

Nature & Society

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April-May 2014

Editorial

Television images from China over several weeks in February and March showed us more graphically than any words could, how dangerous industrial pollution can be. The smog was so thick that the scenery was completely obliterated. People who ventured outdoors needed to wear masks so they could breathe. Many were sick.

These scenes must have brought back memories of the great London Smog in the early 1950s to those who were unlucky enough to experience it. Over 4000 people died from respiratory failure during the event. Man-made smog over large areas has been a feature of society since we invented industrialisation, with burning coal a major contributor. People put up with it as a necessary evil: it took a disaster to force action to curb the smog.

Domestic coal fires were blamed for the London smog; banning these made London a cleaner, healthier place. But with the use of more coal – fired electricity rather than domestic coal burning, the pollution was largely transferred to the country around the power stations and more broadly to Europe.

We cannot quarantine ourselves from aerial pollution – once emissions get into the atmosphere they spread wherever weather systems can take them. The acid rain that defoliated trees, and killed fish in faraway lakes, back in the ‘bad old days’ was eventually sheeted home to such emissions. Yet the problems recur as new countries industrialise.

China’s rapid industrial growth, combined with the escalating use of private cars, is causing the smog in Beijing and throughout China’s

Northern provinces. Although China wants industrialisation, we must remember that it is the appetite for cheap Chinese manufactures in other nations, including our own, which is driving the industry. We truly live in one world, and our greed for possessions is damaging that world.

China has recognised that using coal is a cause of local pollution and is also a major cause of human-induced climate change. In a determined effort to reduce these serious impacts they are

investing very heavily in hydropower. They know that they as well as the rest of the world will suffer from climate change, and they are at least trying to do the right thing.

It is unfortunate that Australia is recalcitrant in this matter. Our governments and mining companies are intent on digging up and exporting as much of our coal and iron ore as quickly as

they can. Wealth today and let the future take care of itself is apparently their motto. Prudence and the future of life, including that of humans, do not figure in their calculations - in fact in Australia the powers that be appear to have very little understanding of what is happening. They keep demanding more growth.

Kardashev misunderstood the underlying drivers of human behaviour, assuming them to be a combination of ingenuity and free will. We indeed have ingenuity, but only in the direction of growth (and damn the entropic consequences). We can't manage preemptive de-growth or even the application of the Precautionary Principle, because as a collective organism humanity doesn't actually have free will (despite what it feels like to us individual humans). Instead we exhibit an emergent behaviour that is entirely oriented towards growth.

Paul Chefurka, Paradise Lost, July 2013

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In so many ways we are encouraged to be selfish, and it is not just the environment that is suffering as a result. The treatment of boat people is a particularly obnoxious example of our selfishness. On one hand the official view is that we need the population to grow, but on the other hand people who risk their lives in leaky boats must not be allowed to settle here. We want to pick and choose the better off, the better educated, the ones we consider are more likely to make our economy grow at least cost to us.

There almost seems to be a race between our political parties to see who can make Australia one of the greediest, least caring and most environmentally damaging countries in the world. In this regard the intended enlargement and deepening of a coal port on the

Queensland coast and the dumping of the sludge where it can damage the Great Barrier Reef, is a prime example. It is also particularly stupid to make short lived wealth from our mineral resources at the cost of damage to a reef system which is a natural wonder, a world treasure and a tourism attraction with a potentially long life if we look after it

The Juggernaut of Growth in population and material consumption must stop. A new economic system based on a steady state is essential. Politicians and 'ordinary' people everywhere and in all walks of life need to

understand the fragility of the planet and our dependence on natural ecosystems for survival. But getting widespread understanding of the necessity for growth to end is an incredibly difficult task. The benefits of growth have been an accepted part of economic thought for far too long: they are engrained in the political psyche. Somehow the great god Growth has to be replaced by the understanding that enough is enough and that a habitable Earth is more precious than any economic system.

Jenny Wanless

Consciousness in human evolution

A word on human consciousness is appropriate here. The fact that we are, or believe we are, the only self-aware species on earth (something that cannot be proven) does not mean that this was evolution's impulse or "intent" or our own "striving". We need not have survived at all; there was and is no "necessity" for *Homo sapiens* to continue to exist. That we did survive, however, can be explained quite satisfactorily by studying our evolutionary ancestry. We can trace it back to intelligent tool-making hominids, or further back to very early primates with useful opposable thumbs and stereoscopic vision, or even further back to mammals, whose warm blood, long internal gestation period, fur and other physical traits were extremely advantageous after the dinosaurs died out.

Consciousness, ethics and morality are not qualitatively different from many non-human behavioural traits such as care of young, defence of the tribe or flock, play, companionship, maternal love, mourning, food sharing and so forth, but only quantitatively, that is more highly developed. In terms of natural selection, adaptability of physical and behavioural traits means persistence, refinement and broader distribution throughout the population. Higher consciousness, including all the intermediate stages of its manifestation before *Homo sapiens* appeared, was not uniquely innate or "sought out" by human beings:

rather, its more primitive stages were themselves adaptive enough to persist; those individuals or populations who possessed it survived and reproduced more successfully. This insured the perpetuation of those same intermediate stages of consciousness, which then made further changes possible. The accumulation of small random adaptive changes through natural selection transformed those populations repeatedly over time – in brief, evolution.

