

Nature & Society

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Editorial

The British Medical Journal (BMJ) has labelled human-induced global warming a public health emergency and has gone so far as to say that such warming will make the current and probable death toll from Ebola seem insignificant. Dr Fiona Godlee, editor of the BMJ, reminds us that about seven million people die each year from pollution and that if our emissions of greenhouse gases, which are after all a form of pollution, rise further then death rates will certainly increase. In reply Sophie Borland, writing in the Daily Mail, has labelled the BMJ article as 'alarmist' and 'desperate'. She says that the BMJ has devoted eleven pages to warning doctors about something that has no relevance to them.

This is a curious claim, and should be easily refuted. But unfortunately a great many people, whether through ignorance or political bias, persist in ignoring the reality that the health of humans is intimately connected to the environment in which we live. Just as living in slums and overcrowded conditions leads to poor health outcomes and reduced life spans, so does living in a badly degraded environment. For health all animals, including humans, need fresh air, suitable food, clean water and an ambient temperature that does not overheat us or chill us to the bone.

Getting too hot or too cold is recognised as a serious threat to health. Death rates of all species rise in any heat wave, as they do in cold snaps. This is recognised in good zoos, where much effort is made to provide shade, as well as water and diets suitable for each particular species. No zoo management wants to have its animals dying off, or to be guilty of cruelty. In a heat wave they make considerable efforts to keep the animals as cool as possible.

It is either ignorance or political ideology that enables normally intelligent people to be blasé about a warming world. Not only does warming

increase the likelihood of heat waves and death from overheating, but it also promotes the spread of tropical diseases and epidemics in general. Therefore it is totally appropriate for doctors to be deeply concerned about human-induced climate change. In fact they would be either ignorant or negligent to dismiss global warming as of no consequence.

A wide range of unfavourable consequences will be triggered by global warming, extending from its immediate effects on people's health, to its effects on our food supply and all aspects of our lives. Many of our crops have a fairly limited temperature range in which they can thrive, so climate change will affect what can be grown and

where. Already wine makers are finding they need to move their vineyards to cooler regions – and whereas in Europe wine regions can move further north and are in the process of doing so, after Tasmania and the South Island of New Zealand where can Southern vineyards be established?

Not that vineyards are an essential part of human lifestyles however pleasant it is to have a glass of wine, but what applies to them applies to other crops, and crops of one kind or another are essential to keeping the mass of humans fed. The latitudes for healthy crops are different for different crops, but the general rule

*2°C is almost certainly too high to be safe
and
too low to be possible*

David Roberts at TEDx

<http://www.youtube.com/watch?v=pznsPkJy2x8>

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applies – the further you are from the mid latitudes the harder it is to produce sufficient food. The further you are from the mid latitudes, the longer the winter and the harder it is to provide year round food. It was a matter of necessity rather than choice that drove the ancestors of the Inuits to become hunters and fishers not farmers.

Whatever our political leanings, it is time for everyone to accept that the way our civilisation has developed is now having an adverse effect on our prospects for a liveable future. It is time for a reappraisal of lifestyles. What do we need for health and a satisfactory lifestyle? At least in the affluent countries we do not need more goods, we probably do not need more services, although what we have should be more evenly distributed.

What we need is an understanding that the world will be a better place if there are smaller gaps between the haves and the have-nots. We need to defuse ethnic and religious tensions rather than exacerbating them, we should remember the humanity of other people, not seek to create or magnify divisions. Above all, we need to realise that keeping the Earth habitable should be our highest priority. Unfortunately, at present, it is not merely not a priority – for many people it is not even on the radar screen of their consciousness.

Man sacrifices his health in order to make money. Then he sacrifices money to recuperate his health. And then he is so anxious about the future that he does not enjoy the present; the result being that he does not live in the present or the future; he lives as if he is never going to die, and then dies having never really lived."

The Dalai Lama, when asked what surprised him most about humanity

Jenny Wanless

Despite the promise of certainty that numbers provided the scientists of the Enlightenment, they were often not as certain as all that. Sometimes when the same thing was measured twice, it gave two different results. This was an awkward inconvenience for scientists aiming to find clear and direct explanations for natural phenomena. Galileo Galilei, for instance, noticed that when calculating distances of stars with his telescope, his results were prone to variation; and the variation was not due to a mistake in his calculations. Rather, it was because measuring is intrinsically fuzzy. Numbers were not as precise as they had hoped.

