DOES THE LONG PAST MATTER?

DOUG COCKS

Does the long past matter? Here we have one of those questions which needs lots of teasing before an answer can be attempted. That is, unlike a request for directions to Dublin, we need some context and clarification before bloviating. Who wants to know? Why do they want to know? What is their purpose? What do they want to achieve? What do they mean by the 'long past'? Do we care if they are asking a second-best question? Remember, if you don't know where you are going, it doesn't matter which bus you catch.

Let us suppose then that the questioner, apart from being strangely like the author, is concerned that global society appears to be heading towards an 'overshoot' catastrophe in which several converging global trends---population growth, atmospheric warming, resource depletion (e.g. oil, fisheries) and the complexification of human affairs (e.g. information overload)---are imminently threatening a large fraction of the world's people with a cruel drop in their quality of life. And not just those with but a little way to fall. Destructuring shocks such as deurbanisation (abandoned cities), deindustrialisation (shattered economies), depopulation (megadeaths), and deglobalisation (loss of international links; trade, aid, currencies, institutions etc.) stand to make daily life an exhausting wretched struggle for billions of people.

Further suppose the inquirer's moral intuition to be that everything possible should be done to prevent what is, so far, a global crisis from becoming a global catastrophe.

Against that background, we can take the 'long past' to be the story of how global society came into being and arrived at its current crisis point and we can suppose that whether this story matters depends on whether it provides some useful understanding of 'what's happening' or some 'what-to-do' guidance to those interventionists who would put a finger in the dyke.

History of course has long been viewed as a source of 'what-not-to-do' guidelines. Santayana's dictum presumes that the past is peppered with behaviours which, in certain generic situations, will turn out to be mistakes. Land armies should not advance on Moscow in winter! Equally though, a knowledge of history enriches people's awareness of the strategies they might try, depending on the challenge being faced. For example, Graeme Snooks is an economic historian who sees war, population growth, trade and technological innovation as the four main strategies that have traditionally been employed by societies intent on securing their own long-term survival.[1]

Using history to produce policy guidelines is an art, not a science, as the saying goes. It cannot be reduced to a routine procedure. It requires experienced historians who understand the present as much as the past; and such may or may not find something useful to say about 'what-to-do.' Less ambitiously, policy makers confronted with an

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[1] Snooks, G.D., 1996, T*he Dynamic Society: Exploring the Sources of. Global Change*, Routledge, New York

issue or a crisis may find it expands their thinking to be briefed on the historical origins of their problem, e.g. the debate on 'the right to bear arms.' Immanuel Wallerstein, father of world-systems theory, is one historian who regularly provides long views on contemporary issues around the world.[2] For example, he points out that it has proved difficult to 'parachute' democracy into cultures which have almost no middle class and no history of independent institutions. In Australia, the Australian Policy and History network works to link historians with policy-makers, the media and the public.[3]

Enough. The case for fostering the study of recorded history and facilitating its introjection into civil society, government and the economy is well-recognised and does not particularly need to be further developed here. But, while history clearly matters, the historical record is but a small portion of the 'long past.' What about pre-history, what about the Proterozoic, what about the pre-life Earth, what about cosmology? The long past is very long.

We will come presently to these earlier chapters, but first a reminder that the story of the long past is a moving feast; not in the sense that what happened did not really happen, but in the sense that our understanding of what happened keeps changing. As told by the 'historical sciences,' the step-by-step narrative of what happened in the long past gets better by the year as researchers collect and interpret more and more data about the natural world and the universe, using ever-better measurement and experimental methods and organising frameworks.

Consilience is making an important contribution here, i.e. insights from different scientific disciplines are, more than ever, being brought to bear on common puzzles; ecology, for example, is as important as genetics for understanding biological evolution. So, while there is much debate over the 'best' interpretation of particular events, concepts and sequences (dates of past events are particularly subject to revision), there are no glaring contradictions in the story in its outline form; it is eminently plausible. It is important to emphasise that this story is much more than a chronology. It also attempts to explain why things happened when and how they did---a large part of the story's value to people trying to understand and manage comparable happenings in today's world. Perhaps I should start with the briefest of synopses.