Lorna Salzman, *Politics as if Evolution Mattered*, p.62

The challenge, then, is to be able to frame climate change problems in a way that relates to everyday experience. Not just that, but we need to be able to show unequivocally that we care as much for those who will be most affected by climate change, those who are most vulnerable to its effects, as we do for polar bears. We need to demonstrate an awareness of the current challenge faced by those who are most vulnerable to climate change, because they are already the most vulnerable to all the other social problems we create. In short, we need to understand that many of us who think this issue is important come from a position of privilege, but that we stand alongside the most vulnerable, understand their current challenges and are working with them to prevent these getting worse.

Tim Senior, a GP at Tharawa Aboriginal Corporation, Southwest Sydney. He is also Senior Lecturer in Indigenous Health at the University of Western Sydney.

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Where we are

The Forestry Building of the Fenner School of Environment and Society at the ANU.

From the building's entrance, turn left past the School's office and our office can be found on the right at the end of that corridor. But ring before coming as the office is occupied irregularly.

By car: There is very limited meter parking 200 metres to the north, near Union Court.

By bus: The route 3 bus from Civic drops you in Daley Road. Walk 100m south-east to the Forestry Building.

By bicycle: Abundant bicycle parking just outside our office.

Progress with the Frank Fenner Foundation

We are progressing on a number of fronts to establish the Foundation, dealing with regulatory requirements of the ACT government, our charitable status (for which we will be negotiating with the Department of the Environment and the Australian Taxation Office) and our bank accounts.

You may have visited our website already and seen the fresh new logo. We are holding on to the natsoc.org.au domain name for the time being. We will use the name Nature and Society Forum in this journal until we have cleared the major hurdles.

Coming NSF meetings

Wednesday 16 April. Josh Creaser: Divestment: Degrading the Social Licence of the Fossil Fuel Industry 7:30 – 9:00 pm at the ANU's Frank Fenner Building, corner of Daley Road and Linnaeus Way.

Josh Creaser, the coordinator of 350 Canberra, will present the case for divestment from fossil fuels. Since 2012 a global movement has emerged of community groups calling on their churches, universities and local governments to cease investing in the fossil fuel industry. This movement is beginning to shake the fossil fuel industry, not yet financially, but by stripping their social licence to operate. Like the divestment movements around tobacco and South African apartheid, this movement has the potential to dramatically shift the fight against extractive industries and run away climate change.

Josh is a fourth year ANU student of Environmental Science and Politics.

Wednesday 21 May. Peter Tait: A Necessary Cultural Transformation. 7:30 – 9:00 pm at the ANU's Frank Fenner Building, corner of Daley Road and Linnaeus Way.

We all agree that a cultural transformation is needed to move our society from its current *modus operandi* to one that acknowledges the biophysical limits of our planet and operates with sensitivity to them. But the way to make that transition has so far eluded us. The Human Ecology Forum has been considering this challenge and some answers may be emerging. Peter will share these ideas with us.

Peter Tait is a medical doctor and a researcher at the Fenner School of the Environment. Peter was a member of the NSF Board, and is currently on the Board of the Frank Fenner Foundation.

General Meeting on 19 March 2014

At the end of Michael Croft's talk on Wednesday, 19 March a very brief general meeting was held for the members to vote on some changes to the rules of NSF, to reflect its name change to the Frank Fenner Foundation. The changes were very simple, basically substituting the word 'Foundation' for 'Forum' wherever it appeared in the rules. The changes were approved, and the meeting, as promised, lasted only about five minutes.

Shirley Pipitone, secretary, FFF

FFF meeting report

Michael Croft spoke to us on 19 March, on a topic we were well-prepared for, given the coverage we have enjoyed at earlier public meetings and here, in this journal.

Michael and his wife run **Mountain Creek Farms**. Their website (<http://www.mountaincreekfarm.com.au>) tells us that their farm is located on the foothills of the Brindabella Mountains approximately 20 minutes west of Canberra. On two sides they border Brindabella National Park which provides them with wonderful bio-security. They have their own clean watershed area and catchment, with several springs found on the farm.

Michael gave an attention-holding talk, interspersing data with referenced sources.

He invited comments, happy to have critical ones. We heard that he covers a lot of territory, including regular attendances at conferences in Rome and Crawford Fund Conferences here in Australia. Both ANU and CSIRO expertise came under scrutiny - adversely. All related to production of food for the vast numbers needing it. He offered us a perspective of someone who is on top of the food scenario - its production, delivery and consumption patterns: their current status; prognosis for progress, and declaration of perils. For Australia, for the world.

With such wide-ranging experience, was he able to answer Stephen Boyden's penetrating and worthy question - how to fruitfully engage the spectrum of political/public attention with these issues? Unfortunately, as expected, he couldn't. A tough task for one man, when the best efforts of NSF, with that very matter as both its basic remit and ongoing hope, has yet to succeed.

The scope of the talk was too vast to be condensed into a couple of hours. It ran out of time; as did the question session. In this, about three visitors took part. Current and looming problems were covered: such as those of addressing the problem of cities' footprints; the drift, and associated personal trauma, of Australian (and other nations') farmers to the cities; climate change; overseas investment in our, and other nations', agricultural landscapes; declaring a pipedream the notion of Australia becoming Asia's (or the world's) food-bowl; the

problem of food-miles. He was well aware of the pressure imposed by human numbers.

