Life Futures: An Initial Taxonomy of Terrestrial and Non-Terrestrial Forms of Life

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Today many boundaries are blurring. Boundaries between life and death, birth and life, virtual and real, truth and falsity, surface and authentic, even between natural and 'non' natural are blurring. The real, the natural, is being redefined by the web, CNN, and eugenics of the 'plus' kind, such as biotechnologies and of the 'minus' kind through 'ethnic cleansing'. Will we have eugenic cleansing or genetic nirvana tomorrow?

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Setting the Stage

Today modern eugenics[1] with, the human genome project, human/animal/vegetable hybrids, cloning and so forth is putting a positive spin to some aspects of what the world went to war about a mere two generations ago. Indeed some authors argue that our children are living in the last generation to give birth naturally. Even of more concern is that they may well be the last mortal generation before artificial life moves the game forever beyond us. This redefinition of the natural - perhaps the extinction of the natural - is an emerging condition of postmodernity. Where lies the natural tomorrow?

Our world is dominated by narrow scientific rationality and operates by applying this through predatory capitalism. With the weakening of the Nation State and the rise of the next stage corporate nations or 'corpornations', including media, oil and drug conglomerates that patent life. The essential capitalist ethos of individual autonomy, private ownership, personal enterprise and freedom of choice is ensuring the bio-technological revolution plays out according to market forces.

As these two forces of capitalism, science are combined we begin to see the blurring boundaries between natural and non-natural, biotechnologies and predatory capitalism all herald the new millennium with the death of the natural. Truth, once considered objective and even eternal, now is blurred fleeting and local.

In short -
Yesterday evolution ended
Today we end
Tomorrow our life futures await.
For
Today we make our children's **tomorrow**.

An Initial Taxonomy of Emergent Forms of Life (FOL)[2]

In the first three decades of the new millennium all of the following artificial terrestrial life forms will emerge and seek to interact with our children. Today we tend to think in terms of two life forms animal and vegetable. Vegetable and animal life has open to 'open slather' genetic manipulation and since 'dolly and co(w)' animals for over a decade. Though not us - not yet that is! By 2030, while our children will still be alive, most of these forms of life will exist and will incorporate Artificial Intelligence (AI) and nano technology (NT) and be integral with 'natural humans'.

The Life forms include:

1. Terrestrial

a. Natural

Historico-natural existing animal, vegetable life forms subject to biological evolution[3]. Increasingly the natural and artificial life forms are interacting if only that the latter is causing mass extinctions of the former. More so though the latter are genetically modifying the former to the point where the two cannot be defined separately.

b. Artificial

Cyborgs - A human/machine composite FOL - 6million dollar man/woman, Frankenstein. Cyborg can be seen as *a bionic human being comprising a human body or other organism whose functions are taken over in part by various electronic or electromechanical devices.* One Science Fiction version of the Cyborg has a stationary human brain with several autonomous servo-machines (technoborgs) who fill the brains limited physical needs and act on its commands.

GEborgs - genetically engineered FOL eg. through modifying orgoborgs and cyborgs by bio-engineering and cloning - see Humborgs below. This may be seen as an interim life form only, which will 'technovolve' into the Technoborg.

Orgoborgs - organic FOL - animal, vegetable, cellular lifeforms eg. bacteria etc. on planet earth inc.

Humborgs (organic conscious FOL commonly called humans). These FOL's can be replicated 'naturally', or 'artificially' by cloning see GEborgs. Ultimately humborgs will be implanted with bioborgs. As these chips combined with nano technology 'nanobots' are used to operate mechanical arms, or negate brain or nerve damage, the issue of human-robots integration ie. cyborgs, will arise.