ORIGINS OF THIS DIFFICULT WORLD

A small bubble containing all the universe's energy exploded in a 'big bang' 13.7 billion years ago. As the universe expanded, its suffusion of super-hot radiant energy began to cool and, as temperatures fell, photons (packets of energy) condensed into a succession of material products---sub-atomic particles, atoms and then molecules of (mainly) hydrogen.. It was these molecules which, under the force of gravity, aggregated into stars and galaxies of stars. Stars turned out to be fusion reactors within which the universe's stock of heavier elements formed. In the distant future, the universe's galaxies, stars, molecules, and atoms will decay back to elementary particles. Everything, from atoms to civilisations, has a finite life.

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[2] comment@listserv.binghamton.edu
[3] http://www.aph.org.au/

The Earth's Sun is a typical star, 4.6 billion years old and the Earth formed from a pile of 'cosmic rubble' which imploded into a molten sphere that has been cooling ever since. In less than a billion years, it was cool enough for liquid oceans to condense out of Earth's primitive atmosphere. Continents, built up from undersea magma (lava) flows, began to form. Soon after, the first simple bacterial life forms had emerged in the still-warm oceans. A clutch of floating-drifting continents began colliding and separating periodically about 3 billion years ago.

Single-celled bacteria had begun evolving into multi-celled plants and animals, on land and sea, by Cambrian times, 542 million years ago. Thereafter, the dominant animal life evolved through an 'age of fishes,' an 'age of amphibians,' an 'age of reptiles,' and, from 65 million years ago, an 'age of mammals,' which includes humans. Birds and flowering plants began appearing about 140 million years ago.

It is not only the world's biota--- its combined plant and animal life---which has kept changing. Under a universal evolutionary process, driven ultimately by the Sun's radiant energy and the Earth's internal energy everything on Earth has been changing and continues to change; and that includes the continents, the atmosphere, the oceans and, after life began, the ecosphere, the latter being the Earth's comprehensive patchwork quilt of biological communities or ecosystems (e.g. forests, deserts, grasslands, reefs, estuaries).

How can this story of ceaseless change be summarised and explained? On a geological time-scale (thinking in millennia and mega-years), the species mix and the ecosystem mix have, irregularly, gone through both longer periods of slow change and shorter periods of faster change. Depending on the number and timing of species comings and goings, such changes sometimes qualify as mass extinctions or mass diversifications. More generally, the result has been an evolutionary 'tree' of life which records how each species has come into existence by 'branching' off from some pre-existing species under a process of natural selection, i.e. all members of a species are different and those that have the genes to survive and reproduce more successfully pass their genes on to their offspring. This means that the average genetic makeup of any species changes slowly from generation to generation and, in time, becomes different enough to be called a new species.

All the time that a species' gene-pool is changing, so is its environment, meaning all the factors that make it harder or easier to survive and reproduce, e.g. light and temperature, CO_2 and oxygen levels, food and water supplies, competitors and predators. If the rate of change for the worse of the mix of environmental factors is fast enough, faster than the species' capacity to evolve, the species goes extinct and becomes a 'dead branch' on the tree of life (as most species do). Or, given that the environment does not change uniformly in all parts of a species' habitat, a species may flourish in one ecosystem and go extinct in another.

Thinking world–wide and in mega-years and millennia, there are a number of trends, fluctuations, recurrences and cycles in the dynamics of the non-biological world which, over many generations (usually), and often in roundabout ways, change the environment for large numbers of species and communities. Collectively these environmental changes have been as important as genetic changes in driving the evolution of the world's species mix and ecosystem mix. Without spelling out just

how these environmental changes have shaped and channelled that evolutionary story (and each other), we can list some of the most consequential:

- Five or six times, the continents have drifted together and then parted, changing regional climates and migration routes each time
- Continents have been uplifted and then eroded to form soils and landscapes
- The oceans have warmed and cooled, risen and fallen, changed chemically (e.g. acidity levels) and, usually, flowed as convection currents around the continents and between poles and tropics
- Glaciation has waxed and waned between the limits of an ice-free world and a 'snowball Earth.'
- Regional and global climates (e.g. long-run temperatures and rainfall) have fluctuated
- The atmosphere's composition, especially its concentrations of water vapour, oxygen and CO_2, has fluctuated
- Volcanic activity has periodically induced conditions inimical to plant growth e.g. years of reduced temperatures and sunlight
- The sun's luminosity has increased significantly
- Large extra-terrestrial bodies have occasionally struck Earth