Alex Bellos, *Alex's Adventures in Numberland: dispatches from the wonderful world of mathematics*. Bloomsbury, 2010

American 'Tea Party' view of taxation

Many American libertarians are consumed by an obsessive hatred of taxation. In the spring of 2008, when federal income tax returns came due, they organised hundreds of "tea parties" to protest the payment of taxes, even though rates of taxation in America are lower than they have been for many years, and also lower than in most other developed societies throughout the world.

They claimed to embody the spirit of the American Revolution, which they remember inaccurately as a tax revolt. The American revolutionaries of 1776 objected not to taxation but to taxation without representation. After 1789, they taxed themselves more heavily than Parliament had ever proposed to do. Americans of that generation understood that taxes were fundamental to a free republic. In the

twenty-first century, a great many people in the United States reject that idea. Politicians pander to their selfishness. Demagogues relentlessly encourage intense hostility to taxes and foster an attitude of alienation from government.

To demand the benefits of a free society and yet to refuse to bear its burdens

or to pay its expenses is not merely selfishness and hypocrisy. It is profoundly destructive to society itself. Taxation is not only the price of civilization, as Oliver Wendell Holmes observed. It is also the price of liberty and freedom. To oppose all new taxes in the name of liberty is to threaten the destruction of liberty itself. This has been happening in the United States during the twenty-first century.

Fairness and Freedom: a history of two open societies New Zealand and the United States. David Hackett Fischer, OUP, 2011

Human hubris

We have lived our lives by the assumption that what was good for us would be good for the world. We have been wrong. We must change our lives so that it will be possible to live by the contrary assumption, that what is good for the world will be good for us. And that requires that we make the effort to know the world and learn what is good for it.

Wendell Berry, *The Long Legged House*, 1969

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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.

Excessive inequality does more than increase the risk of revolution and terrorism. It also erodes sustainability by widening the separation between decision-makers and the adverse effects that their decisions hold for poor and powerless populations. What is important is a greater degree of global democracy, so that wealthy populations become more accountable for the adverse effects that their decisions cause. For example, decision-makers would be far more likely to reduce fossil fuel consumption if they knew that they and their descendants had to live on a low-lying Pacific Island, at risk of drowning because of climate change.

Colin Butler, *Inequality and Conflict*, *In Search of Sustainability*, edited by Jenny Goldie, Bob Douglas and Bryan Furnass, 2003

Coming FFF meetings

The Frank Fenner Foundation notes that the purpose of the forum series is to encourage discussion on a diverse range of ideas. We welcome and support this process, but note that the views expressed by guest speakers do not necessarily reflect the views of FFF.

Wednesday 19 November. Geoff Davies:

Reforming the Economic System, 7.30 – 9.00 pm at the ANU's Frank Fenner Building, corner of Daley Road and Linnaeus Way. Geoff will speak about what he sees as the need to reform the economy, and his new book *Sack the Economists*.

Geoff is a retired scientist who has realised that the way our economy is currently run is actually a problem that needs to be solved if we are to move to a sustainable future. Geoff will enlarge on this theme and explain his ideas about the type of economy that could provide humanity with a better future, without despoiling the world.

Monday 8 December. Film screening -

Surviving Earth - admission \$12. Doors open from 6.30 pm. Finkel Theatre, JCSMR

The film 'Surviving Earth' will be screened in the Finkel Theatre, at the John Curtin School of Medical Research, ANU. The film features Tim Flannery, Ian Dunlop, Ian Low, Tony McMichael and Bindi Irwin, amongst others. The screening will be followed at 8.40 pm by a panel discussion including Ian Lowe, Julian Cribb, Stephen Bygrave, Peter Tait and the film's director Peter Charles Downey, with Jenny Goldie as MC. This showing is being organised by FFF and Sustainable Population Australia.

Tuesday 16 December – FFF Christmas party

7.00 – 9.00 pm at our usual meeting place in the Frank Fenner Building. During the evening Catherine Gross will give a short talk on her project for FFF. All members and friends welcome. Please bring a contribution of food or drink to help us celebrate the festive season.

One of the key tenets in Stephen Boyden's ideas on the most important aspects of human society is the need for social interaction and conviviality with our fellow humans. So the more, the merrier – it is always great to catch up with old friends, and to meet new ones.

FFF meeting report - August

Can we control wildfires biologically?

Report on August 2014 meeting

At FFF's August meeting Walter Jehne addressed the question *Can we biologically control wildfires?* He extended this to asking 'Does controlled burning lead to further aridification, and are there alternatives to this practice?'

If we continue with business as usual we are heading for temperature rises of four to six degrees Celsius. Such rises will lead to further aridification – indeed data show that this is already occurring.

Currently about 400,000,000 hectares burn each year, but in addition two billion hectares are burnt as part of agricultural practices. These burns release over eight billion tonnes of carbon per year, which is a greater amount than all other human emissions. And although it is not from fossil fuels, it still has climatic impacts.

