

THE ANZAAS Mercury

ANZAAS: Communicating Science to the Public

Issue No. 4, October 1999

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Editor's Edict

This last issue of the ANZAAS Mercury for this year is jam-packed with special features to get your brain cells buzzing about improving science and its social impact. John Pigram reports on the need to account for the true cost of supplying water to preserve the environment in the face of competing demands in the **ANZAAS Debate**, Paul Adam discusses the need to reinvent university culture in **Adam's Airing**, and we have reports on environmental risk assessment, and a labelling proposal for Genetically Modified Food. This issue, which was delayed due to budget restrictions, also carries a report on the recent ANZAAS SGM and notice of the AGM for November 28th. We would like to hear from you, please send any comments on the newsletter or ideas for future articles to the Production Editor at rouchd@ozemail.com.au, or to the postal address in the box below. -*Duncan Rouch*

Adam's Airing

Comment From The Chair

By Paul ADAM

Budget Fallout: AGSO, NHT

In the last issue of the 'Mercury' I offered some initial impressions of the 1999-2000 Commonwealth Budget. The devil, as always, is in the detail and one serious consequence for Australian science did not become widely known until several days after the Treasurer's speech. Buried in the Departmental budget, and not highlighted as a line item, were severe cuts to the Australian Geological Survey Organisation (AGSO). AGSO (previously known as the Bureau of Mineral Resources) has been an important part of the national scientific endeavour for over fifty years. The role of the Organisation is much broader than might immediately be assumed. Its work has certainly been essential for the development of the mining industry, but is also crucial for long term sustainable management of land and water resources and for the identification of geological hazards to development. The Organisation has also been very active in producing educational material on geological issues. AGSO is not the only player in geological research in the country, but it is part of a collaborative structure and the sudden and unexpected cuts to the Organisation will have wider consequences. Governments have the authority to make changes to patterns of public expenditure, but it is to be hoped that changes will be made after careful evaluation and be part of a broader strategy, rather than being *ad hoc* and uncoordinated. On behalf of ANZAAS I have written to both Mr. Howard and Senator Minchin, expressing concern at the cuts to AGSO and seeking an explanation for the reasoning behind the cuts. The treatment of AGSO illustrates the vulnerability of many of our national scientific institutions to sudden changes in government policy. One area of the budget with large amounts of money is the National Heritage Trust, where the funds were provided by the partial sale of Telstra. NHT

funding is going to a large number of environmental rehabilitation projects. No-one could doubt the need for extensive environmental restoration works across the nation; the important question to ask is - are we doing the best possible job? Environmental rehabilitation on the scale required in Australia is a new undertaking and all projects should be regarded as experiments, and be planned, executed and studied as such. To make the best possible use of the substantial investment, both now and for the future, there needs to be rigorous evaluation of the objectives and success of projects. Unfortunately there is very little systematic investigation of NHT funding. Certainly there is some NHT funding to scientific studies but the majority of rehabilitation exercises appear to be planned and executed on an *ad hoc* basis and not to be subject to long-term post initial phase study. This is not a plea to divert large amounts of money from NHT to shore up the science budget, rather it is to suggest that we need to take advantage of this unique window of opportunity and spend money wisely to achieve the best possible outcomes. If we do not do this we will not make inroads into the backlog of required environmental rehabilitation and also be vulnerable to a backlash, which could limit the opportunities for funding in the future. The lack of understanding of the role science could play in the NHT process by politicians and senior bureaucrats is extremely worrying and illustrates the need to increase awareness of science and the processes of science.

General Congresses and Reinventing University Culture

The 19th Pacific Science Congress was held at the University of New South Wales in the first week of July. The Pacific Science Congress has a long history, and this was the third occasion it had been held in Australia. The sessions at the Congress were spread across a wide range of topics. Many of the papers were outstanding, and I found the week stimulating. ANZAAS involvement included an address by the 1999 ANZAAS medalist, Professor Donald Watts, the presentation of the Joyce Allen lecture by Dr. Elizabeth Heij and involvement of youth ANZAAS delegates. Although there was much that was good at the Congress the attendance was very disappointing. In part this

can be explained by the downturn in the economy of the north Pacific nations, in part by rival attractions (including the major UNESCO conference in Budapest). However, neither explanation is complete, and do not account for the low attendance from Australia (even from the host institution).

There is clearly little market in Australia for broadly based multi and interdisciplinary congresses. This became apparent with the decline of attendees at ANZAAS congresses and the phenomenon requires serious study. The current Green Paper on university research makes the point that new advances in science are likely to arise at the intersections of established disciplines. If this is indeed so (and the empirical evidence from the past would certainly support the proposition) then the failure of Australian scientists to support multidisciplinary meetings casts a shadow over our future.

The decline of the generalist meeting can in large measure be explained by the development of specialist societies (many of which in Australia started as sections of ANZAAS congresses) and the proliferation of increasingly narrowly focussed congresses. With increased time and other resource constraints and the need for accountability it is difficult for scientists to get support and encouragement for participation in generalist meetings. Those few who do still endeavour to attend generalist meetings are regarded with, at best, amusement and, at worst, scorn by colleagues who view such activities as irrelevant. If the support for multidisciplinary conferences expressed by the great and good is to be other than hollow rhetoric then we need serious measures to reverse the current culture in most universities and other scientific institutions.