Late in the last ice age, some 40 kya, even as their genetic evolution was continuing, modern humans began to evolve culturally at an accelerated rate. That is, they were developing new social and material technologies (e.g. recipes for painting, tool-making) more frequently and, assisted by spoken language and a capacity to learn by imitation, were passing the new technologies from generation to generation. As with genetic evolution, technological innovations have persisted or disappeared in accord with a process of universal selection analogous to biological natural selection, i.e. useful new technologies tend to persist.

A NATURALISTIC WORLD VIEW

What we are asking is whether this narrative, or, more demandingly, a much-expanded version of it, matters in a 21st century world experiencing an overshoot crisis brought on by resource depletion, global warming, massive population growth and a paralysing complexification of human affairs. Will this crisis turn into a quality-of-life catastrophe for billions and can this narrative help avoid such a scenario?

The short answers here could easily enough be 'Don't know' and 'Probably not,' but there are several ways in which a familiarity with this story stands to support and inform those exercised by perceptions of an overshoot crisis.

Overall, it is a story from which elements of a science-based, naturalistic *world view* can be extracted, a world view being *a coherent system of fundamental beliefs that*

describe reality.[4] At the heart of this world view is *process thinking*, the idea that everything changes all the time, albeit slowly by human standards in many situations. Change is the norm. Under this world view, 'things' are simply standing waves (attractors) in a continuous dynamic process and have no inherent absolute properties--- like eddies on a river. As Heraclitus said, 500 years before the Common Era (500 BCE)),'You can not step twice into the same river.' Even a stone is a slow-moving dynamic process! If the story of the long past is listened to carefully, it has the potential to bring home to people that it is often more productive to think of reality as a process of ongoing, ubiquitous change, punctuated by periods of relative stability, rather than the other way round.[5]

For example, the current global overshoot crisis may (or may not) be a period of 'calm before the storm.' Unfortunately, process thinking does not allow any prediction of the moment when a complex system like global society might move from changing slowly to changing rapidly. There are pointers such as increasing and fluctuating rates of change in system behaviour (e.g. oil prices) but such are not definitive. Nor does process thinking indicate what a system's trajectory will be if and when rapid change sets in.

However, while process thinking can't predict when and how change will happen in a complex situation like a global overshoot crisis, it can draw on thermodynamics, the science of energy flows, to explain *why* change occurs and, in a general way, *how* it occurs

Everything that has happened in the universe since the 'big bang' (and everything that will happen in the future) has been an instantiation, an expression of just one pervasive conversion process or equilibration process, namely, the ongoing conversion of that original bolus of high-grade (also called low-entropy) locally-concentrated energy into low-grade (high-entropy) locally-dispersed or spread-out energy. Call it the *cosmic equilibration process.* And *everything* means just that. It includes the formation, persistence and destruction of matter, galaxies, stars, planets, plants, animals, brains, ideas (minds??) and societies. Nature abhors disequilibrium! The cosmic equilibration process is spontaneous in the sense that whenever conditions allow (and such are many) the conversion process proceeds at the maximum speed compatible with those conditions

As for understanding *how* change occurs, the story of the long past contains numerous examples of the illuminating idea that reality is made up of nested layers of *energy-degrading* systems, also known as *dissipative* systems.[6] Ours is a 'Chinese boxes' universe where smaller, faster-running systems nestle inside, and draw their energy from, larger, slower-running 'parent' systems, e.g. Earth sits inside the solar system. The fundamental property of energy-degrading systems is that they continuously take in energy, physical materials and information from their environment and continuously excrete (dissipate) materials, information and degraded energy (energy

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[4] Aerts, D., Apostel, L., *et al.,* 1994, *World Views: From Fragmentation to Integration*, VUB Press, Brussels; Internet edition 2007, http://www.vub.ac.be/CLEA/pub/books/worldviews.pdfInternet (Accessed 3 Jan 2011)

