

Nature & Society

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Editorial

This time last year it was obvious that quite suddenly large sections of the public were taking notice of the climate change debate and realising that there was a real problem. This year has been notable for much more reporting of environmental problems and more public concern. Local governments, activist groups and individuals are getting involved in a big way.

A growing number of scientists have also been prepared to speak frankly about the problems we face. Where the IPCC reports have been hampered by the need for governmental as well as scientific consensus, some individual scientists are speaking out. They are aware that many of the deleterious signs of environmental problems are escalating, and fearful that we will reach an irretrievable state far sooner than was expected. They, more than anyone else, realise that feedback effects, once seriously entrenched, can not be controlled. They know that business as usual is certain doom, and they are warning us as strongly as they can. (See *Under a Green Sky* as an example.)

Predictably the Australian and US Governments realised that they would have to react and take action. Unfortunately, as they had, for the most part, little understanding of the situation their proposed solutions were too little, too late, plain ineffective or even counterproductive. Worse, they turned away from the most immediate, most effective things they could have done, such as mandate energy and water efficiencies, regulate for strict measures on new buildings and greatly increase the uptake of renewable energies. Their preferred alternatives, such as carbon offsetting and trading, biofuels, nuclear energy and geosequestration, are unproven and may not result in any reduction of greenhouse gas emissions.

*The human mind serves
evolutionary success, not truth.
John Gray*

With the change in government in Australia there is hope that action will become more effective. As well as ratifying the Kyoto agreement, we now have a minister for climate change. We hope that the rest of cabinet will not just leave it all to her; the whole cabinet, indeed the whole government must understand that this issue concerns them all.

From now on there must be no more pushing for increased growth in either population or consumption. Everyone must understand that

Australia is arid, its soils infertile and it cannot continue to provide food for hundreds of millions of people. It may have trouble feeding its own current population.

Even some sections of the oil and mineral industries have admitted that supplies of both are declining. It is quite surreal to read the papers and see on one page news about oil extraction probably having topped out, that we are already experiencing Peak Oil, and on another page read the announcement of a new budget airline, increasing freight flights, and expansion of airports.

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The Red Queen in *Through the Looking Glass* told Alice that she should not be bounded by reality, that she should practise believing in impossible things. It seems that humans do not need to practise such a skill, it is an innate one of which we are masters. The problem is to train ourselves not to believe the impossible.

As a national curriculum is now on the agenda, it should include the essential numeracy skill of understanding exponential growth. What happens when a number is doubled repeatedly seems to be beyond the ken of politicians and economists.

One commentator soon after the election suggested that, as clouds gather on the economic horizon, the former Government now Opposition members of Parliament might soon realise that it is actually a good time to be in opposition. Clouds are not only gathering on the economic horizon, but in many other places.

The challenges of reducing human over consumption, and the accompanying destruction of the environment are so great that governments are going to be faced by really difficult choices, although Peak Oil might do it for them. Financial markets have been unstable recently, but that is nothing to what will happen when they wake up to the reality of declining oil supplies.

They will see a future with troubled transport, little plastic, few pharmaceuticals, diminishing supplies of fertiliser, reduced food production and distribution, cut backs in overseas trade. Fears of inflation will be superseded by the reality of major depression.

Yes, happy New Year to our new Government. We wish you well as you, and we, adjust to the new realities which will overtake us in the coming years. We also need to remember that there will be pluses as well as minuses in the adjustments, as we learn to value what we have, rather than always demanding more.

Jenny Wanless

Coral reef futures

With the ARC Centre of Excellence for Coral Reef Studies, the Australian Academy of Science co-sponsored and hosted a Coral Reef Futures Forum at the Shine Dome in Canberra in October.

At the public forum Janice Lough spoke on the Changing Climate for Coral Reefs and the way they react to rising temperatures: not very well and they have not much room for movement. Increasing acidification of the oceans also poses a danger. Garry Russ discussed his research on how well the Green Zones on the Great Barrier Reef work. Glenn Almany has studied the dispersal of larvae between different parts of the system. Sean Connolly was concerned about the ongoing collapse of

the top predators, the sharks. David Bellwood dealt with the very important role of herbivorous fish in preventing coral reefs from being overgrown with algae.

There was some good news from the speakers. Green Zones really do work, increasing not only the number of fish, but also their mass. Larvae can disperse from the spawning sites, and will colonise other suitable areas. If protected areas are within a suitable distance larval dispersal will help to sustain or rebuild populations.

All the speakers admitted big problems but they concentrate on their research and try to be cheerful. As Bellwood said, quoting Churchill –you have to be an optimist because there is no point in being a pessimist.

Optimism and pessimism

In contrast with Churchill we came across this on the internet from Perry Arnett in September 2007:

I rather agree with the observation that optimists are doomed to disappointments, while pessimists can only be pleasantly surprised. I appreciate each day and the things in it all the more for my awareness of their fragility and transience.

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Where we are:

Our rooms are in the South West Wing of Weston Creek Primary School, Minns Place, Weston, ACT.

By car: from Civic, follow the signs to Weston from the Tuggeranong Parkway and continue to Weston by veering left from the traffic lights at the Cotter Road turnoff. This takes you along Streeton Drive for one kilometre, then turn left into Hilder Street (there is a small signpost pointing along Hilder Street). Drive around behind the school into Minns Place and then into the car park. Our rooms are down the slope to the left of the school building – about 40m from where you'll park your car. Follow the sign to 'Sustainability Groups'.

There is space for three or four cars for disabled access close to the entry. There are ramps over the kerb from this small parking space and entry to our building is without steps.

By bus: The 25 bus route from Woden bus interchange and walk 200m.

By bicycle: The office is adjacent to the western trunk cycle path running between Civic and Tuggeranong.

Where we will be:

We are moving into new premises over the coming weeks, and hope to have the move finalised before Christmas. Our patron, Frank Fenner, has arranged with the ANU's John Curtin School of Medical Research that we take over the office he has occupied at the School for many years. Thank you, Frank! We are still working through the arrangements, but we can say for sure that our phone, internet and postal addresses will operate unchanged. More information by e-mail in January.

Seasons greetings to our members and all the best for 2008.

May it bring healthier people on a healthier planet!

If you would like to join us in our existing six projects working towards that aim in 2008 (see back cover), please contact the project convenors or the NSF office.

Forthcoming NSF meetings

For the latest information visit our website www.natsoc.org.au and click on "What's On". There you will also find a link to maps showing the venues.

Topics are still being finalised for the public and members' meetings in 2008. At their 7 November meeting, the board acknowledged the importance of the issue of climate refugees and will look for the opportunity to build on the 21 October discussion of that topic with an event later in 2008.

Wednesday 20 February 2008 - launch of our new website for the Social Change project. The launch will be a public event hosted by Deb Foskey MLA at the Legislative Assembly rooms beginning at 5:30 pm. Speakers will include Stephen Boyden and Frank Fenner with a main speaker whose attendance is being finalised as we go to press. More information will be sent to members well in advance of the launch.

New members of the Nature and Society Forum board

At the NSF board meeting on 4 October 2007, two new members joined to the board: Professor Tony Capon (CSIRO, ANU and the Oxford Health Alliance) and Keith Thomas (NSF office manager) were appointed for the rest of the 2007-08 year.

Reports from NSF

The Australian National Sustainability Initiative (ANSI):

Progress during 2007

During 2007 ANSI Board members have been in discussions with ACT government ministers, and have found support for the sustainability initiatives.

The good news is ANSI is directly written in to the East Lake Urban Renewal Draft Plan. It can be seen on the ACT Planning Authority's website.

There is a designated area in the East Lake Plan for a Sustainability Demonstration Centre, in a section of the site that ANSI has been working to secure as a concessional lease. The ACT chief minister, Jon Stanhope recently responded to ANSI suggesting that ANSI buys the land. So ANSI is planning to workshop this to determine the best way forward, eg. partnering with a developer and still maintaining our leading edge sustainability designs concepts for a Sustainability Centre in the national capital.

