

THE ANZAAS MERCURY

ANZAAS: Empowering the Community with Science

∞ Issue No. 16, March 2003 ∞

Editor's Edict

Please enjoy this issue, packed with news about S&T issues. We report on GM fish, the Australian Synchrotron project, and the role of irrigation in the debate about water conservation. In **ANZAAS Debate** we define new lessons for science communication in 'Public Belief and Disbelief in Science'. We also have the bright breezy ANTENNA. -*Duncan Rouch*

Adam's Airing Comment From The Chair By Paul ADAM

Sustainable Land Use

For many the New Year has not had a happy start. Much of Australia remains drought stricken, and to accompany the drought we have had one of the most severe fire seasons on record. Both drought and fire offer major long term challenges to both society in general and science in particular. The drought raises questions as to the most appropriate long term sustainable land use for much of Australia. This issue has been widely canvassed in relation to salinity and land clearing. The Wentworth group raised the profile of the debate in late 2002. Resolution is still a long way off, and will be determined politically with input from a wide range of interest groups. Nevertheless science has an essential role in the debate, in defining what is possible and in assessing options. Most land and water use decisions are taken at state level, and it is disappointing that in the political arena much of the debate is still narrowly focused on party lines.

At least partly in response to the 2001-2 fire season, fire research was one of the areas singled out in the latest round of CRC funding - an announcement made just in time for the 2002-3 summer. Like drought, fire is an inevitable feature of the Australian environment, and fire-proofing the country is every bit as impossible as drought-proofing, but nevertheless there is clearly scope for increasing our understanding of fire and our preparedness to manage fire emergencies. The current fire season is over, and there will be various inquiries which will

ANZAAS

Australian and New Zealand Association for the Advancement of Science
The University of Adelaide, Adelaide, South Australia 5005
Telephone: (08) 8303 4965 Facsimile: (08) 8303 4965
E-mail, ANZAAS: info@anzaas.org.au Web-site: <http://www.anzaas.org.au>
ABN: 79 883 488 910
ANZAAS Mercury, E-mail: newsletter_editor@anzaas.org.au
Editor in Chief: Duncan Rouch; ANTENNA Editor: Stephanie Looi

examine what has happened. It would be inappropriate to pre-empt the findings of these inquiries, and it is regrettable that a number of prominent politicians have seen fit to make inflammatory statements.

Sustainable Science

One of the most regrettable material losses in the fires was the Mount Stromlo observatory - an institution which had national and international significance for astronomy and was one of the most important components of our national scientific heritage. We extend our sympathy to all those whose work has been interrupted and hope that the necessary funding and other resources are rapidly made available so that the research capability can be rapidly restored and augmented.

On the international front the loss of the space shuttle 'Columbia' is a major blow to space research. Again we must hope that after full evaluation and assessment that the research effort is maintained and expanded.

The various tragedies with which the year commenced

Contents	1
<i>Editor's Edict</i>	1
<i>Adam's Airing-Comment From The Chair</i>	
ANZAAS Debate:	3
<i>Public Belief and Disbelief in Science</i>	5
<i>Synchrotron on Track</i>	6
<i>GM Fish: Panacea or Problem</i>	6
<i>Irrigation Practice: the Dry Continent</i>	7
<i>Perrin's Points</i>	8
<i>Media Report</i>	



nevertheless remind us of the central importance of science to our future. Part of the role of ANZAAS is to continue to lobby governments so that not only is there acceptance of the importance of science but that the necessary resources to advance science are made available. In the last few years there have been various reports and inquiries into aspects of science, research and education. Perhaps we can hope that in 2003 the various pieces of the jigsaw will come together and that we will have a consistent, coherent and long term plan for the future. Substantial parts are in place, but one of the major areas that still needs to be addressed is university funding to assure long term sustainability of research endeavours.

On a positive note, there seems to have been a considerable increase in interest in science - anecdotally seemed to be widespread. One swallow doesn't make a summer, but it is very welcome and we hope the interest is maintained.