The decline in support for generalist conferences is not unique to Australia, but if only raw numbers are considered it appears worse here. However, if attendance at even the last few ANZAAS congresses is expressed on a national per capita basis we do not compare unfavourably with generalist congresses in other western countries. Looking back, what is truly remarkable is the size of earlier Congresses, at times when the national population was much smaller and transport more difficult. It is interesting to study the reports of the British Association for the Advancement of Science, on the occasion of its meeting in Australia in 1914, and realise that, at that time, there were over

300 members of the BAAS in this country. The reports also make us realise how little things have changed. Professor H.E. Armstrong, in his address in Melbourne - "The place of wisdom (science) in the state and in education" - posed the question, "Why do we still go naked and unashamed of our ignorance of 'science'?" without reaching a conclusive answer. More than 80 years later ignorance of science is still seen as a badge of respectability and our parliaments remain dominated by lawyers. Almost all questions addressed by parliaments have a scientific dimension. The basis of democracy must be informed decision making; a basic understanding of science, by both public and politicians, is essential to a healthy democracy. In the absence of a basis for critical examination of issues the decision making process is at the mercy of the most persuasive snake-oil merchant. I would venture to suggest that the current debate about GM food highlights the need for a better understanding by the community and politicians. Such an understanding will not, nor should not, result in universal consensus, but should lead to more rational and considered debate. As Armstrong also observed in Melbourne in 1914 - "none are so intolerant as the ignorant".

One contributory factor in Australia to the apparent lack of interest in generalist science meeting may be our university 'culture' (a rather pretentious expression, but used for want of an obvious alternative). Most undergraduates, even though recorded as "full time", of necessity have one or more part-time jobs, the majority commute (sometimes long distances) to campus. The consequence is that the campus is somewhere that is visited (often briefly) rather than being the centre of life. Student societies are mostly small and rarely "academic". It could be that I am viewing my own past through rose coloured glasses, but in my case my recollections of my undergraduate years are not of the importance of lectures and classes (for in most cases the information could have been gathered from books) but of society meetings (in a whole range of disciplines, often far removed from what I was ostensibly studying) and debates and discussion (including in the bar!). The modern tertiary sector is increasingly about training and decreasingly about education.

Do we need to reinvent tertiary education? Am I terminally infected with nostalgia? Later this year we are promised a Green Paper on undergraduate teaching. It would be useful if members could use the 'Mercury' as a forum for how ideas about the universities in the next century should function, and particularly given the objects of ANZAAS, how we address the lack of shame at the ignorance of science.

Green Paper on University Research

The Commonwealth Government recently released the long awaited Green Paper on University Research, to which ANZAAS has responded, see our website and News Analysis in this issue. The Green paper is one of a number of related reports and inquiries. The Wills report on medical research has already reported and the Government's response was apparent in the increase in funding in the Budget. A Green Paper on undergraduate teaching is expected soon, an inquiry into Intellectual Property has just been announced. One concern with this process is that we cannot tell how well the various bits of the jigsaw will fit together. In a few years time, after this current round of activity, will we find that there are still missing pieces in the total picture?

In other western countries there has been a recent, and substantial, increase in funding for basic research. The Green Paper does not address the question of how much expenditure on research is appropriate, and contains no indication that there is likely to be more money in the future. Are we merely proposing to redistribute the deck chairs on the 'Titanic'?

Kakadu National Park

The editor requested that I write some comments about the recent controversy over the proposal to declare Kakadu National Park a World Heritage Site in danger. I do not know enough about the details to comment on the outcome, but what does warrant concern is the Government's reaction - an almost gloating triumph that the scientist's captive to the environmental

lobby had finally got their come-uppance. This is a completely unjustifiable attack on both the scientists involved and on the process.

The World Heritage Committee receives advice from a diversity of sources, including some of the world's most distinguished environmental scientists. Having had involvement with the World Heritage process on a number of occasions I am sure that the advisors are not captive to any interest groups. Indeed, this is evidenced by recent media reports that the advice on another matter, the proposal for including the Blue Mountains on the World Heritage list which is strongly supported by both the Government and the environmental movement, is not favourable. Doubtless if, later this year, the nomination is rejected the Government will have further opportunity for attacking scientists. The issues involved in World Heritage are complex and rarely will there be a simple consensus answer. Ultimately decisions will be based on an evaluation of all the evidence. Unfortunately the Government's attitude in this instance appears to be indicative of a wider suspicion of science.

ANZAAS is not an environmental lobby group, but recognizes the importance and significance of the Australian environment. Throughout its history ANZAAS has been a strong advocate for scientific environmental management and conservation. For example, over a century ago submissions for ANZAAS were important in the establishment of the first conservation reserves in West Australia. When appropriate I would hope that ANZAAS will continue to make informed submissions on environmental issues.

I would welcome any comments and suggestions for issues that could be addressed (e-mail: p.adam@unsw.edu.au,

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ANZAAS NEWS

NEW DIVISION PROPOSED - A Queensland member, Stephanie Looi, is interested in getting a Qld. Division up and running, and has support from a number of other Members. If you can help or are interested, e-mail Stephanie at, looi-stephanie@pwerup.com.au

We know that she will appreciate your help.

ANZAAS MEDAL - The ANZAAS Medallist this year is Professor Donald W. Watts of Notre Dame University, WA. The Medal was presented by President Paul Adam at a Plenary Session of the Pacific Science Congress on Wednesday, July 7th. Professor Watts later presented a research paper to the science communication section of the Congress. Robyn Williams made three references to the ANZAAS medal in the Science Show broadcast on Saturday July 10th.