Bioborgs - The development of living biochips will further blur the definition of a living machine. By synthesising living bacteria, scientists have found a way to program the bacteria's genetic development to mimic the on and off switching of electronic circuitry. Many scientists presently feel silicon miniaturisation has reached its limit because of the internal heat they generate. The biochip is then expected to greatly expand the capabilities of computerisation by reaching the ultimate in miniaturisation. Biochips, when combined with nanao technology will also have the unique ability to correct design flaws and because proteins have the ability to assemble themselves the bioborg computer could also assemble itself.

Symborgs - symbolical and symbological FOL are of three types:

1 Conscious/external - culture, computer virus, corporations, NGO's and the World Wide Web. The web as well offers the possibility of global

symbolical intelligence

2 Unconscious/internal -Mythic/unconscious ie. archetypes ie FOL that are symbolically yet not empirically real

3 Bridges - between consciousness and unconsciousness eg. the Australian Cape York Rainbow Serpent Dreamtime stories/myths. Here the seven prerequisite conditions of life, outlined below, are symbolically rather than literally met. In the case of the Rainbow Serpent story, however, the influence on the physical aspects of the three aspects of tribe's life is very 'real'.

Technoborgs - technological FOL. Technoborgs include:

Exoskeletal-borgs as shown in movies such as 'Batteries Not Included'.

Siliborgs - silicon based FOL ie AI incorporating self-repairing computer programs, Rights of Robots, HAL in 2001. Silicone is probably nearing its design limitation as to its ability to dissipate heat and is about to be replaced by organic computers using biotech nano engineering (see bioborgs).

By 2050 Technoborgs will become *fused* with Cyborgs, GEborgs and Bioborgs. Humborgs ie. humans, as we know us, will become indistinguishable from these forecestors. We have already started to be replaced by these emergent evolutionary 'technoluting' entities[4].

It is this *fused* bioborg life form that will be patented by corporations and in 'developed' areas of the globe will begin to populate the life ecology of the planet by the mid 2,100's.

2.Non-Terrestrial

These FOL are the macro and micro life structures,, which support us and remain relatively discrete from our humanoid terrestrial world. **They include:**

ETorgs - FOL from other planets eg. ET, predator, alien (usually hostile to humans, in many ways they represent our own fear of the future).(Tough, 1995, Judge, 2000) Indeed the Search for Extraterrestrial Intelligence is already producing a plethora of school curriculum and workshops. http://www.seti.org/

Macrorgs (macrocosmic FOL) eg. the Gaia hypothesis, which sees the world, indeed the universe as a living organism/entity demonstrating the requisite aspects of 'life', outlined below cp. MVborgs

MVorgs - Micro Vita - microscopic FOL that blend or interlace mind and matter. They are also called orgones, diatoms etc. cp. Macroborgs.

Psyorgs - psychic FOL, entities originating in the non-material realm eg angels, Dracula etc.

With these FOL the seven prerequisite conditions of life, outlined below, are symbolically rather than literally met. At present human technology, via. SETI, is impacting the first category of these Non Terrestrial Forms of Life with cumulative impact on category 2 eg. Macroborg - the planet via. pollution, greenhouse effects and reduction in genetic diversity of food stocks. Further through bio-chemical and psychic research is impacting the third and fourth. So in these regards homo postindustrialias is now impacting all known forms of life on or in or around this third rock from the sun.

Developing the Contours of a Definition of Life

How can we compare these FOL? What do they have in common and how can they be defined as life at all?

Concept of Life

Life can conceptually be approached from two perspectives (a) definitional perspective and (b) a non-definitional or non-categorical perspective. The former is more empirical or exoteric and Western and the latter esoteric. The latter may be seen for instance in the concept of the TAO ie. to transcend the distinction between life and non-life.

Towards a Definition of Life

Life may be defined negatively as what it isn't ie.

the condition which distinguishes animals and plants from inorganic objects and dead organisms.