Scientists Join Public on Spinal Push

Spinal injuries and conditions blight the lives of many Australians, and cost governments many millions of dollars annually. However, there is very little awareness in the community as to the impacts of spinal injuries and compared to other higher profile medical conditions has received relatively little research funding. It is an area where the potential research dividend is high - even a small improvement in the quality of life of sufferers would be of immense benefit to patients and yield substantial cost savings.

It was my privilege in late January to attend "Making connections. NSW Premier's Forum on Spinal Cord Injury and Conditions" at the Darling Harbour Convention Centre. This was one of the most remarkable conferences I have ever been to, with a highly diverse audience of people with spinal injuries and conditions and their carers, medical professionals, research scientists and members of the public. The whole forum was arranged in a very short time, over only two months, and yet the organization was superb. Making provision for the large number of wheelchair bound participants meant that the facilities were accessible and comfortable for all. The accessibility requirements ruled out a conventional lecture theatre format - instead the main sessions were held in a large hall, with the participants arranged in small groups around tables. Allocation to tables was such that each had a diversity of participants - this led in discussion sessions to very productive interactions - it is an organizational model which could well be adopted in conferences on a range of topics.

The Keynote speaker, and the draw card for the media, was Christopher Reeve. Since his own injury he has helped to raise awareness of spinal cord injury worldwide and he has been a vigorous advocate for medical research, particularly in debates about the legalisation of stem cell research. He was a well informed and articulate speaker, and particularly for those in the audience with spinal cord injuries, an inspiration.

The scientific speakers outlined the current state of spinal cord and nerve repair research - in the last few years there have been major advances and there is a consensus that we stand on the brink of a revolution. Australia, with a long tradition of nerve and sensory research is in the forefront of the international research effort. It was stressed, however, that every case is different; there will not be a universal cure, but, rather, the prospect is for a range of new treatments.

There have also been great advances in other aspects of treatment, and there were discussions which dealt with case management, nursing, physiotherapy, electrical stimulation treatment and quality of life and social issues.

The Showcase hall provided a mixture of scientific posters and displays of treatment equipment and life style aids. Given my own interests I was fascinated by the 'Access dinghy' display of sailing boats which can be handled in a wide range of weather conditions by the most profoundly disabled. This represents highly innovative design and engineering, illustrating the multifaceted challenges offered by an area such as spinal cord injury.

The forum certainly raised community interest and awareness of a wide range of issues, and was well covered by the media. The possibilities for 'Making Connections' between researchers and the potential recipients of the outcomes of research was not the least of the valuable outcomes of the forum - which provided a model of organization which is likely to be widely emulated.

The NSW Premier, Mr Carr, has taken a prominent role in lobbying for amendments to federal legislation regarding embryonic stem cell research. It is an issue about which he clearly feels strongly, and he is a strong advocate both for the potential of research and the need for governments to actively support science. That he was prepared to take such a prominent public role during what is, in NSW, an election year, was a measure of his commitment - after all there are few votes in serious illness and embryonic stem cell research is opposed by significant elements of society. Addressing society's needs for research in this and other areas requires political leadership, hopefully not of a partisan nature. In this regard the absence of politicians from the audience was disappointing, although credit is due to Senator Stott-Despoja for her active involvement over both days of the forum.

During the course of the Forum Mr Carr announced a substantial increase in research funding for spinal cord injury, and also increases for assistance to patients. ANZAAS has long drawn attention to the low investment in research by State governments. In the last few years there has been a dramatic change, with several states taking major research initiatives. While in part these initiatives may have been driven by traditional interstate rivalries they are to be applauded. *For a full report on the stem cell debate see the December 2002 issue of the Mercury.*

I would welcome any comments and suggestions for issues that could be addressed -e-mail: chair@anzaas.org.au, Tel: (W) 02 9385 2076, (H) 02 9314 2453, FAX: 02 9385 1635

Australian Synchrotron

ANZAAS Victoria ran a successful symposium about the planned Australian Synchrotron in August last year. The symposium explained the workings of the synchrotron and showed the benefits it will offer to Australian science and industry.