YOUTH ANZAAS - From the 4th July to 7th July 1999, 49 high school students and 14 members of Young Scientist of Australia (YSA) met at St Joseph's College, Hunters Hill. The high school students came from all the states and territories of Australia, most states sent at least four representatives, with the ACT sending the most (12 in all), Queensland which does not have an ANZAAS division sent one student and the Northern Territory sent two.

The students were engaged in a variety of activities and the overall structure of the conference broke the previous approach to Youth ANZAAS. Firstly this conference was not "tied" to an ANZAAS Congress and secondly the activities were more hands on and fewer lectures. The Conference started with the "Welcome" ceremony and proceeded straight to the "getting to know you" activities organised by YSA. By Monday morning most of the students at least knew the names of other students in their group. By Wednesday the event was counted as a great success.

ANZAAS PUBLICATIONS - A list of all ANZAAS publications still in print is being compiled with a view to improving the income from, and disposal of, any

publication. If there are any publications that Members think should \ be included, please let me have details as soon as possible, and where possible, a specimen of the item.

MEETINGS - Please remember that ANZAAS should still stage meetings at the Divisional level and all Members, young and old, are encouraged to assist the Divisional committees in organising and staging meetings of all kinds.

Meetings can be staged as a solely ANZAAS event or in co-operation with other organisations such as Royal Societies, AIP, RACI, etc.

Where possible, the meetings should appeal to the public at large, including schools, although more specialist meetings should not be ignored *provided adequate advance publicity* can be gained to encourage a strong attendance.

Whilst meetings can be considered as not-for-profit, they should not make a loss either!

Divisional meetings can be good recruiting grounds for new members.

BRAIN TRAINING - The Australian Institute of Management Victoria reported, in the May issue of its newsletter Agenda, that it will launch a new training scheme this year on 'Superworking', a scientific way of improving the use of your brain at work. While the workshop was introduced sometime ago for AIM Sydney, one of the original studies on the effectiveness of the method was conducted for the 1991 ANZAAS Conference.

The ANZAAS Debate: Competing For Water In A Thirsty World

*As we approach the millenniums we face another Summer with water restrictions in many places around Australia. How will we deal with increasing demands for water in the next century? This issue is discussed here in ANZAAS Debate by **John PIGRAM**, Director of the Centre for Water Policy Research, University of New England (Email: jpigram@metz.une.edu.au) and Chair of the Organising Committee for the Xth World Water Congress, Melbourne 2000.*

Australia is a large, old, relatively dry, island continent, with a non-uniform population distribution related to water availability and resource potential. Precipitation is erratic with marked variations between the south of the continent and the tropical north, and between the coast and inland. Our population is concentrated in a few major urban nodes, a situation which presents significant challenges in maintaining an adequate water supply in quantity and quality and keeping pace with urban growth. Elsewhere, irrigation and land clearing have had major impacts on river environments and groundwater systems, particularly in the Murray-Darling Basin in the southeast of the continent. An associated problem is the resistance by both urban and rural water users to meet the full costs of supplying them with water, including operation, maintenance and replacement of aging water supply systems. Given the variable nature of the occurrence and availability of Australia's water resources, it is hardly surprising that water occupies such a prominent place in the history of European settlement of the continent. Until recently, the emphasis was on water quantity and every opportunity was grasped to harvest and store as much water as possible for human use. It is only in the past 20 years that attitudes to water have begun to change and serious economic and environmental questions have been directed at water resources development, river regulation, and storage construction. Emphasis has now turned to management of the quantity and quality of available water supplies in an economic and ecologically sustainable manner.

Along with this shift to sustainable management have come concerted efforts to ensure that the full range of values, economic and otherwise, are placed on water in competing uses. Australia's water industry is being called upon to both rationalise conflicting claims on the resource and to achieve consensus on the redistribution of demand in time and space between existing and emerging uses and values of water.

Wide ranging water reform measures are now being implemented across Australia, in the interest of more efficient, equitable and environmentally compatible water allocation and use. These reforms have been accompanied by far-reaching changes in the way the water sector is organised and managed, with an increasing role emerging for the private sector and for corporatised and privatised water services and facilities.

The reform process is well advanced, ongoing and incremental. The challenge is to maintain that momentum and take Australia into the next century when water demands will be kept in balance with supply, when past mistakes will be rectified, and when the nation will be committed to sustainable management of its water resources in keeping with the opportunities and constraints which govern their use. Specific changes forecast to take place during this reform process early next century are shown in Table 1.

Table 1: Forecast Changes in the Water Industry.

The water industry will evolve to:

- Charge more for water to meet the true cost of supply,
- Allocate increasing amounts of water to the environment,
- Explore opportunities for more flexible water use, including extension of tradable water entitlements,
- Achieve higher use efficiencies and "do better with less" through adoption of best management practices,
- Conform to more demanding environmental regulations,
- Fund maintenance and replacement costs of infrastructure,
- Develop effective technologies for water recycling and reuse,
- Implement integrated environmental management of land, water and biophysical resources of catchments to promote ecologically sustainable development.

Australia is not alone in experiencing pressure on water resources. Balancing entitlements to water is a global issue. Agriculture, commerce and industry, hydropower, domestic water supply, outdoor recreation and tourism, and the

environment, all seek a share of a limited water endowment. The challenge of satisfying these competing claims in a time of change is the focus of the Xth World Water Congress to be held in Melbourne, 12-17 March 2000. The four themes of the Congress reflect this process of change; (1) sharing the waters of the earth, (2) sustainable water use policy and practice, (3) protecting the resource, (4) river basin management. The Congress will provide an opportunity to find new ways of resolving the complex water problems of an increasingly thirsty world.

