

Nature & Society

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Editorial

Anyone who attended the Australian Academy of Science's annual symposium in May would probably answer Yes to the question posed in its title '*Dangerous climate change: is it inevitable?*'. The dramatic reduction in Arctic sea ice shown in one presentation graphically confirmed that dangerous change is well under way. Another pointed out that coral reefs, including the Great Barrier Reef, will die in the near future from the twin perils of global warming and ocean acidification. This will affect millions of people, from those who rely on tourism for their livelihood to those who rely on the reefs for their daily food.

Considering these sobering presentations it is shocking to realise that the heads of the fossil fuel industries are pressing the Australian Government to try to ensure that their industries are not damaged by any measures taken to reduce the country's emissions. Their actions are reminiscent of the actions of tobacco companies that denied that their products kill people and that are still peddling their dangerous products, without any apparent qualms of conscience.

While many people may not be interested in the welfare of people other than their own kin, or their own group, many other people are concerned about the plight of others, as is shown by the reaction to natural disasters. How strange, then, that so many people consider that their own present prosperity is more important than the welfare, or even the survival, of their own children or grandchildren.

Some commentators think that this strange conjunction is the result of a failure of imagination. Those who refuse to recognise the need for change simply cannot imagine that the world they know will not go on and on. They can neither envisage another form of society

nor can they envisage the collapse of the earth's life support systems.

On the other hand maybe their imaginations are too vivid. They imagine that the world with all its natural systems is like a magic pudding, a kind of cut and come again bonanza that thrives on being consumed. Or their imagination is so unbounded that they think human ingenuity can overcome every obstacle, even those presented by a finite planet and the laws of physics.

We are cutting down our world, like lumberjacks in Eden. And the consequence of that plundering will be a desert, if we do not exercise our rationality to control our Darwinian drives to consume and to reproduce as much as possible.

Peter Hall, Lumberjacks of Eden, 2007

The continuing rise in oil prices has exposed the woeful lack of understanding of the real world shared by both the Federal Government and the Opposition. From their statements and proposed actions they seem to be

living in some sort of Wonderland. Either that, or more cynically, they do not want to alarm the citizenry by admitting the truth – we are running out of oil and life as we know it now is bound to suffer radical readjustment. There is no sign of a sensible plan for enabling society to function into the future.

How do you engage such people with the reality of earth system change? How can you persuade them that it is possible to organise society and the economy differently, in ways that satisfy human needs without damaging earth's life support systems?

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When plain facts allied with vivid pictures of what is happening fail to move them, would they be scared into action by possible scenarios of a desolate earth, as shown by geologist Peter Ward's descriptions in *Under a Green Sky*? Would they be moved by Jeremy Leggett's fable of the blue pearl in *Half Gone*? Would they be attracted by stories of the way changes in lifestyles can actually improve human well-being? Would they be impressed by the stories of many successful businesses, such as Interface Carpets, that have found that they prosper as they reduce their environmental footprint?

Of course companies whose business depends entirely on mining or burning fossil fuels will not benefit under carbon trading if they stick to those fuels, but they would profit if they started moving into alternatives. They, and the whole of society, would benefit by promoting a distributive power system in which other energy sources supply local power and also feed into the grid. This could help local communities, while it reduced the likelihood of major power system failure when something goes wrong in one part of the centralised grid, an experience that has occurred in North America and China, and is possible anywhere.

Horrible visions of the future could come true if society as a whole continues with business as usual, with growth as its mantra. Fortunately there are other ways forward, but they will need a much firmer commitment to the future than anything any government has yet endorsed, underpinned by a much greater understanding of the biological realities involved in the survival of a living world.

Improved understanding of the risks we face is not helped by turf wars such as whether global warming or increasing carbon dioxide concentrations come first. Few things on this earth have a single cause and most are part of feedback loops. There is no doubt that increasing greenhouse gases cause more global warming. There is no doubt either that higher temperatures cause rises in carbon

dioxide and methane concentrations, as the gas is released from sinks such as permafrost, soils and the ocean. Arguing which is the primary problem allows governments and business to do nothing 'because the jury is still out'.

Let us face the fact that business as usual in industry, the energy sector, transport, farming, land clearing and logging of old forests are all harmful - as too, let us not forget, is business as usual in our homes and at work, where we demand the services and products of government and industry. The important thing is that there are better options that need to be implemented and implemented soon. The question is how do we get government and industry to realise that and act now? How do we get them to realise that the earth is not a magic

pudding, but the home of intricate and wonderful natural systems that are essential to the future existence and well-being of all life on earth, including humans. If they have any interest in their own children, let alone future generations, they need to stop arguing and start acting as responsible global citizens now.

Jenny Wanless

How long before we're locked into a spiral of living beyond the interest from our natural capital and eating into the capital itself? No one knows for sure, but the scientific consensus seems to be converging on a figure somewhere around twenty five years from now. If we haven't stopped haemorrhaging natural capital by 2030, we may not have enough left to choose a different path.

*Alex Steffen
Worldchanging, 2006 (p. 17)*

Population and probabilities

All of our infectious diseases came from other animals; the most recent one of course is AIDS and the chances of a transfer going on depend very heavily on not just the closeness of the contact but how big the human group is where the transfer is made. So, what are the probabilities of transfer? There's a better probability of transfer if there are 1000 people in the area than if you have 10. After it's in there, what are the chances of it becoming established? Again, much higher if you have 1000 people than if you have 10. You may remember work that Bob May in part did years ago showing that you had to have a city of somewhere between 50,000 and 60,000 people before measles could take hold and persist, otherwise people became either dead or immune so fast that the disease died out.

Paul Ehrlich extemporizing at the Ecological Society of Australia conference Perth November 2007

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Tel: +61 (2) 6125 2526

Fax: +61 (2) 6125 1756

E-mail: office@natsoc.org.au

Website: www.natsoc.org.au

Where we are

Room E-319-A in the old building of the John Curtin School of Medical Research at the Australian National University in Canberra.

From the entrance use the intercom phone to call the NSF office on extension 52526.

By car: There is a two-hour car park in Balmain Lane, 300 metres to the south of the office.

By bus: The 34 bus from Civic drops you off at the foot of Eggleston Road. Walk 250m south up the hill and turn right; from there the entrance to the building is visible.

By bicycle: Plenty of bicycle parking on the ANU campus.