From the East Lake Draft Plan, it seems that ANSI will need to negotiate for the additional area of land designated "Open Space" in the Plan as the landscape buffer between the urban developments and the Jerrabomberra Wetlands. ANSI has the study and plan work of the renowned naturalist-educator, Allan Fox which gives ANSI a very strong position for such negotiations.

ANSI has written a submission for the Jerrabomberra Wetlands Nature Park Management Plan particularly referring to the ANSI proposal providing a buffer between, and learning opportunities connecting with the Nature Park.

The vision for East Lake as expressed in the draft plan, is "for East Lake to become a lively, high-density urban community providing a showcase of sustainable development". Throughout the draft Plan there is the approach of creating the whole area as leading sustainability design.

Wendy Rainbird and Joanne Warren-Wilson represented ANSI at the initial discussion/ workshop consultation run by CSIRO Sustainable Ecosystems, Sustainable Communities Initiative (SCI) in early October. This was a discussion with

leading Canberra industry organisations, like the Housing Industry Association, Canberra Business Council, Master Builders Association, Canberra Property Council, Institute of Landscape Architects, and Royal Australian Institute of Architects. ANSI members pointed out that if East Lake really did become a leading edge sustainably designed area which is for Living, Working and Learning for Sustainability, it could be unique in the world.

ANSI has written a submission to the ACT Planning Authority and CSIRO SCI about the East Lake Urban Renewal Plan.

Janis Birkeland and David Hood, as ANB Co-Presidents, have been in contact with CSIRO officers, who have been partnering with ACTPLA about running the consultations with different sectors about the East Lake Urban Renewal. Janis and David discussed ANSI's contribution to leading

edge sustainability design and ANSI's role. Also, Geoff Pryor represented ANSI at a subsequent meeting on 23 November.

Janis Birkeland, who is now Professor of Architecture at QUT, has assigned to fifth year Architecture Design students the task of creating

net positive designs, which are to be exhibited. Janis' book on Positive Development is with the publishers. Both her book and the design exhibition can inform people, like developers about what can be designed for sustainability.

Learning for living healthily and sustainably through bringing together all sectors, and thinking collectively and innovatively and taking actions, is what ANSI proposes. Valerie Brown's book *Leonardo's Vision: a Guide to Collective Thinking and Action*, launched on 6 December in Canberra, provides a strong and tried basis for much of ANSI's work. As Barry Jones pointed out in the Melbourne launch of Val's book on 1 December, it should be read and carried by Rudd, Garrett and Wong to Bali!

The seriousness of climate changes and their implications are some of the issues becoming more widely recognised. We notice that there are other, various styles of Sustainability Centres being proposed, like the recent one proposed for Phillip Island in Victoria.

Continued on page 7

..but consider what we now know: editors can reduce or increase the likelihood of mass murders, and encourage a nation to war or peace. Given such power, it is surely not too much to ask that they tread lightly.

*Michael Bond, on reportage of the Virginia Tech massacre and its perpetrator
New Scientist, 12 May 2007*

NSF meeting Panel discussion on climate refugees

Wednesday 17 October 2007

A panel comprising Dr Bryan Furnass (NSF) and Kerrie Tucker (ACT Greens) gave us a thought-provoking discussion of this serious problem facing the world. In our area, rises in sea levels will particularly affect the many small low-lying Pacific Islands, the Pacific Rim countries, and South and South-East Asia with their heavily populated river deltas.

Dr Bryan Furnass

Bryan opened the evening with a remembrance from his childhood of newsreels showing the Nazis gunning down Jewish refugees, and his subsequent life-long awareness of the refugee problem.

He gave the meeting several examples of the climate changes the world is already experiencing and will continue to increasingly experience, especially increases in sea levels, cyclones and unusual and extreme weather patterns.

The year 2005 was the second warmest on record. Already between 1950 and 1999 there has been a four-fold increase in natural disasters. The economic costs of these events had increased eight-fold and the insurance costs, thirteen-fold. The IPCC keep upgrading their projected estimate of rises in water levels. It is now one metre, and probably underestimated.

The predicted weather changes will not only create human refugees, they will also threaten species diversity and food production (the low-lying river deltas and coastal plains are generally the most fertile and also the most heavily populated regions). Changes in temperature and weather patterns will probably also affect the spread of infectious and vector-borne diseases. The areas at most risk are the river deltas of the Yellow and Yangtze rivers in China, and similar low-lying areas and river deltas in India, Bangladesh, the Philippines, Indonesia, Vietnam, Thailand and Burma. An increase of sea levels of one metre would mean that 17 per cent of the Ganges

delta would be flooded. The world needs to acknowledge these possibilities and plan for when they happen.

At the 2002 Pacific Islands Forum climate change was at the top of the agenda. Unfortunately the UN does not officially recognise environmental refugees as a category, although it has been estimated that by 2050 China may have 74 million displaced persons, Bangladesh 26 million and India 20 million.

New Zealand has undertaken to accept 2,000 refugees from Tokelau and Tuvalu; and the USA has agreed to offer sanctuary to the Marshallese (58,000). The inhabitants of Kiribati (78,000) have so far no place to go.

Australia is not yet accepting any responsibility either for the plight of these peoples, or for resettling them when disaster strikes.

It is wrong to destroy the habitability of our planet and ruin the prospects of every generation that follows ours. The climate crisis offers us the chance to experience what few generations in history have had the privilege of experiencing: a generational mission; a compelling moral purpose; a shared cause; and the thrill of being forced by circumstances to put aside the pettiness and conflict of politics and to embrace a genuine moral and spiritual challenge.

Al Gore 2007

Australia will itself experience major weather changes, affecting our ability to accept climate refugees. Some of these have already begun to occur – increased drought in the food-producing southern and eastern parts of the continent and increased rainfall in the north and west. In the last three years the rainfall over the southern parts of the continent has been lower than ever recorded, whereas the northern part of Australia has had increased levels of rain.

Bryan suggested that it may be possible to offer climate refugees a home in the northern parts of Australia, if they undertake to farm the areas receiving the increasing rainfall, to help with the inevitable food shortages as the rest of the country experiences drought and water shortages. He reminded us that Asian peoples have good experience in farming sustainably under these conditions.

Comments from the audience raised several potential problems with this solution:

- Fertility depends on the soil, and Australian soils are thin and would need considerable building-up – this takes many years.
- The northern part of Australia contains large areas which are protected Aboriginal reserves –

this would have to be respected and land use carefully negotiated.

- The natural ecological systems need to be preserved.
- There may well be problems in confining refugees to northern areas, particularly if the farming does not prove viable. The refugees may also have to agree to stay put as a condition of their residence here. Bryan suggested that the Defence forces might have to be involved.

It was also pointed out that by the time areas go under water the population will have increased, compounding the refugee problem and food shortages.

Kerrie Tucker

Kerrie started her contribution by pointing out that the Greens are particularly concerned that climate change will have the greatest impact on the world's poor, even though the poor have contributed least to the problem. Climate change refugees are among the world's most poor. The Greens believe it is essential that Australia recognise its responsibility for creating the problem of climate change and accept that it must also contribute to the solution.

The Stern Report estimated that there could be between 150 and 200 million climate refugees by 2050. The IPCC Report released in April 2007 also stressed the seriousness of the problem and stated that unregulated population movements in the Asia-Pacific region will provide an additional challenge to national security.

The governments of Kiribati and Tuvalu have approached the Australian and New Zealand governments on several occasions to request a plan for the migration of their populations as their homelands become uninhabitable.

New Zealand has created a 'Pacific Access Category' in its immigration policy. However this includes certain conditions which would need to be met in order for people to be accepted as suitable refugees. These conditions include age, language and employment.

Under its coalition government Australia, has specifically ruled out accepting climate refugees but has pledged \$3 million over 3 years to help the islands adapt to their changed living conditions. It

has also proposed the establishment and funding of an Australia Pacific Technical College which would offer courses and training for people in the affected island states, to help them to cope in their own countries. And it has contributed \$7.5 million to the UN Least Developed Countries Fund, to limit the impact of climate change on the poorest and most vulnerable countries.

