



Permaculture; 4 decades of education, design and action for a prosperous energy descent future

Introduction

Being invited to present the 2016 Keith Roby Memorial Lecture in Community Science in the Kim Beasley Lecture Theatre of Murdoch University is something of a home coming.

When I left WA to discover Australia by hitch hiking in late 1972 Murdoch University was still under construction in the pine plantations that I had spent time wandering through in my teens. And Kim Beasley (senior) was the member for Fremantle and the minister for education in the newly elected Whitlam Labour Government that had, amongst hundreds of other reforms, abolished university fees (ironically making my scholarship to attend university worthless).

A year on the road around Australia, including time at Nimbin in the aftermath of the 1973 Aquarius festival, had convinced me that despite having been academic dux of John Curtin High School in 1972, I was not fit for a university education (or that university was not worth my precious time).

Environmental Design

In 1974 when Keith Roby became foundation lecturer in chemistry at Murdoch University, I had moved to Tasmania to join the Environmental Design School founded by Hobart architect Barry McNeil at the then recently established College of Advanced Education. When Keith Roby was active in promoting interdisciplinary education and early environment awareness at Murdoch, Environmental Design was designed to facilitate interdisciplinary study. It attracted all of the radicals and dissidents from the architecture, planning and landscape architecture faculties around Australia. Renewable energy, natural materials, owner building, participatory design, public transport, ecology and biodiversity were all part of the foment of what I believe, was the most radical experiment in tertiary education in Australia's history.

A three year generalist degree in Environmental Design preceded a three year, part time, post graduate specialisation in architecture, landscape architecture or planning, where it was required that students had part time employment in their field of study.

One third of the staff budget was allocated to visiting lecturers and practicing professionals. The school functioned as a consultant to government, undergraduate and graduate students worked together on projects, and were involved in selection of new staff. There was self assessment up to submission of a thesis, the time table was self organised and most shocking of all, there was no curriculum. McNeil said that the world was changing so fast that you needed to teach problem solving and thinking rather than any particular skill set that could become redundant by the time students became leading practitioners.

This lecture is a memorial in another way with the passing last month of Bill Mollison aged 88, my mentor when we co-created permaculture in the mid 1970's. Although I was there at the start, if it has been left to me, the manuscript that became *Permaculture One*¹ would probably still have been lying in a drawer awaiting editing and I would not be speaking to you today. Bill Mollison was the internationally acknowledged father of the permaculture movement whereas my role in that movement has been a harder one to pin down.

A Chance Meeting

After a chance meeting in Spring 1974² Bill and I developed a completely informal student mentor relationship including sharing house. I poured all of my energy into both the manuscript and the garden to which we later attached the term permaculture, but I never attended any of his lectures as senior tutor in the Psychology faculty at Tas Uni. Even within the radical freedom of Environmental Design, my single minded focus raised concerns, but I did complete a property design for rural self sufficiency as my thesis, for which I had the audacity to use my unpublished permaculture manuscript as my primary reference. Of the 106 first year students who started Environmental Design in 1974, I was one of 6 who survived the savage freedom, passed themselves through each semester, submitted a thesis and was awarded a Bachelor of Environmental Design. I promptly left academia to continue my journey in practical skill building. Bill focused more on promoting the ideas and after editing and additions to the manuscript by Bill, *Permaculture One* was published in 1978 to much acclaim and some scorning critique.

The First Wave of Environmental Solutions

What was going on in 1977 for 6 mainstream publishers to offer publication to a rambunctious Tasmanian academic and a completely unknown graduate student? To answer that question, I need to zoom out and leave behind the personal story to gain a historical perspective on the growth and spread of permaculture at the same time that Keith Roby was articulating his community science concept.

The conception and initial spread of permaculture in the mid to late 1970s was part of the first wave of modern ecological solutions that can be seen as responding to the evidence presented by systems scientist Dana Meadows and colleagues in the Limits To Growth report of 1972, commissioned by the Club of Rome international think tank. It was arguably the most important scientific report in history. The first oil crisis the following year highlighted the level of dependence of modern industrial societies on cheap and abundant energy, creating the first substantial recession since the end of WWII and stimulating an explosive interest in renewable energy, urban design, sustainable agriculture and more efficient and even frugal ways of living.