As an aid to education on this important topic, the symposium was professionally recorded on video and VHS tape copies are available for borrowing by any interested people or organisations. If you would like to borrow a video of the symposium please contact Roger Brown: rfgbrown@onthe.net.au

See the News & Analysis section for a report on current status of the synchrotron project.

The ANZAAS Debate - Public Belief and Disbelief in Science

Science and technology have given us a life with ever more comforts yet why are sections of the community ambivalent belief about science? Here I investigate alternative beliefs in the community and how they relate to belief in science. Why do intelligent people believe in astrology and other unproved means of forecasting the future? Why are psychic mediums popular on television? From the analysis I deduce ideas about improving science communication in the 21st century. -Duncan Rouch.

This essay is the first in a 4 part series examining fundamental areas in the community-science interface and what they tell us about improving the effectiveness of science communication. In the imperative push to make the planet sustainable science communication faces great challenges that will require the utmost effectiveness.

Science communication is more than relaying stories and facts, it is fundamentally about helping and empowering people in the community to learn more about their lives and the world around them, through the power of science. That is, to empower them to improve the control of their lives through science. A good teacher knows that for a student to learn effectively the teacher must begin with the preconceptions of the student, and connect the learning of new knowledge to the existing knowledge of the student. Learning must be built from what the student, or anyone else, already knows. In this vein I examine alternative belief systems in the community and how the process of science relates to them. From the analysis I deduce lessons on how to improve science communication.

Belief and Knowledge: Many Systems!

As humans we all build models in our minds of how the world works. This begins from our first waking moment, accelerates in childhood and continues through out our lives. We learn these models from observing the world around us and listening to our parents and other adults. Those world models of the mind allow us to make decisions, especially when direct information is limited. This decision-making on the fly is a hall mark of our adaptability as a species. These models also allow us to both understand the past and forecast common events in the near future, such as what are the main things that will happen to us during our next day at work.

Yet what is the veracity of these models of the world? In fact common views of the world, commonsense, are often rough-and-ready truths. These views are ideally suited to every day life, yet also flawed. There are many things we cannot predict. How often do we make a bad decision? How often is our view of the world changed by new information? How often do we not believe something simply because it conflicts with our preconceptions, or like

something because it just looks like part of our preconceptions? How often do we believe things that contradict each other?

We are also a creative species, and somewhat prone to fantasy. As children we often invent fantastic other worlds to explore with our imaginations. Some adults also create other ways of looking at world, which may be the ravings of a deluded soul or the impenetrable truths of a genius. How do you tell the difference?

We also pride ourselves on our modern life styles, yet cultural ideas from the distant past still travel with us. Superstition, astrology, fortune telling, and ghostly messages from psychic mediums still pay a significant part in popular culture. Fortune tellers are booked up months ahead while many magazines continually carry astrology predictions and psychic mediums appear regularly on television.

Interestingly superstitions usually have a basis in historical fact¹. That is, there was originally a likely reason for the behaviour suggested by a superstition. For example we are told not to break a mirror as this could bring bad luck. Thousands of years ago there were no glass mirrors as we know today, but you could see your reflection in a still pond. If you broke the surface of the pond it would have been difficult for you to see behind yourself in the disturbed surface. That could have been dangerous if a wild beast or an enemy was creeping up behind you. From this scenario it is clear how the advice came about

not to break a mirror. What was originally common sense later became superstition when the original reason was lost in the mists of time.

Science can create material comforts and knowledge about the world, but can do little to help people confronted by great personal uncertainty. Yet older traditions of knowledge, such as shamanism, astrology and psychic communication can help with personal issues.

Shamans are important people in various native communities around the world, such as the Yakut people of Siberia. They work as mediators to ensure there is no disharmony between the human world and the perceived cosmos (spirit world). In this belief the universe of the physical and spirit worlds are permeated by divine forces, which can be manipulated by those in tune with them, the Shamans. Western thought also originally, in pagan times, entertained belief in a universe permeated by divine forces². Such a notion of forces beyond the physical world informs a number of alternative belief systems of today, such as astrology and psychic communication.