The Greens have a population policy, directed towards achieving a sustainable relationship between people and their environment. They support the 1994 UN Population Report. Kerrie has spent time on both Kiribati and the Pacific Islands and believes Australia has two choices - either a 'Fortress Australia' attitude, or a collegiate working together. She believes an ethical response is urgently needed, based on the human rights of all people. Social justice and ecological sustainability

need to be the driving principles in our approach to the climate refugee problem. It is important to assist people to remain in their own countries as long as possible, and maintain their cultural cohesion.

Greens Senator Kerry Nettle introduced a bill into Parliament earlier in the year, which advocates amending the Migration Act to include a Climate Change Refugee visa class. This would allow for up to 300 refugees per year from Tuvalu, from Kiribati, and from other parts of the Pacific, as appropriate (ie a total of up to 900). The Bill also recommends that Australia work with the UN and other international forums for the establishment of an international definition and framework which addresses climate change and environmental refugees.

Open discussion

The following points were made:

- It would be helpful if a map of Australia were produced showing the areas that would be affected by rises of 1, 5, or 10 m in sea level. We need to get people talking co-operatively *before* disaster strikes, and to plan for the changes in sea level.
- Irrigation, sewerage systems and drinking water supply would be affected by rising sea levels. Also food production and security: the world has only 57 days supply of grain in storage.

By cleverly manipulating our core emotions, advertising gets us to buy products that are never quite what they seem. (Have you ever seen a car advertisement shot in rush hour traffic?)
Gerry McGovern
New Thinking website
November 2007

- The recovery of New Orleans has been much slower than anticipated and people have not been very helpful to each other. We need to realise this may also happen in Australia, unless we plan our response beforehand.
- Health, including mental, problems will greatly increase - it won't only be food, water and sea level problems. This has happened in India and New Orleans following their weather disasters. These water shortage and health problems will strike many years before sea level rises per se become an issue.
- Records indicate that Javanese and Japanese seafarers have been coming to the north of Australia for over a thousand years, and have attempted to settle, but were not able to establish agriculture and left. The CSIRO has shown how agriculture could be established, and this knowledge needs to be made available to prospective settlers in the north of Australia.
- Climate change is a moral issue of the first order.
- Australia will have to look carefully at the industries and crops it supports. Cotton growing is possibly not a reasonable choice, given its water needs. Rice and bananas in suitable areas are probably much more appropriate choices, helping us feed our neighbours and leading to change in our own diets.
- Democracy may not be the best way to cope with the decision-making Australia now faces. NSF member David Shearman (also with Doctors for the Environment), has recently addressed this issue in his book *The Climate Change Challenge and the Failure of Democracy*.
- If we do not incorporate social justice and ecological integrity into our culture in time, the likelihood of fair and equitable contributions by Australia to the coming refugee problem will diminish rapidly. In 20-30 years our economy and lifestyle will be hugely different but there are no long-term plans for this future.

*A pine cut down, a dead pine, is no more a pine than a dead human carcass is a man.
Can he who has discovered only some of the values of whalebone and whale oil be said to have discovered the true use of the whale?
Can he who slays the elephant for his ivory be said to have seen the elephant?
These are petty and accidental uses; just as if a stronger race were to kill us in order to make buttons and flageolets of our bones; for everything may serve a lower as well as a higher use.
Every creature is better alive than dead, men and moose and pine trees, and he who understands it aright will rather preserve its life than destroy it.
Henry David Thoreau, 1817-62*

Kerrie Tucker added a final comment, saying we still need to be positive; and Stephen Boyden added that he sometimes felt negative, but would like to think a positive approach was possible – hence the existence of the Nature and Society Forum and its vision of Healthy People on a Healthy Planet.

Kerrie Tucker has provided the following references for her talk:

- Friends of the Earth *A Citizen's Guide to Climate Refugees* 2007
- The New Zealand government's immigration website
- Senator Vanstone, then Minister for Immigration, reported on the ABC website *No such thing as climate change refugees* on 30 October 2006
- *PM rejects Tuvalu on sea level*, The Age, 20 February 2007
- Alexander Downer *Australia Funds Climate Change Adaptation in Most Vulnerable Countries* 5 June 2007.

Gerda Mark



**ANSI progress,
continued from page 4**

Janis and David have found strong interest in Brisbane for a sustainability centre, where there is the money, the will and developers who want to be involved.

There is the potential for linking with any places which are working for living healthily and sustainably, as well as promoting the national centre being a place where, as Valerie Brown has so eloquently said in her book, people communicate across sectors, respectfully and cooperatively, searching for the core meanings of living healthily and sustainably, and working collectively and innovatively to take the actions needed for a humane and sustainable future.

Wendy Rainbird, ANB Secretary

Meeting report:

Sustainable housing development

Our November meeting launched Derek Wrigley's new book *Climate Change needs Housing Change: why is Australian housing unsuitable for the 21st century?* The launch was combined with a forum on the topic.

Professor John Sandeman, an emeritus professor of physics, started the proceedings with a quick review of the evidence for human induced climate change, and its serious consequences. He concluded that we have a moral duty to reduce our greenhouse gas emissions, being citizens of the country with the worst emissions in the world. Annually, Chinese per capita emissions are two tonnes per person, compared with nine tonnes for an American and eleven tonnes for an Australian. And Canberra is worse than the rest of Australia!

It seems ridiculous as well as immoral, when we could be making so much better use of the sun, as Derek has pointed out in his two books, and various articles and presentations. New suburbs are so badly laid out that 50 to 80 percent of houses cannot have proper solar access. Houses go on being built in inefficient and energy-guzzling ways, taking no notice of building research or even commonsense. Why do smaller numbers of residents per house require ever bigger buildings? Why are houses designed for the car(s) and the garage to get the best solar access? Why do houses always have to face the street?

Discussion became very lively. It quickly became obvious that there are a number of impediments to change. Part of it is sheer inertia, but it is hard to do anything because a lot of things need to change. The regulatory framework needs to change, the planning authority needs to be enabled to plan wisely and not be hamstrung by outdated rules, builders need to understand the importance of the changes, shortages of skilled workers have to be addressed.

Financial institutions could have a lot of influence. Politicians need to understand the problems and their responsibilities. Over all there is a gross lack of leadership. As an aside, it is also possible for very well meant intentions to have unfortunate consequences, such as a recent case where a preservation order on one tree prevented the proper planning of the surrounding area.

At least with Derek's book in hand, buyers can learn what they should be looking for and asking builders to do better. They should not just accept what the market is offering, without complaint. One of the men present pointed out that, acting on the information in Derek's first book, he has been able to reduce his home's energy consumption to a quarter of what it was, and have a comfortable house.

Why indeed do people put up with stupid design and the spiralling cost of houses? Is this really what they want? Derek suggested that a house buyers' association could make a difference, by persuading builders that they are not happy with what they are being offered. Somehow something has to happen, house buyers' association or not. People are now finding that with the internet they can recruit support and take action. Maybe this is what house buyers need to do. They could take advantage of some of the websites that now offer advice on reducing one's footprint, and publicise the benefits offered by better buildings.

Many things could be done. We could look at new forms of housing, co-housing, community housing rather than individual housing for everyone. What about a model retirement complex, utilising Derek's ideas?

Building codes need to be improved and star ratings should try for twenty stars, rather than five. We should have a Sustainability Charter and a Commissioner for Sustainability.

Builders and buyers need to look to the near future, when the inevitable blackouts will occur on hot days, with the potent mix of air conditioners, heat waves and oil depletion. Anyone then with a well planned house and photovoltaic cells on the roof will be the envy of all their neighbours.

Jenny Wanless

A splendid idea!

Crispin Hull, having read Derek's book and writing in *The Canberra Times*, has proposed that a new Prime Minister's Residence should be built showcasing the best in carbon neutral building design.