Annual General Meeting – 2008

NSF's annual general meeting will be held on Wednesday 17 September. This early warning is needed because the August-September issue of *Nature & Society* will be several weeks late, too late for the legally required notification date. It would be very good to have some new faces on the board. I, for one, would like someone who is prepared to do the job, take over as secretary. While I am happy being editor I am a very nominal secretary, leaving most of the work to Keith.

Jenny Wanless

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 to help you locate the venue.

Wednesday 18 June - Whole-of-community involvement in transformational change: an interactive workshop on collective thinking and action. This workshop has been applied recently in a number of circumstances to bring together the areas of health promotion, community development, environmental management, professional extension, and strategic planning, in communities all over Australia. These are the areas of action required if we are to achieve NSF's mission of healthy people on a healthy planet.

To achieve effective whole-of-community change, all of these fields will need to pool their distinctive contributions. Individual change agents, community interests, specialised advisors, organisational power-brokers and holistic or integrative thinkers will need to work together over the long term in any effective sustainability program. The workshop will involve all participants in designing a sustainability action plan for climate change in the ACT. The plan will be based on creating synergies between these interests in a collective social learning spiral.

Venue: the ANU Emeritus Faculty. A map showing the venue can be found on the ANU website. The building is called the Fellows Lane Cottage and is building 3T on the website map. Fellows Lane runs off Fellows Road. The cottage is to the immediate north of the Law Faculty buildings and east of the South Oval.

Wednesday 16 July 2008 – 7:30 pm – A talk and discussion on "food flows" at the local, regional and global scale in a world of rising food and oil prices.

Venue - as above

Wednesday 20 August 2008 – 7:30 pm – A talk from Professor Brendan Mackey reflecting on his recent experiences in America and their relevance for healthy people on a healthy planet here in Australia

"If you don't know how things are connected, then often the cause of problems is solutions."

We repeat this succinct and powerful quotation here to acknowledge its origin: Amory Lovins said it in an interview with Susan Witt of the E F Schumacher Society on 8 September 2001.

Deeper in Debt

Australia's addiction to borrowed money

Steve Keen (University of Western Sydney),
NSF meeting 17 March 2008

Steve Keen gave a sobering account of the shifting sands upon which Australia's supposedly prospering economy has been built. Our prosperity is built on debt, and the bills are now coming due.

According to Steve debt has been growing faster than the GDP and twice as fast as asset values. Mortgage debt alone is now about 25% of GDP. Total indebtedness, public and private, is 160% of GDP.

The burden of debt servicing depends not only on interest rates but also on how much we've borrowed. Although interest rates are much lower than in the early-1990s recession, our debt is much higher. The result is that, adjusted for inflation, the debt burden is now greater than in that recession and approaching the levels of the 1930s and 1890s depressions. A truly scary aspect of this is that "the annual increase in debt is responsible for almost 20 per cent of aggregate spending in our economy", to quote Steve's recent blog at www.debtdeflation.com. This means we kept the economy "booming" by borrowing lots more. Clearly this can't continue.

Steve spent a little time explaining how he thinks this has come about. Basically, private banks have an incentive to maximise lending, and in our deregulated financial system they have a lot of freedom to do so.

A historical perspective is provided by Hyman Minsky's "financial instability hypothesis". It boils down to short memories. After a depression or severe recession, everyone is very cautious about taking on debt. After a while, as the economy picks up, they decide they're overdoing the caution and unnecessarily restraining their business, or the economy. After a generation or so the memory of the bad old days fades, financial cowboys start to think they're invincible and an orgy of debt ensues, until ...

The prognosis is not good. House prices may be double what they should be, based on the income they could yield (in the form of rent). That means they might fall by half in coming years. House prices in the U.S. are already on the way down, though

their situation is a little different. Our problem is not junk mortgage loans, it is that banks have loaned people money to buy existing houses in the expectation that prices would continue to increase. In other words, the banks have financed speculation on existing houses, rather than the building of new houses. That's why we simultaneously have absurdly high prices and a housing shortage.

The crunch, when it comes, would be eased if the Reserve Bank would allow some inflation, as that would reduce debt relative to inflating incomes. However, given the Reserve's obsession with reducing inflation Steve is afraid they might push us into deflation, which would magnify the debt relative to incomes and make things much worse. That's what happened in the 1930s.

Steve's advice is to get out of debt.

Geoff Davies

Just as primitive people adopt the Western mode of denationalized clothing and parliamentarism out of a vague feeling that these magic rites and vestments will at once put them abreast of modern culture and technique, so the economists have developed the habit of dressing up their rather imprecise ideas in the language of infinitesimal calculus. ... Any pretence of applying precise formulae is a sham and a waste of time.

*Norbert Weiner
God and Golem Inc, 1964,*

Robert F Kennedy on GDP

For too long we seem to have surrendered personal excellence and community value in the mere accumulation of material things. Our gross national product now is over 800 billion dollars a year, but that gross national product, if we judge the United States of America by that, that gross national product counts air pollution,

and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors and the jails for people who break them. It counts the destruction of the redwoods and the loss of our natural wonder in chaotic squall. It counts Napalm, and it counts nuclear warheads, and armoured cars for the police to fight the riots in our cities. It counts Whitman's rifles and Speck's knives and the television programs which glorify violence in order to sell toys to our children. Yet, the gross national product does not allow for the health of our children, the quality of their education, or the joy of their play; it does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our country. It measures everything in short except that which makes life worthwhile. And it can tell us everything about America except why we are proud that we are Americans. (1968)

Child's Play

Paul Tranter, our May speaker, addressing the question of coping with peak oil, suggested we examine the Disney film *Monsters, Inc.* In the film the monsters of Monstropolis power their city by harnessing the energy of human children's screams. To this end the monsters frighten children at night to make them scream. When they find the children are becoming less easily frightened, the monsters realise they are facing a power shortage. One of the more monstrous monsters plans to kidnap children and terrify them, in order to get more energy.

Fortunately one of the nice monsters hears children laughing at play and realises that laughter energy is more powerful than scream energy, so the film ends happily.

Peak oil will be a monster problem for our society, adults and children. There will be global food shortages, more people living in poverty and probably wars over the remaining oil supplies. All of these will harm huge numbers of children. But if we consider the problem and start changing our cities and the way we live now to avoid or at least ameliorate some of these problems, we can also make a world that suits children better than our present one does.