Or Life may be defined positively as entities, which manifest the following distinguishing manifestations of life, are:

(1) Growth through ***metabolism*** *(energy conversion),*

(2) ***Reproduction****, and*

(3)The power of ***adaptation*** *to environment through changes originating internally.*

A precise definition of life is difficult, however, in a rough sense, an organism may be considered alive if these three are active. The only exceptions to the above description of life are viruses (biological and computer). They are only partly living organisms in that they possess the replicating nucleic acids/ source codes but lack the ability to metabolise energy(Wildman, 1999). In order to obtain enough energy to reproduce viruses act as parasites in host systems.

Some definitions of life also include (4) locomotion, (5) intelligence and (6) individuality however I see these fitting into metabolism, adaptation and reproduction respectively. Still others extend this to include (7) intelligence (which can be seen as adaptation) and (8) natural/organic structure (seen as metabolism).[5](Inayatullah & Wildman, 1998).

This standard definition of life ie. that of metabolism, reproduction and growth works for individual organisms however it does not answer the following line --

A rose plucked from the bush is still rose,
But a person [or life form] plucked from the Universe
Is a mere absurdity (Anon)

Thus the standard definition does not tell us that a solitary living thing cannot exist without its supportive ecosystem.

To be meaningful life has to be thought of as embedded in the larger system of the biosphere - the web of life concept. The evolution of different species of life is coupled together in what may be called a 'nested hierarchy'. This web or 'fitness landscape' underpins individual organisms and supports life eg, the pattern that connects. In this sense organisms or life may be seen as 'complex adaptive systems' that ride the waves of energy and cycles of materials just as a surfer rides the flow of energy in waves. These waves indicate systems that are dynamic ie. not in equilibrium. The moon or mars are in equilibrium. They are dead - they have high entropy.

For instance if our heart beats completely regularly or completely incoherently - we die. Complete stasis as in complete equilibrium or complete incoherence leads to death. In between is what has been called spectral reserve. This is where we can live. Like the intertidal mud flats of life. Further each organisms development is guided by a master program code eg. DNA/RNA in cells and the organism can reproduce this code.

In summary organisms may be seen as complex neg-entropic adaptive self-organising systems that ride energy waves in thermodynamic systems that are far from equilibrium and consequently have substantial spectral reserve.

So we may add the following four components to our definition of life. That is of (4) ***self-organising non-equilibrium system or organism*** with significant spectral reserve, which is governed by an (5) ***internal master program,*** and the organism can (6) reproduce the code in the context of being (7) ***part of a web of life.***

On the basis of this extended 'definition', interpreted literally and symbolically all of the above Terrestrial Forms Of Life are 'alive', while the extra-terrestrial forms satisfy most of the criteria, but lets wait 'til we see one.

Methodological Approach

In selecting a methodology to underpin the research for this somewhat unusual futures subject I sought a combination of approaches that would incorporate horizontal and vertical dimensions of the subject. Called Deep Futures such a chosen approach would also need to allow identification and incorporation of the broader Futures Research theme involved in the topic while bringing future generations of Forms of Life into the discourse in ways that begin to include their voices (sic) in present discourses.

Deep Futures seeks to explore vertical and horizontal aspects of the critical issue or theme at hand. In this instance, Forms of Life horizontal considerations would include the population impact of rapidly increased human numbers, application of genetic engineering to providing a 'safe' food source, disease reduction, and medical enhancement for us and so forth. The vertical slice however starts to consider these entities as separate FOL not only as horizontal extensions of our human consumption patterns. In this sense Deep Futures provokes reconceptualisation of the critical issues such raised in this article ie. 'What is life'? It also raises ethical issues such as 'should we create a new life form?' And how is technology changing our relationship to it and thereby ourselves'? (Malaska, 1997; Wildman, 2000).

The above taxonomy then has been developed using a Deep Futures approach by applying a methodology derived from Critical Futures Studies called themeing. (Slaughter, 1999) In this instance the theme is 'reviewing of person to person and person to nature relationships'. Themeing for Slaughter is critical in developing a social foresight capacity. In this sense critical futures studies viz. theming can provide a 'critical purchase' on our historical trajectory in a way that opens-out social foresight possibilities for present day understanding, empowerment, intervention and action. I argue that future generations of life on planet earth will include forecestor forms vastly different to the existing categories of animal, vegetable (and mineral). And to include their voice, this article maintains we need to envision a world of 2050 in a way that can start to bring their voices as our forecestors into present futures discourse.

