainable development." Note too a statement by 2500 economists, including eight Nobel Prize winners: "For the United States, there are policy options that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run."

3. Biodepletion, also-known-as Mass Extinction of Species

Forget the word biodiversity, what's important is biodepletion. According to 80% of biology experts, we are into the opening phase of a mass extinction of species. We are losing thousands and more likely tens of thousands of species every year. This is thousands and more likely tens of thousands more than in the prehistoric past. Within our children's lifetimes we look set to bid adieu to roughly half of all the ten million species that

share this planet with us (though they might think we are not so hot at sharing). That would make for the biggest mass extinction since the demise of the dinosaurs and associated species 65 million years ago. Sure, evolution will one day generate replacement species to match today's in numbers and variety--but that will take several million years, maybe twenty times longer than humans have been humans.

4. Tropical Deforestation

Closely related to mass extinction is tropical deforestation. These forests are they the most exuberant celebration of nature that has ever graced the face of the planet. They occupy only 5% of Earth's land surface, about the same as the United States, yet they contain well over half of all species. They share another unique tribute: they are being eliminated faster than any other ecological zone. We have already lost half of these forests, and the rest are disappearing at a rate that may leave little within just a few decades.

5. Topsoil Loss

We are losing 25 billion tonnes of topsoil to erosion per year. To put the figure in perspective, consider that it is enough in principle to grow sufficient grain to make up the diets of malnourished people totalling 700 million (all hungry people total 820 million). Minimum economic costs, in terms of additional fertilizer needed to offset loss of natural plant nutrients, totals \$400 billion per year (in the United States, at least \$200 per person).

6. Water Shortages

Global water use tripled during the four decades 1950-1990, and demand is expected to double again during the two decades 1991-2010. At least half a billion people today are short of water, yet already we divert three fifths of all available freshwater runoff and most convenient supplies have been grossly over-used. In the United States, farmers are taking water from the Ogallala aquifer underlying the great wheat states at rates averaging forty times that of natural replenishment. By 2025 some three billion people worldwide are forecast to be living in water stressed areas.

7. Over Consumption of Materials

Consider the amount of materials we use or waste in support of our lifestyles. Citizens of industrialized countries need huge volumes of bricks, cement, iron, oil, chemicals, paper and

many other materials. They also generate vast quantities of pollutants and other waste, plus they cause similarly large quantities of materials to be excavated or moved around in their pursuit of valuable minerals. To produce one kilogram of gold, for instance, somebody moves 350 tonnes of earth--and hence the gold ring on your finger effectively weighs three tonnes. In the United States the physical displacement of materials is about 80 tons per person per year, or over 1000 times a typical American's weight. In Japan with its more efficient economy, the amount is only one quarter as much--but five times more than it need be if the country were to deploy all efficiency technologies available. U.S. "outflows" (pollutants, eroded soil, waste water, etc.) amount to 25 tons per American per year, well over twice as much as in Japan.

8. Poverty

Like population, this is not itself an environmental problem, but it is a major cause of deforestation, desertification, water shortages, soil erosion, and other planetary ills--which in turn are severe sources of poverty. The bad news is that there are still 1.3 billion people who subsist off less than \$1 per day. The better news is that we have enabled more people to escape from poverty in the past fifty years than in the previous 500 years.

Bottom line: we have the scientific understanding and the technological means to head us into a bright future. It will not cost the Earth to save the Earth; in many respects, e.g. through energy efficiency, it will actually save us money and boost our economies. We have the managerial know-how to turn our biggest problems into supersize opportunities. What is missing is the political will, driven by public opinion. According to numerous surveys, large numbers of people in large numbers of countries want more done to save our environments. All depends on political will, which is the most vital resource of all--and the resource in shortest supply. Will our political leaders kindly lead?

This article is based on Myers, N. (2003) Earth's Top Environmental Problems. Population Press, 9 (1) Jan/Feb 2003.

<http://www.popco.org/press/articles/2003-1-myers.html>

Perrin's Points

NOTICES TO MEMBERS FROM THE HON. SECRETARY

Attention all members

I have received the following message from a member requesting assistance:

" Dear Secretary
I am a member of ANZAAS & I wondered if you could possibly assist with the following request I received from my daughter Kate Wilson who is currently the Director of the Australian Physics Olympics team.



I meant to ask you - can you think any biologist sort of people down there who might be good running the biology Olympiad program the way I look after the physics program? The current director is leaving, and they're looking to replace him. It has to be someone who doesn't mind doing residential stuff, likes teaching, and doesn't mind teenagers, and who has lots of energy and enthusiasm. It doesn't have to be someone at a university, it could be someone at a research institute. Any suggestions for people who might be okay?

Thank you for your assistance with this
Solveiga Hall
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Media Report

By Victor BIEN

Seriously Rejecting Science



I think the scene of a mother polar bear teaching its cubs how to get about on a snow covered slope in David Attenborough's six part series "Planet Earth" shown on ABC TV Sunday evening 7:30 pm in July and August must be the scene he discussed in his Royal Society talk, mentioned in my previous media report, where the

"sound" one was listening to was artificially produced but nevertheless morally justifiable.

Unfortunately there are many indicators in the media that despite efforts for the improvement of the public understanding of science, that when it is inconvenient to know about certain points of scientific knowledge - "reality" - large bodies of people and their leaders simply don't want to know. We get characteristic ostrich like head-in-the-sand approaches. For many literalist Christians the vast and growing body of knowledge of evolution is simply brushed aside. Thus we have the "Intelligent Design" movement, which has been taken up by many schools even here in Australia. Robyn Williams feels the situation is so serious, he has written a personal polemical book entitled "Unintelligent Design".

There are other manifestations of rejection of science because it is inconvenient not necessarily religiously motivated: the frenetic campaigning by "Yuk factor" advocates against recycling treated sewage effluent into drinking water in Toowoomba; in general media presentation of rising petrol

prices there is little mention of the reality of Peak Oil; the Federal Government does not adequately talk about energy alternatives; discussion by all parties about nuclear power is fixated on the uranium cycle despite the fact that the burgeoning thorium cycle potentially avoids all the negatives of the uranium cycle (bearing in mind that getting a nuclear program up has at least a 20 year lead-time and I reckon research to get a thorium reactor to a pilot level is likely to be much shorter than this); the NSW Government is hostage to (or fails to lead away) the majority's love affair with the car despite many studies showing that pandering to motorists leads to more and more gridlock and generally dysfunctional cities; as with evolution resistance to stem cell research is largely driven by anti-scientific religious ideology with President Bush's veto being the latest most dramatic expression of this.

Catalyst attempted to present Australia's participation in this year's International Science Olympiads as a four part human interest story in July. I did not think the attempt was a success, or at least I found it too long and boring. The fundamental problem of an intellectual Olympiad against the physical Olympics is that the drama of what is actually happening cannot be directly seen. It could only be inferred by the personal reaction of the participants after the various exam results were announced. The series showed the personal endeavour, rivalry and sacrifices of the participants from the selection of representatives to compete in the finals in Beijing to the final award ceremony in Beijing. The drama there was who would get a medal particularly a gold one. Nothing about the actual science the competitors faced was presented. I found the human-interest focus of the competitor's personal reactions repetitive after a while and the whole program blocked out the usual items which does convey actual scientific matters. Perhaps if the story was presented over at most 2 episodes it would have been more appropriate.



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