In *Monsters, Inc* the monsters see children as toxic and dangerous, but later discover that they are valuable and capable – it is a child who helps them solve their energy problem. In our society cheap oil has driven (literally) a separation between children and the rest of the population. Children are often considered to be a nuisance. They are also considered vulnerable. We need to see them as capable individuals, with much to offer society.

In a child friendly city children would not need to be driven everywhere and protected from everyone. Children would be able to explore their local area, going further afield as they grow older. This would give them a sense of connection to place and people. They would relate to other children and to adults as independent entities. In return other people would also keep a benevolent eye on children as they explore.

Cheap oil has fuelled the current state of dependency, one of the most obvious ways being the way children get to school. Over the last several

decades it has become common for most children to be driven to school. This is said to be to protect them from stranger danger, and traffic danger – all those cars converging on the school at the same time!

At last there is a reaction to this trend in the form of 'the walking school bus', in which volunteer parents walk a group of neighbouring children to school, the children joining the 'bus' as it passes their own home. (It was great to see several volunteer 'bus' leaders recommended for awards at this year's annual Canberra Volunteer of the Year awards.)

The loss of children's freedom to move has numerous costs. For adults it means much time transporting children, with associated increases in cost, congestion and pollution. Adults also become more isolated, lacking the interaction with other adults that children's lack of reserve would often foster.

Costs for children include lack of physical exercise, increased obesity, lack of development in many ways, increased traffic and stranger danger, the high pollution inside cars, increased pollution generally, lack of a sense of place and (very importantly) the loss of opportunities to experience joy and wonder.

To rectify this we need to return to the provision of local services, including local schools, shops and libraries. (Closures of these in Canberra have been very bad for the areas affected.) Children need to be able to walk or cycle to all these facilities, with good public transport available for longer distances.

Traffic in suburbs needs to be slower than it is now. In many European cities traffic in suburbs would be limited to 30kph. In turn there needs to be a general slowing down in life, and children should be able to grow up in an unhurried way, without constant exhortations to hurry up. We should value children as children and let them play in the dirt, or stop and wonder over a butterfly or a flower opening. Children live in the present and that is what they should do.

We need to realise that children are capable and have a real part to play in society. In the looming food crisis, children could be important producers, growing vegetables, keeping chooks, and gaining joy and self esteem through such activities.

Paul suggested that we can think of energy sources as 'scream energy' or 'laughter energy'. Coal, oil and

The range of what we think and do is limited by what we fail to notice. And because we fail to notice that we fail to notice, there is little we can do to change; until we notice how failing to notice shapes our thoughts and deeds.

R. D. Laing quoted in Alex Pattakos' Prisoners of Our Thoughts, 2004.

nuclear are all scream energy; just think of the children who used to work in coal mines, or the children who have suffered or will suffer in resource wars, or from pollution. Laughter energy such as solar or wind does not harm children. We should look at all the proposed solutions to our energy crisis and see if they are child friendly. Maybe we should require a Child Impact Statement for all new developments.

After this stimulating talk there was a lively discussion that would horrify big business, including big sport. In the future people will need to travel less, and live more in their own locality. Too much sport is bad for health and when it comes to night training, night matches and much travel, bad for the environment. We must learn to live with less.

What will be the respective roles of education and of government in achieving a transition? Both will have a part to play, but it will probably take a crisis to make society in general accept these limitations. However there are a number of local groups acting now, with a growing number of Transition Towns achieving considerable success. Local government is also showing the way in some cases.

In all of this we must remember the role of emotions. People actually love their cars. They think they need a car to really live, and will be less of a person without it. They do not realise that a great deal of their working life is spent paying for their car; they just can't imagine another way to live. Unfortunately many Chinese and Indians also share these delusions. This is certainly hastening the arrival of a major crisis.

Jenny Wanless

Scarred Lands and Wounded Lives

Alice and Lincoln Day, of Washington DC, are some of the busy NSF members who have recently been in touch with us about their work. They have spent several years making a film, *Scarred Lands and Wounded Lives*, about the environmental footprint of war. Now that it is ready they have offered to send NSF a DVD of the film. The Days will be in Canberra early next year and it is hoped that NSF will be able to host a public showing of their film while they are here.

People usually think of the effect of war on the lives of combatants and on the residents of the lands where the fighting is taking place: they rarely think of what it is doing to the environment. In fact the environmental impact is huge, from the greenhouse

gases released in the manufacture of armaments as well as by the war machines in action, to the disposal of left over chemicals. War, and the war games that form part of training, also disrupt ecosystems, killing, damaging or traumatising many other species as well as humans.

Scarred Lands and Wounded Lives made a strong impression at a recent environmental film festival in Washington, getting prolonged applause from a capacity audience.

The use of nukes in the past 60 years would have been an economic hazard. Those days will soon be over; energy decline means economic decline. Another important consideration is that since governments are running out of energy, they are going to need more "energy efficient" means of killing the enemy — "more kill per kilowatt". That means nukes instead of large infantry formations. First a little nuke here, then a little nuke there, then a little bigger nuke, ... Well, you know the rest of the story.

*Comment on the internet
30 March 2007*

There is always an easy solution to every human problem — neat, plausible, and wrong.

H.L. Mencken

Why, for example, is it "economic" when a plumber fixes a leak, but not when a neighbour does it? Why do counselling and Prozac count but not the daily interactions that might reduce the need for these drugs? There is no reason, beside the astigmatism of the conventional economic mind. We are told we are nostalgics for believing in such things. To entertain the thought that a prior state of affairs might have had advantages over the current one is to be deemed psycho-emotionally deficient. Yet take a hard look around you. What are the greatest needs you see — for more stuff, or more community? Which would do more for your life: a high definition television, or a good neighbour?

Jonathan Rowe, *The Ecologist*, April 2007

Retirement Villages

On behalf of the NSF Solar Housing Group, Rosemary Blemings and Shirley Kral inspected seven ACT retirement villages, focussing on low energy use and sustainable design. Their findings were depressing, although not unexpected.

Units with a north-facing aspect were that way rather by accident than design, and often landscape plantings blocked possible solar access. Very little advantage was taken of natural daylight within units. North facing balconies, while providing a pleasant place for residents to sit, effectively blocked sunlight penetrating into the units in many cases. In a number of units, some rooms received little or no natural daylight, necessitating lights on throughout the day.

In most villages roofs were dark coloured, causing unwanted heating in summer, and therefore more use of air-conditioners. As a matter of course the newer villages provide lifts/inclinators, clothes dryers, dishwashers, reverse cycle air-conditioners, energy hungry light fittings, exhaust fans, remote control doors.