Whatever the contentious subject (though most should not be), supporting data is available. From the web it ranges across the spectrum: solid science to contrarian and denial; with almost all hues in between. Michael did state his sources but, with lecture-time constraint, many passed over before they could be noted.

Ecologists have noted mammals' two fundamental drivers: food and sex. Michael chose to concentrate on the former; more than once declaring population wasn't the problem: the world had adequate food; the demon was waste.

In contrast to my own alarm at forecast world population peaks rising from 7 billion through 9 then

to 11, he quoted statistics declaring peak to be coming down year by year: 11 to 9 to 8 That doesn't conform to the official UN 2012 revision of population estimates (medium variant) of 10.9 billion by 2100.

Even peaking at almost 9 billion by the "more optimistic"

Wolfgang Lutz (April 2013) was tempered by Lutz' February 2013 estimate that 2100 would still see us (though temporarily) with 7 billion. If correct, the planet would be bearing a continuous century-long average of 7.7 billion.

"We do not live by bread alone", and our survival as a species depends equally upon sexual proclivities. When the 1994 world population stood at 5.6 billion, the International Conference on Population and Development (Cairo) recognised this. Unfortunately, the Conference's recommendations have been mostly ignored. One result of this is noted by the Population Reference Bureau (12/9/2013): It projects Africa's population to rise from a present 1.1 billion to 2.4 by 2050: An extra "waste problem" from 1.6 billion more people. Nor does Australia wish to be alone; adding waste from the equivalent of an extra Tasmania every 15 months.

Population numbers are equally important as food (waste or otherwise); especially when we can do something about it. As well as the waste problem.

Colin Samundsett (with Keith Thomas)

Neo-liberal politics is incompatible with radical emissions reductions, because it has reduced citizens to consumers and led to a concomitant infantilisation of the electorate.

*Jane Hindley, University of Essex
Radical Emissions Reduction
conference
London, December 2013*

Letter to the editor

Your Dec 2013-Jan 2014 issue gave much prominence to John Schooneveldt's article 'The Terrestrial Carbon Pump'.

It certainly calls for follow-up pieces, not only from scientists who have studied soil carbon, but also by climate change scientists; one may need to look no further than speakers at the 2013 Fenner Conference on the Environment held in Canberra.

Schooneveldt implies that we have a responsibility 'to feed the growing human population'. Yet supplies of fossil fuels and fertilisers – essential requisites for current food supply levels – are quickly diminishing. Moreover, what is going to be the impact of climate change? Productivity across southern Australia, for example, is forecast to decline.

The Australian Government's Carbon Farming Initiative also gets a mention, and is seen to have serious shortcomings. Let's ensure that these are soon put right!

Have we also forgotten the message of our very own Professor A. Duncan Brown (*Feed or Feedback*, International Books, 2003) who eloquently demonstrated the widespread continuing drawdown of soil nutrients, including carbon. He saw this phenomenon as the inevitable consequence of historic changes from the hunter-gatherer mode, to that of cultures focussed on human groups in towns and cities.

It is to be hoped that Australian society, now with its belated understanding of former Aboriginal lifestyles, will eventually come to terms with the intrinsic limitations of this land to supply food and fibre.

Of course we must quickly adopt land use practices that will maximise soil carbon, but also be aware that there is little community understanding that our sustainable human population levels will, perforce, be very low indeed in the long term.

Chris Watson

Why we must, and how we can regenerate Australia

Walter Jehne's reply to Chris Watson

As Duncan Brown, John Schooneveldt and Chris Watson have written in previous issues, we need to face the responsibility of feeding the growing human population despite diminishing fossil fuels, fertilisers, soil degradation and increased climate extremes.

Fortunately we can do this naturally, safely and practically, but only if we restore the high natural carbon content and thus structure of our soils (Strzelecki 1842 in CSIRO 1983 Soils; An Australian Viewpoint).

Only by drawing down carbon from the air back into the soils from which most of it was oxidised can we

now progressively return carbon dioxide levels back to below 350 ppm but more importantly restore the 'in soil reservoirs' that underpinned the terrestrial hydrology and resilient bio-systems that humanity depends on fundamentally for its water, food, bio-materials, social stability and our former hydrologically buffered, cooler safe climate.

Just as nature did via pedogenesis in evolving our terrestrial bio-system, every gram of extra stable carbon that we can bio-sequester into our soils has the potential to retain up to eight grams of extra soil water, aid the cycling of essential plant nutrients, improve soil aeration and root growth and enhance microbial activities to aid the regeneration of more resilient, productive bio-systems.

Our challenge is to encourage the adoption and extension of this awareness and such changes throughout the wider Australian and global community. Practical grass roots initiatives to do this over 300 million hectares of inland and northern Australia, or half of our rural landscape, are being led by innovative farmers and Michael Jeffery, Australia's National Soils Advocate (Soils for Life).