Astrology and fortune telling both attempt to predict your future. There are many ways to 'tell a fortune', from reading the pattern of tea leaves to the sequence of tarot cards³. Ordinary playing cards can also be used in



Origins of Belief: detail of a shaman's rattle, U.S.A.

this way, and share a heritage with tarot cards⁴. All astrology and fortune telling schemes arose before the age of enlightenment in the mid 1600's, the era that heralded the birth of modern science and medicine.

Notions from the distant past also include psychic concepts, such as the séance (communication with the so called 'spirit world') and out-of-body experiences, also known as 'astral travelling' (visiting the 'spirit world'). These concepts are given popular weight from the widespread belief in life after death. Humanity has been haunted by the possibility of a vigorous post-mortem existence for thousands of years. That all mainstream religions contain the idea of life beyond death shows the strength of this belief. This age-old idea offers hope that no matter how miserable, painful or treacherous your life is on this planet a better life awaits you beyond the grave.

TV Mediums

The general failure of mainstream religions to address modern spiritual needs has left the door open for the old-age ideas to continue. These old schemes of astrology, fortune telling and so on have reinvented themselves as New-Age spiritual tools⁵.



TV Psychic John Edward: healer or charlatan?

For example mediums like James Van Praagh and John Edward have been streamlined for the modern media. Gone is the necessity of turning out the lights - a common earlier practice so that mediums could perform "levitations," spirit "materializations," and other trickery. Gone too are the feigned trance states, spirit writing, and other trappings of old-fashioned mediumistic phenomena. Instead, the modern celebrity spiritualist opts for purely "mental" mediumship⁵.

Considerable evidence attests that popular mediums are fakes, James Van Praagh and John Edward among them^{5,6,7,8}. They have been shown to rely on the magician's 'mind reading' technique of cold-reading. In this technique the medium throws guesses at an audience member about a dead relative or friend and then feeds back the answers to give the appearance of knowing secrets about the dead person. They also use the related warm reading and hot reading methods, by drawing on common behaviour of grieving people or performing research on a person beforehand⁷.

Despite the long history of debunking mediums people go on believing in their claimed supernatural powers. Many people, especially those in grief, want to believe. In the west we are poor at discussing death and this leaves many people isolated with grieving emotions and strong confusion and doubts about what has happened. Mediums offer a way of dealing with grief that people see as meeting their emotional needs. Why are not social services and mainstream religions dealing with these needs?

Astrology

People also use astrology to address doubts about their future, as the biweekly

astrology show on radio 3RRR in Melbourne attests. In the last two years three different astrologers have appeared on this talk-back format program, Rob, Peter, and Stella. They too also have used the interactive cold reading technique of magician 'mind readers'. Moreover Peter has stated on air that the people who call in general have in common that they are facing personal problems. This means the astrologer has some idea of what issues will come up and so what advice to offer. In this advice, interleaved with the jargon of astrology, is generally the kind of commonsense that we all recognise. Astrology provides a type of advice to people that they see, and want to see, as being different from other sources, like parents friends or counsellors. Astrology is seen as another option, yet in reality the astrologer is like a friendly uncle or aunt willing to advise from their long experience of the real world.

Both Peter and Stella have heavily relied on feedback from the caller to tailor their advice. In common with psychics Stella rationalises her mistakes as being the fault of the client or being due to some unexplainable other-world affect. In contrast, Rob appeared to be more 'intune' with callers than either Peter or Stella. He used less feedback and made fewer mistakes. His greater skill at 'reading' callers appeared to be a result of perceiving the non-textual emotional content of the caller's voice, and being more perceptive about his or her responses. We can conclude that a good astrologer, or any other kind of fortune teller is in reality an expert at personal communication.

From the rational scientific point of view astrology and other new-age belief systems are irrational tomfoolery at best and dangerous delusions at worst. Yet many people believe in the alternative ways of dealing with the world, as well as science, as a kind of each-way bet on what kinds of information can help them through their lives. Many cultural notions (memes) from the past are not forgotten, but reinvented to meet present needs. The industrial revolution may have made our lives more materially comfortable but spiritually many people are adrift on the sea of an ever changing world. While science and technology are, and have been, driving change, they cannot in themselves help people to deal with the change.