Few roofs have a pitch suitable for the installation of photovoltaic panels, and solar hot water and double glazing are not offered. The development salesman for one village actually said 'the ACT is hopeless for solar hot water and double glazing is too expensive'. He did not know what photovoltaics were.

There is a trend towards multi-storey blocks, with garages underneath. These may provide a feeling of greater security for residents, but they necessitate the use of lifts. Multi-storey blocks also provide homes for more people on smaller sites, which is probably a major consideration. They could provide more efficient plumbing, and better insulation from weather extremes, but they also militate against cross ventilation.

There is a near-total absence of knowledge about or interest in energy efficiency on the part of the developers and managers. There seems to be an equally strong ignorance on the part of residents.

Where there are north facing windows they are usually screened or covered in some way to prevent any sunlight entering the unit. As the living rooms and bedrooms are uniformly carpeted (maybe to

soften the falls of the elderly) there would be no hope of a thermal bank, such as dark tiles could provide, for winter warmth.

Village community facilities for leisure activities and administration also often have north facing windows always curtained, keeping out sunlight, and with lights on all day.

The dependence on lifts, air-conditioners and electric lighting raise some serious safety issues. One village manager stated 'there will never be power blackouts in the ACT'. There may have been a time when that could have been thought true. Now experience is showing that as more and more people install and use air-conditioners there is a possibility of blackouts in very hot weather in any city.

The use of photovoltaics on every building that has air-conditioners would go a long way to preventing

such blackouts. In retirement villages it would lessen the danger to residents of being trapped in the lift, or in their overheated apartments, in very hot weather. However there are other dangers to residents of being dependent on lifts, air-conditioners and other mechanical and electrical devices: they can also break down and be out of service until spare parts or replacements

can be obtained. In our current 'just in time delivery' system, failure of supply will become an ever greater problem as oil shortages start to bite.

The lack of outdoor clothes drying facilities removes one possible incentive for getting some gentle outdoor exercise along with a little solar exposure to improve the bone strength of elderly residents. Daylight, and especially sunlight, are known to help lift depression. It seems a shame that so many elderly are encouraged to live in artificial lighting when sunlight is plentifully available in Australia.

Indeed the survey reinforced the fact that there is a general lack of knowledge about low energy use and sustainable design amongst developers, the building industry and the general population. The retirement building industry would benefit from increasing its knowledge in this field. The health, morale and safety of residents would also benefit.

Jenny Wanless

All these standard green things, like sustainable development, I think these are just words that mean nothing. I get an awful lot of people coming to me saying you can't say that, because it gives us nothing to do. I say on the contrary, it gives us an immense amount to do. Just not the kinds of things you want to do.

*James Lovelock
The Guardian, 1 March 2008*

Dangerous Climate Change: Is it inevitable?

The public perception and risks of climate change.

After 25 years of warnings the scientific and public consensus is now overwhelming. Climate change is real and serious with evidence of abnormal increases in CO₂ levels, temperatures, changes in ice sheets and shifts in many natural bio-systems.

This climate change reality is reinforced by four reports over the past 18 years from the Intergovernmental Panel on Climate Change (IPCC), the latest in 2007, which project expected warming scenarios up to 2100 due to past and future greenhouse emissions.

In turn these IPCC projections have influenced

Government responses to climate change such as via proposed international agreements to reduce future greenhouse emissions in developed nations by up to 60% by 2050 via various emission trading systems.

Although the IPCC consensus suggests that climate change is understood and being addressed by governments, recent evidence leads us to question whether the IPCC reports and proposed policy responses have considered all the scientific evidence relevant to understanding the global climate, the recent changes and particularly the risks and consequences therefrom.

Specifically the IPCC and resultant policies may not have taken account of the scientific evidence that the current and projected warming may trigger a range of positive feedback processes each of which could result in the further rapid and uncontrolled acceleration of dangerous climate impacts.

This evidence, which was presented at a conference in Exeter UK in 2005, was not considered by the IPCC as it focused on risks, and was thus speculative, and because it did not meet the cut off date for the 2007 IPCC review. This raises concerns about the extent of the IPCC understanding of the risks from climate change and about the adequacy of the proposed mitigation responses.

Indeed as many as 17 of 20 identified dangerous feedback processes may have already been triggered and are accelerating¹. Any one of these processes could impact dangerously on regional climates directly as well as via multiplier effects.

As such we must consider the risks from these feedback processes as well as those from the models which have governed the IPCC projections of a gradual warming later this century which is able to be 'mitigated' by reductions in greenhouse gas emissions.

We need to assess whether these IPCC and policy responses will be adequate to control global warming or whether the risks of imminent, dangerous and irreversible climate change as raised by the 2005 Hadley Centre conference are real and need much more urgent and effective avoidance action.

The AAS review of the science of Dangerous Climate Change; Is it inevitable?

In view of these uncertainties and risks and to ensure that Australia's climate change response is fully informed, the Australian Academy of Science held a conference in May 2008 to examine the question; Dangerous Climate Change: Is it inevitable?

To answer this question the conference reviewed climate developments in a range of areas, including the Arctic,

coral ecosystems, and Australia's rainfall, to assess how well these accorded with IPCC projections and what they tell us about the processes and the risks involved.

a. Recent Arctic realities

To help inform this answer Dr Hamilton presented evidence that:

- The arctic climate has and is changing fundamentally.
- These changes are far more rapid and serious than predicted by the IPCC models.
- These changes result from a range of complex processes and feedbacks additional to just

More and more people are now realising what the scientific evidence shows, and that is that modern lifestyles are profoundly dysfunctional and hostile to health and well-being. So rather than wait for the whole of society to make these changes people are making up their own minds and making the changes themselves.

...What we need to see in order to address the various problems and challenges we face is an ethic of frugality when we basically regard flaunted wealth and extravagant consumption as poor taste.

*Richard Eckersley, The Canberra Times
12 April 2008*

1. www.natsoc.org.au/html/publications/GW_08_01-Garnaut.pdf

global warming associated with the CO₂ greenhouse effect and predictions.

These changes are occurring now, not in 2100 or 2050 as projected by the IPCC as late as early 2007, with the on ground reality being that:

- All of the permanent, but not seasonal, Arctic ice sheet has already been lost.
- All of the remaining ice is less than 3 years old and 20% of its former thickness.
- The minimal summer area of this ice is now declining exponentially from 5.4 m km² in 2005, 4.2 m km² in 2007 and 2.2 m km² projected in 2008.
- The Arctic is expected to be ice free in summer by as early as 2013 not 2050.
- This may accelerate further warming via changes in the ice/ocean albedo effect.