In addition burning oxidises the soil, causing degradation in the soil biosystems. Since plants started fixing carbon about 420,000,000 years ago these biosystems have been evolving and operating, sequestering carbon in the soil. It is estimated that human use of fire has caused the loss of two billion tonnes of carbon from the soil.

The immediate causes of the ignition of wild fires are the heat and the amount of oxygen in the air and we cannot do anything about these, but we can manage the fuel loads available. We need to balance the oxidation against the formation of humus, so what governs this balance? Humus, the vegetative matter bound up in the soil, is essentially solar energy stored in a carbon matrix. The limiting factors are water and nutrients. Australia is unique in that it is a very dry continent, with low nutrient levels – but Australian plants evolved in these conditions and are therefore suited to them.

Nitrogen is particularly important in governing the accumulation of litter and thus fuel levels and fire intensities. Where there is insufficient nitrogen, we find dry sclerotic litter. With too much nitrogen, there is increased microbial activity, leading to emissions of carbon dioxide but also the oxidation and degradation of soils. However, with the optimal biological fixation of nitrogen, this plant material, which can be both a fuel and fire risk, is composted safely into stable soil humus, where it further aids the water holding capacity, fire suppression and productivity of landscapes. Nature evolved and sustained such balances. We can restore them and we need to do so urgently.

The fern forests of the south coast present a different picture, with bacteria in the roots maintaining an optimal balance. But over much of

Australia there are actually lots of native nitrogen fixers. In drier areas nature has provided herbivores which are mobile biodigesters. They produce soil carbon and biofertiliser. Also some insects have specialised in eating the leaves of eucalypts which are generally not eaten by other animals. Unfortunately – tragically – from about 1850 to 1920, about one million koalas, some of our best aerial biodigesters were killed annually.

Bandicoots eat truffles, and in their hunt for these delicacies they dig up to one hundred holes each up to fifteen centimetres deep per night. In the process they turn over six tonnes of topsoil per annum. Again, in our ignorance, we have largely got rid of these useful animals.

How can we redress the balance where we have destroyed it? Sometimes quite easily. John Walmsley fenced one hundred acres in the Adelaide Hills to keep out foxes and cats (two of the real evils in our bush). When the Ash Wednesday fires went through the area they hardly touched his property, just causing some leaf scorch. And Tasmania is in a better situation because it still has Tasmanian Devils – and no foxes or cats in the bush.

After several thousand years of so-called civilization, most people still have to toil day and night for the rest of their lives. In the tenth chapter of The Story of My Heart, (1883) Richard Jefferies says, "The most extraordinary spectacle, as it seems to me, is the vast expenditure of labour and time wasted in obtaining mere subsistence." If Jefferies is right, then what was the point in creating "civilization" in the first place?

Whatever wisdom may be, in part it must be something beyond what is called civilization. To look for happiness in the material wealth of civilization is a waste of time. All the gadgets that are meant to give comfort to the body will bring little comfort to the soul. It is a mistake to think that technology will ever cure the ills of the spirit. It is foolish to love machinery while despising the world that was here before those machines.

Peter Goodchild, Essays, 2012

So can we regenerate landscapes? This is important. We have three hundred million hectares of arid country that is at risk, as it produces about two billion tonnes of fuel each year.

Solutions to our fire risk can include fire breaks, mosaic landscapes to break up fire threats. Clearing and screens around urban areas are needed. Maybe chickens could be used as mobile biodigesters (scratchivores) in these screening belts. We need a suite of such measures because there is not sufficient time or a big enough workforce for controlled burning in the appropriate seasons and conditions in most years.

At last we are beginning to understand that the aborigines had the right idea, using cool mosaic burning at suitable times of the year.

We also need to understand that we made another mistake in clearing almost all of our wetlands, which had supplied some protection to neighbouring areas. If there is sufficient moisture in the soil, making a humus sponge cools by evaporation. We need to rethink the whole system, and try to mimic the protections the natural system provided.

Medical school teaches us to believe we are living longer now, and so today's diet must beat the diets of the past, hands down. This argument had me so convinced that I never considered questioning the dietary dogma I'd absorbed throughout my schooling. But I realize that today's eighty-year-olds grew up on an entirely different, more natural diet. They were also the first generation to benefit from antibiotics, and many have been kept alive thanks only to technology. Today's generation have yet to prove its longevity, but given that many forty-year-olds already have joint and cardiovascular problems that their parents didn't get until much later in life, I don't think we can assume that they have the same life expectancy.