Scientists and journalists communicating science to the community, therefore, need to be aware of the its potential social ramifications. We may decry new-age belief systems, but we need to recognise why people hunger for them.

Science Cuts the Gordian Knot of Complex Issues

Given the flaws of common world models, like common sense, how do we improve our knowledge of the world? Different kinds of information vary in their level of truth. How do you rate the truthfulness of a gossip column, an astrologist's prediction, a newspaper story, a scientific article? Your answer will depend on your point of view. Many people would rate the gossip column and astrologist's prediction as being highly truthful, appearing to be most relevant to their lives. In contrast, highly educated people would tend to rate the newspaper story and scientific article as being most truthful. Also some people will agree with both astrologist's predictions and



Milky way detail: stars the pretext for motherly

scientific articles. Clearly if different people pay more attention to different kinds of information then they will have different world models, they will believe in different things.

The truth value of good journalism and science comes through examining the evidence in detail, and verifying facts by assessing multiple sources of information. Scientists have an advantage over journalists, in often being able to investigate a particular phenomenon in the laboratory, where it can be experimentally deconstructed in fine detail over many years. The power of science comes from revealing things about the world that are not commonsense, that challenge our views of the world.

Science as a Belief

Non-scientists who value science generally do not know personally what science is and can do, but instead believe in it. They may believe and trust that science has a positive role in the future of our community. Scientists too must also rely on belief. For example an astronomer may know that the sun will rise tomorrow from ascertaining data about the sun, earth and space and consulting predictive models. A biologist however, may believe that the sun will rise tomorrow, but he does not know this. He is not aware of the specific astronomical information that would allow him to know what paths the sun and earth will take. Moreover, some discoveries can take years of work to prove, so the scientists involved must carry belief in a positive outcome for the project all that time. We can describe science as a powerful system of reason based in close examination of evidence and deduced laws. Science is a rational objective system supported by personal belief of scientists and the belief of those in the wider community that support it.

Science in the Community Context

Community support for science, therefore, depends on public belief and trust in science, not the direct intrinsic value of the scientific method in understanding and changing the world. Science is in effect given a licence by the community to operate, similar to any organization or company.

Many people are ambivalent about science. There is no doubting that science and technology has fundamentally improved people's lives in quantum degree over the last century. Yet at the same time many applications of science have been problematic, such as weapons of mass destruction (nuclear, chemical and biological), chemical plant disasters like lethal isocyanate release in Bhopal India⁹ and human and animal health disasters like the failure to expedite screening of transfusion blood for the AIDS virus in the USA during the mid 1980's¹⁰, and the Bovine Spongiform Encephalopathy epidemic in the UK¹¹.

Conclusion:

Improving Science Communication

People can add learning by connecting new knowledge to what they already know. So from alternative belief

systems in the wider community how can we improve the approach to science communication?

- At a broad level fortune telling paradigms are likely to connect with science prediction: the power of science hypotheses are rarely shown in museums or other science communication events. Here then is subject for the future.
- Fortune telling also can be connected with science forecasting, such as of the weather.
- Astrology provides a direct connection with the science of astronomy.
- Science communicators need to be aware of social needs and the social impacts of science and technology. Being up front with problems will certainly benefit public trust in science in the long term.

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News And Analysis

Synchrotron on Track

By Duncan ROUCH

The Australian Synchrotron took its next step to construction in March by securing commercial funding from MiniFAB, a Melbourne-based Research and Development company. MiniFAB will provide up to \$600,000 to build a high-tech laboratory at the Australian Synchrotron. This contribution joins the commitment of University of Melbourne to fund at least one beamline.