In spite of the fascination of fossils, it is surprising how much we would still know about our evolutionary past without them. If every fossil were magicked away, the comparative study of modern organisms, of their patterns of resemblances, especially of their genetic sequences, are distributed among species, and of how species are distributed among continents and islands, would still demonstrate beyond sane doubt, that our history is evolutionary, and that all living creatures are cousins. Fossils are a bonus. A welcome bonus, to be sure, but not an essential one. It is worth remembering this when creationists go on (as they tediously do) about 'gaps' in the fossil record. The fossil record could be one big gap, and the evidence for evolution would still be overwhelmingly strong. At the same time, if we had only fossils and no other evidence, the fact of evolution would again be overwhelmingly supported. As things stand, we are blessed with both.

Richard Dawkins, The Ancestor's Tale: a pilgrimage to the dawn of life, 2005

Similar practical local action to help in this is also being implemented via urban agriculture groups throughout Australia supported by the effective recycling of organic wastes and effluents back into gardens to grow healthy nutritious food to benefit the health and welfare of local communities.

While starting from a small innovative base this regeneration of our rural and urban soils and landscapes is growing rapidly, revitalising the health and wellbeing of many communities.

The question is can we effect such changes adequately and in time before climate extremes, resource limits and their social consequences seriously constrain our capacity to do so?

Walter Jehne
Healthy Soils Australia

The Wallace line

One of the most powerful and important facts about the Earth that human scientific study has revealed is that Earth is just one of the planets revolving around our sun – and that our solar system is just one of untold numbers of such systems in the universe. An equally important scientific fact is that humans are just one of many species that have evolved on Earth and that we are related in lesser or greater extent to the other life forms with which we share the planet.

The theory of Evolution is our birthright, and it is a most wonderful one. It was elucidated for us by two men, one, Charles Darwin, whose name is well known to many in our society (and reviled by some who do know it), the other was Alfred Russel Wallace. The latter is relatively unknown, although there are a number of enthusiasts who have been trying to rectify that lack of public knowledge. The Natural History Museum in London recognised Wallace's co-discovery of the theory of evolution by installing his portrait near Darwin's statue on the centenary of Wallace's death last year.

Wallace had spent the years 1848 to 1866 earning his living as a collector of natural history specimens, first in the Amazon region of South America and then in the Malay Archipelago (now Indonesia), sending his specimens back to Britain for sale. During that time he had suffered amazing hardships and near deadly diseases. He also had a lot of time for thinking. While in the Amazon he had noticed how different species were often isolated from related species on the other side of a river, a fact that stirred his curiosity.

But it was after crossing the fifteen mile strait between the islands of Bali and Lombok that Wallace

had his revelatory understanding of evolution, aided, just as Darwin was, by memories of Malthus's *Principles of Population*. On the western side of that strait the animals were typically Asian. On the eastern side Wallace saw Australasian fauna: flocks of Sulphur Crested Cockatoos, scrub hens that scratched up mounds of earth in which to incubate their eggs, and marsupial tree kangaroos.

At the time it was generally thought that God had created different species to suit different environments. But here were two islands, very close together, with almost identical soil, climate and aspect, yet with totally different fauna. It was as though the two lands belonged to two different continents. And that was the conclusion Wallace came to. He decided that the islands west of the strait were separated parts of continental Asia, and Lombok and the islands east of it were parts of a former Pacific continent which had somehow disappeared.

Six years later, T. H. Huxley honoured Wallace's discovery by naming the unseen but very real line that passed northward through the chain of islands, the Wallace Line. Future work confirmed its reality and the twentieth century discovery of plate tectonics provided the mechanism which had driven its formation.

Wallace was more correct than anyone at the time realised. Although the strait between Bali and Lombok is quite narrow, it is deep and is part of the boundary between the Indo-Australian plate and the rest of Indonesia. Because of its depth, the strait remained impassable even during the ice ages, when falling sea levels enabled many species to cross between other islands. Thus the Asian and Australasian fauna remained separate.

It is wonderful that Wallace happened along at the right time, and with the right mental equipment to notice and understand the line when he did. If he had not, then given our propensity for shipping people, animals and plants around the globe, the sharpness of the boundary would very probably have been blurred, and Wallace's profound discovery would not have been made.

As it is our society seems to have a problem with understanding the importance of the Wallace Line. Many reference works call the line hypothetical: this should be changed. Plate tectonics provides the mechanism: Wallace's original hypothesis is geographical/geological fact.

(for more information see Iain McCalman's book *Darwin's Armada*, 2009)

Jenny Wanless

Book review

Oil and Honey: the education of an unlikely activist.

Black Inc, 2013

Bill McKibben is well known as the author of a string of books on environmental themes. In one of them, *Eaarth*, he proposed that as the Earth itself has been changed almost beyond recognition by its human inhabitants, it needs a new name. He suggested renaming the planet Eaarth, to distinguish it from the planet on which our species evolved.

McKibben had been writing on the assumption that if you told people the facts of our dependence on the Earth's natural systems and the damage we are causing, then they would realise that we need to reform our civilisation to fit more comfortably with the ecological realities that could enable life such as ours to continue to survive. But no, as a society we are rather like an obese patient who has been told that unless we change our eating patterns we will kill ourselves. Just as with many such patients we lack the will power, and will try gastric banding, a form of engineering, rather than making the effort to eat more healthily. We don't seem to care – the allure of food is too great.

Reluctantly McKibben decided that knowledge was not going to change our collective behaviour and he realised that he would have to become an active protestor. The trigger came with the proposal for the construction of the Keystone pipeline to transport oil from Canada's large reserves of tar sands, across the US border for use and shipment from the USA.