He also suggested that the current Lodge be retrofitted to show what can be done with existing buildings, in this case one that is eighty years old.

What a great idea!

Climate shifts and the re-forestation of northern Australia to restore former rainfalls

Global warming is increasingly threatening the viability of Australia's agro-ecosystems, its water and food security and our dependent economic and social wellbeing and future.

However far from being an issue that can be addressed progressively over the coming fifty years by reducing greenhouse emissions, the reality is that dangerous climate change is happening now and has already seriously reduced rainfalls in southern Australia.

Australia south of 30 degrees latitude is not in drought, but in a systemic climate shift that has displaced cold moist westerly fronts from Antarctica to our south, decreasing winter rainfall by some 30 per cent throughout southern Australia. Similar serious rainfall impacts are already occurring globally including rainfall increases in some regions, such as in north-west Australia.

Australians and international environmental refugees will inevitably look to Australia's wetter and relatively under-populated north as regions for possible expanded agricultural and urban settlement.

Can northern Australia deliver on such expectations?

Australia has some 698 million hectares (m Ha) of land with over 200 m Ha under tropical savannah woodlands. These savannahs contain over a thousand rainforest patches that have survived from the wetter, more mesic¹ climates and floras that existed up to 4,000 years ago prior to increased fire impacts.

The rainforest patches often occur on similar soils and sites and have dynamic boundaries with the savannah woodlands. The rainforest boundaries often retreat following severe fires or extend under milder fires as soil microbial conditions conducive to increased litter and nutrient recycling, reduce fire

risk and enhance rainforest expansion and growth. The micro-biology of these processes and how they can be managed are reasonably well understood.

As such, these processes can be used to naturally extend and restore some of Australia's northern savannah to their former rainforest climax, reversing some of the ecological impact of the recent more intense fires and rainforest decline. Through extending and seeding new patches it may be possible to restore parts of the savannah into their more bio-productive and bio-diverse rainforests and sustainable agri-systems, naturally, quickly, safely and affordably.

The restoration of such rainforests in northern Australia may also help restore the hydrology and rainfall of much of inland Australia which pollen paleo-data confirms was higher and more reliable prior to the extensive recent intense burning, de-forestation and desertification.

Even today vast quantities of water vapour continue to evaporate from the ocean to the north-west of Australia and flow to the south-east over Australia as the former Australian monsoon. While clouds and some precipitation occurs over the Kimberley, most re-

evaporates and passes over inland Australia without precipitating. Some of this humid air again condenses and precipitates when it reaches still-forested regions in eastern Australia but most is lost over the Pacific.

These monsoon air flows and precipitation processes sustained the moist eco-systems over northern and inland Australia in previous inter-glacials and from 19,000 to 4,000 years ago. While the humid air flows persist, vegetation changes due to intense fires and de-forestation over the past 10,000 years may have significantly altered rainfall processes and patterns.

Can we restore the natural processes that paleo-evidence confirms previously extended the formation of clouds and rainfalls over much of northern and inland Australia and thereby help restore the former more mesic and productive bio-systems?

The formation of first clouds and then rain depends on the sequential availability of two different types of nuclei. Very small (<0.1 microns) cloud condensation nuclei are needed for water vapour to

But the temptation to frame these debates in terms of certainty is fraught with danger. Certainty is an unforgiving taskmaster. It may seem prudent to say when the scientists are certain then we'll know what to do, but it is a mere step from there to say we should do nothing until we are certain.

*David Malone, New Scientist
4 August 2007*

1. a mesic habitat is a type of habitat with a moderate or well-balanced supply of moisture

condense into micro-droplets to form hazes and clouds. However much larger (>1 microns) water-attracting nuclei are then needed to coalesce the thousands of cloud micro-droplets required to form a raindrop heavy and stable enough to precipitate as rain.

Dust and particulate pollution as well as marine and forest aerosols are important as nuclei for the formation of cloud condensation micro-droplets. Ice crystals, salts but particularly certain bacteria, are essential to coalesce the cloud micro-droplets into raindrops and rainfall. Rainfall, particularly in inland warmer regions, is therefore often highly dependent on the availability of such large biological nuclei. Over one billion tonnes annually of these organic nuclei are produced globally, particularly over forests – enough to nucleate 50 per cent of global rainfall.

It follows that deforestation and land management changes can directly alter regional rainfalls by affecting these critical cloud and rain nucleation processes.

Both the higher former rainfalls over much of inland Australia and its systemic shift to dryer desert and savannah over the past 10,000-4,000 years is fully consistent with the paleo evidence that the more intense frequent fires and deforestation resulted in a decline in the production of essential biological rain nuclei and rainfalls. Field studies support this.

For example winter rainfall has increased by some 70 per cent in formerly cleared regions in south-west Queensland that have been allowed to regenerate. The increased rain can only have resulted from the increased nucleation of humid air that has flowed over the desert from the Indian Ocean. Similar associations between forests and enhanced rainfalls relative to adjacent cleared areas occur in south-west Western Australia on either side of the rabbit proof fence. These differences can also be explained if forests increase the level of such biological rain nuclei.

Fires and land clearing, apart from decreasing the production of rain nuclei, may also increase the level of dust and hence the persistent suspended humid hazes of cloud micro-droplets too small to coalesce into raindrops if there are not also the essential biological rain nuclei. Such 'humid haze droughts' have increased across Australia, significantly

lowering rainfalls. Similar 'Brown Hazes' over Asia have also reduced their monsoonal rainfall by some 30 per cent.

Satellite data indicate that the current aridity of inland Australia is due not to a lack of humid air but to the lack of suitable rain nuclei which formerly coalesced and precipitated the available haze micro-droplets into raindrops. Indeed, before extensive human and fire impact, much of northern Australia may have resembled the climate and flora of the Amazon basin where the biological nucleation of humid onshore air flows contributes to the repeated cycling of rain across the basin to support the high rainfall and bio-productivity of the forests. As is the risk in the Amazon now, excessive deforestation and fire in northern Australia is likely to have converted much of its rainforest into open, dryer savannah accentuating further fire degradation, except in the remnant patches.

I've just got back from living with the Penan people of Sarawak, Malaysia, who are losing their lives, livelihoods and their forests because of the outside world buying hardwoods. Forget demonising the loggers, we are the reason these things are happening. What we buy comes from so far away that we have no idea what consumerism is doing to the rest of the world.

*Bruce Parry,
New Scientist, 8 September 2007*

With global warming and the southward displacement of the cold wet fronts from Antarctica as well as more frequent and intense El-Nino events, Australia needs to urgently come to terms with these challenges to its climatic stability, water security and the sustainability of bio-systems. Restoring and enhancing the former natural monsoonal rainfall from the reliable humid

air flows from the north-west may be critical in meeting these challenges and in naturally rehabilitating the fire degraded bio-systems and climates over much of arid inland Australia.

The natural extension and restoration of the rainforest patches and reforestation of parts of the fire-degraded savannahs of northern Australia may provide an opportunity to restore natural rain nucleation processes and so enhance and secure regional rainfalls safely, naturally, at minimal cost and with significant ecological, economic and social benefits.

The natural forests and agro-systems that could be expanded in inland Australia through this proposed strategy could potentially bio-sequester over a billion tonnes of additional carbon per annum. This could generate over \$50 billion annually in potential carbon credits. The national returns from such forest and rainfall restoration, together with the associated dividends from improved water security, bio-diversity,

habitat and eco-systems services, should greatly exceed the modest projected costs of catalyzing such natural ecological restoration.

A re-forestation program also has the potential to generate major employment and multiplier benefits and provide the foundation for sustainable new biomass-based industries. These may be critical in remote regions in sustaining communities with the decline in cheap fuel oil.

The strategies and skills involved may also be of major relevance and interest internationally.

Such a natural re-forestation strategy may also be beneficial globally in creating a major new carbon sink and bio-habitat resource to offset the rampant destruction of natural rainforest within the wider region. It may also be beneficial in enhancing the resilience and viability of much of Australia's inland environment and economy in the face of the serious current and pending climate shifts and its impact on current farming systems.