Contrary to predictions the Arctic is warming four times faster than the global average with winter minima being 12°C and summer sea temperatures being 5°C warmer than previously. As a result fish biomes have already migrated poleward up to 800 km.

Similarly 50% of Arctic and Greenland glaciers are melting. Some 300,000 km² of the

Greenland ice sheet has been lost, 6 times the 50,000 km² projected by the IPCC models. This loss has occurred 20 to 30 years ahead of projections by the IPCC models.

Furthermore as the Arctic warms it is causing large areas of previously frozen permafrost and tundra, representing the largest terrestrial carbon sink, to thaw and respire. This may release up to 100 GTC/annually as CO₂ and methane. Such emissions would be 18 times greater than the 6 GTC/an being released via fossil fuels and swamp the proposed emission reductions of perhaps 2-3 GTC/an resulting from multilateral emission reduction and trading policies.

Based on the Arctic evidence climate change may be much more serious and imminent than projected by the IPCC models and assumptions. As such what confidence can we have that the IPCC explanation of its cause or projected impacts are reliable? What confidence can we have that the proposed mitigation

via emission reductions, which are based on these IPCC models, will be effective in the Arctic or elsewhere?

b. Changes to Australia's rainfall

However of more direct relevance and concern to Australia, but less well understood, is evidence from the Bureau of Meteorology that climate change may have already altered Australia's rainfall with systemic decreases in southern and eastern Australia and increases in north western Australia. These changes have occurred over more than 50 years, well before the marked increase in CO₂ levels assumed to cause global warming.

Although El Nino droughts may have increased in intensity and frequency recently this is unable to account for all of this change in rainfall and its serious consequences which risk the viability of

much of Australia's agriculture, water security and bio-systems. These systemic changes to Australia's rainfall are perhaps the most dangerous climate challenge to Australia and needs to be better understood and addressed urgently.

Clearly there is much that we don't understand about the global climate, let alone: how we are affecting it, the cause of the observed climate changes, their likely impacts and how to

prevent what may be very dangerous imminent risks of serious climate shifts.

We urgently need to better understand what is causing these major climate shifts and be prepared to look beyond assumptions from IPCC models and the hope that the impacts of these shifts can be mitigated by reductions in future greenhouse emissions.

This imperative was made clear by the Australian Academy of Science conference. Unless we prevent the further acceleration of the numerous positive feedback processes it may not be possible to avoid accentuating dangerous, irreversible climate shifts and their consequences within decades.

The AAS review of the dangers from current policy responses to these realities

As well as reviewing the dangers resulting from physical climate changes and from the inconsistencies between the observed realities and

Richard Klein adds that this phase of our species' evolution [that is, the megafauna extinctions] marked the transformation of humanity from a relatively rare and insignificant member of the large mammal fauna to a geologic force with the power to impoverish nature. What greater condemnation of a way of life could be imagined?

*Kirkpatrick Sale
After Eden, 2006, p90
on the origin of our attitude to natural resources and the environment*

the assumptions from IPCC models, the Australian Academy of Science conference was also valuable in reviewing to what extent the proposed policy responses to these realities and risks are likely to be adequate.

Clearly the scientific evidence and on ground realities in the Arctic and on Australia's rainfall do not accord well with the IPCC models or assumptions of what has caused and is driving these dangerous climate changes. It follows that inappropriate policy responses based on these assumptions may not only be inadequate and ineffective but in themselves create perhaps the most dangerous risk from climate change.

Based on previous policy statements and papers to this AAS conference, the Australian Government is proposing to respond to climate change via:

- The encouragement of climate change adaptation strategies by communities, industries and regions to reduce their vulnerability to the unknown climate change risks and impacts and enhance resilience to them.
- The introduction of an Emissions Trading System (ETS), from 2010 to try to impose a market price on CO₂ greenhouse emissions to lower Australia's greenhouse emissions in line with Australia's Kyoto and post-Kyoto obligations.
- Ongoing efforts in multi-lateral fora to progress adoption of more stringent and broader greenhouse emission reduction targets in the hope of maintaining CO₂ levels below the now pragmatic target of perhaps 550 ppm and mean global temperature increases in the range of 3-5°C.

However based on the risks from dangerous climate feedbacks and the fact that we have already triggered most of these at less than a 0.8°C warming, these proposed responses, even if implemented as hoped, will be totally inadequate and far too late to prevent the dangerous climate impacts that are expected within decades.

Neither ill-defined adaptation measures, future market incentives to reduce emissions nor more talk at international fora can address the changes we have already induced in regional and global climates nor mitigate their imminent dangerous impacts.

Effectively we have no option but to better understand our climate system, how we have impaired previous natural climate balances and urgently restore the key processes governing the former balances so as to minimize further dangerous climate impacts.

From the presentations to the AAS conference it is inescapable that:

- We have already released more than enough CO₂ to raise levels well above the 500 ppm needed to trigger dangerous climate feedbacks by as early as 2020 even though this has yet to be fully expressed due to ocean lag effects on CO₂ levels.
- No level of future CO₂ emission reduction by Australia or the world can now prevent CO₂ from reaching 500 ppm and accelerating dangerous climate changes. We have left it at least 20 years too late for such options to hope to be effective.
- We must immediately prevent any further warming if we are to prevent further dangerous change and impact and restore the former climatic balances.

It follows that we must urgently find safe means by which we can cool regional climates so as to offset any locked in CO₂ warming effect and prevent further accelerating the onset of dangerous climate change while we restore natural bio-sequestration balances. Safe natural, but innovative, options have been proposed for doing this² but we need to be prepared to consider them critically and urgently.

However we may have less than a decade to safely restore these natural climate balances so as to prevent further accelerating these climate feedbacks and their resultant environmental, economic and social crises by as early as 2020.

Consequently the Australian Academy of Science conference on *Dangerous Climate Change; Is it inevitable?*, was of national significance in demonstrating that:

- We need to face the reality that climate change may be far more serious and urgent than many

Congratulations to us! We have optimized the efficiency of the global market by removing all the shock absorbers. We shouldn't be surprised to get a bumpy ride.