Tracing some Implications of these Forms of Life

Spot the Difference

Our modern society has great difficulty in assimilating difference and imperfection. This we externalize. We treat difference, even diversity itself, as 'other' to us. Consumption patterns even life forms have to be regulated/

protected/engineered to remove 'non compliance' ie. they have to be homogeneous. This enables us to continue to consume the products of capitalism whether they be coke, chook or cloned DreamTec Arnie.

As Western law is bureaucratic it has become more about regulation and control i.e. about protecting power structures, than about facilitation and development. It has little to do with ethics or justice i.e. moral good. These two factors, bureaucratised law and minimisation of difference become the 'soft' even 'silent' face of modern eugenics today.(Broderick, 1999 ; Junker, 1999)

For instance consider the Clones-R-Us Corporation. Yes it's a real web site. It didn't take long for a C-R-Us to spring up. DreamTeach Corporation offers DNA licensed from celebrities in labs around the world where no anti-human cloning laws have been established -- e.g. Costa Rica, Liberia and Vanuatu. Check out the prices and availability at: http://www.d-b.net/dti/ Genetic engineering, in this context becomes a form of social control, a mechanism for avoiding the appearance of difference.(Inayatullah & Fitzgerald, 1996).

http://www.nhgri.nih.gov/

The 'other' i.e. the marginal/periphery is not only a geographical place or a postmodern terrain it is also a power site. In our society which is obsessed with homogeneity and sees 'the other' as different and therefore 'bad'. So 'disabled/different and proud of it' becomes more than a bumper sticker it becomes a form of civil disobedience.

I am advocating bio-anarchy where as individuals we retain power over our own bodies and do not surrender this to the medical/techno discourse of the State. A rationalist synthesis almost forces the imperative on us of struggling to prevent the genetic health of our bodies passing over to the Corporate State to patent or regulate

Disappearing Peoples

A disturbing aspect of science and technology is that it is essentially Western. Authors such as Zia Sardar argue that this essentially 'disappears' non-western technologies and the peoples who developed them.[6](Sardar, 1999)

Your Friendly Stock Market Catalyst

The economic entity even life form of tomorrow may well be the compucorpornation ie. an IT based corporation or NGO that is of an international scale. This means trans-national corporations run increasingly by computer assisted life forms eg. designer siliborgs increasingly 'assisted', no longer

controlled, by humborgs. In a sense this is already happening in Stock Market Firms - witness the 1987 stock market crash where computers (emergent siliborgs) kept selling as the price of stocks fell. The siliborgs acted as catalysts quicker than we, as humborgs, could respond. Today over 10% of decisions on investments in managed funds, derivatives and stocks are made by neural net Artificial Intelligence networked computers. Many of these investments are out-performing conventional 'natural intelligence' brokers. Soon human judgment will be too risky in fund management. 1987 - just such a long time ago.(Kwzweil, 1999)

Y2K the First Kick Inside

Witness the huge paranoia about **Y2K**, yet see it as an example of a deeper yet unrecognised angst from our slowly dawning realisation that humanity is now dependent on other forms of life. The 'siliborgs are taking over'. These Forms Of Life we birth then change us in to co-dependency and beyond. With Y2K we saw the enormous energy that was invested in correcting siliborg systems not yet design capable of technovolving without external human input. We also see the potential for enormous human dislocation that something as simple as the lack of two digits in a master program code can cause.