The opportunity to obstruct the pipeline by protesting was provided by the fact that the pipeline could not legally be constructed unless the United States' President signed permission for the pipeline to cross the border into the USA. Despite President Obama having said that 'in my administration the rise of the oceans will begin to slow and the planet begin to heal' he seemed inclined to approve the pipeline. As always there was a big push saying that the pipeline would create many jobs and benefit the economy.

While this would have been true during the construction phase, the jobs would be short lived. After construction only a small number of maintenance staff would be required, yet the processing and use of the extremely polluting tar sands would leave a lasting legacy of climate change. McKibben joined the ranks of those who were actively working against the approval of the pipeline.

During his campaign McKibben focussed on three numbers which he considers hold the key to the future of life on earth, three numbers we should keep before us at all times. The first is that scientists have estimated that we must keep human induced climate change to no more than two degrees of warming. The second is that to do that we must not release more than 565 gigatonnes of carbon from

fossil fuels. The third is that the carbon contained in known fossil fuel reserves is 2795 gigatonnes, more than five times the amount we can use before inducing catastrophic changes. This means that we must leave eighty percent of known fossil fuel reserves in the ground; which, incidentally, also means that we should stop any and all further exploration for fossil fuel sources.

McKibben also argues powerfully for divestment from

fossil fuel shares. This should make sense to any investor – after all, if our species wants to save itself from destruction, fossil fuel investments should become worthless in the near future. As he says, the fossil fuel industry by itself 'holds the power to change the physics and the chemistry of our planet, and they are planning to use it'. They need to be stopped, and the sooner the better.

This book is the story of the campaign to stop the pipeline, of going to gaol for one's beliefs, of rallying others to joint that struggle. But it is much more, too. McKibben is a thinker about the human condition. The book has two story lines – the environmental activism and the reflections on the life of a bee keeper. What leads to a fulfilling life, what do we need from life?

The story is interesting, the book well worth reading, and the message critical.

Jenny Wanless

Ammonia – friendly fuel for the foreseeable future?

The era of a relatively stable global climate which followed the last ice age was named the holocene. Since the beginning of the industrial revolution, 250 years ago, the climate has become unstable, due to exponential increase in greenhouse gases, leading to global warming of almost 1 degree, accompanied by extreme weather events which damage humans and their environment. The cause is attributable to prodigious combustion of carbon-based fossil fuels and destruction of most of the world's forests which soak up carbon dioxide from the atmosphere. Extension of "business as usual" replaces cooling chlorophyll by heating concrete, polluting the terrestrial, aquatic and atmospheric environments of the planet. In view of the large anthropogenic component of this disturbance, reinforced by the industrialisation of the large populations of China, India and Brazil, many scientists refer to the present as the anthropocene era, which is unsustainable over a relatively small timescale.

Almost all politicians maintain that "business as usual" from economic growth based on our fossil-fuelled industries is essential to maintain 'competitiveness' in the modern world. They promote new open-cast coal mining, fracking for coal seam gas, deep sea oil exploration and the highly inefficient conversion of tar sands into oil. This is in sharp contrast to the great majority of climate scientists who maintain that mitigation via reduction of greenhouse gas emissions is urgent if humankind is to attain a sustainable future. Climatologists emphasise the importance of harnessing non-polluting renewable energy sources such as solar (local and central), hydro, geothermal, wind, wave and tidal power, a combination of which could reverse the trend towards unsustainability and which are already collectively economically competitive with fossil fuels.

A missing link in this mitigation program is portability of energy for transport, currently provided by both the industrialised and developing world's obsession with the petroleum or diesel-fuelled infernal combustion engine, which adds massively to local and global pollution. This dilemma can be solved by replacing carbon-based fuel (hydrocarbons) by nitrogen-based ammonia, which is composed of one nitrogen atom and three hydrogen atoms (NH₃), whose combustion products are nitrogen and water, with traces of nitrogen oxides.

Confused by "Evolution is only a theory"? Try this: evolution is a FACT; Darwinian natural selection is a THEORY of what drives evolution.

*Richard Dawkins on Twitter,
23 March 2014*

Ammonia as a fuel was successfully used by street cars in New Orleans in 1871 and by buses in Brussels in 1943 when diesel was wholly diverted for military use. Trials have been successfully conducted in Canada on ammonia as a fuel for automobiles, (www.NH3fuel.com), the combustion process being kick-started by a small quantity of petroleum, which temporarily emits small quantities of CO₂ and CO. There are many advantages to the widespread conversion of a carbon economy to an ammonia economy.

An ammonia industry is already well established for fertiliser manufacture, using methane and high temperature combustion for synthesis. Facilities are available for replacement of this energy source by clean renewable energy.

Vehicle engines designed for petroleum or diesel combustion can be converted for ammonia combustion, kick-started by one of these fossil fuels, at relatively low construction and running costs. Existing filling stations could be adapted to deliver ammonia, as they currently are for natural gas as fuel, without human contact. On a

test drive across USA between Detroit and San Francisco, an NH₃ car "filled up" only once, about half way, in Wyoming.

Ammonia is not explosive and is much denser than hydrogen, being storable in vehicle cylinders at relatively low pressure (about 150 PSI). As well as providing energy for mobility, it can fuel generators for electricity.