Cate Shanahan, Deep Nutrition, 2009, p 11

Confirmation bias

The confirmation bias (the mind's tendency to pick and choose information to support our preconceptions while ignoring a wealth of evidence to the contrary), is just one of a truckload of flaws in our thinking that psychologists have steadily documented over the past few decades. Indeed, everything from your choice of cell phone to your political agenda is probably clouded by several kinds of fuzzy logic that sway the way you weigh up evidence and come to a decision.

Why did we evolve such an apparently flawed instrument? Our irrational nature is very difficult to explain if you maintain that human intelligence evolved to solve complex problems, where clear, logical thought should offer the advantage....

Today, when one observes the many severe environmental and social problems, it appears that we are rushing towards extinction and are powerless to stop it. Why can't we save ourselves? To answer that question we only need to integrate three of the key influences on our behavior: biological evolution, overshoot, and a proposed fourth law of thermodynamics called the "Maximum Power Principle" (MPP). The MPP states that biological systems capture and use energy to build and maintain structures and gradients, which allow additional capture and utilization of energy. That is that biological systems will organize to increase power generation, by degrading more energy, whenever systemic constraints allow it. One of the great strengths of the MPP is that it directly relates energetics to fitness; organisms maximize fitness by maximizing power. With greater power, there is greater opportunity to allocate energy to reproduction and survival, and therefore, an organism that captures and utilizes more energy than another organism in a population will have a fitness advantage.

Jay Hanson

<http://jayhanson.us/loop.htm>

(Hugo Mercier and Dan Sperber) believe that human reasoning evolved to help us to argue. An ability to argue convincingly would have been in our ancestors' interest as they evolved more advanced forms of communication, the researchers propose. Since the most persuasive lines of reasoning are not always the most logical, our brains' apparent foibles may result from this need to justify our actions and convince others to see our point of view – whether it is right or wrong.

Dan Jones, The Argumentative Ape, *New Scientist*, 26 May 2012

Amusing ourselves to death

When a population becomes distracted by trivia, when a cultural life is redefined as a perpetual round of

entertainment, when serious public conversation becomes a form of baby-talk, when, in short, a people become an audience and their public business a vaudeville act, then a nation finds itself at risk; cultural-death is a clear possibility.

Neil Postman, *Amusing Ourselves to Death*, 1985

Tony McMichael died on 26 September

All of us in the Frank Fenner Foundation (FFF) have lost a very good friend. We will sadly miss his wisdom, dedication, and good humour. We so much appreciated all the time and effort he put into FFF matters, bearing in mind his numerous other commitments - locally, nationally and internationally.

Our thoughts go out especially to Judith and their two daughters, Anna and Celia, at this time.

Much has been, and will be, written about Tony's outstanding contributions to the health sciences and to humanity over the past four decades. Here I will simply mention one aspect of his work which is particularly pertinent to the interests of FFF. I refer to it as his panoramic vision. There are two facets to this.

First, Tony liked to discuss human health against the background of the story of life on Earth and our own evolutionary history. The medical profession has been slow to wake up to the fact that this biohistorical perspective is essential for the proper understanding of issues of human health in the modern world.

The second characteristic of Tony's panoramic approach was his transdisciplinarity. The evolution of academic culture over the past couple of centuries has led to a situation in which different groups of scholars focus on different aspects of the total situation – giving rise to a range of so-called academic disciplines. Attempts to study the system as a whole are often met with disdain from specialists in conventional disciplines. Tony defied this academic tradition. He recognised that the kind of understanding we need for making wise decisions requires knowledge of the interplay between the different parts of the total system. He drew our attention to the crucial connections between the health and wellbeing of human populations and the health of the living systems around us. Climate change is at present the most critical illustration of this principle.

I would also like to say that Tony's wise counsel, and especially his encouragement, have meant a

great deal to me personally. They have helped me to keep on track.

FFF owes so much to Tony McMichael. He has been a pillar of strength in our midst, and his legacy will continue to inspire us as we move forward.

Stephen Boyden

Tribute to Tony McMichael

Tony McMichael made many contributions to epidemiology and public health, beyond occupational health and climate change. They include contributions on lead and its harm to cognitive development, on smoking (on which he appeared in court as an expert witness), on cancer, nutrition, infectious disease, on global ecological

and environmental change, including but exceeding that of climate change. He chaired and co-chaired numerous technical working groups across a very broad range of public health topics including national enquiries into water fluoridation and the health effects of passive smoking, both of which set the scene for national public health action. Later

It is high time that we stopped calling for an "End to Growth". Stopping growth is meaningless. Or promoting "degrowth" or a scaled down form of industrialism. Degrowth and de-industrialism is inevitable. I don't know of a weather forecaster that advocates or promotes a coming storm. It's coming - and in fact has begun whether we like it or not or choose to ignore the signs.