Xth World Water Congress -More information on the Congress, including a registration brochure can be obtained from the Congress Secretariat at ICMS Pty Ltd., 84 Queensbridge Street, Southbank, Victoria, 3006, or Email: worldwater@icms.com.au, or look on line at <http://www.icms.com.au/worldwater>.

Please join the debate,

by sending your response to Prof. Graham Johnston: Email- grahamj@mail.usyd.edu.au; Post- Honorary Editor ANZAAS, Department of Pharmacology, The University of Sydney, NSW 2006. Responses will be posted on the ANZAAS web site.

NEWS Analysis

ANZAAS Green Paper Response

By Duncan ROUCH

ANZAAS has submitted a response to the Government's Research Green Paper, a discussion paper on higher education research and research training. On research, the submission argues for maintaining the proven strengths of the current system while avoiding policy changes that reduce diversity in Australia's research base. An overemphasis on national research priorities is liable to produce weak short-term results, while hampering the diversity required to produce major breakthroughs in the long term.

The green paper argues that the distinction between pure and applied science is breaking down, while our submission argues it is sometimes useful to preserve this dichotomy. To expand on this it is first useful to distinguish two types of applied science, in research that produces a defined commercial product, or a defined public outcome to benefit society. Therefore, including the pure variety there are three types of science. There is a serious danger in confusing the requirements of the three types of science so the boundaries should not be obliterated. While all three types involve research the goals and approaches are different. The goal of pure science is to discover new knowledge about the world around us, which requires a soft focus and a long-term approach that allows interesting odd results to be followed up in different directions to give breakthroughs in understanding. In contrast, the goal of commercially applied research is to make new products for profit in almost totally predefined and rapid processes of product development. Public science applications to provide policies and infrastructures, such as for environmental management, tend to require medium to long-term development but otherwise have well-defined goals. Clearly the three types of science must be managed and funded independently. Otherwise there is a danger of driving all science

through short-term goals to the long-term detriment of the entire Australian community.

On training, ANZAAS strongly supports measures to promote greater student mobility, to match each student with the institution that best suits their aspirations and talents. There appears to be little value, however, in making scholarships portable for post-graduate students, as the green paper proposes.

As others have argued the main impediments to enhancing industrial innovation are not within each sector in the innovation cycle, but between them, so a broader approach is required. A more wide ranging review by the Department of Industry Science and Resources is to follow, the Australian Science Capability Review, for which ANZAAS will also produce a submission, due 30th November. Clearly, however, a more comprehensive, across government, approach is required if the rate and quality of industrial innovations are to be optimised.

GM foods: Government and Producers in the Spotlight

By Duncan ROUCH

Public disquiet about Genetically Modified (GM) foods in Australia is founded on five main issues; (1) consumer doubts about the safety to human health of GM foods, (2) cultural factors, (3) the current lack of direct consumer benefits in GM products, (4) the possibility of significant long-term environmental disturbances due to GM crops and (5) the perceived leverage of commercial interests in shaping research on GM crops as well as government action or inaction.

Many consumers perceive that there is a risk to health by GM products, while the Australian government line counters that there is no risk. As GM foods have been around for such a short time, however, it is difficult to accurately assess the long-term health effects of them. So for the government to say there is no risk about GM foods is both illogical and counter-productive.

Every human activity has a risk, so it is important to find what is the level of risk the public would accept with GM foods. It is likely that the public would

accept a trade-off of some uncertainty in health safety against the value of any direct consumer benefits, such as lower prices compared to non-GM food or a health benefit from consuming the food. Such a compromise has developed in previous cases of new technology, such as with chemical additives for food. No GM products however, have yet been placed on the market which offer direct consumer benefits, while current applications of the technology are widely seen as supporting only narrow commercial interests. Thus if the food industry wishes to gain consumer acceptance for GM technology in food manufacture it would be wise to provide GM foods that directly advantage consumers.

While American consumers have accepted GM products with little argument their culture differs from that of others in relation to food, such as in European- and Asian-type social groups. In mainstream America there is a tendency to support a wider choice in food over maximising food quality, in part due to the lack of cultural importance attached to food. When American style supermarkets say quality they usually mean consistency. In contrast, for many other cultural groups around the world food can be a very important part of life. Australia has many kinds of such cultural groups, so a proportion of Australians may reject GM foods due to the perception that they interfere with their relationship to food. Only cultural change can alter such perceptions, not short-term advertising campaigns, so people who reject GM foods for cultural reasons may well remain resistant.

Potential environmental problems with GM crops relates to, (a) the propensity for the pollen of GM crops to spread to nearby non-GM crops of the same or related species, (b) the significant spread of insecticide resistance genes to weeds combined with accelerated development of resistance to insecticides in insects, (c) the use of genetic modifications that include bacterial antibiotic resistance markers, potentially increasing the spread of antibiotic resistance genes in bacteria (Microbiology Today, Feb 1999; Australasian Science, Oct 1999). While these are difficult problems they are not unsolvable, for example GM crops could be engineered to have pollen production delayed until after non-GM crops had been fertilized. Crop companies are naturally resistant to the calls to address these environmental issues since they have never faced

them before with the existing crops. Nevertheless, to solve these problems by positive action would provide such companies with improved environment-conscious profiles, and help avoid continued consumer resistance to GM technology.