Overall, an ammonia economy could provide abundant and sustainable employment opportunities

Summary

Conversion from a carbon economy to a nitrogen/photon economy is feasible, and based on adaptation of existing industries, notably clean renewable energy generation. When we burn ammonia, we're actually burning embodied hydrogen, since that's the element in ammonia that combusts and provides the energy.

The main obstacle to mitigation of climate instability is not technical or economic but political, with huge global vested interests in fossil fuel industries at stake

I think of the new era as the sustainocene www.sustainocene.com. – see refs 1, 2 and 5 in Wikipedia for details.

Bryan Furnass is a retired physician interested in environmental health. He is a member of Nature and Society Forum and the Strategic Council of the Climate Institute.

The human attitude to nature – then and now

The following is a rough transcript from a rollicking podcast broadcast earlier this year between Joe Rogan and Stefan Molyneux. It can be found here:

http://cdn.media.freedomradio.com/feed/FDR_2579_Joe_Rogan_Experience.mp3

Although the original contains some swearing, do listen in, skipping to the one hour 34 minute mark to get this sample of the unrehearsed entertaining philosophical discussion young people are used to.

1:34:40 Stefan Molyneux (SM): We like nature because we are a comfortable distance from it. We have our air-conditioning, our antibiotics. But the people in the Middle Ages, they were really close to nature and they died like flies: childbirth was often fatal ...

Joe Rogan (JR): Half the stories have a big bad wolf in them because wolves were killing people on a regular basis; until people had firearms, wolves were killing people routinely.

SF: One flea comes over on a rat from the Middle East and within a short period a third of Europe is killed by the Black Death. Nature is great to visit, but it's not an Ansell Adams poster.

JR: (1:35:30) There is a story from the 1450s: There is a series of murders in Paris by wolves; they killed forty people. We are the same as any other food to wolves: we are just like tender caribou. Today we have protected ourselves with cities and cars and guns and then we can afford to look at them and think "Oh, Beautiful nature". But that beautiful nature cares nothing, absolutely nothing about you. A wolf will eat your baby in front of you. In London recently they have had urban foxes breaking into children's bedrooms and attacking children while they are sleeping.

SM: Rats in Harlem, New York, will just eat a baby's face off.

JR: It's all about survival, and we have eradicated the need to be at all conscious about that ...

SM (1:43:40): You know we are not all that terrified of nature because all the kids' toys are cute predators. You know the kids' song "If you go down in the woods today you're in for a big surprise" because the teddy bears are having a picnic....

JR: That's so common ...

SM: But it's only common now. They didn't have bear toys when bears could kill you. Now there are no bears around, they can be all cute and cuddly. And you can have *The Lion King* because lions are no problem around here. But in Africa people are still eaten by lions and I'll bet there are not a lot of cute fluffy lion toys in those parts.

The bacteria that turn water into ice

Meet *Pseudomonas syringae*, a bacterium that causes disease in plants and helps make snow machines work.

It all has to do with ice nucleation — the process that forms ice crystals in the atmosphere and, thus, snow. You probably know that raindrops and snowflakes form around *something*. There's always a central nucleus that serves as the backbone of the water molecule structure. Usually, when people talk about this process, they use soot or some other kind of particulate matter as the example of what a nucleus can be. But bacteria can also become the nucleus of a snowflake. In fact, *P. syringae* is so good at forming ice

crystals around itself that, in the video above, you can watch it turn cold water into ice almost instantly.

Here's how biologist Mark Martin described the process in the video:

In my microbiology course at the University of Puget Sound, I like to demonstrate the wild and wonderful and weird microbial world. In this video, I supercool a bottle of water to approximately -6 degrees C. I then add a drop of a *Pseudomonas syringae* culture. This organism makes an ice nucleation protein, which allows the supercooled water to immediately change to water ice...while you watch.

The "Environmentalism Stereotype" which is somewhat true, sees environmentalism and therefore conservation as leftist or progressive, tying conservation to gun control, gay rights, vegetarianism, political correctness, and so on. In the United States, the overwhelming linkage of environmentalism with progressivism and the Democratic Party is key for why it lacks trust with some Americans. We need to show that conservation does not have to be linked to these progressive social causes (even if many conservationists are progressives and Democrats), and to make moderates and thoughtful conservatives welcome.

Dave Foreman, Take Back Conservation, 2012, p 9

P. syringae gets this skill from the proteins that cover its surface membrane. The proteins basically form a physical structure that water molecules latch onto. That structure also orients the molecules in a way that prompts the formation of ice crystals. It's these proteins that really serve as the instigator of ice nucleation and they're incredibly efficient at it — far more so than dust. That means that *P. syringae* can get water to freeze at higher temperatures than would happen without its help. Pure water won't crystallize until temperatures dip down to -40 degrees F. If the water in our atmosphere were pure, most of us would have never seen snow. Add in the proteins from *P. syringae*, though, and, suddenly, ice can form at 27 degrees F. You can even get ice formation at higher temperatures than that, depending on the specific strain of *P. syringae* involved, and how densely the ice-forming proteins are packed along its surface.

Commercial snow machines use the proteins (though not the bacteria itself) to help instigate the creation of snow on ski mountains. In other words, you can thank *P. syringae* for all the snowboarding and downhill ski action at the Winter Olympics.