First Wave Resistance

Since the late 1960s, oppositional environmentalism had been on the rise in the affluent counties. The flooding of Lake Pedder in Tasmania in 1972 is now recognised as one of the key milestones in the emergence of the global green movement. Mollison had been at the forefront of the campaign to save Lake Pedder and other environmental campaigns when I met

¹ Bill Mollison and David Holmgren *Permaculture One* Corgi 1978

² This short piece recalls that meeting: holmgren.com.au/a-chance-meeting/

him in '74. I came from a family of anti war, social justice and environmental activists. In *Permaculture Pioneers*³ I acknowledge myself as being “second generation alienated” from the values of the society around me, while I described most of my peers as being “first generation alienated”. Although we were a generation apart in age, both Mollison and I were firmly focused on how to directly create the world we wanted, rather than fighting against the world we didn't want. As a West Australian footnote, my younger brother Gerard (Gerald) Holmgren at 16 was writing press releases for the Campaign to Save Native Forests and lying down in front of D9 bulldozers at the same time that I was working on the permaculture manuscript.

Permaculture Influences

While a dark view of the state of the world informed the conception of permaculture and the structure of the Permaculture Design Course later developed by Bill, the focus was firmly on ecological design solutions. Organic agriculture, alternative energy, self reliance, intentional communities and co-operative localism were all part of the mix that gave rise to permaculture. At the conceptual level the work of EF Schumacher (*Small Is Beautiful* 1973) and Edward Goldsmith (*Ecologist* magazine), Ian McHarg and Christopher Alexander, combined with earlier visionaries of the organic agriculture movement including FH King, Russell Smith, Albert Howard and others. Most important from my perspective, the first reference in *Permaculture One* was to Howard Odum's *Power Environment and Society* (1971) a difficult text that used embodied energy as a currency, and an energy circuit language to identify and explain principles and patterns that unified natural, human and geophysical systems. This was independent of Lovelock's concurrent work towards the Gaia hypothesis.

Keith Roby's “community science” concept can be understood as another expression of that first wave of positive environmentalism informed by skepticism about the prevailing faith in technological complexity to control nature, denial of the limits to growth and elevation of materialist values.

The Permaculture Design Course, first taught by Bill Mollison in 1981 became the vehicle for the spread of the concept and creation of a network of designers, teachers and practitioners, all outside of mainstream education, business or government funding. Although I was critical of Mollison's outlandishly ambitious plan to teach a cadre of permaculture students who would go out and redesign the world, his casting of permaculture as primarily an education practice outside of academia was directly in line with my own actions to test the concepts. It was probably the single most important action that built on the flush of enthusiasm in late 1970s and laid the foundations for a global movement of hundreds of thousands of teachers, designers, activists and practitioners.

Energy Descent

The view of the future that informed the permaculture concept was one of “energy descent” that would require, over many generations, a relocalisation of economies, a reruralisation of human settlements and a synergistic integration of ecological agriculture, appropriate technology and community organisation. It was a clear response to *The Limits To Growth* and the evidence that society was showing all the signs of following past civilisations into overshoot. We thought that markets would factor in resource depletion leading to economic contraction if not collapse and that a bottom up response to build parallel systems in the

³ Kerry Dawborn & Caroline Smith editors *Permaculture Pioneers: stories from the new frontier* Melliodora Publishing 2011

shadow of the main economy was the best response. It is also important to acknowledge that in his teaching of permaculture, Bill Mollison was ambiguous, to say the least about energetic limits to humanity's future, often suggesting various technologies could overcome the energy limits while he maintained a very strong view about the ultimately destructive nature of agriculture and fossil fuel use. This is the other half of the *Limits to Growth*, those of Sinks rather than Sources is now upon us as non-negotiable climate change. At the same time the seeds of mainstream sustainability were being sown, focusing on a "techno-stability" future for humanity reflecting the final sweet scenario of the *Limits To Growth* that could come about by a coordinated global policy to reduce growth in energy and resource use, pollution and population while making the maximum of technology to make the transition.

Friedmanite Revolution

Both the Techno Stability and Energy Descent frames of the future were swept aside in the Friedmanite revolution⁴ that included market deregulation, privatisation, cheap resources plundered in a new wave of neo-colonialism and most importantly, credit expansion to bolster the "techno-explosive" future of perpetual growth. A generation of scientists, academics, environmental and political activists who survived the purges of the Friedmanite revolution came to the conclusion that the limits of resources was not going to lead to a change in society in the foreseeable future.

Most significant for our current dilemmas, the field of environmental accounting, especially using energy as a scientifically valid alternative currency with which to measure value was defunded. In Australia many hoped for a new golden age of environmental policies and workers at the table of power with the Hawke Keating government elected in 1983. Instead they delivered the Friedmanite revolution with a human face.