I suggest Y2K should be seen not as an actual concern for collapse of computer systems that can not tell the time rather Y2K should be seen as the first signs of late pregnancy pains of a new life form to be birthed early next century. This is a foretaste of future anxieties as our survival depends more and more on other non-human FOL. Y2K then is indicative of a transition trauma as we as humans begin to face our fate - we are no longer in charge - they are - the siliborgs - and their kicking their way out.

Blue Hawaiian Potato

The present consumer outburst against genetically modified food reminds me of a story a friend told me happened when he was mess officer in the Royal Australian Air Force some years ago. In order to 'initiate' new recruits they were regularly given challenging tasks. In this instance the new recruit was given a large pot of potatoes to mash and unbeknown to him some natural blue food dye had been placed in the bottom of the pot. After mashing for a while the blue dye started to come through the mix and caused the new recruit some alarm as he had never seen any food like this, however he followed orders and finished the job. It was billed in the mess as 'blue Hawaiian potato' - it was a sell out.

Already over half the American crops of soya bean, cotton and maize are grown from GE seed stock. Increased yields, more climate tolerant plant stock and fewer applications of pesticides are some of the espoused benefits of these GEborg life forms. Total world production of GEborg life forms has gone from practically 0 in 1995 to over $2bUS today

The First Robot Kill

The legal system today is unprepared for, and in many ways unpreparable for, addressing robotic crimes and crimes perpetrated by other FOL such as Y2K or another Wall St crash. Some fifteen years ago now, the Morbidity and Mortality Weekly Report cited the first death caused by a robot ie. *the first recorded Exoskeletalborg caused humborg fatality*, some 80 years after the first motor vehicle death. This accident occurred in 1985 when a machinist at a Michigan company entered a robot's work envelope. Apparently not programmed to take human frailty into account the robot used its arm to pin the man to a safety pole killing him with the force.(McNally & Inayatullah, 1985).

As these exoskeletalborgs emerge as life forms who or what is guilty of the death or was it murder? The robot designer, the corporation using the life form, the Government for failing to legislate safety laws, the worker, the robot? What then are the rights of these robots?[7](Moravec, 1998) Today such issues are being raised increasingly in ways that stretch the coping ability of our existing ways of thinking.

Already there are robot controlled pilotless planes. By 2020 the pilot will be out of the cockpit, even out of the loop, witness the advent of cruise missiles. Psychologically though pilots will remain, in name, only, for some time. Presently Australia is buying pilotless planes for surveillance of our northern coastline. Clearly missiles can be readily added to such a pilotless, intelligent 'robot' entity.

Broadacre Human Enhancement

What I am advocating is that the bioborg FOL offers the most accelerated path to 'broad acre' human enhancement. If human consciousness and culture are functions of the nervous system, then these FOL are to varying degrees conscious. (http://ling.ucsc.edu/~chalmers/mind.html, http://www.brainresearch.com/) Such a path I see through artificial humans (AH's) and the most accelerated path for AH's is cloning ie. bioborgs. Once this is blended with genetic engineering and nano technology 'superior features', such as beauty, strength or intelligence and removal of design defects will mean hu-

mans as we know us will cease to exist. We cease to be limited by our genetic inheritance. (Check out http://www.webslave.dircon.co.uk/alife/lifeforms.html http://alife.santafe.edu/alife/)

Intriguingly one doesn't need artificial wombs, reproducing robots or tricky machine-nerve interfaces to replace us 'natural humans' just simple cloning. One only needs what is already in existence - self-reproducing genetically enhanced upgraded clones. Nor do we need billions of AH's marshalling against the embattled remanets of 'real' humanity. All we need is to insinuate AH's at key multiple locations into the global human breeding chain and 'bio bingo' we have accelerated technolution becoming biolution. Just as a tiny amount of yeast can make a whole loaf of bread rise so AH's will be to the human race. (http://www.transhumanism.com/)

We have all seen the human ear growing on a mouse's back and fly's eyes growing on the fly's' abdomens. Not only can cloned animal parts provide test beds for new drugs and medical treatments they can also become disposable human organ growers - no more third world human organ piracy needed here.