Why would bacteria develop this particular ability? Nobody knows for sure, but the current hypothesis is that it's part of *P. syringae*'s life cycle and how the bacteria spreads. The idea is that the bacterium infects plants, multiplying and growing the same way that a bacterial infection multiplies and grows in your body. There's evidence, though, that instead of just spreading on the air from one plant to another, *P. syringae* can also go higher, pushed up into the atmosphere by wind currents. By forming ice crystals, which become rain or snow, the bacteria are able to fall back down to Earth, infecting plants far away from their original hosts.

<http://boingboing.net/2014/02/24/the-bacteria-that-turns-water.html>

24 February 2014

It is the mark of an educated mind to be able to entertain a thought without accepting it.

Aristotle

Corporations and humans

We can remember our ancestors, and we can imagine our grandchildren, and so sometimes we act in odd and counter-instinctual ways. We may cry when we see a hungry person, and even empty our pockets to feed him; in extreme cases we may give our lives over to that kind of service. Or we sometimes vote for politicians who will raise our taxes and give our money to the poor. Or we go to jail because we worry about global warming. The precise glory of humans is that we are complicated, and those complications are what rein us in – what might still, say, keep us from deciding to tap the tar sands of Canada or cut down the rain forests of the Amazon.

A corporation, far more wonderful in its abilities to execute a plan than any of us as individuals, is

nonetheless uncomplicated. It

doesn't care much about the past and can't think very far into the future. If it does, its shareholders will rebel. It's less like a person than like a bee, at least in this regard. Given the power of speech like a human, it won't use it to reflect, to check itself, or to think about the larger good. It will simply put this new power to work on its single-minded goal of amassing wealth, just as the Koch brothers did, sublimely unconcerned that their tar sands investments were threatening the planet.

In other words, if your goal is to efficiently tap the tar sands, you need a corporation. But to decide if tapping the tar sands is a good idea, you need to keep corporations out of it.

Their relentless simplicity will combine with their wealth to overwhelm reason, science, love. If you want honey you need a hive of bees. But if you were trying to decide if making honey was a good idea, bees would be the last creatures to ask. You know what their answer is going to be. In fact, if you get in their way they'll be a little perplexed for a while, trying to find the door. And if you persist in getting in their way, they're eventually going to get mad and sting. That's just how it is.

Bill McKibben, *Oil and Honey*, Black Inc 2013

The apparent mystery, beauty and fascination of Nature are by themselves worthy of reverence and homage; the fact that (to paraphrase Darwin) from primitive beginnings such wonders have unfolded is as miraculous as any theistic dogma. The spiritual inspiration we gain from the endless miracles of Nature's work is surely a foundation for human values far sturdier than any organized religion, and far more capable of redefining and resolving the major moral crises of our time through new adaptive values and structure. Ecology is in fact the only extant idea with a future. The recognition of the common origins and interdependences of life forms within the biosphere is perhaps the highest moral awareness of which humans are capable. The challenge to global citizens is to create a new politics out of this awareness.

Lorna Salzman, *Politics as if Evolution Mattered*, p.68

Farrago

Saving wildlife

Did you shudder when you saw the news that Namibia had auctioned a permit to enable a wealthy hunter to shoot an aged male rhino? An article by Simon Jenkins in *the Guardian Weekly*, 21-27 February 2014, should help you to repress such shudders in the future.

It seems obvious to us that all elephants and rhinos should be protected, none should be killed for their tusks or horn. To this end, we have international organisations dedicated to their protection. But we also have a massive poaching industry that is slaughtering the animals. An estimated 22,000 African elephants are killed annually. The number of elephants in Africa has halved in the last ten years, the Asian elephant is close to extinction. Rhino deaths have risen from a very small number to more than 1,000 a year.

Jenkins argues that these increasing numbers of animals killed are a direct result of our efforts to ban all killing. He says that Cites is to wildlife what the US Drug Enforcement Administration is to the narcotics industry: a major boost to the profitability of the very thing we want to ban. Those of us who know of the historical failure of Prohibition in the USA, should be able to understand this argument immediately.

While wildlife tourism can provide income for some people in some places, it cannot provide the wealth that poaching does. Auctioning the right for a hunter to shoot an elderly animal that is past its breeding days is a sensible compromise which makes money for African countries. Also, just as farming crocodiles for their skins has removed the incentive to poach those animals, farming of rhino for their horns would remove the financial incentive for illegal slaughtering.

South-east Asia is hooked on ivory, and while there is demand there will be people prepared to supply it. The conservation of these large animals depends on the local people who will protect them if it is in their interests to do so. Banning all hunting is counter-productive.

The value of old trees

During the January heat wave this year *The Canberra Times* reported that older suburbs, well-endowed with trees, recorded temperatures about seven and a half degrees cooler than those in new suburbs which are currently treeless. The importance of trees in keeping cities more habitable is becoming recognised in many places, including major cities such as New York. Not only do trees moderate temperature excesses, they also help to clean the air, and add to the general pleasantness of places. By providing habitat for birds, they also provide other benefits such as winged insect controllers, and the pleasure of bird watching.

Another important job trees do is store carbon. The extent of this storage has now been studied and published by a team at the U.S. Geological Survey Western Ecological Center.