The independence of CSIRO in the GM area has been questioned due to the substantial funding it receives from agricultural companies to support its research (Australasian Science, Oct 1999). At this level CSIRO has been caught between a rock and a hard place, since it supposed to work closely with industry. The real issue in this case is, however, that people question the motivations of the agricultural companies. Nevertheless it may be wise for the CSIRO to declare its relevant commercial affiliations whenever giving advice on GM matters.

That commercial interests are at issue simply reflects the perception that GM technology companies are part of the problem. If these companies wish for significant numbers of consumers to accept GM foods they may benefit from taking positive action along the lines indicated above, rather than simply reacting in fire-fighting mode or not at all, as has generally been the case. We can conclude that both government and industry could improve their play in the GM game.

Labelling GM foods: A Proposal

By Duncan ROUCH

While many consumers may come to accept GM foods a significant number may continue to reject them, particularly on cultural grounds (see above). So for consumers to exercise their right to choose we require an informative labelling system. Moreover, consumer acceptance of GM foods has not been aided by secrecy over what foods are made using GM technology, even if this lack of information has been simply by default. Clearly a transparent labelling system for GM foods is required.

In this light the Council of Health Ministers got onto the wrong foot by initially deciding that a GM product did not have to be specially labelled if it was 'substantially equivalent' to an existing food, that had met all safety standards.

This decision is, however, understandable from the view of government regulators. To allow for substantial equivalence was a way of not making food regulations any more complex than they already are. This allows the regulators to preserve safety standards, following the philosophy of the international food code, Codex Alimentarius.

The Council of Health Ministers agreed in September, however, to the need for a comprehensive labelling system, discarding the 'substantial equivalence' policy. This will include a rule that processed foods will be labelled as containing GM products even if these are in only trace amounts.

The established history of chemical additives in food provides one starting point for developing a labelling system for GM Foods. Table 1 shows the natures of chemical additives and GM foods according to seven properties. These properties cover four technical issues about food products, the means of production, environmental impact, food quality, and public health. For chemical additives questions about the environmental impact of production and chemical toxicity are dealt with by government waste management and food safety regulations and are not included in labelling requirements. The information given on food labels specifies the class of additive, such as anti-oxidant or flavour enhancer, as well as the exact identity of the additive, by a numerical code. The precise identification of additives, albeit in a form difficult for the public to interpret, provides for tracing of any affects of additives on public health. The most notable deleterious health affect of additives is in inducing allergic responses in a small but significant proportion of the population. Once sufferers are aware of what compounds are allergenic for them they can avoid problem foods by label information on food packages. In term of the allergy question about GM foods it is also useful to consider that some natural foods, such as nuts, are also strongly allergenic to some people. These people can react to the presence of allergens when present in trace amounts only. The use of the label "May contain nuts" to help allergy sufferers has proved simply to confuse and annoy them. Therefore at least some manufacturers are learning to separate the production of allergenic foods and non-allergenic foods, so that there is no cross-contamination of safe foods with allergens. This will give allergy suffers a clear choice, while the good

manufacturing practice raises the health-safety profile of the companies concerned.

Can allergen-sensitive production methods be applied to GM food production?

While no GM product has been yet found to be allergenic it may only be a matter of time. So, it is problematic that GM and similar non-GM crops are currently often mixed during processing. For example, it is estimated that a significant proportion of non-GM soy bean products contain about 1% of GM soy beans. While GM soy beans may not be allergenic the public are still keen to know if foods contain GM components. So it may be important to identify foods that contain any level of a GM component, even at trace levels, as the Council of Health Ministers recently agreed. To avoid a public crisis producers may need to prove that Non-GM foods do not contain even traces of GM components, and good manufacturing practices will help them to avoid the problem in the first place. It has been forecast that non-GM foods will have a market advantage over equivalent GM-foods for the next 2-3 years. In the meantime it will be vitally important to educate consumers about GM-foods, to allow them to make informed choices.

So what information should a GM labelling system give us? Considering the seven properties in Table 1, clearly the public may wish to have access to more information than can fit on a small food label. A way around this limitation is to make use of information technology. The actual information on GM food labels could mirror the additives system, with its two part labelling of class and identity of labelling. Part A of the system would consist of a label in plain English that specified (a) that the food was genetically modified and (b) marks against the listed ingredients that had been genetically modified. Part B of the system would consist of a unique identifying GM code that referred to the exact nature of the modification. The GM code and corresponding detailed description of the genetic modification, with a summary in clear English, could be held in a central database by a suitable regulatory body such as ANZFA. Easy public access would be provided to the database, with internet access through major shops and supermarkets (touch-screen facilities) and libraries. The database could also carry information on foods for which genetic technology had been applied in the production process, but the final product

did not contain a genetic modification. These could be identified by a GM code, but not the GM worded label.

In this scheme food producers would also be free to advertise the provable benefits of the genetic modification, however, if they would wish to do so is another question. Food producers in general do not publicise the benefits of chemical additives, arguably due to public ambivalence over the use of such 'unnatural' additives in food. So it seems likely that the makers of GM foods would also be reticent to trumpet the benefits of genetic modification.

Nevertheless, it will be important to show consumers the benefits of genetically modifying food if the application of gene technology to food is to be widely accepted.

The scheme proposed here for labelling GM foods would provide more information to the public than any existing food labelling system, in part through using information technology to provide details at points of sale and local libraries. A high level of knowledge transfer seems necessary, and could provide leadership for providing better information about other labelling systems, such as for additives. Moreover, the labelling system for Italian olive oil has also been criticised in the media recently as it appears to allow a range of unscrupulous product formulations.