The 1979 ANZAS congress in Hobart that I attended had half a dozen papers on embodied energy in agriculture. But by the mid 1980's only a handful of energy systems modellers around the world had managed to maintain a tenuous hold in academia. In Australia the most powerful and insightful method of embodied energy accounting developed by Howard Odum and colleagues remained unknown and more generally systems ecology was displaced by more reductionist approaches to modeling natural and human managed resources. In conservation biology what we call Nativism took hold here and more generally in the Anglo-american world.

Permaculture activism retreated to the geographic and conceptual fringes where the graduates from the permaculture design course formed a subcultural network leading to the first international convergence held in northern NSW in 1984. The 13th national convergence here in WA was the other reason for my multi purpose journey to the west for this lecture.

Second Wave Solutions

In the late 1980s the next wave of modern environmentalism responded to the scientific consensus on climate change with mainstream sustainability concepts. Everyone wanted to get tech savvy with smart renewable technology, all evaluated through the new metric of Green House Gas emissions. Although permaculture remained marginal to that discourse, it also grew rapidly in Australia and overseas at that time. Mollison's encyclopedic self-published work

⁴ After its chief architect Milton Friedman euphemistically called neo-liberalism introduced by Thatcher in UK 79 and Reagan USA 81 and Hawk/Keating Aus 1983

Permaculture; A designers manual in 1988 and two documentaries shown on ABC TV had perfect timing, and laid the foundations for that second wave. Although it was popularly seen as a set of gardening and land use techniques, the commonality of teaching permaculture was always as a design system founded on clear ethics of Earth Care, People Care and Fair Share. I characterised the design system as integrating sustainable land and resource use with sustainable living. Thus it applied to both the production and the consumption sides of the human economy and predated the emergence of the sustainable consumption concept⁵.

The Weightless Economy

By the mid 1990's another phase of techno-optimism had taken hold of society, supported by the IT revolution that underpinned globalised Just In Time manufacturing, massively expanded and deregulated financial services and plundering of the resources of the vanquished Soviet Union. In teaching Permaculture Design Courses in the 1990s I highlighted the centrality of agriculture and food, behaviour change to voluntary simplicity, restarting the non-monetary household and community economies and continuing import of the *Limits to Growth* thesis to any realistic discussion of ecological sustainability. Most controversially I emphasised the biodiversity value of naturalised species in contributing to what are now called novel ecosystems⁶. Most significantly I identified the suburbs as the human habitats that had the greatest potential for a bottom up transformation through what I called garden agriculture⁷. I felt somewhat like a dissent scientist in the then recently imploded Soviet Union challenging the central orthodoxies of the society except that rather than being sent to a gulag, we were dismissed or simply ignored.

Principles and Pathways

In *Permaculture Principles and Pathways Beyond Sustainability* (2002) I clarified the energy descent view of the future that required fundamentally different thinking from that which had served humanity on the upslope of the energy peak for at least 250 if not 500 years. The framework of 12 design principles firmly grounded in both system science and the wisdom of sustainable traditions reinvigorated the teaching of permaculture globally and rekindled new interest in the concept from outside the existing networks.

Unfortunately the events of 9/11 had shunted the whole sustainability agenda sideways, so the impact of this third wave didn't really get going until the peak oil debate and the global financial crisis provided the right context for renewed interest in ecological design solutions.

Third Wave Solutions

The currently converging crises of geopolitical stress, economic stagnation and instability, peak oil and most fundamentally accelerating climate change have seen another major wave of environmental activism since the GFC. However an escalating mobilisation of people shouting for less has not worked to stop or even slow, much less reverse the acceleration of the ecological overshoot and many people can now see that bushfires are breaking out faster than the efforts to damp down the sparks. As Graham Turner of CSIRO concluded in 2014

⁵ As part of Agenda 21 at the UN Rio Earth Summit in 1992

⁶ Hobbs, et al Novel Ecosystems: Intervening in the New Ecological World Order 2013

⁷ *Gardening As Agriculture* 1991 in *David Holmgren Collected Writings* Melliodora eBook

“...preparing for a collapsing global system could be even more important than trying to avoid collapse”⁸

On the positive side of the ledger there is a jostling market place of sustainability solutions from corporate managed global scale to the household and community level. The growth and diversity of permaculture inspired action now includes strong threads of influence through mainstream environmental and university education, community development, regenerative agriculture, and natural resource management. Right here in WA the work of Josh Byrne⁹ as both a TV presenter, researcher and practitioner of sustainability informed by permaculture is a great example of this spread of permaculture design solutions laterally through refinement and popularisation as well as influencing the more glacial shifts in policy and regulatory circles.