Tim Murray, commenting on Chris Clugston's Scarcity: Humanity's Final Chapter?, 2012

he co-chaired a programme for the *Special Programme on Research and Training in Tropical Diseases*, leading to a WHO Technical Report on the relationship between environmental change and infectious diseases of poverty. He favoured exploration of the causes of causes, in his words escaping the "prison of the proximate".

Tony's most important book is "Planetary Overload". Today ecological public health courses are recognised as legitimate and indeed vital.

If we are to survive as an advanced, wise and compassionate species the work of people like Tony McMichael will increasingly be recognised as fundamental to the shift that we are engaged in.

Colin Butler

*So, naturalists observe, a flea
Hath smaller fleas that on him prey;
And these have smaller fleas to bite 'em,
And so proceed ad infinitum.*

Jonathan Swift, On Poetry, 1733

Examining ancient diets

The teeth of ancient humans are proving a store house of information on what these people ate – and the health effects of those diets. Alan Cooper leads a group of researchers at the Australian Centre for Ancient DNA at the University of Adelaide. His team has analysed the dental calculus on the teeth of early European skeletons dating from 7500 to 700 years ago. This has enabled the researchers to compare the microbial DNA in the samples from these early populations with that of the microbiomes in the mouths of today's population.

The results show microbial communities shifting as lifestyles changed. The bacterium associated with dental caries, *Streptococcus mutans*, first appeared in the early Neolithic era, as people changed from hunters and gatherers to farmers. At the same time the bacteria that cause gum disease, including *Porphyromonas gingivalis* became more common. It seems that the diets of hunter-gatherers had consisted of foods that were conducive to oral health, whereas the diet of farmers did not.

The next big change in oral health occurred with the advent of the industrial revolution, and specifically the general adoption of a diet rich in refined sugar. This has continued, with most people host to mouths full of *Lactobacilli* and *Streptococci*, bacteria that feed on sugar. These bacteria release lactic acid, which dissolves tooth enamel and lowers the pH in the mouth, thus making it a hostile place for more beneficial species that would be at home in a less acidic environment.

The fossil record also shows that ancient hunter-gatherers, including the Neanderthals, had strong, intact teeth. Even the populations for whom sugary dates were a major food item had an almost complete lack of decay. So it looks as though it was the absence of the bacteria, rather than the diet, which gave their owners healthy teeth.

Estimates based on the genetic divergence of varieties of *S. mutans* in other animals indicate that the species started to infect humans about the time of the dawn of agriculture, 10,000 years ago.

There is little doubt that the modern oral microbiome is not good for us. A deeper knowledge of the bacteria that lived inside ancient humans could lead to better understanding of what we need for healthy mouths and guts. Balancing our microbiomes in light of this knowledge could reduce our susceptibility to a range of diseases.

Sharon Levy, *New Scientist*, 19 April 2014

Natural economy

Studying the Earth's ecosystems is fascinating and can show us the way to sustainability if we are

In the sixteenth and seventeenth centuries Western Europe fell in love with collecting data. Measuring tools, such as the thermometer, the barometer and the perambulator – a wheel for clocking distances along a road – were all invented during this period, and using them was an exciting novelty. The fact that Arabic numerals, which provided effective notation for the results, were finally in common use among the educated classes helped. Collecting numbers was the height of modernity, and it was no passing fad; the craze marked the beginning of modern science. The ability to describe the world in quantitative, rather than qualitative, terms totally changed our relationship with our own surroundings. Numbers gave us a language for scientific investigation and with that came a new confidence that we could have a deeper understanding of how things really are.

Alex Bellos *Alex's Adventures in Numberland: dispatches from the wonderful world of mathematics. Bloomsbury, 2010*

willing to act on the evidence before our eyes. When we consciously observe nature – the tides, atmosphere, movement of clouds, river systems, microbial communities, living soils, plants and animals – evolutionary logic is revealed. Nature is always adapting to changing conditions and seeking equilibrium. Everything has a purpose, nothing is lost, nothing is wasted, and nothing is extraneous. We know that the Earth's naturally functioning ecosystems are the basis of life on Earth, providing air, water, soil fertility, raw materials and energy. It is also clear

that the global economy does not recognise that the production and consumption of all goods and services depends entirely on the ongoing functionality of these ecosystems, and, as a result, fails to value it correctly. This is not surprising for a system that was founded on feudal privilege, military force, colonisation and slavery. While our stock market screens and bank accounts claim we have generated wealth, in reality, we have enriched a small minority of people while impoverishing a much larger majority of people on Earth, and destroyed ecological function over huge portions of the planet.