Clearly humans, over millennia and through their impacts through burning, de-forestation, land degradation, desertification and more recently greenhouse gas emissions and pollution have fundamentally altered many natural eco-systems and processes. These impacts now risk the viability of many of these eco-systems and dependent populations, particularly their own.

Due to ocean lag effects and the long residence time of greenhouse gases, we can no longer avoid dangerous climate chaos by 2030 by just reducing future greenhouse gas emissions. We are at least 20 years too late for such reductions to be effective. However this does not waive our responsibility for mitigating the impact of our emissions. We simply must find more effective ways of avoiding their pending dangerous consequences in time.

As previously outlined (*Nature and Society* December 2006), the restoration of the natural cloud and rainfall dynamics over much of northern and inland Australia may be significant not just in restoring natural bio-systems, water and food security but in directly and rapidly mitigating global warming. Dense clouds, through their albedo effect, can reflect up to 90 per cent of incoming solar

radiation back out to space significantly cooling vast regions. Indeed increasing mean cloud cover by just 3 per cent could reflect enough heat back out to space to cool the earth equivalent to restoring CO₂ levels and their greenhouse effect back to pre-industrial levels. Such cloud cooling effects can occur relatively quickly, not the 50-100 years needed to reduce CO₂ levels.

Our challenge is simply to restore the natural water and heat dynamics that drive such clouds. We can do this simply, cheaply, naturally and safely by restoring strategic forests and the transpiration and particularly the nucleation processes that govern cloud formation, cloud albedos and rainfalls. Restoring such forests simply involves the intelligent application of proven restoration ecology skills and our understanding of these eco-systems and regions.

Our secular, rational, industrial society, with its amazing scientific insight and technological skills, has established the first radically anthropocentric society and has thereby broken the primary law of the universe, the law that every component member of the universe should be integral with every other member of the universe and that the primary norm of reality and value is the universe community itself in its various forms of expression, especially as realized on the planet Earth.

Thomas Berry

The Dream of Earth, 2006, p.202

Just as valuably, such strategies can also be implemented by communities regionally to both protect and enhance the resilience of agro-ecosystems in the face of pending climate impacts. Such action is not dependent upon political responsibility, initiative or international agreement.

All that is required is for communities to take responsibility, critically review the reality that they are facing and take appropriate effective regional action, hopefully in time.

Walter Jehne

Certainty

As every climate scientist knows, there will always be facts that won't fit even the best model of global climate. That's the nature of models and the weather – and it illustrates just how badly we can be led astray by the fiction that science is about certainty. If we are honest and say the scientists' conclusions aren't certain, we may find this being used as justification for doing nothing, or even to allow wriggle room for the supernatural to creep back in again. If we pretend we're certain when we are not, we risk being unmasked as liars.

David Malone, *New Scientist* 4 August 2007

Book reviews:

Under a Green Sky

by Peter D Ward, Smithsonian Books, 2007

Peter Ward has spent his working life studying the rocks that contain the evidence for the mass extinctions that have punctuated the story of life on earth. Along the way he was one of the geologists who helped to find proof for the Alvarez hypothesis that a meteorite impact caused the demise of the dinosaurs at the end of the Cretaceous period, the mass extinction that really resonates with the public. When this hypothesis was resoundingly confirmed in rocks all around the globe, geologists and others wondered whether similar impacts had caused all or most of the other extinctions also recorded in the rocks.

This book provides an interesting view of the working life of a geologist, in a chatty and readable style. It also reveals the changes in geological thinking which have been forced on geologists by the evidence available to them in the rocks. In Ward's own case, he did not stop with the rocks, but also dived in tropical waters, to link the evidence in the rocks with the evidence in today's oceans. The conclusion Ward and his colleagues have reached is striking, and a matter of no mere academic interest but of tremendous importance for us today.

Their conclusion is that the famous K-T extinction of the dinosaurs is the only one that was caused by meteorite impact. Their evidence shows that the other extinctions, including the most deadly of all at the end of the Permian, but also the late Cambrian, Ordovician, Devonian, Triassic and other minor ones, were all caused by rapid greenhouse events. Geologists had postulated that the great flood basalts that coincided with many extinctions had indeed caused them. Ward and others have shown that it was the massive outpourings of carbon dioxide and methane by the volcanic events that triggered the extinctions. As the world warmed so did the oceans, causing a shut down or at least major change in the oceanic conveyor belts. This allowed the ocean to become anoxic and the atmosphere poisonous.

Ward has written this book because he has seen the clear parallels between what vulcanism has accomplished in the past, and what humans are

doing now. As he says, it does not matter whether the greenhouse gases are released by vulcanism or by cars and other human activity. Already we can see the temperature rising, oceanic circulation shifting and possibly shutting down, even large dead patches in the ocean. It is ominously like the conditions that triggered almost all of the mass extinctions of the past.

This book is Ward's cry to his fellow humans to take notice and take action.

Jenny Wanless

ACT otherWISE (Sustainability and Health Project)

A couple of years ago NSF received a Healthpact grant to run a workshop to assist community groups in developing projects that could compete for ACT Department of Health funding. ACT otherWISE is one of the many successful Sustainability and Health projects that resulted from this process.

ACT otherWISE started in 2006, and its recent project summary shows us a very enthusiastic and active group. They now have 130 young Canberrans on their network list, and have initiated a number of projects. These have included training young people to be facilitators to help other groups. They have run many workshops, some for Venturer Scouts and Orana School, others at the Griffin Centre and at the 2007 Youth InterACT conference.

Other activities have included making a documentary on Uranium for the information of other youth. They are also running sewing workshops and organising clothes swap events, which are social as well practical in nature. Other purely social events also help to develop networks, improving support and therefore the health of their community.

They have worked with and been supported by several other ACT organisations, and have been successful in getting grants to continue with their work. The latest grant from ACT Environment will enable them to keep going for the next three years, and will fund the employment of a part time worker for the next six months.

Congratulations to these energetic workers, who are making a difference in their local community.

On Borrowed Time: Australia's Environmental Crisis and What We Must Do About It

David Lindenmayer, Penguin Books, 2007

David Lindenmayer argues in this book that Australian society with its increasing urbanisation is culturally disconnected from nature. This disconnection has been a driver of ecological destruction. In just 220 years, Australia has had biodiversity loss that is second to none, and we lead the world in recent mammal extinctions, and the number of threatened species per capita. During the early 2000s it has been estimated that around 2 million mammals, 8.5 million birds, and 89 million reptiles died annually in Australia as a direct result of land clearing.

At a hard-headed pragmatic level, Lindenmayer argues that if our environment, and plants and animals continue to be destroyed, the impact on our economy, agricultural productivity, tourism and national heritage will be devastating and irreversible. As he says: "*This is the real bottom line.*"

Biodiversity's 'ecosystem services' include pollination, pest control, soil production and protection, and storage and cycling of essential nutrients. A number of examples from the 2001 State of the Environment Report are quoted, including commercial fisheries valued at \$2.3 billion and honey production at \$300 million. The rivers, wetlands and flood plains of the Murray-Darling Basin are estimated to provide \$187 billion in ecosystem services annually, as compared with Australia's GDP of around \$700 billion in 2001.

The first three chapters of the book provide a primer on 'the good, the bad, and the ugly' aspects of biodiversity in Australia. The good canvasses the immense mega-diverse nature of Australia's animals and plants, supported by attractive photographs. The bad and the ugly address the scale and urgency of the problems (as reflected in the title of the book), from land degradation to invasive plants to altered fire regimes. He says "our lack of action to date is *exasperatingly* ugly."

A final large chapter of the book is devoted to 'the hero', and puts forward ten key environmental problems in Australia, with ways forward suggested.

These are big picture policy actions of the kind that Nature and Society Forum has also been promoting.