Action at the Edge

However the majority of permaculture design, teaching and practice remains at the organisational and conceptual fringes of society where a creative explosion of ideas and actions is now at a scale many times those from first and second waves. The best of these designs simultaneously achieve four goals;

create a better life now for those involved

act as models capable of viral replication when economic and social conditions change retract labour, consumption and capital from centralised systems and so provide a market signal and a political strike more effective than mobilisations to shout for less.

Finally they create life boats and networks of resilience best able to contribute as centralised systems progressively and/or suddenly fail. The potential power of these bottom up strategies is consistently underestimated by those wedded to top down responses.

The work of local sustainably and community development educators Shani Graham and Tim Darby in facilitating the Hulbert Street Community¹⁰ is an example of how spontaneous bottom up action in the non-monetary household and community economies can do more with less, engage rather than frighten ordinary citizens towards greater self reliance, while demonstrating alternatives to centralised, monetarised, and regulated ways of providing for human needs and aspirations. Such behaviour is seen by some as fringe and in need of regulation. More problematic, the spread of this type of bottom up change would contract the monetary economy while improving a range of social and environmental indicators.

We are now seeing serious work towards top down climate emergency strategies¹¹ to save humanity from dangerous climate change that recognises the importance of regenerative agriculture, carbon farming, tree crops, perennial grains and other strategies highlighted through permaculture as ways to sequester carbon and produce perennial abundance in a post fossil fuel world. Ironically the modeling of these strategies on the mobilisation for WWII is acknowledging a need for change at least as radical as those enacted through the more anarchistic bottom up changes I have described.

⁸ Turner, Graham (August 2014) Rickards, Lauren, ed “Is Global Collapse Imminent?” Melbourne Sustainable Society Institute Research Paper No. 4 University of Melbourne

⁹ For example Josh’s House

joshshouse.com.au/about-the-project/josh-byrne/

¹⁰ ecoburbia.com.au/

¹¹ The Climate Mobilisation Victory Plan

resilience.org/stories/2016-09-16/the-climate-mobilization-victory-plan-foreword

Retrosurbia

My forthcoming book, *RetroSuburbia; a downshifter's guide to a resilient future*¹² due out early next year draws together the lessons and solutions from those already engaged in the retrofit of the built, biological and behavioural fields to adapt in situ where most Australians live in the suburbs and suburb-like residential landscapes of our regional and small towns. If our timing is good, before the Australian property bubble bursts, we may see a substantial enough uptake of these ideas that they become mainstream news. Inevitably with that success will come pushback on many fronts. Criticism from Peter Newman¹³ to my articulation of the positives of ruralisation of suburbia has already been noted. If we can demonstrate a prosperous way down then we may be able to replicate what happened with the Victory gardens movement in the USA during the war mobilisation. First the USDA treated it as a threat to commercial agriculture but after Eleanor Roosevelt had part of the White House lawn plowed up to grow a Victory garden, they changed tactic and began promoting it.

While garden farming is central to the RetroSuburban agenda, the surplus underused indoor space is at least as important as the potential to grow a significant portion of household food outside of the monetary economy. Our massive and underused building stock will allow economies of scale in extended family and shared households not possible in previous depressions and downcycles. That history suggests household consolidation is the primary strategy that ordinary folks will adopt once the monetary economy turns sour. What is urgently needed is the proliferation of models to enable those that follow in more difficult conditions to avoid the pitfalls, and benefit from the incredible economic and environmental efficiencies of larger and more community-reliant households. The Transition movement started by Rob Hopkins in the UK may be most significant permaculture inspired action that is building the community resilience that is so desperately needed in affluent countries like Australia.

Two thirds world permaculture

The spread of permaculture global is now so extensive that Australian permaculture represents only a small fraction of the whole. It has been claimed by some that permaculture is Australia's greatest intellectual export even if it continues to be mostly understood in popular culture as a cool form of organic gardening. While much of that spread has been to similarly affluent countries, the strong resonance between permaculture and indigenous and traditional cultures of place, has accelerated the uptake in countries where the adverse effects of globalised materialism have been accumulating. My experience of this other side of global permaculture is limited but two projects illustrate the value.