To be fully effective the proposed GM labelling scheme would require testing of foods to prove their GM status. It is likely, though, in practice that analysis of some foods claimed to have non-GM will be shown to have trace amounts or more of GM components. With appropriate resources ANZFA would be a suitable testing agency.

Table 1. Application Properties of Chemical additives and GM Foods

Property	Chemical Additives	GM Foods
Improving Food Production	Indirectly.	Currently the main purpose of GM

		foods.
Environmental Impact of Production	Low, with handling of chemical waste according to regulations.	Potential for GM crops to disrupt the environment: risk assessment and monitoring required.
Improving Food Quality	A common purpose of additives.	An established purpose.
Improving Shelf life	A common purpose of additives.	An established purpose.
Toxicity testing	All food components must meet current safety regulations.	All food components must meet current safety regulations.
Allergenic?	A small proportion of people can be allergic to one or more additives.	There is the potential for GM foods to have altered allergenic properties.
Long term effects on public health?	Low, if any, given over thirty years of wide-spread use.	Expected to be low. The risks should be assessed on a case by case basis.

Explaining Risk Assessment: a Tool for Environmental Management

Natalie BARAN

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In the debate over the introduction of GM foods we have seen the crucial importance of understanding the risks involved. Here I explain how risk is assessed and show why formal risk assessment should also be an important tool in managing the environment.

We are all familiar with the concept of 'risk'. Just about everything we do is risky and every day we undertake personal risk assessments to evaluate choices. Deciding what to have for breakfast, how to get to work, choosing a career path, taking an adventure holiday and selecting a partner all involve some kind of risk assessment¹ - procedures that enable us to make judgements in the face of uncertainty. In our everyday language, risk is often used synonymously with the word hazard. In 'risk science', however, the terms hazard and risk have different meanings. A *hazard* is an intrinsic property of a substance to do harm². The concept of *risk* has two elements - the *likelihood* of an event occurring within an implicit time frame and the *consequence* of the event if it does occur. To illuminate the difference, consider the risks associated with smoking cigarettes. The cigarette constitutes the hazard, the act of inhaling cigarette smoke is the event which invokes risk. The consequences may include lung cancer, heart disease and reduced fitness (to name only a few!) each with its own likelihood of manifestation within a particular time frame.

Risk assessment is applied as a cross-disciplinary tool to fields such as engineering, the health sciences, economics and the environmental sciences. Environmental risk assessment (ERA) is defined as the process of evaluating risks to human health, welfare and ecosystems from adverse developmental impacts to the natural environment². Appropriately, the generic framework of risk assessment involves a systematic analysis and review of the individual

components of risk. The steps in risk analysis include identifying potentially hazardous events and analysing the consequence and likelihood of each event. The combination of consequence and likelihood provides an estimate of the risk associated with each hazard and this step may involve quantitative methods (e.g. using numerical methods such as Monte Carlo simulation, interval and fuzzy arithmetic, fault and event trees) or qualitative methods (descriptive scales and scoring). Risk assessment involves comparing the level of risk found with previously established criteria and deciding whether the risks are acceptable. The product is a prioritized list of hazards, those that fall outside the acceptable criteria require further management. Options for risk treatment include avoidance (choosing not to proceed with the activity) or adopting measures that may decrease the risk to tolerable levels by reducing the likelihood and/or the consequence⁶. For example, the risk of injury from car accidents can only be avoided by banning the use of cars, however we can reduce the likelihood by following traffic regulations and we can reduce the consequence of an accident by wearing seatbelts. ERA does not stop with a list of prioritized risks, the performance of a risk management system requires monitoring and review in a continuous feedback system⁶.

For any ERA it's important that risk avoidance doesn't occur inappropriately by ignoring hazards or by downgrading risks. In general, people are notoriously bad judges of risk, and experts are no exception. We are biased, overconfident in our ability to judge risks, we are influenced by framing (the way in which a question is posed can influence the answer given³), and we tend to place far too much trust in data from small sample sizes⁴. Our perception of risk is influenced by factors such as catastrophic potential, familiarity (or novelty), understanding, controllability, voluntariness, media attention (recent events loom larger than distant events) and the perceived effects on future generations³. It's not surprising then, that in the public arena, environmental management is controversial, given the competing uses of land and water resources. With an inevitable diversity of viewpoints, it is essential that all interest groups be involved in the process of ERA to achieve a fair and most objective assessment.

ERA provides the forum where differing viewpoints can be reconciled, assumptions are revealed, gaps in our knowledge of natural systems are highlighted and the inherent uncertainty associated with risk is dealt with. It is also an opportunity to create a transparent documentation of the decision-making process, available for peer review or updating sometime in the future. In Australia, one of the key policy documents that creates an imperative for environmental protection is the Inter-governmental Agreement on the Environment (IGAE, 1992).

It contains a summary of the principles underlying environmental policy for all levels of government. The IGAE adopted the somewhat controversial 'precautionary principle' as one of four guiding principles, together with inter-generational equity, conservation of biological diversity and improved mechanisms for valuing natural resources. The IGAE defined the precautionary principle as:

"Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

- *Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*
- *An assessment of the risk-weighted consequences of various options."*

Traditionally, an activity will be permitted unless there is proof of likely and unacceptable harm, consequently the burden of proof falls onto opponents of the activity⁵. In contrast, the precautionary principle shifts the burden of proof from the environment to the proponents of the activity. In addition, the principle introduces the assessment of uncertainty and risk as a key foundation to informed decision-making in environmental management. The Australian/New Zealand Standard on Risk Management provides a non-specific guide for the establishment and implementation of the risk management process⁶. To date, however, there is no legal mandate for the use of risk assessment in this country nor are there any policy guidelines for

environmental risk assessment *per se*. Perhaps it is time for risk management to become a legally effective tool in environmental protection.