One major problem is a failure to invest properly in our environment, with an environmental policy surplus and an implementation deficit. An example of a needed action is the restoration of vegetation and the repair of landscapes in the wheat and sheep belt at a scale needed to tackle the area's major problems of salinity and soil erosion. Another is quick action to remedy the setbacks to adequate research and monitoring as have occurred at CSIRO. Lindenmayer suggests various options to assist funding such as a land management levy, a nationwide environmental lottery, and more favourable tax treatments for environmental donations.

Another key problem is the lack of understanding about the environment upon which humanity

depends. This lack of ecological literacy is all too apparent in many politicians who have a very narrow economic mindset. Lack of a deep understanding of environmental issues

Are we going to continue destroying the planet, just to be somewhat more comfortable for a little while?

Dmitry Orlov

Quoted in the movie What a Way to Go

encourages many of them to propose bandaid solutions to problems, without addressing the underlying causes. Much greater attention to environmental education for the whole community is required, together with the greater involvement of the community in the ownership and resolution of environmental problems. Such increased widespread understanding will no doubt facilitate the increased funding priorities mentioned above.

Yet another crucial issue is the need for a strategic response to climate change. The biodiversity losses associated with climate change are expected to be enormous, but we don't have the proper strategies in place to deal with the problem. Preparing Australia for the consequences of climate change is critical, not only to protect our unique animals and plants, but also to prepare resource-based industries such as forestry, fishing, agriculture, and tourism.

The book ends with the statement that "biodiversity loss is the most significant environmental problem facing Australia." In parallel, James Lovelock, in a recent speech to the Royal Society in Britain, deplores the conceptual separation between the geosphere and the biosphere that has led to a lopsided focus on just emissions reduction. The place of natural ecosystems has been lost, and the consequences of removing forests for farmland, and

their role in sustaining a stable climate, are not sufficiently understood.

David Lindenmayer is Professor of Ecology and Conservation Science at the Australian National University. His CV is a stellar one, with many prestigious awards. The book is intended for a wide audience and easily readable – as Paul Ehrlich says on the front cover: “This wonderful book should be read by all Australians.” I like its Australian biodiversity overview and its broad policy action approach.

Murray May



Switching off

Mackay argues that the cumulative effects of all the change he describes has combined with a rising tide of prosperity at the turn of the 21st century to induce Australians to disengage from big issues. A sense of powerlessness began to affect the national mood, and this intensified after the terrorist attacks on the United States in 2001 ...

In the midst of these and other global horrors, we began to master the art of “switch-off”, focusing inward on domains we could control: our homes and gardens, our own bodies. In a world which called on us to live with high levels of ambiguity and unpredictability, we began to yearn for the magic simplicities of fundamentalisms of all kinds, and to make out our credit cards to indulge our desire for the soothing balm of narcissism.

Shelley McInnis, *Canberra Times*, 6 Oct 2007 reviewing Hugh Mackay’s *Advance Australia – Where?*

Day in and day out, television provides us with examples of the exceptional. Should we be surprised that we’re left feeling rather unexceptional? ... Television seems to intensify a sense of relative deprivation and distorts our sense of where we stand in various pecking orders and hierarchies, such as age, appearance and social influence ... Our society’s growing melancholy comes from the increasing gap between reality and expectations raised by vague, ambient, emotive images over time. As the electronic delivery system of distorted points of comparison, television acts as a false reflection of the outside world ... Loathing yourself can be even easier if you watch a lot of television awash with the beautiful people.

Aric Sigman
Remotely Controlled, 2007
p 190 – 192, 269

Remotely Controlled

Aric Sigman, Vermillion, London, 2007 edn

- Children under three should see no screen entertainment
- After this age, television viewing of good quality programs should be limited to an hour a day
- Teenagers should be limited to one and a half hours a day
- And for adults, two hours a day.

These recommendations are for all screen use (DVDs, computer games etc.) for normally healthy people. For people with ADHD, obesity, suffering sleep problems, attentional disorders or depression, the daily viewing time should be considerably less.

These are the clear recommendations reached on page 262 after Dr Aric Sigman’s comprehensive survey of the effects of television viewing on mental, physical and social wellbeing, drawing mainly on evidence from the US and the UK.

Sigman – like Jerry Mander before him (*Four Arguments for the Elimination of Television*, 1977) – makes it clear that abundant and authoritative medical and epidemiological research shows that program type (documentary, soap opera, sport, news, game show) makes little difference to the well-being outcomes. Mander, in fact aims directly at what

might appear to be the most difficult target, the David Attenborough type of natural history program and other documentaries to demonstrate the harm the medium does. Sigman shares Mander’s position that news and documentary programs distort reality in order to arrest and hold the viewer’s attention. In fact, these programs are more insidious in their impact: they get past our guard as, although we

What we inherit from our fish ancestors

Our time as fish has left us with one central spine, two arms, two legs, jaws, teeth, lungs and the habit of both eating and breathing through our mouth.

From Chapter 6 of *Your body: The fish that evolved*, by Dr Keith Harrison, 2007

expect special effects in dramas and exaggeration in advertisements, we assume documentaries are not significantly enhanced, edited, cut, spliced and scripted.

Sigman also deals directly and at length with those who reject the sort of viewing restrictions he proposes. He says we need to conceptualise all time spent watching television as a health hazard and to think in terms of dose and overdose, pointing out that most of the negative effects of television reported in the medical literature are associated with watching two hours a day or less. Experts (usually in media studies, not the research team) call for “everything in moderation” and he asks what the comforting term “moderation” means when it applies to our children’s health and well-being. He points to the fact that most people enjoy television and find it soothing, so they easily rationalize what is – according to the medical literature (though not the societal norm) – abuse of the medium by themselves and others. Sigman spends some time debating how “abuse” is defined in other medical contexts and demonstrates its applicability to television viewing.

Among many physiological systems, Sigman looks closely at the endocrine system and at how television distorts the natural occurrence of dopamine, growth hormone, ghrelin, cortisol, adrenaline, oxytocin, melatonin, leptin and prolactin. He shows how television may stimulate particular hormones which, in turn, cause early onset of puberty.

Sigman, being the parent of a young daughter, is wisely inclined to give special attention to early childhood development. He quotes the Jesuits’ adage “Give me

a boy till the age of seven and I will show you the man” and then explores the effects of giving a child to television for four or more hours a day when the growing brain and developing mind are at their most plastic.

As one example of many the author uses to illustrate the way television distorts social reality and marginalizes victims, Sigman examines the depiction of divorce in television dramas. As a psychologist, Sigman is well aware of the trauma of dissolving adult relationships on children and the prolonged unsettling in the years following divorce. And yet on television divorce is portrayed as a lifestyle option; a television drama simply doesn’t provide enough time to depict it in any other way. He points to the unremittingly positive stereotyping in television dramas of children in divorced families. He

pinpoints American programs in which a young boy typically meets his mother’s new love-interest who address the boy with “Hey big guy”, throws him a football and they bond and are soulmates before the end of the episode. In other programs the man picks up one of the children and the child takes to him without batting an eyelid – despite the fact that many children in this situation in real life have been physically abused.

Sigman argues that we prefer television portrayals of lifestyles which leave us feeling good; we are comforted by programs which show that divorce doesn’t affect children as much as evidence from the real world indicates. Program producers don’t want their plot lines straying off into confusing or unresolved tangents or conflicting with their own highly-divorced lifestyles.

Television is unique, the perfect medium to produce strong [neurochemical] rewards for paying attention to something. So what is so powerful about this reward? Compared to the pace with which real life unfolds and is experienced by young children, television portrays life with the fast-forward button fully-pressed. Rapidly changing images, scenery and events, and high-fidelity sounds are overly stimulating and, of course, extremely interesting. Once you are used to food with salt, sugar and monosodium glutamate flavour enhancers, real food doesn’t taste as interesting. Television is the flavour enhancer of the audiovisual world, providing unnatural levels of sensory stimulation. Nothing in real life is comparable to this. Television overpays the young child to pay attention to it, and in doing so it seems to physically spoil and damage his attention circuits. In effect, television, regardless of program content, corrupts the reward system that enables us to pay attention to the other things in life.