John D. Liu, SPA Newsletter, June 2012

Bread of life

There are three food trees that were very important for the voyagers who populated the Pacific Ocean. One of these trees is the coconut palm, the quintessential tree in cartoons of lonely castaways on desert islands. The coconut, with its hard waterproof casing, has always bobbed around on waves and colonised new islands without any human help.

In contrast the other two trees have always depended on humans for their worldly voyages, as they are propagated vegetatively. One of these is the banana palm, the fruit of which has come to be a staple in Australian shops and homes, and indeed around the world. The other is the Breadfruit, which never seems to rate a mention. Yet the breadfruit has played a part in history, and it may be about to make a comeback.

In 1789 Lieutenant William Bligh had a cargo of one thousand breadfruit trees aboard the HMS Bounty when the famous mutiny occurred. The trees were bound for the sugar plantations of Jamaica, where the owners were anxious to obtain a cheap and reliable food supply for their slave labour. Bligh's plants did not get there, of course, because the mutineers threw them all overboard.

In 1792 the by then Captain Bligh successfully shipped 2000 breadfruit plants to Jamaica. Of these 678 grew and produced fruit. At first the slaves refused to eat the green lumpy fruit, with flesh like potatoes, but within fifty years it had become a staple food in the Caribbean.

Over the succeeding centuries breadfruit fell out of favour, replaced by cheap wheat, rice and maize. But now, with Jamaica in debt and importing more than half the food it needs, the Government has started to encourage self-sufficiency and local food production. Again there is interest in growing breadfruit. With the many varieties of breadfruit known different ones can be chosen to suit the tastes of current populations.

The renewed interest in breadfruit is largely the result of work done by Diane Ragone of Hawaii's National Tropical Botanical Garden. She has been studying the plants since the 1980s, and has collected and studied more than 200 varieties. She has propagated 125 varieties, sourced from thirty-four countries.

Ragone has worked with Nyree Serega of Northwestern University in Chicago, to try to identify a common ancestor for the trees. With so many varieties offering different tastes and textures there is still a definite pattern to their geographical spread. The further east you are in the Pacific, the less genetic diversity there is, and the less likely that breadfruit are able to set seeds. It looks as though the breadnut, from New Guinea, is the common ancestor.

I believe that in the process of locating new avenues of creative thought, we will also arrive at an existential conservatism. It is worth asking repeatedly: Where are our deepest roots? We are, it seems, Old World, catarrhine primates, brilliant emergent animals, defined genetically by our unique origins, blessed by our newfound biological genius, and secure in our homeland if we wish to make it so. What does it all mean? This is what it all means: To the extent that we depend on prosthetic devices to keep ourselves and the biosphere alive, we will render everything fragile. To the extent that we banish the rest of life, we will impoverish our own species for all time. And if we should surrender our genetic nature to machine-aided ratiocination, and our ethics and art and our very meaning to a habit of careless discursion in the name of progress, imagining ourselves godlike and absolved from our ancient heritage, we will become nothing.

Edward O. Wilson,
Consilience: The Unity of Knowledge

This fits with the archaeological work done to tease out the patterns of human settlement in the Pacific. The Austronesians are thought to have come from Taiwan originally, reaching New Guinea about 4000 or maybe as little as 3000 years ago, before island hopping through Melanesia to Polynesia, and fanning out northwards to Hawaii and south to New Zealand. They could have carried roots of the breadfruit with them, or even have had advance parties take the plants to new islands before actually settling there.

The breadfruit is now set for a new entry on the world stage. Rather than having to take cuttings, methods such as tissue culture are in use. A US charity, Trees that Feed, are providing funds to import several varieties of breadfruit

to the Caribbean. Different varieties provide a spread of fruiting seasons and a range of tastes and uses. Breadfruit pasta and crisps are also being developed to make this convenient food tastier and more convenient.

New Scientist, 28 June 2014

What passes through us passes on

Many years ago there was serious concern when it was found that male fish in rivers downstream from sewage works were beginning to show female characteristics. It was found that hormones, from the comparatively new contraceptive pill, were causing the changes in the fish.

Over the years this concern has faded – after all there are an indefinitely large number of environmental problems to concern us and we have to pick and choose. But the Daily Mail of 27 October has brought the problem back into focus.

This time it is not just the contraceptive pill, but a much wider range of pharmaceuticals that have been shown to cause problems. The use of anti-depressants in the general population is high – the Daily Mail article says that the figure is one in six people in the UK. More than fifty million prescriptions for these drugs are issued each year in just that country.