David Ewing www, 23 April 2008

2. www.natsoc.org.au/html/publications/Journal%2006-6_BiologyGW.html

have assumed and projected from the IPCC models,

- There is much that we don't understand about its various processes,
- We should not assume that our proposed efforts to mitigate it through future emission reductions will be adequate, effective or in time,
- We have already triggered a range of climate feedback processes that risk accelerating dangerous climate impacts over the next decades, and that
- If we don't face these realities and prevent these processes urgently, by safely cooling regional climates we may not be able to prevent the serious consequences from climate change to human futures, in time.

Walter Jehne

Soil Carbon

An innovative Australian Soil Carbon Accreditation Scheme (ASCAS) is measuring the important role of healthy crop roots and soil in drawing down massive amounts of carbon, at the same time buffering the effects of drought and re-supplying essential nutrients. The work is largely the brain child of soil scientist Dr Christine Jones, who has been working for ten years to increase knowledge of the microbial 'carbon-highway'

Farm trials with biologically-based protocols involving perennial deep-rooted pastures as well as annual crops are showing measurably increased soil carbon, which can be used as a verifiable carbon sink. Data on soil carbon accumulation rates are being collected across various soil types in the northern agricultural region of Western Australia and in central Queensland.

Photosynthesis enables plants to convert carbon dioxide to sugars to feed the plants' growth, while releasing oxygen into the atmosphere. Symbiotic bacteria and fungi associated with roots actually feed on the sugars then help the exuded carbon to combine with soil minerals and become part of stable humus. This humus can stay in the soil for 100 years and even up to 1000 years. It improves the formation of healthy soil with high moisture-holding capacity, boosting plant productivity.

When agricultural chemicals are used they kill the soil microbes responsible for the process, turning soil from a carbon sink to a carbon emitter. Under our usual cropping practices soil carbon has declined by up to a half of its former level.

Tim Wile, of WA's Department of Agriculture and Food, reports that trials show perennial pastures sequester five to ten tonnes of carbon dioxide per hectare annually. With millions of hectares of poor sandy soil in WA, there is enough potential to soak up the state's current carbon emissions. Degraded lands around the world could be used to sequester carbon, at the same time improving yields largely by increasing water and nutrient retention. They could also bring useful carbon sequestering credits to boost farm incomes.

A group of twelve farmers in ASCAS's benchmarking trial in Western Australia will be completing trials to see how much carbon has been sequestered by perennial pastures this year. In Queensland field trials 516 tonnes of carbon per hectare have been found in treated soils on one property, as against 149 tonnes per hectare under the surrounding native bush.

The right kind of farming – in this case zero till with microbial stimulants instead of agricultural fertilisers – has the potential to sequester more than Australia's total emissions. If the Government backs these initiatives it could cut emissions, improve yields and increase farm incomes.

Ecos, 141, February-March 2008

Geosequestration

Owen Jordan, in a letter in the *New Scientist* on 19 April, pointed out that capturing waste gases from power stations for geosequestration is not going to make much of a difference to our output of carbon dioxide. If the coal burnt comes from an opencut mine, emissions of carbon begin the moment the over burden is stripped away, and continue throughout mining. The spoil heaps are likely to contain a lot of shale and mudstone that has a high carbon content, and these will continue to emit carbon as the heaps weather.

Considering the energy used in mining and transport as well, it is probable that the capture of gases from power stations would account for only about 5-10% of the total emissions.

In Jordan's opinion *Carbon sequestration shares with nuclear power the indefensible moral position of forcing future generations to deal with the consequences of our greed for energy.*

Carbon capture proposals share the platform with nuclear power on a second front: our ceaseless ability to construct webs of self delusion about what we are doing to the planet, accompanied by a queue of politicians wanting us to believe them.

Book review

“Peak Everything - Waking up to the century of declines”

Richard Heinberg

New Society Publishers, Canada 2007
214 pages. \$45.95 hard cover.

Richard Heinberg's first book on Peak Oil *The Party's Over* was, for me at least, a significant book. His subsequent books on the subject, *PowerDown* and *The Oil Depletion Protocol*, were hardly less important. But often when I mentioned Peak Oil to people and expressed concerns about possible economic meltdown, they would reply: “Oh, but there's plenty of coal”.

As the title of this, Heinberg's latest book, suggests, well, it ain't necessarily so. He argues that conventional oil production probably peaked in 2005-6 and natural gas will peak globally around 2010. But contrary to what we had believed, namely, that coal would last at current usage rates for another 200 years, recent studies have shown that coal will peak and begin to decline in a mere 10 to 20 years.

But, as he says, it doesn't end there. This century we will see an end to growth and a decline in a number of parameters including population, grain production, uranium production, fresh water availability, arable land, wild fish harvests, and the yearly extraction of some metals and minerals such as copper and zinc.

In other words, as Heinberg notes, we are at the end of the period of greatest material abundance in human history, one that was based on temporary sources of cheap energy, and we are now at the beginning of overall societal contraction and simplification. It had to happen sometime, of course. Growth in population and consumption cannot continue unabated on a finite planet.

It need not be all doom and gloom, Heinberg insists. He reminds us of Ivan Illich's 1974 book *Energy and Equity* that argued that inequality increases with the flow of energy through society. Hunter-gatherers, who lived on minimal energy flows, lived in societies free from economic inequalities. Thus, as energy declines, we might reasonably expect a more

economically equal society. Indeed, a reversion to village life with extended families and local food production – but with a few modern frills such as global communications – could provide future generations with an existence that current generations would envy.

Heinberg concludes that our central survival task for the decades ahead is to make the transition away from the use of fossil fuels and ‘to do it as peacefully, equitably and intelligently as possible’.

There are, however, two problems whose potential consequences outweigh all others: climate change and energy depletion. If we do nothing about the former we will set off positive feedbacks, particularly the melting of the north polar ice cap reducing reflectivity and the melting of tundra and permafrost releasing methane, resulting in perhaps six degrees

of warming and a largely uninhabitable planet. If we do not proactively reduce our reliance on oil, gas and coal ahead of depletion and scarcity, we could trigger economic collapse, famine, and war over remaining resources. As Heinberg notes, all that is required for these worst-case scenarios to materialise is for world leaders to do nothing.

So how do we achieve this great transition to an energy-depleted world? Heinberg says it will require ‘enormous adjustments

on the part of every individual, family and community’ and if we are to make these adjustments successfully, then we need to plan rationally. We have to adopt strategies in nearly every area of human interest - agriculture, transportation, global war and peace, public health, resource management and so on.