A synchrotron is a large and complex machine that produces beams of very intense light. Synchrotron light is channelled down long straight beamlines to experimental stations where scientists can conduct research. While the Victorian Government is providing \$157.2 million towards the synchrotron building and machine, funding for individual beamline stations is planned to come from other governments, research institutions and industry. The planned total cost of the project is \$206.3 million. MiniFAB, based in Scoresby, Melbourne, is a high-tech micro and nano machining facility that focuses on producing devices at the micro-level. Commercial examples of the technology include air-bag sensors in cars, portable blood analysers and ink-jet printer technology. The company's Chief Executive Officer, Professor Erol Harvey, said the synchrotron would play a key role in the growth of Australia's high-tech industry sectors. These include development of advanced manufacturing materials in opto-electronics and special plastics. Research in the minerals and petroleum industries is also supported by synchrotron techniques.

The Australian Synchrotron is planned to come online in 2007. This is none too soon for many organizations and companies such as the Co-operative Research Centre for Microtechnology, University of Melbourne and companies like Varian, Masterfoods, Micromachines Ltd and AMCOR, which are already participating in product fabrication projects in collaboration with overseas synchrotron facilities.

Also areas of life sciences that synchrotron research can support include medical, agricultural, food and environmental sciences. Nobel Laureate Peter Doherty comments, "Synchrotrons are becoming fundamental tools in the battle against disease. The Australian Synchrotron, with its powerful machine supporting high-performance biomedical beamlines, will allow Australia's medical researchers to work at the cutting edge." For example synchrotron radiation can be used to distinguish features of a cell up to 1000 times smaller than is possible with conventional medical X-ray sources.

Construction plans were recently improved to allow over 30 beamline workstations. The planned facility is a 3rd generation synchrotron, which will be built at a site adjacent to Monash University in Melbourne. That site in a former life was the Clayton Drive-In film theatre.

Of 78 constructed or planned synchrotrons around the world Australia's machine with a 3.0 GeV beam energy shares the same energy with three others, in the mid-range of all beam energies. Seven overseas machines have higher energies than the Australian Synchrotron, ranging from 5

to 14 GeV. While the Australian machine will not be among the most powerful, it will nevertheless suit up to 95% of local synchrotron research requirements. The intermediate energy value of the Australian Synchrotron gives the optimal return on investment.

Given the long time line on construction will the synchrotron still be relevant in 2007? The relatively long time line has produced a cautious response from industry and other potential users, often used to dealing mainly with short time frames. Nevertheless strategic analysis by both the Victorian and Queensland Governments, as well as university experts strongly supports the long term value of an Australian Synchrotron. Synchrotrons has the largest array of different research applications compared to any other large-scale research equipment. Frank Larkins, Deputy Vice-Chancellor at the University of Melbourne, speaking at the ANZAAS Victoria synchrotron symposium, summed up their value, "Can we afford **not** to have a synchrotron?"

We can also estimate the long-term value of synchrotrons from their history, as these machines have been around since the 1960's. Overseas many earlier low-energy machines overseas are still supporting active research. For example a second generation synchrotron at the Brookhaven National Laboratory in the USA is still in use after more than 20 years of operation. So it is probable that the Australian Synchrotron will have a long and useful life, easily reaching its 25 year designed life.

GM Fish: Panacea or Problem?

By Duncan ROUCH

Overfishing of dwindling fish and seafood stocks continues to be a worldwide and pressing issue.

The United Nations Food and Agricultural Organisation (UNFAO) estimates that between 60% and 70% of the world's fisheries are in danger of collapsing due to over fishing. Despite the forecast collapse in natural fish catches demand for fish is set to increase, due both to rising world population levels and increased demand among more health conscious consumers in developed countries. The UNFAO calculate that within 25 years, half of all fish consumed will be bred on aquaculture farms. Moreover can aquaculture help to halt over fishing?

According to the UNFAO, the World Fish Center and the International Food Policy Research Institute, only strong growth in aquaculture can prevent a strong increase in price and decrease of fish available to the developing world, as well as the developed world.

GM proponent Professor Yonathan Zohar of the Maryland Biotechnology Institute argues that gene technology could be a major aid in building the necessary growth in fish production. Modifications such as increased growth rates and improved levels of nutritional components like Omega 3 fatty acids could be genetically engineered into farmed species. A GM salmon has been created that can grow eight times larger than normal.