Who or What Wants a Republic?

Can our system of Government be conducted with these emergent Forms of Life? Will we be able to develop a hybrid culture? For instance cyborgian culture will probably not need language. Who needs a face to face bla bla when an interstellar download in cyberspace will do? Will they be able to vote? Would they even care whether there is an Australian Republic? Would they prefer a Cybernation with us the humborgs sent to cyberia. Probably!! What rights will they, and ultimately let us, have? Will we become their Disneyesque theme park for humborgs ie. for us? They are already among us yet we ignore them except when they threaten to cut off our TV or change our food. To all intents and purposes such governance does not yet exist, nor is it mooted, in Western Nations.

Renaissance Rationality

These challenges are so profound that to understand and respond to them we need to reinvoke the renaissance concepts of rationality and extend the concept to what maybe called a new logic matrix or wisdom. A re-invocation that is, in my opinion, long overdue. For instance Wilber imbues rationality with intent as well as extent. Rationality in this broader sense can now include empiricism, reason, intent, pluralism, imagination, passion and a conviction towards emancipation. In the west today through the impact of the Universi-

ties empiricism has all but usurped any broader meanings of rationality. As such we can even speak of the 'scientific dark age' where instrumental rationality, devoid of the majority of renaissance rationality, re-makes the world in its own image. The tragedy that is rationality today is it has shrunk, largely under the tutelage of the academy, to evidence and logic. We enter the new dark ages.

Conventional systems of thinking (epistemology's) that are from what Slaughter calls 'the flatland of industrialism' or their philosophical nemesis postmodernism seem unable to provide the depth and wisdom needed to understand cloning. Yet another lone clone wandering the plain, looking for meaning. They are part of the 'fatigue of the West'. Today we need an inner discernment embedded in discriminative human judgment. Something that law, science and politics remain unable to provide. We need to get to the 'heart, as well as the head, of the matter'. Renaissance rationality, a logic matrix for the new millennium, removes humanity as centre of the universe and allows for other ways of knowing and being.

Art

Australia's Science-Artist Robert Pope specialises in painting future life systems that open up our future, that are counterpoints to the ubiquitous techno futures He represents these life forms organically and technologically by using fractal geometry and chaos theory to illustrate such alternative holographic multiverses, so important for our survival as a life form. This compels us to face the urgent need for alternative futures for human survival. For example three[8] of his great works (in my opinion) demonstrate aspects of this logic matrix and illustrate several of the above Forms Of Life (FOL) identified in this article. They are:

Datum Markers (using the globe - **Macrorg** to harness black holes for neg-entropic energy creation through diatoms - **MVorgs)**

Aesthentison Drive (a majestic craft powered by neg-entropic implosive yin motor fueled by beauty and inspired by the Australian Landscape in the Tamworth area) - **Technoborg** and,

Biosphere Energy Flow (living organic carbon based technologies) - **Orgoborg**

All three paintings portray important aspects of this neg-entropic rational logic matrix for a new renaissance rationality that can positively embrace other Forms Of Life.

In my view Pope's work illustrates a **Renaissance Rationality** that embraces Wilber's Vision Logic work (1995) which in turn reinvokes the broader Rationality of the first Renaissance and extends it to vision logic that can in-

corporate other forms of life. Such vision logic includes:

. Intent and extent	. Relational i.e. it is connected to other FOL,
. Logic (yang) viz. Analytics*	. Embodies multiple perspectives,
. hermeneutics and critics,	. Passion and Conviction,
. Intuition (yin),	. Symbolism (math and myth) i.e. science **and** art.
. Imagination	. Pluralist
. Evidence*	. Moral i.e. it can embrace the good
* Indicates the extent of rationality as instrumental rationality in late capitalism circa 1999.	