Now the use of anti-depressants has been linked to starlings losing interest in both food and sex. The birds had been eating earthworms that thrive in the mud at the sewage works. Crayfish have been found to become more aggressive when exposed to the chemicals in ‘happy pills’, and anti-inflammatory drugs are causing severe liver damage in otters.

The effects of these drugs occur even at very low doses. Concentrations as low as one part per million can have severe effects on wild life.

A bad-tempered future

A hotter world could well be a more violent one. As reported in *Science*, 1 August 2013, researchers from Princeton University and the University of California-Berkeley trawled through 12,000 years of human history to see if there is a link between hotter weather and violence. They analysed sixty studies

dealing with various parts of the world, and from fields as diverse as archaeology, criminology, economics and psychology. They were looking for links between climate and civil unrest or interpersonal violence.

What they found was that even slight spikes in temperature and precipitation produced marked increases in such violence. They say that although climate is not a sole or primary cause of violence, it certainly exacerbates existing social and interpersonal tension, regardless of the wealth or stability of a society.

It does not require a large change to have this effect. A change of as little as one standard-deviation from the local norm can raise the risk of riot, civil war or ethnic tension by an average of 14

per cent. A one standard-deviation change in temperature would be around 0.35°C in some African countries. Climate change models are predicting changes of two to four standard-deviations by mid-century.

Both drought and flood can cripple economies. This is especially true for agricultural economies or ones that are already weak. Small changes can then produce large effects. Heat alone makes people more aggressive – even a warm room increases aggression.

When you consider that everyday our planet gets more crowded, it certainly looks as though tensions will

rise along with the temperature.

Population problem

Solving the population problem is not going to solve the problems of racism... of sexism... of religious intolerance... of war... of gross economic inequality—But if you don't solve the population problem, you're not going to solve any of those problems. Whatever problem you're interested in, you're not going to solve it unless you also solve the population problem. Whatever your cause, it's a lost cause without population control.

Paul R Ehrlich

We are heading toward economic, political and social collapse, and every day that passes brings it closer. But we just don't know when to stop, do we? Which part of "the harder we try, the harder we fail" can't we understand? Why can't we understand that each dollar of debt will drive us into national bankruptcy faster, harder and deeper? Why can't we grasp the concept that each additional dollar of military spending further undermines our security? Is there some cognitive impairment that prevents us from understanding that each additional dollar sunk into the medical industry will only make us sicker? Why can't we see that each incremental child we bear into this untenable situation will only make life harder for all children? In short, what on earth is our problem?

*Dmitry Orlov, Collapse Competitively
2 April 2010*

Farrago

Antibiotic resistance

We are beginning to see the end of the golden age of antibiotics, a period in which most serious infections could be cured by antibiotics. Now about one in seven patients who need such help cannot be cured as the bacteria that cause the infection have developed resistance. Hip operations, Caesarean sections and even simple scratches could be deadly. The World Health Organisation has declared that this is a public health crisis.

Resistance has developed because of the careless and inappropriate use of antibiotics by doctors, vets and patients. It has been difficult for doctors and vets to know whether they were dealing with a viral or bacterial infection, but it is really important to know which, because only the latter can be cured by antibiotics. Also many patients have expected antibiotics to be prescribed whether they were appropriate to the case or not.

A further problem is that too few children have been immunised against the common childhood illnesses such as diphtheria, whooping cough, polio, measles, mumps and rubella. Parents who have never experienced, seen or maybe even heard of these diseases do not understand that they were often deadly. In fact the population at large has no realisation that before the mid-twentieth century children were very vulnerable and deaths were common. Misuse of antibiotics could see a return to that situation.

UK Daily Mail, 26 Sept 2014 *Antibiotic Resistance Rates in UK 1991-2014*

Protecting whales

The International Whaling Commission has passed a resolution, proposed by New Zealand, to enforce much stricter criteria on any application to conduct whaling for research purposes. In future, Japan will need to convince the Commission that any proposal for research is "reasonable" as well as scientific. It will be necessary to show that the proposed research is genuinely useful in terms of whale conservation, as well as being of scientific interest.

Dancing bees

Bees can assess the state of their environment, and some humans have managed to decode their reports. Scientists at the University of Sussex, UK, videoed 5484 waggle dances from three honeybee colonies living near several conservation zones. Most bees danced to inform their hive mates about a nature reserve that had many wild flowers in bloom.

But they also praised farms which were part of Higher Level Stewardship schemes, which set aside wild land. They were less keen on Organic Entry Level Stewardship farms, where regular cutting meant fewer flowers.