In a later chapter, *Population, Resources and Human Idealism*, Heinberg elaborates on this axiom, arguing that if we want peace, democracy and human rights we must create the ecological condition for these things to exist, namely, a stable population at – or less than – the environment's long-term carrying capacity.

This is another important, readable, authoritative book from Heinberg. Buy it, read it and share it around.

Jenny Goldie

Evolutionary psychology is not just one more school of psychology. It is a perspective on the whole of psychology that claims that we are human animals, and that our minds, no less than our bodies, are products of the forces of nature operating on a time frame of millions of years; human nature was forged from our ancestors' struggle to survive and reproduce.

David Livingston Smith
Why We Lie: The Evolutionary Roots of Deception and the Unconscious Mind, 2004

The Light Revolution: Health, Architecture and the Sun

By Richard Hobday, Findhorn Press, 2006

This interesting book addresses the interaction of themes of interest to NSF, as reflected in the subtitle "Health, Architecture and the Sun". It draws on historical evidence, traditional wisdom and scientific findings to explain how light, particularly sunlight, can promote health in the built environment. Early in the book, Florence Nightingale is quoted. In her *Notes on Hospitals* in 1859 she wrote: "Direct sunlight, not only daylight, is necessary for speedy recovery".

The early chapters cover various aspects of the health promoting properties of sunlight, including, for example, a discussion of depression and its alleviation with sunlight, and the way in which pain management is improved with sunlight, with less use of pain-killing drugs. Other chapters deal with Vitamin D deficiency, and superbugs and the sun. The role of healthy darkness at night is also acknowledged, in that exposure to light at night disrupts the secretion of melatonin. Later in the book the implications of electric light for health, and the 24-hour culture (as with shift work) are explored.

Later chapters pick up the design theme (e.g. one called "Temples to the Sun"), not just for energy conservation and broader environmental concerns, but also as part of promoting health and well-being. Five points of "solar architecture for health" are summarised on page 120 as follows:

- Orient the building for sanitation and sunbathing.
- Position the rooms for sunlight therapy and disinfection.
- Put windows in more than one wall to let the sun in at different times of the day or year.
- Ventilate naturally.
- Underfloor heating (although one thinks here of a solar hot water underfloor hydronic system, free of electrical fields).

The book concludes by discussing issues such as where the sunlight revolution sits with respect to the skin cancer prevention public health message of recent decades, and the need for right-to-sunlight legislation. It argues for architects and planners who know how to work with sunlight to exploit its health promoting powers to the full.

The print quality, font size, and presentation in the book are very good. Each chapter is supported by an extensive list of references. The author, Richard Hobday, is an independent consultant, researcher and lecturer. He received his MSc and PhD from the School of Engineering, Cranfield University, where he specialised in solar design.

Murray May

As the UK's most successful supermarket, Tesco, is both an architect and reflection of the way we live in modern Britain. It has brought within our grasp vast possibilities for consumption, beyond the imagination of previous generations. Supermarkets have trained us to believe that nothing but affordability should constrain what, when or how much we consume. Unfortunately this means that we have forgotten that we live on an island planet.

Posted on the BBC "Green Room" website, 16 March 2007

Salt of the earth

Australia faces an issue of biblical proportions. It is one which impacts upon society, and biology in general, in a great diversity of ways. Between both demon and saviour, the issue is salt.

Our Silurian progenitors 400+ million years ago, newly-emerged from oceans, did not free themselves from salt. It remains an essential component of our bodies, and of our terrestrial environment.

Manifesting itself with almost god-like omnipresence, salt loads the dice for human sustainability: *Homo sapiens*, tread warily or incur disaffection; take no ill-considered chance – tug the forelock for maintenance of salt-balance in our favour.

Members of society, of whatever attitude to cognitive existence as they gather by the river of life, mostly take pleasure in contemplating its mysteries; enjoy feasting upon snippets of knowledge and the sauce of speculation. For those who have no taste for inquiry – those who would impede the evolution of society's knowledge of nature – let them take their seat below the salt for this discussion.

In the beginning there was sodium: present as 2.8 per cent of the earth's crust, a constituent of many very important rock-forming minerals. As rocks eroded, these minerals were transported to the sea, and subjected to decomposition. In this way, and via volcanic vents, sodium entered the ocean.

In that great laboratory it met up with another element, similarly released to roam the seas - chlorine. An instant match (made in heaven the "creation science" folk might say) which begat salt – NaCl. But the great match-maker is not perfect - constancy is the problem, and to this day experiments continue in the maternity ward, tweaking production and recycling rates to obtain a balance. The great master juggles rock formation with rock destruction; the control of zealous biological activity; interplay with atmospheric carbon dioxide and its consequential fluctuation of oceanic acidity. It is all too much really, but he has got it fairly close with a present 3.5 percent salinity, or thereabouts. And, if *Homo sapiens* would only behave themselves there mightn't be a quick return to that mess-up he had with the Trilobites. The details of that bit of juicy gossip are best dealt with by palaeontologists, who guard the fossil herds.

There was also a bit of hoo-ha about 6 million years back. The great designer was fiddling with the African continent, and bumped it hard, up against Spain. The closed Mediterranean basin dried up. Not a quick learner, he caused it to happen a number of times. Not to worry, it was fixed after a few million years. Although it helped to shepherd in our recurring ice ages, a placement of three kilometers of seawater was sufficient to cover the immediate embarrassing evidence - enormous salt domes. It wasn't until 1969 that prying *Homo sapiens* stumbled onto them. Just consider those gigantic Gibraltar Falls at that last filling - such a difference between those and the present local spillage here.

The Mediterranean was not the only hiccup of its kind (will he ever get it right?) – there are similar domes/deposits at Salzburg, Cheshire and Ontario. Fortunately, one Creator's mistake can be another man's benefit, which Mark Kurlansky deliberates upon at length in his book *Salt a World History*. Perhaps it is time to turn to Australia.

Atmospheric moisture from the ocean is not via evaporation only. The wind also contributes. It skims the surface, especially with the assistance of bursting bubbles from foam. As a result, rain

contributes salt to the landscape. Fortunately, that small component mostly gets flushed down the rivers. However, for some localities, evaporation and geological time eventually bring about accumulations of real consequence - as do what used to be old sea-beds from some previous geological era. During the great drought of the last ice age (terminating about 15 millennia ago), salt from dry lake-beds within the lower Murrumbidgee/Lachlan/Darling region carried eastwards in the wind. Sheep have been seen to use eroded gully banks as a salt-lick at the head of Woolshed Creek. However, that is small beer.