[5] Whitehead, A.N., 1933, *Adventures of Ideas,* Free Press, New York

[6] Salthe, S.N., 1985, *Evolving Hierarchical Systems: Their Structure and Representation,* Columbia University Press, New York

of a lowered quality in terms of its capacity to do work) back into the environment. For example, the multi-species assemblages which ecologists refer to as *communities* or *ecosystems* can, in some sense, be considered as energy-processing systems which are transforming high-quality solar energy into chemical energy and then distributing this to all of the community's members to be dispelled, eventually, as heat, a low-quality (useless) form of energy. Equally, one can think of any evolving species (e.g. humans) as a dissipative system which processes more and more energy as long as it is spreading and adapting successfully.

As long as the flow of energy through a dissipative system remains more-or-less steady, the system cycles materials and degrades energy in a repetitive way. But when the materials or energy supplied by the parent system changes sharply, up or down, the system either reorganises itself or collapses. This may be the current situation for the human ecosystem, meaning global society and the more-or-less natural world in which it is embedded. For example, global society is highly dependent on fossil oil which is beginning to run out. Global society will collapse if it does not reorganise. That is not so much a prediction as a truism. A more general lesson here is that one should never be more than momentarily surprised when a complex system, suddenly and unexpectedly, changes its structure and behaviour, e.g. unrest in the Middle East, the recent global financial crisis.

The long past's procession of dissipative systems passing through their life cycles provides strong empirical support for the validity of a world view based on process thinking. That procession's participants range from notable and spectacular such as continental drift, ice ages and mass extinctions of species to the slow cycling of various elements (e.g. phosphorus, carbon, sulphur) through the oceans, the atmosphere, the biosphere and the Earth's crust.

CONTRASTING PERSPECTIVES

Before coming to several more concrete benefits from a world view based on understanding the what and why of the long past, let me argue for its 'philosophical' and psychological value.

Alongside strong instinctive drives for autonomy (self-assertion) and for bonding with others, modern humans have long had a powerful urge to find meaning in what is happening and what exists. For most of human history and pre-history, this urge to understand and explain has been satisfied by animistic and deistic belief systems. In animism, the behaviour of natural phenomena, both living and non-living, is explained by assigning (all) objects (including places) and processes a human-like agency, a *spirit*, with a capacity to act intentionally. Deism extends the animist solution to explaining life's mysteries by recognising supernatural beings (gods) which, among other activities, have created the universe and the Earth and directed subsequent changes there, particularly human affairs.

It is against such religious world views that a naturalistic world view can be most readily contrasted. Where did we come from? Unlike the 'origin stories,' of many religions, science's story, despite its residual gaps, has no place for capricious supernatural forces; life does not have to be lived as a desperate attempt to secure a place in the next world. This is the only heaven there is and if humans do not destroy themselves (an unlikely scenario) they have millennia, probably mega-years, in which

to achieve high quality of life for most people. That is a deeply optimistic perspective, certainly more so than end-time thinking which can see no point in labouring to improve the short time we have left. Optimism may be the ability to believe in the improbable but its real value is that optimists will always be more likely than pessimists to seek and perhaps find solutions to big problems.

Next, the scholars' story of the long past is a narrative for all humanity. No-one is excluded. It emphasises that we are all members of one species, the product of one continuous evolutionary process extending back to the beginning of the universe.[7] Science has demonstrated that physiognomic and physiological differences between peoples rest on minor genetic differences. From there, it is a small step to accepting that strangers have minds like one's own and, notwithstanding cultural differences, needs like one's own. Strangers lose their strangeness. For many people, once this common biological inheritance is accepted, the inherent concern they have for the wellbeing of their immediate relatives expands to embrace the species as a whole.

The importance of this perspective, this value, that all people, present and future, are one's 'brothers and sisters' or, at least, one's 'neighbours', is that, if it were to spread, it would be an ameliorant for a fundamental problem which emerges as a great under-recognised truth from the story of the long past---there is no We. Even before our ancestors came down from the treetops, they were organised, very effectively, into troops that each defended a well-defined territory against other troops. This was the evolutionary crucible for a dual moral code that persists to this day. Morality is largely a willingness to take the interests of others into account when making decisions. The suggestion here is that within the troop or tribe attitudes towards others were driven more by amity than enmity whereas this was reversed in dealing with strangers.