*Aric Sigman
Remotely Controlled, 2005 p 21*

What we inherit from our amphibian ancestors

Our time as amphibians has left us with a bendable neck, elbows, knees, wrists, ankles, five toes on each foot and five fingers on each hand. This was also the time when we lost our fins, our gills and most of our fish scales.

From Chapter 7 of *Your body: The fish that evolved*, by Dr Keith Harrison, 2007

Drawing on his own experience in television production, Sigman describes how television producers despise individual viewers who write in with comments on their programs – a depressing but believable part of the book.

The author does not shy away from providing useful guidance on selecting the better television programs and movies for children; in doing so he also proposes criteria for those that should be avoided. He goes further than this and shows just how children should watch these shows to minimise the risk of harm. In doing so he does not make it easy for parents as he has a role for them no less demanding of time, judgement and interaction than required for reading to children. But we know that good parenting cannot be replaced by electronic media.

The writer of this review has watched no more than ten hours of television a year since reading Jerry Mander's book in the 1970s. He found this update on the deleterious effects on health and well-being, which have been backed up by research not available when Mander wrote, convinced him that his television-free choice 30 years ago was – and continues to be – the right one.

Keith Thomas

The mystery of the missing carbon

Cores from permanent ice and ocean sediments show that there have been six fairly regular ice-age cycles in the past 650,000 years due to slight variations in the elliptical orbit of the earth around the sun¹, each 100,000 year cycle consisting of a warmer “greenhouse” era followed by a cooler “icehouse” one (Fig.1). A strange feature of each greenhouse-icehouse transition, when most high-latitude forests were disappearing under snow and ice and taking less and less CO₂ from the atmosphere for want of light, was that CO₂ tracked temperature all the way to the next icehouse. How, asked Ruddiman¹, did the atmosphere lose ~700 billion tons of CO₂ at each transition? He concluded that the deficit (~14 million tons per year for ~50,000 years) must have gone into the ocean, which occupies over 70% of the earth's surface and contains most of its CO₂. Another interesting feature is the asymmetry of consecutive transitions: while CO₂ tracked temperature from icehouse to greenhouse, it lagged well behind from greenhouse to icehouse. What is the meaning of those patterns and how relevant are they to today's greenhouse warming?

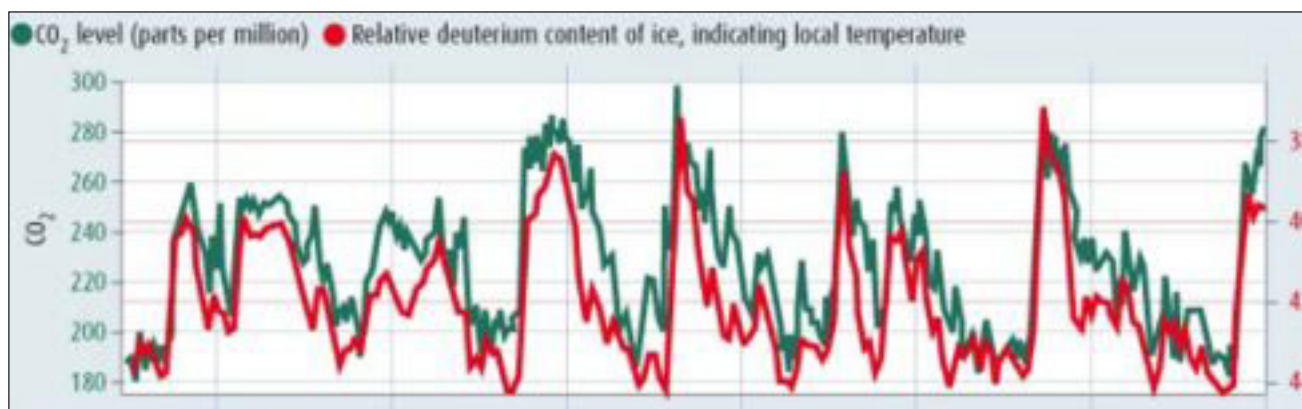
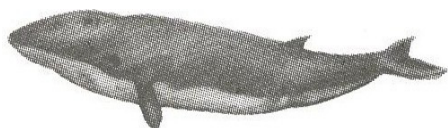


Fig.1. Periodic cycles in temperature and atmospheric carbon dioxide over the last 650,000 years².



Here we show that the sea-ice which forms around Antarctica each winter – a vast expanse of ~15 million km² – could account for those “anomalies” and we identify several strands of knowledge which, when considered in a common context, support that proposition. CO₂ dissolves more readily in cold seas than warm and, in the Antarctic, brine is extruded

What we inherit from our reptile ancestors

Our time as reptiles has left us with a waterproof skin with no scales, a lumbar region of our spine with no ribs, elbows and knees that bend in opposite directions, an eardrum and the first stages of becoming warm blooded.

From Chapter 8 of *Your body: The fish that evolved*, by Dr Keith Harrison, 2007

from sea-ice as it forms, raising the salinity (and density) of the underlying water. Enriched with CO₂ and oxygen, this cold, saline “Antarctic Bottom Water” sinks to the sea-floor under its own weight and circulates through the deep-sea basins of the global ocean, ventilating the abyss.

Matrices within the sea-ice created by brine extrusion become colonised by siliceous algae and bacteria³ whose annual uptake of dissolved CO₂ has been estimated at ~66.5 million tons⁴. Summed over the duration of a greenhouse-icehouse transition, (say 50,000 years), this could account for the loss from the atmosphere that Ruddiman identified. Furthermore, when sea-ice melts each summer, the algae it contains escape with melt-water as sticky, organic aggregates, which sink quickly to the deep-sea floor⁵, the habitat of a rich, recently discovered benthic fauna⁶.

One could think of the mechanism as a biannual two-stroke “carbon pump”, the first stroke drawing brine from sea-ice, increasing the density of the underlying sea causing it to sink, the second stroke drawing organic aggregates from ice-melt to the sea floor nourishing the bottom fauna.

There are two possible reasons why CO₂ lagged behind temperature in greenhouse-icehouse transitions: first, the time Antarctic Bottom Water takes to complete its deep-sea circuit and return its load of CO₂ to the atmosphere (~1000 years); second, the time it takes for sea-floor animals to die and decompose when the sedimentation of algal aggregates from ice-melt comes to a halt. In both cases, the common denominator is the retreat of sea-ice as icehouse yields to greenhouse.

The earth has been exposed to alternating greenhouse-icehouse cycles for millions of years⁷, during which long period there were several well-known species extinction events, mostly during greenhouse eras⁸, at least three of them when global temperature was rising rather sharply⁷. The most severe of all (~250 million years ago), which wiped out most life on earth, is thought to have resulted from poor ocean ventilation, anoxia, and widespread mortality of the bottom fauna, generating hydrogen sulphide gas which rose to the surface and poisoned

the atmosphere⁹. If that is true, then any future downward trend in the formation of Antarctic sea-ice is cause for much concern.

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Acknowledgements I am indebted to Dr Stuart Godfrey (ex-CSIRO) for leading my early thoughts on this subject in the above direction.

David Tranter

What we inherit from our four-legged mammal ancestors

Our time as four-legged mammals has left us with a waterproof skin with warm blood, hair, perspiration, breasts, pendulous testicles and the ability to rotate our shoulders in opposite directions and to touch our toes. We also develop in our mother's womb and no longer from an egg in a nest, and we drink milk as newborn infants.

From Chapter 9 of *Your body: The fish that evolved* by Dr Keith Harrison, 2007

Innovation and Invention

With the twentieth anniversary of the signing of the Montreal Protocol this year, it is worth considering the career of Thomas Midgley Jnr. Midgley was a mechanical engineer and chemist of note, but now is considered a cautionary example of what not to invent.