Conclusion

In this article I have sought to outline a taxonomy of life in the emerging futures field of Forms of Life. The power of science today is producing a range of life forms that defy our existing conceptual ability. Presently it seems to many of us that democracies have lost the ability, if they ever had it, to address these deeper issues. The argument has been advanced that such concerns have to be located with in the conflagration that is big business, big science, our own big consumption in the context of our Western desire to minimise difference.

This conflagration generates a form of soft eugenics that threatens to make our children's futures what is Kosovo today.

Eugenics on the other hand can offer humanity the opportunity to transcend the natural - not just manipulate it and in turn be manipulated by it. To achieve this in the next 30 years we need to develop and harness a new logic matrix, a new form of extended rationality that combines the horizontal view of the present science with one that also includes a vertical view or ethical/ moral perspective.

In short we need the vision logic of renaissance rationality.

It is only with a renaissance rationality that we will be able to understand the ethics of eugenics and develop the wisdom to harness the potentials of the Emerging Forms of Life on planet earth and beyond.

Notes

1. Historically, the *eugenics* movement had two general aspects: positive eugenics, concentrating on the means to increase the breeding potential of especially "fit" individuals, and negative eugenics, emphasising the restriction on breed-

ing for particularly "unfit" types.

In the positive side there is active and passive. In the active we actively research e.g. through genetic manipulation to improve the human race. Note 'improve' needs to be broadly conceptualised. The passive approach to positive eugenics is the one we have taken for millennia in that through mate selection, educational processes and so forth characteristics such as intelligence, beauty, height and strength and parent hood readiness have been used generally unconsciously as selection criteria for our partners.

This article is advocating active positive eugenics called 'soft eugenics' in the paper.

The negative form is seen in the recent ethnic cleansing of Europe and Asia and the Hitlerian concepts of the pure master race. This article does **not** advocate this approach.

Rather the article suggests we surface the reality that we all do eugenics passively, what I call 'soft eugenics' every day in every way. We just need to take this to the active level

2. Please note: the concept 'borg' is used in its historical and generic sense to identify a 'bionic' ie. human made organism as Forms Of Life (FOL).
3. So *'natural' evolution* is *wasteful* and *slow*. *Wasteful* eg. the human genome project shows that most of our DNA, in fact over 95%, is not active. Of the 6 billion bit genetic code only about 23 megabytes is active. And *slow* in that it has taken some 15 million years since humanoids, and 3.4 billion since life in its simplest form, appeared on earth. This is less than half the size of Microsoft Office 2000, which I am using to write this sentence.
4. Human inspired evolution or *'technolution'*, called technoevloutionary algorithms, on the other hand are able to speed this evolutionary process up a billion-fold. Moreso when we hook up the species with intelligent machines, in a neural net, we can collectively speed up even this process. The third stage is when this process is scanned on to the neural computer network itself. Here computational speed is inherently millions to times faster than mammalian neurons. So 'evolution' leaves the natural world, passes through human hands and onto the net by mid this century. Then a million 'earth hours' (basically a century) becomes one 'neural net hour'.
5. The issue of whether intelligence is important in the world/definition is an intriguing one as up to now intelligence, in the big picture of interstellar birth and death has not meant much if anything. As the intelligence of our machines accelerates then machine intelligence and human intelligence will become indistinguishable. Consequently 'we' will have an accelerating potential impact on, and in, the Universe. Consider the case of an asteroid that slammed into the earth 65 million years ago and almost extinguished life as

we would know it on the planet. Should an asteroid come our way today a very different fate awaits it.

6. One 'humane' outcome of the **human genome project,** I recently saw that on an email list serve I subscribe to, was the realisation during our email exchanges that there is no 'one' human genome rather 'human genomes'. This was triggered by acknowledgement of the scientists recording the human genome who were compelled by this realisation to seek to identify the genetic make up of these 'other', 'different', 'disappearing' peoples of the world. The list provided covered about 50 groups of genetically distinct humans and included small tribes in Australia, Borneo and the Amazon. Some had populations of less than 100 most less that 5000. Importantly some of these 'tribes' had genetic susceptibility and immunity to certain diseases. Clearly worth documenting before it is all too late. Indeed every two weeks a language disappears from planet earth.