The claim that 'there is no We' is just an extravagant way of making the point that it is normally difficult, and often impossible, for groups with divergent interests to find and take coordinated actions that will benefit all; or even to find reasonable compromises. This inability to cooperate with outsiders has been the case throughout history and pre-history and, *prima facie*, it is the case today. Perhaps the single most important lesson from the story of the long past is that humanity, understandably, has this ever-present background problem and that facing and learning to overcome it is at least as important as finding social and material technologies for directly tackling overshoot problems such as population growth, global warming, complexification and resource depletion.

Fortunately, staying with the assumption of an extended future, there is every reason to believe that sociality can and could be widely taught and learned. Human behaviour is very malleable and children can be brought up to hate or to be fraternal-sisterly and cooperative. There already exist social technologies with demonstrated capacity for fostering our inbuilt appetency to cooperate, e.g. conflict resolution, rules of dialogue, clear thinking. Democracy, with its appeal to humanity's evolved sense of fairness, remains the social technology with the brightest prospects for constraining sociopathic self-interest at a political level.

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[7] Christian, D., 2003, World History in Context, *Journal of World History* , **14**(4), pp.437-458

RECULER POUR MIEUX SAUTER

Consider now the question of whether delving into the story of the long past can more directly help those who are looking to create social and material technologies which might ameliorate or reverse the overshoot processes threatening a new dark age.

When dealing with such 'what-to-do' situations, the most immediately usable information to be gleaned from the long past is its stock of facts and inferences about strategically important recurrent phenomena and their causes, e.g. natural disasters, climate change, cosmic weather, species extinction rates, reserves of non-renewable resources, sustainable harvests of renewable resources, epidemics and population dynamics. An excellent example is the inductive generalisation ('rule of thumb') that whenever atmospheric CO_2 levels have reached and remained above 500 ppm, the Earth has become ice-free. So, humanity's knowledge of the past is telling us that if 'we' want to avoid the massive sea level rises that come with an ice-free world, we 'know' what we have to do. The information in this case is about a 'tipping point' but the past is equally able to yield parameter estimates for measures such as, for example, limits to change, rates of change, trajectories over time, extreme values, thresholds and historical probabilities.

While this sort of empirical and inferred knowledge from the past does not allow specific predictions (any more than personal memory does), it underpins the construction of scenarios of plausible futures, e.g. what could happen under a 'worst case' scenario? Objective knowledge of the past makes the future less surprising and more explicable when it happens. More generally, technocrats and mandarins call on society's knowledge of the long past so extensively in today's world that they may well be unaware of what they are doing. What does a goldfish know about water? Even interventionists who regard the long past as 'bunk' behave as though it were anything but.

Designing better technologies

A large part of any society's culture is its technology 'mix.' Technologies are the 'recipes' which societies use to maintain themselves. They range from the material (turning stuff and energy into products and processes) to the social, meaning technologies which organise and control human behaviour to create 'problem-solving' institutions. Thus democracy and nuclear power are equally technologies.

Apart from providing technocrats with practical 'factual' knowledge, the story of the long past is also a rich source of guidelines and ideas for designing better technologies and avoiding problematic technologies. In particular, these come from accumulated efforts to understand and make generalisations about evolutionary and ecological processes.

The concept of *evolution* is the cornerstone of process thinking. At its simplest, evolution is any process of piecewise or bit-by-bit change over time. Understood at this level, evolutionary change pervades nature in all its forms. And of all macro-scale natural processes, it is biological evolution that has most to suggest about managing humanity's immediate future. For example, genetically speaking, we will continue to be hunter-gatherers, programmed for some time yet to behave in ways

compatible with that lifestyle. More to the point, we would not want to try and breed our way out of any looming overshoot crisis.