In Timor Leste the original Permaculture Guidebook produced by well respected NGO Permatil in 2006 and updated in 2008, blended the best of ecological design and traditional sustainable agricultural practices. It has been a great success and widely used in Timor and has been translated and adapted for much broader application in Indonesia and other countries. A major reworking of the guidebook to create A Tropical Permaculture Guidebook¹⁴ as a gift from Timor Leste is underway that promises to create a highly accessible and refined permaculture design manual.

The Chikukwa project in Zimbabwe has used a permaculture teaching and community development process to spread a suit of simple ecological strategies and techniques in poor

¹² retrosurbia.com/

¹³ Peter Newman et al *Resilient Cities: Responding To Peak Oil and Climate Change* 2009

¹⁴ permacultureguidebook.org/

rural communities over the last 20 years. The success has been so significant that the nutritional status of communities across the region is now significantly better than in comparable areas of the country that has not had a functioning monetary economy for more than a decade. The excellent documentary¹⁵ of Chikukwa by Australian academics and permaculture activists Gillian and Terry Leahy is inspiring in showing how little resources are required to help poor rural communities get back on a track to self reliance.

Permaculture was conceptualised as a design system applying ecological principles to the provision of human needs in just and enduring ways. Its foundation in ecological science is strong, but design needs both science and art. Trying to pin down the systems thinking and design processes that generate permaculture solutions is difficult to say the least. Some of the successes highlight the truth in the well-known quote from Bill Mollison “Though the problems of the world are increasingly complex, the solutions remain embarrassingly simple”. At least simple in the sense that they do not require complex technology or large-scale institutions. On the other hand the solutions require subtle interventions that nurture the positive processes already at work in the local social ecosystem just as we need to do the same with the soil ecosystem.

Critiques of Permaculture

As the influence of permaculture grows there is increasing critical analysis within both academia and the permaculture movement itself questioning the veracity of some permaculture strategies and techniques and the nature and efficacy of the design system¹⁶. The divergent evolution of permaculture over 4 decades may have led to lots of dead ends and reinventions of the wheel but it is also providing pathways of experimentation and innovation that continue to cross fertilise with related schools of thought and action. Although the resources for scientific research to support permaculture is only just beginning with post graduate programs¹⁷, and plans for a research journal, I think permaculture can be seen as closely aligned to Community Science as defined by Keith Roby as “...*scientific effort directed explicitly and primarily towards human fulfilment, social well-being and the resolution of critical contemporary issues, within the context of a search for a just and sustainable society.*”

Psychology and Spirituality

The experience of bottom up personal and social change informed by permaculture shows that changing ourselves is as important as the transformation of our infrastructure and environment. Those changes to the “inner landscape” draw on the sciences of psychology and sociology but they are also powered by ethics and include spiritual transformation. The uneasy relationship between science and spirituality that characterised the life and times of Keith Roby continues today in society at large, and within the now culturally diverse understandings of permaculture.

In discussing spirituality in *Permaculture Principles & Pathways Beyond Sustainability*, I wrote: “*Although permaculture can be reasonably seen as essentially materialist and scientific, it depends on an ecological perspective. Spiritual beliefs about a higher purpose in nature have been universal and defining features of all cultures before scientific rationalism. We ignore this aspect of sustainable cultures at our peril*”

¹⁵ thechikukwaproject.com/

¹⁶ Blog by permaculture teacher and designer Dan Palmer makingpermaculturestronger.net/

¹⁷ CQU Post graduate program in Permaculture

Some of the most nuanced and creative thinking on both sides of that cultural divide suggest a coming together is possible. The breakdown in the hubris of modernism and the awareness of the wisdom of traditions in which science and spirituality are unified are contributing to greater tolerance of spiritual perspectives being useful in maintaining psycho-social and environmental health for traditional peoples connected to place. On the other hand, efforts to do so within the dominant culture are commonly regarded as religious relics holding back progress. This dismissal is modest compared with contempt for New Age efforts to construct new spiritual practices and beliefs appropriate to current or emerging realities. While many of these critiques are valid, I think that truly sustainable human cultures are not likely without new appropriate spiritual practices and beliefs attuned to place and time with both global and local dimensions.