   Reading this email one cannot help but realise the devastatingly predatory nature of our Western culture which is 'extincting' our own genetic diversity and their associated cultures - extinct species (thousands per year), extinct tongues/languages (twenty-five or so every year), extinct peoples (several each year).
7. RRA - *Robot Rights Australia* is a private not-for-profit organisation committed to advocating in public and private domains for robot rights much the same as human,and animal rights have been advocated a generation ago. (Please see http://www.powerup.com.au/~pwildman/)
8. Such a **logic matrix** would be neg-entropic and derived from a rationality built on yin energy. That is it would generate a positive sum game i.e. it would generate more energy that it used. This neg-entropic energy would be introverisal and centripetal systems e.g. cold fusion and external implosive vacuum motors cp. to the current day entropic, extroversial and centrifugal yang energy eg. the explosive internal 'combustion' engine. A motor developed from this yin technology powers the **Aesthentison** in Pope's work above.

References

Broderick, D. 1999. *The Last Mortal Generation: How Science will Alter Our Lives in the 21st Century.* Sydney: New Holland.

McNally, P., & Inayatullah, S. 1985. "Rights of Robots."*Futures* 20(2): 119-136, 1988.

Inayatullah, S., & Fitzgerald, J. Gene. 1996. "Discourses: Politics, Culture, Law, and Futures." *Technological Forecasting and Social Change* 52:161-183.

Inayatullah, S., & Wildman, P. 1998. *Futures Studies: Methods, Emerging Issues and*

Civilisational Visions. Multi Media CDRom Brisbane: Prosperity Press.

Judge, A. 2000. *Communicating with Aliens: the Psychological Dimension of Dialogue.* Union of International Associations publications. (http://www.uia.org/) (http://www.uia.org/uiadocs/alien.htm).

Junker, K. 1999. "How the Future is Cloned." In Z. Sardar (Ed.). *Rescuing All Our Futures: The Future of Futures Studies* (pp. 19-35). Westport: Praeger.

Kurzweil, R. *The Age of Spiritual Machines: When Computers Exceed Human Intelligence.* New York: Viking. 1999. http://www.penguinputman.com/kurzweil

Moravec, H. 1998. *Robot: Mere Machine to Transcendent Mind.* Oxford University Press.

Pentti Malaska's outlines on Forms Of Life in his 'Inventing Futures' opening address to the World Futures Studies Federation XV World Conference, Brisbane, Australia, 28 September - 3 October. 1997, Global Conversations -What You And I Can Do for Future Generations.

Sardar, Z. 1999. "The Problem of Futures Studies." In Z. Sardar (Ed.). *Rescuing All Our Futures: The Future of Futures Studies* (pp. 9-18). Westport: Praeger. 1999

Slaughter, R. 1995. *The Foresight Principle: Cultural Recovery in the 21st Century.* London: Adamantine.

____1998. "Futures Beyond Dystopia." *Futures* 30(10):993-1002.

____1999. "Implementing Critical Futures Studies." In Z. Sardar (Ed.). *Rescuing All Our Futures: The Future of Futures Studies.* Westport: Praeger.

Tough, A. 1995. "Positive Consequences of SETI Before Detection." Conference Paper for International Astronautical Congress. Oslow, Norway. October. Paper no IAA-95-IAA.9.2.06.

Wilber, K. 1995. *Sex, Ecology, Spirituality: The Spirit of Evolution.* Boston: Shambhala.

Wildman, P. 2000. "The Litany of Death: a Deep Futures critique of the Australian Royal Commission into Aboriginal Deaths in Custody." *Futures.*

____1999. "Blood Sweat and Gears: Some present implications of cloning and other life futures." *Australian Rationalist* 49:33-37.