The results indicate that it is misguided to take out the old, big trees, as the rate of sequestration is actually higher in older bigger trees than in small ones. Out of the 403 species studied it turned out that ninety seven per cent actually increased their rate of growth after reaching maturity.

Duke University ecologist Stuart Pimm has shown with careful step-by-step reckoning how mankind is taking 42 per cent of Earth's net primary productivity (NPP is the yearly sunlight hitting Earth and being changed into life-energy by photosynthesis). As we add half again or more as many mouths in the next few score years of year, how much NPP will we be gobbling up? How much will be left the other ten or more million kinds of Earthlings with which we share our enthralling world?

Dave Foreman, Take Back Conservation, 2012, p 2

Chinese dams

China is pushing on with plans for more hydroelectricity, as part of its five-year (2011-15) plan to boost renewable energy to 15% of the country's energy

production. If the Chinese can double hydropower (from 190,000MW) that will push up the renewables' share to 10% of the total.

As part of this effort they have nearly completed a new dam on the Jinsha river, a tributary of the Yangtze. By October this year 14 billion cubic metres of concrete had been poured, raising a 200 metre high wall near the city of Xiangjiaba. Official figures show that more than 100,000 people were moved to make way for the dam.

Another dam with substantially greater hydroelectric capacity is being built further upstream on the Jinsha at Xiluodu. The big push for hydro power is coming from the need to reduce the pollution from coal-fired power stations, in an effort to improve air quality in Chinese cities.

The Guardian Weekly, 25-31 October 2013

Evolution in action – the Himalayan rhubarb

Above the tree line in the Himalayas plants are small and low growing, but every now and again there will be a towering green and yellow column up to two metres high. Joseph Hooker, Darwin's botanist friend, first saw this plant in the 1840s, and was totally puzzled by it. On examination it turned out to be a member of the rhubarb family which Hooker named *Rheumobile*.

The plant has a base of green leaves and, as in the common rhubarb which the leaves resemble, the stems are edible. Rising from this base is a tower of overlapping pale-yellow leaves, or bracts. These act as a greenhouse, protecting a flower spike inside the column. The flowers develop inside the column and are pollinated, produce fruit and ripen within this protected space. Only after this do the bracts fall off, exposing the dead seed bearing stems within.

The bracts allow visible and infrared light to pass through but act as ultraviolet filters, keeping out these harmful rays.

On a sunny day the air inside the column is about ten degrees warmer than it is outside the column. Also, as the plant flowers in the rainy season, the protection afforded by the bracts prevents pollen from being washed away, and boosts germination.

A fungus gnat, the main pollinator of the plant, is also attracted by the warmth of the plant's greenhouse. The gnats lay their eggs in the flowers and their larvae feed on the seeds, but the plant still gains from the interaction, because they have a ready supply of pollinators and the plants do not have to rely on chance visitors to enable them to set seed.

New Scientist, 19 October 2013

More on large old trees

Large, old trees do not act simply as senescent carbon reservoirs but actively fix large amounts of carbon compared to smaller trees. At the extreme a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree.

In human terms, it is as if our growth just keeps accelerating after adolescence, instead of slowing down.

Stephenson et al (2013) *Rate of tree carbon accumulation increases continuously with tree size*. *Nature*.

Feeding Ethiopia

Dessie Zuria, a highland region of Ethiopia, can be a desperate region in which to live. At altitudes over 2,400 metres, with about 90% of the population dependent on rain-fed agriculture and droughts common, getting enough to eat has been a real problem. Farmers in the region have been depending on growing barley, their only staple.

Lately though, people there have been feeling much more optimistic. The reason is that potatoes have been introduced to their region. One farmer, who had been thinking of selling up and moving into town to find work, reports that whereas his plot would produce only 75 kg of barley a year the same land has produced forty 50kg bags of potatoes. His family is now well fed, and their income has improved.

Four years ago the NGO Concern Worldwide introduced the crop to sixteen families. As smallholders saw the benefits they inundated Concern with requests for help. So far 17,000 growers in the district

have taken up potato growing, making it a major crop and improving nutrition for the residents.

According to the 2013 global hunger index levels of hunger in nineteen countries, the majority of them in sub-Saharan Africa, are estimated as alarming or extremely alarming.

The Guardian Weekly, 29 November 2013

Sea anemones endangered

Like coral, sea anemones depend on symbiotic algae for much of their food. Also as with coral these algae get expelled as the water warms beyond their normal range. This is now happening with concomitant bleaching in the anemones in whatever seas you study – the Red Sea, the Indian and the Pacific Oceans. Anemones are particularly vulnerable because they are long lived and slow to reproduce.

As with any ecosystem the removal of anemones would be disastrous for other species, especially those little fish and other small creatures that live amongst the anemones fronds, including clown fish like the movie star Nemo.

Australasian Science, November 2013

It's horrifying that we have to fight our own government to save the environment.

Ansell Adams

American wilderness photographer



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 21 May 2014.

Contributions may be sent on paper or electronically. Electronic submission is preferred.

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 about biosensitivity.

Jenny Wanless and Keith Thomas prepared this edition together with the named contributors; Jenny and Keith also provided the unattributed items and the quotations. The editor welcomes contributions of suitable quotations.

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