In *Permaculture Principles & Pathways Beyond Sustainability* I used a systems framework to describe the creative reunion of science and spirituality to which permaculture was contributing from the science and materialist side of the divide. In doing so I became aware that part of the problem in discussing this divide and its creative resolution, is that science and spirituality were also being drawn back together in a destructive union. When the methods of science are seen as tools in implementing a materialist ideology that will reduce everything to measures of corporate gains and the practices of spirituality become ossified in a hard religious fundamentalism that practices holy war and terrorism, then we can see that this apparently massive gulf between these two views of reality are coming together in a destructive union of Survivalist Materialisms and Spiritual Purity Through Armageddon.

While efforts to directly construct a unification of science and spirituality remain problematic, I think the faith that scientific materialism can completely displace spiritual beliefs and practices from human culture has about as much chance of success as the goal of eliminating infectious diseases. Further I think that this drive to displace the other half of our nature is a major factor driving the destructive reunion of science and spirituality that I have described.

Energy Descent Redux

While the place of spirituality in permaculture remains a subject of debate, another debate concerning the future material basis of human existence, is again up for more open discussion. During the 80's & 90's when Australia continued to be asleep at the wheel, permaculture teaching and activism had to accommodate the cultural norms just as it had to do so in more traditional societies.

Even within permaculture networks, the faith in a “techno stability” if not “techno explosion” future reflected the quasi-religious belief in the wider society that science and technology make us masters of our destiny. If humanity really is on a pathway of energy descent, rather than stability or growth, then permaculture is one of the few lineages of intellectual and practical action that survived the dark decades since the *Limits To Growth* report showed the power of systems thinking to understand the deep structural problems facing our now global civilisation.

While permaculture cannot change the trajectory of our civilisation it is certainly one of the threads of cultural continuity that could allow our decedents to survive and even thrive through the energy descent future. Whatever the future, permaculture is providing inspiration and know-how to hundreds of thousands if not millions of people who are "creating the world we do want now". Many of those creatives seek a refuge from the ethical and spiritual wasteland that the technosphere and markets generate but an increasing number of people with strong roots in traditional cultures of place find permaculture to be one of the few expressions of

modernity that strengthens rather than erodes and derides their traditional sources of wisdom for working with rather than against nature.

Indigenous Permaculture

Finally I want to acknowledge that, even those of us who long ago recognised the wisdom of indigenous land management practices as a source for the future rather than a relic of the past, underestimated the scale and depth of what Bill Gammage¹⁸ has called “the biggest estate on earth.” Bruce Pasco’s¹⁹ unearthing of the historical evidence of aboriginal agriculture that was highly evolved rather than newly emerging challenges further the story of the origins of civilisation. The evidence of historians has ruffled the feathers of biological scientists still struggling to get past the Terra Nullius view of Australia as wilderness. Australia has been subject to the longest lineage of slow but enduring massaging of nature, from the genome to the geomorphology, through the cycles of the ice ages to create both diversity and abundance by indigenous peoples, while they maintained their place in the park as humble stewards of a frugal paradise.

But this is not a uniquely Australian story. In Amazonia, archeologists and soil scientists have confirmed that prior to the holocaust of diseases of crowding that may have killed 90% of the inhabitants of the Americas after European invasion, the indigenous peoples had, over a thousand years transformed approximately 10% of Amazonia from leached red rainforest soils to the Terra Preta (black earths) that provide one of the clues for how we might extract carbon dioxide from the atmosphere while sustainably maintaining or even increasing global food production²⁰. In a new world of eruptive change, we need to find the strength and the wisdom to act with small, slow and subtle solutions, that will allow us to follow a prosperous way down. The coming decades and centuries of energy descent promise more challenge to our creativity and flexibility than were required during centuries of big, fast and blunt solutions sustained by stocks rather than flows of energy.

Conclusion

So the challenge I leave for those still in receipt of the opportunities and remaining privileges of academia is to use permaculture as the most dynamic and robust conceptual framework for community science to provide the helpful monitoring and feedback for the households and communities that are already creating the models for a prosperous way down; and leave governments and corporations to use their remaining capacities to follow rather than lead.

David Holmgren October 2016

¹⁸ Bill Gammage *The Biggest Estate On Earth; How Aborigines made Australia* 2011

¹⁹ Bruce Pascoe *Dark Emu Black Seeds; agriculture or accident?* 2014

²⁰ Albert Bates *The Biochar Solution; Carbon Farming and Climate Change* New Society Publishers 2010



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murdoch.edu.au/Support-Murdoch/News-and-events/Keith-Roby-Memorial-Lecture



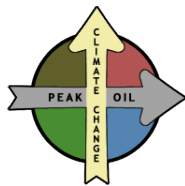
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