Evolution's fatal flaw, and this applies to cultural evolution as well as biological evolution, is that it is short-sighted. Evolution will always select variations that are immediately useful, irrespective of how maladaptive that variation might be in the longer run. Just ask the giant pandas whose ancestors decided to occupy a niche called 'No-one eats bamboo shoots.' A knowledge of evolution prompts us to ask if we are being similarly short-sighted in our plans for the future, and, if so, what scenarios suggest themselves. An irradiated world perhaps?

As emphasised in popular texts such as Fritjof Capra's *Web of Life*,[8] the reigning paradigm in ecological science is to see ecosystems in terms of `food chains' or `nutrient cycling.' Carnivores, at the top of the food chain, eat nutrients in the form of herbivores which eat nutrients in the form of plants. Plant and animal by-products and plants and animals which die uneaten are broken down by micro-organisms (the decomposers) from complex to simple nutrients which are taken up by plants to be cycled up the food chain once more. Ecosystems differ primarily in the groups of species which play these generic roles. These same generic roles have existed for much of the time of life on Earth and, to the best of our knowledge, will continue, albeit played by different species, into the deep future.

More generally, the basic relationship between members of ecosystems is one of mutual interdependence or symbiosis---a process of unwitting 'invisible hand' cooperation. Certainly there is often competition between species seeking to occupy the same niche (e.g. plants which shade each other out) but, popular prejudice notwithstanding, competition and cooperation play necessary and complementary roles in persistent ecosystems.

As an example of the value of ecological thinking, Capra identifies five common characteristics of long-lasting ecosystems which provide context for interventionists looking to develop long-sighted problem-solving technologies. Apart from the cooperation-competition balance, these focus on the importance of materials recycling, solar power and diversity of species and on the need to be resilient. Resilience or 'bouncebackability' is an ecosystem's ability to recover from shocks and disturbances and often depends on having 'slack capacity' available, e.g. seed reservoirs.

HUMANITY'S VIRTUAL MEMORY

How do I know what I think till I see what I say? This essay is an attempt to capture my conviction that the story of the long past, apart from being a towering cultural achievement and a treasury of mind-expanding revelations, has value at several levels for a world wondering if it is in overshoot crisis.

- At the highest level, conceptually speaking, it supports an optimistic, meaning-full and inclusive world view. An understanding of this story,

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[8] Capra, F., 1996, *The Web of Life*, Doubleday, New York

viewed through the lens of process thinking, stands to equip protagonists with the spiritual energy and positive mindset which would seem to be necessary prerequisites for successfully addressing the converging and interconnected problems of population growth, atmospheric warming, resource depletion and complexification.

- At an intermediate level, a knowledge of the complex systemic nature of eons of ecological and genetic processes provides planners with a context within which to better weigh-up proposals for experimental technologies, including categories of technologies which (probably) should or should not be pursued

- At the 'hands on' level of designing and improving specific technologies for addressing specific overshoot problems, the long-past story often contains empirical and inferential knowledge that demands to be turned into firm design criteria

Valid as they are, these benefits are abstractions. Is there a way of encapsulating the argument for the importance of this story in a 'take home message'? Yes, a very apt metaphor suggests itself: *The story of the long past matters to the human species in the same fundamental way that memories and their interpretations matter to the individual.* While a store of personal memories and reflections cannot ensure correct decisions, such does stand to improve one's *intuitive* capacity---all that one normally has---to make what-to-do choices in complex situations. [9]

Humanity as such has no memory, but, if we personify the species, the story of the long past, as stored in the scientific and historical record, functions as a 'virtual' memory for the collective 'we.' In ways that are sometimes tacit and implicit, it too is available to be drawn on at any time.

The metaphor goes further. Like personal memory, the species memory contains contradictions and bits which have become inaccessible or have been reworked. The big difference, as exemplified by consilience, is that humanity's virtual memory gets better by the year. That is fortunate but it may not be enough. To finish with a warning, a reworking of Santayana, those who do not remember the past will not benefit from it. Let us hope that the owl of Minerva takes flight before the dusk.

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[9] McKenzie, C., and James, .K., 2004, Aesthetics as an Aid to Understanding Complex Systems and Decision Judgement in Operating Complex Systems, *E:CO*, **6** (1-2), pp.32-39