In 1922 Midgley received a medal from the American Chemical Society for his discovery that the addition of tetra-ethyl lead to petrol prevented knocking and improved the power of internal combustion engines.

In 1930 General Motors asked Midgley to find a replacement for the dangerous volatile chemicals used at the time in refrigerators. He developed dichlorodifluoromethane, a totally safe and inert gas. He was rewarded with the Perkins Medal in 1937, the Priestly Medal in 1941 and the William Gibbs Medal in 1942.

Even at the time there was some doubt about the wisdom of adding lead to petrol, which is why its trade name, Ethyl, did not mention lead. There was no conceivable problem with the wonderful new refrigerant, at least not until the British Antarctic Survey reported finding the ozone 'hole' in 1985.

At the age of 51, Midgley contracted polio, and this time he really was unfortunate. He was bed ridden, and invented a complicated contraption of ropes, pulleys and levers to manoeuvre himself in bed. He became entangled in this and strangled himself.

It is unfair to laugh at Midgley or to blame him for the harm his chemical discoveries have caused. In both cases he had provided society with much appreciated products, that only later proved to cause major problems. In that light much of what we have traditionally regarded as the glorious history of human endeavour, invention and progress must also be considered a failure.

There is certainly a case for deploring the invention of the steam engine, electricity generation, the internal combustion engine, mass production, heavier than air flight, plastic and almost everything we associate with modern life. Someone recently even suggested that the first person who deliberately saved seed and planted it should have been buried with the seed. Yes, even that act started deforestation, and human induced climate change can be traced back to that time.

Of course killing that one innovator would not have stopped the development of agriculture, which developed many times, and in different places. Throughout history there have been many examples of parallel invention, several people developing the insight at much the same time. The time itself was right, the necessary prior knowledge had been achieved and humans are inherently creative.

Mobile phones have positive network externality (the utility of my phone increases every time someone else buys a mobile phone) - the holy grail of 21st century economics. Cars are so 20th century - they have negative network externality (the utility of my car goes down every time someone else buys a car thereby driving up my congestion, etc). Cars - just say no!

N Goddard, writing on a Grist blog 29 October 2007

The vast majority of people alive now would oppose being deprived of all their modern amenities (of course they would not be alive now in such numbers if the inventions had not occurred). Anyway it would be horrible to have to regard all of humanity's inventive genius as having produced nothing but disaster. So we must look at Midgley's case, and

start assessing all developments to see how benign they are, and work hard at reducing all malign aspects.

We have the good example of the Montreal Protocol to show that humanity can cooperate and agree on restorative measures. But we also need to note that such action takes a lot of goodwill and more time than we hope it will. After the signing of the Protocol it was estimated that the ozone hole would be fully repaired by 2015, now it is apparent that the process will take until the 2070s.

Jenny Wanless

What we inherit from our tree-dwelling primate ancestors

From our tree-dwelling ancestors we have inherited grasping hands with an opposable thumb and great manual dexterity, fingernails and fingerprints, an extremely wide range of arm movement including a rotatable forearm, a prominent collarbone, a large big toe, an ability to balance on our hind legs, a very mobile neck, forward-facing eyes and depth perception, the ability to distinguish red from green and permanently displayed male genitals. This was also the time we lost our ancestral tail.

From Chapter 10 of *Your body: The fish that evolved* by Dr Keith Harrison, 2007

Farrago

Carteret Islanders

The Carteret Islands are a low lying group located 86 km north-east of Bougainville in the South Pacific, with a population of about 2,500 people. The islanders are amongst the first environmental refugees. Although the islanders have built sea walls and planted mangroves, storm surges and high tides are washing away homes and vegetable gardens, and contaminating fresh water supplies.

The Papua New Guinea government has agreed to resettle the islanders, ten families at a time, on Bougainville. The evacuation started in early 2007, and is expected to continue until 2020. However the islands are expected to be completely uninhabitable by 2015.

Aim High the newsletter of
Australian Ethical Investments
Spring 2007

Grasses help clean up

Soil microbes will break down various toxic hydrocarbons, including spills of diesel fuel, but with help from some grasses they can work more quickly. Sharyn Gaskin, a PhD student at Flinders University, has been experimenting with nine species of Australian native grasses and finds they perform well.

The grasses secrete compounds that stimulate microorganisms that already inhabit the root zone. The grasses themselves are hardy and fairly easy to grow. They have dense root systems and top cover so they also stabilise the soil.

Three of Gaskin's grasses were particularly effective, but it seems that different species work better for different hydrocarbons. While it would be preferable to use species that are indigenous to the area being remediated, this may not always be possible.

Grasses provide a low cost technique promising remediation of mines and industrial sites, and compare favourably with alternatives in effectiveness and length of time needed to achieve the result.

Australasian Science, September 2007

The terrible implication is that a relentlessly declining fuel supply will almost certainly have devastating economic, social and political impacts. Trade, manufacturing and farming will be hard hit. No nation is prepared to deal with the high prices and shortages for energy that will soon begin to work their way through the entire global economic system. Richard Heinberg, 4 November 2007

The Honey Bee Network

Twice a year Anil Gupta of the Indian Institute of Management goes on a week long Shodh Yatra, or 'walk to find knowledge'. With his team he travels to remote regions of India, consulting community organisations, local-language newspapers and other sources, looking for grassroots innovations invented by people to help in their daily lives.

The inventions have usually been the product of adversity, and poverty. Geography and language often prevent the inventions from reaching a wide audience. The inventors may even have been ridiculed by their communities for daring to innovate, rather than to just put up with the problem, like everyone else.

Gupta set up the Honey Bee Network twenty years ago to help promote such innovation. The network

connects the inventors with each other and with academics who can test the products and help with patents and business plans. The network is already the repository for more than 10,000 inventions.

One item in this collection is a pedal-powered washing machine, the outcome of the frustration of a fourteen year old schoolgirl. She had found that the time taken to wash

clothes by hand was preventing her from getting on with her studies.

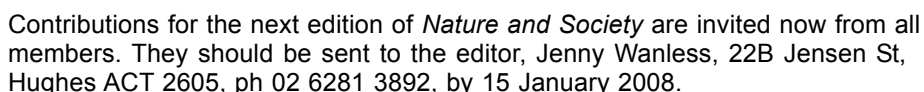
Another example is a bicycle that goes faster when ridden on a bumpy road. The inventor lived in a remote mountain area. Energy from the shock absorbers is used to help turn the pedals, via a set of springs. In the latest prototype, this energy charges batteries, creating an electric bike.

This year, for the first time, Gupta is going abroad for his Shodh Yatra, to the region around Newcastle, north-east England.

New Scientist, 22 September 2007

You can start [dealing effectively with reality] by taking all the mental effort that you are currently wasting on the subject of cars, and how to run them on fuels other than gasoline, and instead focus your energy on how to rescue our political institutions so that a truly informed public can reconstruct a bankrupt society into a living and credible republic.

*James Kunstler,
in his weekly internet bulletin
3 September 2007*



Items in *Nature and Society* do not necessarily reflect the opinions of the majority of the Forum members, but are published in the hope of stimulating thought and discussion.

Jenny Wanless and Keith Thomas prepared this edition together with the named contributors; Jenny and Keith also contributed the unattributed items and provided the quotations.

ANSI: The National Sustainability Initiative is working towards the establishment of a working display site in Canberra that addresses all aspects of sustainable building and lifestyle. Contact Wendy Rainbird

Social Change Project: interactive website to be launched in February, to provide authoritative information on social and environmental issues for public discussion. Also kits on the same lines for use in discussion groups. Contact Stephen Boyden

SEE-Change: community based discussion and action groups to encourage local involvement in sustainability activities. Contact Bob Douglas

Sustainability and Health project: a number of groups focussing on different aspects of this topic, including art and transport, youth film makers, local communities. Contact Valerie Brown

Climate Friendly Planning and Housing: extending knowledge of how to build or retrofit houses to use less water and fossil fuel energy while enhancing liveability. Contact Derek Wrigley

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