New Scientist, 31 May 2014

While climate change is not the major driver of coral loss at present, it can be expected to dominate if we continue on our current course. No one likes to say it out loud, but we should publicly recognise that we are planning to destroy the Great Barrier Reef by setting targets for climate change that we know are inadequate to protect the reef.

*Dr Chris McGrath
writing in Crikey, 5 October 2012*

Monitoring Arctic ice

The Marginal Ice Zone Programme is a large experiment being conducted in the Arctic. A suite of specially designed instruments are automatically monitoring the ice conditions, giving scientists an unparalleled picture of what is happening in the area.

Twenty wave buoys built by the British Antarctic Survey are

embedded in the pack ice, measuring air and ice temperature, air pressure and ice thickness, and taking photos, sending the information via satellite links four times a day. Ten polar profiling floats, modified by the Woods Hole Oceanographic Institution, have a robot monitor that descends a one thousand metre cord and measures water temperature and salinity. Four "sea gliders", rocket shaped underwater vehicles operating autonomously under the ice, measure water turbulence and dissolved oxygen.

The US navy has invested twelve million dollars in this programme because they need to know what is happening there and how much of the area will be accessible to shipping. Much of the area was under solid ice a few years ago, but it is changing quickly. Information from the cameras has shown that the ice can melt surprisingly quickly. In June it took only three days for the surroundings of one wave buoy to go from solid ice to a glossy melt pond.

New Scientist, 12 July 2014

Sixth Great Extinction?

Because all children seem to find dinosaurs irresistible, everyone seems to know about the great extinction event, almost certainly a meteorite strike, which led to their demise. But it is less well known that there have been five other great dyings over the last 440 million years, events that resulted in the end of at least half of all species that inhabited the Earth before the event.

It is also not so well recognised that we are in fact watching the sixth great extinction under way at present. We keep hearing about this species or that species in danger, but we do not really understand the magnitude of this disaster. Nor do we readily accept that it is our species, and our lifestyles that are causing the problem.

We actually have no excuse not to know, for the facts are presented in the public media, and particularly in the excellent wildlife documentaries which we are fortunate enough to get on the ABC. But none of this seems to make a strong enough impression for us to actually do anything much about it – to change our ways so that we do not cause so much damage to the environment and to other species.

The *Living Planet* report, produced by WWF, should shock governments into action, but is likely to be ignored. Our business and political systems simply do not recognise that without viable ecosystems to support us, our economic systems and our society at large will not have a secure base, and will suffer great damage.

Suburbia is where the developers bulldoze out the trees, then name the streets after them.

Bill Vaughan

Complexity illustrated

When we try to pick out anything by itself, we find it hitched to everything else in the universe. One fancies a heart like our own must be beating in every crystal and cell, and we feel like stopping to speak to the plants and animals as friendly fellow-mountaineers. Nature as a poet, an enthusiastic workingman, becomes more and more visible the farther and higher we go.

John Muir, 1869, *My First Summer in the Sierra*

Flightless birds – the Ratites

Big flightless birds such as emus and ostriches, collectively known as the ratites, all look rather similar, so it would seem natural that they should be related. It had been assumed that they had spread around the world on foot before the ancient supercontinent of Gondwana had broken up into the present arrangement.

But DNA evidence shows that this was not the case. Alan Cooper at the University of Adelaide has sequenced the DNA from the extinct elephant birds of Madagascar and compared it with the DNA of living ratites. The only ones that are closely related to the elephant bird are New Zealand's kiwis, with a last common ancestor that dates from a more recent period than the separation of Madagascar and New Zealand. The implication is that they evolved separately from a flighted bird that could cross oceans.

The moas were most closely related to South American flying birds called tinamous.

New Scientist, 31 May

Kiribati buys land

The Alliance of Small Island States (including the Maldives, Kiribati and Tuvalu) is telling the world that these low lying island groups are the first to suffer from the effects of human induced climate change and the disaster is already in progress. Kiribati, a nation of 110,000 people scattered over thirty three low-lying islands, has bought twenty square kilometres on the Fijian island of Vanua Levu, about 2000km away. President Anote Tong says the land will be used for growing food, as seawater increasingly penetrates into the groundwater on Kiribati itself. Eventually, if sea levels keep rising, it may be necessary for the whole population of Kiribati to move to the new land.

In March the Intergovernmental Panel on Climate Change reported that the sea level around these island states is rising by 1.2cm per year, about four times faster than the global average. The impacts there are irreparable, whatever global agreement on climate change may be reached. These small island nations need an international mechanism for loss and damage compensation as their countries are rendered uninhabitable and the populations face the tragedy of relocation.

The Guardian Weekly, 4 July 2014



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

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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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