Proposals pop up regularly for the carving of a channel from Spencer Gulf to Lake Eyre: to encourage "Hughie to send her down" and enable greening of the inland. It might take more than just that to enhance rainfall, but we might suppose it

does, and also that persuading seawater to head inland continuously and fast enough is no engineering sweat.

The area is substantial – roughly 120x50 kilometres. Getting the moisture into the air is a breeze, as the region's evaporation rate is 3.3 metres per year. Without pumping, 120,000 x 50,000 x 3.3 tonnes of water could be lifted skyward annually. QED, well – almost.

There will be salt residue to deal with: global average salinity for seawater is 3.5 per cent, and salt weighs 2.2 times more than water. 1,500 million tonnes of salt will need to be removed every year if salt concentration is not to be ever increasing: shoveled uphill, to

above sea-level, to some place where it is not in danger of being flushed back down again by the hoped-for increased rainfall.

Even in biblical terms, that is a Lot. There is much more to tell, but such issues as mycological buffering of salt against its depredations into agricultural issues like soil acidity and aluminium poisoning are best left to others.

Colin Samundsett

Colin's musings were inspired by wondering what we might do with the salt from a desalination plant.

Earth stayed cool enough for life to evolve. Once that happened the planet had a super-weapon in its arsenal to combat the greenhouse effect: photosynthesis... The regulatory effect of life suggests it is a geological force in its own right, and despite man's best efforts it is nearly impossible to push the planet into a Venus-like greenhouse while photosynthesis continues unabated. But Earth's sister planet remains a cautionary tale on the ravishing effects of a runaway greenhouse effect on what might, at one time, have been a habitable planet.

*Craig O'Neill,
lecturer in Geodynamics and Planetary
Science, Macquarie University,
comparing Venus and Earth, twin
planets with very different
atmospheres and temperatures.
Australasian Science, April 2008*

For Our Grandchildren's Sake!

Dr Graham Chittleborough, retired marine scientist and NSF member from Western Australia, became so worried about what was happening to the environment that he wrote a book, *Shouldn't Our Grandchildren Know?*, arguing that we are destroying the environment, and should stop doing so. He continues to be frustrated, as are many of us, that despite all the evidence, we have done nothing much to change our destructive ways. He has sent us the following comments directed to those who think that climate change is not a real problem, or, if it is, it can be halted relatively easily.

For those who believe that if we can avoid an average temperature increase of two degrees by 2050 we'll be OK, Chittleborough has the following reply. It is already too late, we have passed that critical point, now that we have initiated a self-accelerating meltdown in the Greenland Ice Cap and set in train a similar meltdown of the West Antarctic Ice Cap. These runaway meltdowns (feed-back loops) have set up an exponentially rising sea-level. At present some 85% of our population lives on the coast, and the proportion is increasing. People living on the coastal lowlands will soon be dispossessed; they are likely to be surprised by how quickly this will happen. At least this will provide our industrial leaders with an enormous number of people to retrain for other jobs if they must keep the boom going at any cost!

We must face the fact that sea-level rises are inevitable and will happen surprisingly quickly. We are likely to see the central southern part of Australia, as a shallow, inland sea (as in the Miocene some 24 million years ago). The hopeful delusion that we can limit the temperature rise to two degrees is now dead. There is not time to develop safe geosequestration of waste gases from coal-fired power stations, there is not time to adapt our agriculture to the changing climate!

Although many deny it, Chittleborough argues that Australia, and the whole world are already vastly overpopulated! Nothing anyone can say can alter this fact. With the changing face of climate, and rising sea-level cutting back our tiny proportion of arable land, we in Australia can no longer expect to be able to feed ourselves. It is all very well claiming that we have bags of space, but most of it is arid sand, so will not feed many people in the manner to which they are accustomed. Do not think that sustainability can be reached and held by belt-tightening.

*"You cannot do only one thing",
Garrett Hardin's First Law of Ecology*

Farrago

Waste

A 2004 Australia Institute report found that Australians waste over \$10.5 billion a year on goods and services that are rarely or never used, such as excessively large houses with multiple living areas and spare bedrooms, or holiday homes that are vacant most of the year.

Bathroom cabinets are stuffed with cosmetics, wardrobes with clothes, and garages with power tools that receive little or no use.

Probably the most alarming example of waste is the \$5.3 billion worth of food thrown away annually.

Richard Eckersley, *The Canberra Times*, 12 April 2008

The CO2 debate

Peter Cox, a climate scientist at the University of Exeter, UK,

says that the climate change sceptics have a point – temperature increases precede rising carbon dioxide levels. However he says that they should take no comfort from that fact, as all it shows is that the situation is worse than was feared. Actually the causality goes both ways, but carbon dioxide is more sensitive to temperature than vice versa, as shown by studies of the Little Ice Age. In cooler conditions oceans absorb more of the gas and the carbon cycle on land slows, also allowing more carbon dioxide to be absorbed.

This means that we are heading for large natural increases in carbon dioxide levels on top of our emissions, meaning that models based on past climate change are too optimistic.

New Scientist, 22 March 2008

Upside of Crisis

When Soviet Union support collapsed in 1989 Cuba experienced serious food and fuel shortages. From 1991 to 1995 Cubans got only about 1800 calories per day and walking or cycling were their only means of getting around.

As a result there was an average drop in body mass index of 1.5 in the whole population. Obesity rates halved and in the following years deaths from diabetes fell by 51%, coronary artery disease declined by 35% and stroke by 20%.

New Scientist, 12 April 2008



Contributions for the next edition of *Nature and Society* are invited now from all members. They should be sent to the editor, Jenny Wanless, 22B Jensen St, Hughes ACT 2605, ph 02 6281 3892, or to our office by 25 July 2008.

Contributions may be sent on paper or electronically. This journal was prepared using Microsoft Word and PageMaker 7.0.2.

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.

Nature and Society Forum's major projects

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

Biosphere Reserve Nomination: supporting the nomination of the ACT as a UNESCO Biosphere Reserve, part of UNESCO's Man and the Biosphere program. Contact Ian Anderson

Biosensitive Futures: interactive website launched this year provides authoritative information on social and environmental issues for public discussion. Also kits on the same lines for use in discussion groups. Contact Stephen Boyden. Visit www.biosensitivefutures.org

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

Solar 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

All contacts can be reached through the NSF office.

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