References:

- 1, P. Calow, "Environmental risk assessment and management: the whats whys and hows," in Handbook of environmental risk assessment and management, P. Calow, Ed. Oxford: Blackwell Science, 1998, pp. 1-6.
- 2, T. Beer and F. Ziolkowski, "Environmental risk assessment: an Australian perspective," Commonwealth of Australia, Barton, Supervising scientist report 102, 1995.
- 3, V. T. Covello, "Risk Communication," in Handbook of environmental risk assessment and management, P. Calow, Ed. Oxford: Blackwell Science, 1998, pp. 520-541.
- 4, A. Tversky and D. Kahneman, "Belief in the law of small numbers," in Judgement under uncertainty: heuristics and biases, D. Kahneman, P. Slovic, and A. Tversky, Eds. Cambridge: Cambridge University Press, 1982.
- 5, W. Gullett, "Environmental protection and the "precautionary principle": a response to scientific uncertainty in environmental management," Environmental and Planning Law Journal, vol. 14, pp. 52-69, 1997.
- 6, A.N.Z. Standard, "Risk management," Published jointly by Standards Australia and Standards New Zealand AS/NZS 4360:1999, 1999.

NEWS FROM THE DIVISIONS

Unfortunately due to space limitations no divisional news could be included in this issue. Divisional news and additional book reviews submitted shall appear in the next issue.

Annual General Meeting 1999

Notice of Annual General Meeting

The Annual General Meeting of ANZAAS will take place on:

Wednesday, November 24th. 1999 at

Room 201, Dept. of Continuing Education,

10, Pulteney Street, Adelaide and will commence at 7.30 pm CST

Satellite meetings will take place in each Division at the relevant time and the Convenor of those meetings will be the Divisional Council Member or the Divisional Secretary.

The satellite meetings will have the same status as the Adelaide meeting and all financial or honorary members are entitled to attend in person at any of the meetings.

AGENDA:

1. Apologies
2. Chairman's opening remarks
3. Minutes of the AGM held on 28th April, 1999
4. Matters arising from those minutes
5. Minutes of the SGM held on Wednesday, 22nd September, 1999
6. Matters arising from those minutes
7. Report of Chairman and Council for the period July, 1998 to June, 1999
8. Treasurer's report and accounts for the period July, 1998 to June, 1999
9. Any other business

- motion 1

Copies of the Report of Chairman and Council and the Consolidated Accounts for the year 1998/1999 will be available at all venues.

Postal voting will not take place at this meeting.

No member may hold more than five[5] proxies.

The contact person for your Division is:

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Dr. Bob Vickery tel: 02 9369 2705

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TAS

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Council Member-at-large:

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SA, NT and Queensland members should contact:

Robert Perrin

ANZAAS

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ADELAIDE,

South Australia 5005

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[08] 8374 2203 [H]

fax: [08] 8303 4965 [O]
e-mails: perrin@camtech.net.au

Motion 1:

"That a subscription level of \$20 per year shall be applied to all students in full-time education and under the age of 21"

If you do not intend to attend the AGM in person, you may complete and sign this proxy form and return it to the Secretary by the time of the meeting.

I..... of.....
[name] [address]

.....
city state post code

being a financial or honorary member of the Australian and New Zealand Association for the Advancement of Science nominate.....
as my proxy to cast my vote at the AGM of the Association on Wednesday, 24th November, 1999.

My vote should be cast

Motion 1 FOR AGAINST AT DISCRETION
delete where inapplicable

otherwise at discretion for all other business

signed:..... date.....

NOTICES TO MEMBERS FROM THE HON. SECRETARY

ANNUAL GENERAL MEETING - Motions for consideration, discussion and voting at the forthcoming Annual General Meeting should reach me as soon as possible.

SUBSCRIPTIONS BY CREDIT CARD - Following the advice of the bank on the design of our renewal notice, I allowed a spot for Members to indicate a choice of credit card against which to debit their subscription. I am now informed by the bank that only Visa, Mastercard or Bankcard are acceptable cards. Regrettably, I am having to write to Members who made AMEX or Diners their card of choice. Also, our credit card facility does NOT provide for telephone renewals as we would be required to place \$5000 on deposit at the bank to underwrite non-signature transactions.

MEMBERSHIP CARDS - All Members should have received a membership card by this time; some members will also have received a *yellow slip* with their card and renewal notice detailing the *pro-rata* renewal subscription amount required to maintain financial status until 1st July 2000.

NEW RECRUITING AND INFORMATION LEAFLET/FORM - Members from two Divisions have kindly provided me with drafts for the design and/or wording for a new glossy recruiting leaflet or form. Before I circulate Council with a "mock-up", I would like to hear from our younger Members as what would attract them to ANZAAS and what information they would like included into a revised membership form or information leaflet.

INTERNET DOMAIN ESTABLISHED - anzaas.org.au is now operational and our web address is now: <http://www.anzaas.org.au> A visit to the site will show only the bare bones of a web-site - there are no bells and whistles. Mailboxes for links to the Executive are being set up. By the end of the year, through the efforts of our Members, young and old, we should have a very professional site with links, mailing lists, discussion lists for Members [non-members will be read-only] etc, etc. Members can send suggestions or material for site design to me or to the Honorary Editor for consideration by the Executive and Council. If you want some pointers as to what might be included or excluded, you can visit either the American or British Association sites.