While the GM debate has so far mainly been focussed on crops and domesticated animals, GM fish have not escaped attention. The World Wide Fund for Nature responds that GM fish technology does not address the real threats

currently facing world fisheries. The fund claims that issues surrounding the over exploitation of world fisheries are political and regulatory matters that science cannot address.

Nevertheless, the fund concedes that GM fish farming may offer a solution for fish used as a food resource.

Other environmental campaigners are concerned about the consequences of GM fish escaping from farms or cages. Escape of GM fish could be environmentally destructive if they interbred with natural cousins or out-competed native species.

Scientists, however, may be able to address these concerns, for example by using genetic techniques to limit breeding with natural stocks. Also fish stocks that are genetically modified to suit aquaculture may be poor competitors in the natural environment. Nevertheless, the challenge for GM technologists is to improve fish stocks for aquaculture while substantially minimising the risks of the technology to damage the environment.

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Irrigation Practice on a Dry Continent

By Graeme BATTEN

With or without the current discussion of water sharing plans Australians should not forget that water must be used wisely every day. It is now clear to most people in the community that water is a vital resource. Yet everyone expects their share which has led to a period of unprecedented demands for water. Irrigators, industry and urban users, the environment, and the rivers all have legitimate claims to a share of the available water. But availability is not static. As demands have increased the variability of the Australian climate has become far more evident. The current El Niño event brings home the message that variability is the key feature of the Australian climate and the Australian water cycle is very fragile.

So we need to ensure sustainable land and water use, which will entail improved environmental management. The Draft Water Sharing Plan for the Murrumbidgee Regulated River Water Source states that its aim is "... to provide environmental benefits while attempting to minimise impacts of consumptive users."

Media reports on the current debate seem to be fueling conflicting views, namely: 'More water must be used for environmental or there will be "rivers of salt"', versus, 'with restricted water use there may be \$347 million of gross value of production lost across the State, which will result in the loss of 4,400 jobs'. Both views are quite alarming. Why? Because if either or both eventuate the disastrous impacts will be felt by everyone in the community. To counter the above conflict we make two points; firstly, every person depends on the outputs of irrigated agriculture for much of their food and beverages.

About 30% of agricultural production is underpinned by irrigation. We have become accustomed to wholesome foods and drinks at affordable prices throughout the year, which is sustained by current irrigation practice. Secondly, the majority of the population, irrigators as much as anyone else, appreciates the biodiversity and wishes to preserve healthy rivers and other habitats.

There is a crisis, which cannot be resolved if we continue with a polarised debate. To overcome this we need leadership, political leadership such as recently shown by Deputy Prime Minister John Anderson. The need to change is such that only by working together with a community-wide approach can we achieve the win-win outcome that is essential. The issue of water sharing will be a hot topic of conversation for a long time unless a wise, efficient and equitable approach to water use is accepted across the community.

Australian irrigators are responsible for about 70% of the water drawn from regulated rivers in Australia - in this respect they are similar to their counterparts in many other countries. So in the short term, it is the irrigation sector which will be expected to cope with the reductions in available water. I think a fair question is "Why should the community expect irrigators to go it alone during this period of enormous change when as a result more money and more jobs are at stake off farm?"

Irrigation operations have already shown that water can be used much more efficiently on farms. Improvements in Farm layout, water scheduling, pressure delivery systems, changing the crop and water trading have all enhanced water use efficiency. But the capital costs of such changes and the technical skills needed to make the changes and maintain the more efficient systems can prevent or delay the decision to make the changes.

Rice growers are seen by many as "water villains" but they now produce about twice as much grain per megalitre as they did 20 years ago. Furthermore, current research by Charles Sturt University and the CRC for Sustainable Rice Production indicates savings of 40% can be gained in the near future. These savings will benefit the environment and enhance the flow on effects in the economy. Gains will occur in both regional and urban areas.