HONORARY MEMBERS ELECTED - The Council of ANZAAS is proud to announce the election of two honorary members:

Sir Rutherford Robertson of NSW Division, a member since 1945

Mr. Geoffrey C. Simmons of Qld Division, a member since 1948

Best wishes for continuing health and a full life go to these champions of science

REPORT FROM THE SPECIAL GENERAL MEETING

A Special General Meeting was held on Wednesday, 22nd September at 8pm EST; 7.30pm CST and 6pm WST

The agenda, resolution and proxy forms had been sent to all members well ahead of the meeting so that every member could participate in the direction of ANZAAS.

The meeting was necessary in order to formally adopt the Consolidated Accounts for the year July 1st 1997 to June 30th 1998. The Consolidated Balance Sheet is set out below and Members will see that a *substantial loss* occurred during that unhappy period.

The haemorrhage has been stopped and the patient is responding well to treatment!

The report and accounts for the current period will show a *vastly* different state of affairs, ALTHOUGH *SOME* LOSSES WILL SHOW, BEING CARRIED THROUGH INTO 1998 FROM THE 1997 CONGRESS in Adelaide.

At the commencement of the meeting, Divisional convenors reported a total of twenty-one [21] members present and voting. The Secretary declared that a quorum had been found and the resolution to receive and adopt the Consolidated Accounts was put to the meeting and passed unanimously.

The period covered by these accounts was one of the most traumatic in the 111-year history of the Association. The SGM brings that period to a definite close - the task now is to move forward and put the aims of the Association into effect - to advance science - and to rebuild the membership base and the financial reserves.

The task for the future is to develop a new relationship between the Association and its membership; this Newsletter is just a part of the new outlook which will bring you, the Members, into the decision making processes.

ANZAAS BALANCE SHEET FOR THE FINANCIAL YEAR ENDED JUNE

30TH 1998

	1998	1997
	\$	\$
CURRENT ASSETS		
Cash at Bank	29829	67998
Receivables	2212	17836
Investments	37419	63251
Other Assets	15000	-
Total Current Assets	84460	149085
NON-CURRENT ASSETS		
Furniture and office equipment	2162	2162
Less depreciation	(2032)	(2006)
Total non-current assets	130	156
TOTAL ASSETS	84590	149241
CURRENT LIABILITIES		
Creditors and borrowings	-	4619
NET ASSETS	84590	144622
MEMBER'S FUNDS		
Balance as at 1st July, 1997	144622	188696
Surplus/(Deficit for the period)	(60032)	(44074)
TOTAL MEMBERS FUNDS	85590	144622

Book Bite

The Yarra - a Natural Treasure

David and Cam Beardsell (additional research by Richard Marchant, Alan Yen and Tim Entwistle) Published by the Royal Society of Victoria, 1999. ISBN 0-958775-85-0

Home to the Woiwuring people for at least 25,000 years, the Yarra River has existed for over 100 million years as a result of volcanic activity and uplifting on the Gondwanaland super-continent. From its origins in the Yarra Ranges, through the heart of Melbourne and onwards to Port Phillip Bay, the Yarra River today provides opportunities for recreation, commercial activity, and most importantly a refuge for flora and fauna along its banks.

The Yarra Valley is home to an astonishing number of plant and animal species- approximately 20% of Victoria's native flora and over half the vertebrates reside along the Yarra's banks and within catchments. Of these, over 30 species of birds, mammals, fish, butterflies, reptiles and frogs and over 20 species of plants are rare or threatened in Victoria, as a result of factors such as habitat fragmentation, environmental weeds, erosion, the absence of floods and run-off. Breeding populations of the Platypus from the lower Yarra have disappeared, and the Rosella Spider Orchid has been reduced to 200 individuals, all of which occur in the Yarra Catchment.

However, the pro-active and co-operative effort of government and community groups has improved management practices, and as a result species such as the Australian Grayling, a rare native fish, have recolonised the Yarra.

Prior to European settlement, floods were common throughout the Yarra (recorded up to 6 metres) and were important in the reproduction of many plant and animal species. The flow of the Yarra is now half of that recorded from 1892 to 1933 as a result of construction of major dams and water diversion works in the Upper Yarra. As a consequence, many billabongs have dried up and swamps have been filled, including the west Melbourne swamp, which was described by George McCrae as "a real lake, intensely blue"

which, surrounded by the Rounded Noon-flower, "seemed in broad sunshine as though girdled about with a belt of magenta fire".

The Yarra - a Natural Treasure is an informative guide to the natural history of the Yarra River from The Middle Yarra hills to the Estuarine Yarra. The book is sub-divided into three sections based on biogeographical differences in the Yarra and the natural and urban history of these regions is well documented. The Yarra- a Natural Treasure has been well researched, and is accompanied by many photographs of wildlife and plants, as well as historical maps of the watercourse. Although the book makes reference to the Woiwurung people, a brief history of the practices of the Aborigines and their use of the Yarra would have complemented the history of European settlement.

The Yarra - a Natural Treasure should be sold at outlets along the Yarra to inspire Melburnians and visitors to explore the natural wonders of the region. I urge you to take a copy of The Yarra - a Natural Treasure next time you sip a latte at Southgate or ride your bike along the banks of the Yarra, so that you take time to reflect on one of Melbourne's most important natural resources- the Yarra River -*Elisa Raulings*.