The majority of irrigation farms are small operations and the average irrigation owner/manager is aged over 50 years. At that age many are looking for a less intense life style. New efficient irrigation systems actually offer the opportunity to have that lifestyle while producing crops with lower inputs of water and often also less fuel, and chemicals and, most importantly, reduced operator's time. Discerning consumers can also be winners because efficient irrigation systems also make it possible to control plant growth to achieve higher quality produce.

Water sharing is about to take on a new meaning with formulas to determine how much is diverted for environmental flows and how much is diverted to produce food and fibre. If the increases in population are seen as a problem only to the east of the Dividing Range, and if more efficient use of water is seen only as the responsibility of irrigators, then we will have missed the opportunity for all Australians to contribute together to an issue which is of vital importance to everyone.

Planning ahead: targets must be set down so that the impacts of change can be assessed. These targets must be directed at the efficiency of water use in irrigation, industry, urban and environmental sectors. Water directed to the environment must also achieve goals set by a community involvement process.

In average terms, Australia has a relatively high volume of water per head of population but a very uneven water supply per region. We have an opportunity to develop

water efficient technologies, apply them to solve our own dilemma (in as short a time as possible), and then take the technology to the rest of the world where the challenges are as great or greater than we know.

The Uzbeks have a saying " If you run out of water, you run out of life" - Mikhail Gorbachev (2001).

Graeme Batten is Professor of Irrigation, School of Agriculture, Charles Sturt University, Wagga Wagga, NSW 2678.

Perrin's Points

ATTENTION ALL CANBERRA MEMBERS!

After many years of sterling service, our **Public Officer** needs to finally relinquish his remaining responsibilities with regard to ANZAAS.

We need a replacement volunteer!

The duties are not onerous and consist of keeping a membership list [supplied by the Hon. Sec] and about twice a year ensuring that official documents are properly registered with the Registrar of Associations.

Qualifications? Only two - You **must** be a resident of the ACT and you **must** be over 18

Contact the Hon Secretary [E-mail: secretary@anzaas.org.au. or telephone 08 8303 4965] for more information and to say that you are interested.

Media Report

By Victor BIEN

Commanding Heights

Commanding Heights is based on a book by that name written by Daniel Yergin, who features prominently in the TV series. It tells the story of why economies everywhere have given up government regulation and moved to the markets as the primary determinant of economic outcomes - that the "commanding heights" of the economy be determined by markets and not by regulation. Harvard development economist Jeffrey Sachs observed that Keynesianism and "third way" socialist economies, where the commanding heights were under government regulation since WWII typically lasted about 30 years. This period came across to me as some sort of "time constant" which says something about the nature of human behaviour.

Without exception this approach led to the gradual collapse of these economies, not to mention the Soviet Union which also collapsed for essentially the same reasons. In short the regulated approach does not work. The inefficiencies and self serving work relations that gradually takes hold invariably led to costs becoming higher than income across the whole economies. As Sachs says, "all the governments moved to market based systems not because of the strong arguments of economists but because they had no alternative". Many of the economies made the transition to market based

ones in chaotic and desperate conditions. Sachs advised many of them of the steps to be taken.

Japan today is going through an agonising wrenching process to break the vice like grip of vested interests which have become entrenched due to rights granted to them after WWII to regulate various aspects of their economy. Watch the news with this point in mind.

'Evolution' was another excellent series on SBS TV. It gave an excellent overview for a general audience showing how evolution works in the present as well as presenting the better known evidence from the fossil record. SBS is currently working with Dymocks to make the tape available for purchase. Check out the SBS shop: <http://www.sbs.com.au/sbsshop/>

Both these programs came from PBS (Public Broadcasting Service) based in the US. It is a great site to visit: <http://www.pbs.org/> If you search the site for "Sachs" you'll get to the pages which are or are near to the ones listing many essays about different ways of running economies or letting them run.

These were excellent programs which achieved "must watch" status.

SBS as you know now uses advertising to get funding or at least some of it. It seems that the fear that this would lead to degradation of program quality towards mindless popularity has not happened.

If undeliverable, please return to:
Australian and New Zealand Association for the Advancement of Science
The University of Adelaide, Adelaide, SA 5005



