

COMMUNION AND CARGO CULTS

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Abstract

The countries of the first world discuss the inappropriate introduction of technology within the third world. One illustration are the Cargo Cults developed in the South Pacific as a result of insensitive exploration and exploitation. Nevertheless the first world remains largely unaware of the inappropriateness of the ultra-rapid development and introduction of information technology within their own culture. The development of high-bandwidth human computer interaction via 'virtual' interfaces will lead to intimate symbiosis between human consciousness and artificial intelligence. One possible consequence of this is a new religion based on the current grass-roots belief in technology epitomized by the popularity of subjects like Chaos Theory. Tightly coupled human computer symbiosis promises an electronic communion for this new religion and the possibility of a new hi-tech cargo cult that, unlike its predecessors, actually 'delivers the goods'.

Cargo

Cargo cults are a largely 20th century development and have evolved as the result of insensitive and inappropriate introduction, by an alien culture, of a new technology into a resident society who were previously unaware of that technology and its potential and value. The term is strictly used to describe the cults that developed in Melanesia and the best documented come from Papua New Guinea. Jarvie (1) describes these cults as having the following characteristics:

- they are doctrinal offshoots of Christianity - the followers of native pagan religions do not usually subscribe to them;
- they are usually led by a native prophet who announces that, provided certain conditions are met, the millennium will come about. This will usually occur in the near future and is often predicted for a specific date;
- a central tenant of their doctrines is that when the millennium comes it will be accompanied by the arrival of ships and aircraft often piloted by ancestors and always loaded with a cargo consisting of material consumer goods (which are, of course, delivered to the ruling classes - traditionally the white overlords - in this same manner);
- another aspect of the millennium that is often prophesied is the inversion of

the order of society - the black native subjects will rule the whites and, in some cases will become white and visa versa. An assumption here is that the native people are Gods favourites and that the white interloper has misappropriated the shipments of cargo sent by God to his chosen people.

A familiar aspect of these cults are their 'religious' symbols. These include aircraft, ships, landing strips, radios and many other items of the paraphernalia of modern communication systems but made from simple and roughly hewn and decorated materials. The visual appeal of these tokens has made them collectors items in the first world where they are converted into valuable and so-called primitive art. This often leads to an image of the cultist as a 'noble savage' seeking spiritual enlightenment by attempting association with a technology which they don't fully comprehend (their assumption that cargoes come from God for example) because of the inappropriate way it has been presented to them. Herbert Umlaut (2) warns that this is a misleading fantasy: Cargo Cults are the consequence of single-minded possessive greed and that the largest cargo cult of modern times was the German Third Reich "those guys wanted to possess the entire world". Other authors have also recently discussed world-wide cargo cults (3).

A dominant feature of Cargo Cults is their basis in the misinterpretation of an inappropriately introduced communication technology. It is my belief that a modern communication technology - digital Information Technology (IT) - is being introduced as a similarly inappropriate way and within the very heart of the dominant first world culture. The lack of understanding of this technology by the majority suggests that a likely consequence will be the development of a major new international Cargo Cult. Some developments of this cult are already discernible. One in particular is the public response to the recent developments in mathematics and science that have been dubbed Chaos Theory.

In presenting this essay I make several assumptions. Some of these have been discussed in more detail in my previous publications (4). Some of the more important are that:

- intelligence has evolved as a survival mechanism and that personalized, or ego-oriented perception of intelligence is largely illusory;
- advances in information technology will lead to the evolution of super-intelligences that have significantly more capacity and potential than humans;
- these super-intelligences will dwell within extended networks rather than within individual nodes of a network and that;
- in order to survive humans will have to enter into a close symbiotic relationship with these new intelligences.

In this essay I do not wish to defend or attack these assumptions. Others are busy

doing that (5). Instead I intend to speculate on the likely effects on humanity and on art of developments of this kind. Firstly it may be useful to illustrate the symptoms of the evolving Cult of Information Cargo.

Messiahs and Mandelbrot.

Science and technology have long provided the substance for a dominant belief system. They evolve directly from Christianity and are complementary to its patriarchal causalistic dogma. A theological revolution - the Reformation - gave birth to the modern scientific method, modern capitalism and vitalized technological colonial exploitation. The eighteenth-century polymath Pierre Simon Laplace suggested an "intelligence" that "would embrace in the same formula the movements of the greatest bodies in the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes". Newtonian determinism is here applied to consolidation of the deity itself in much the same way that Ramon Lully and Leibnitz had previously applied logic for this purpose. Laplace's interpretation of that "same formula" is what modern scientific interpretation would doubt. The search for prime causative factors or relationships is still as vigorous as ever.

Towards the middle of the 19th century many, following Laplace's example, believed that science was close to describing everything in the universe (the millennium was due?). The high academic art of this period like the works of Alma Tadema, Leighton and others echo this optimism. Then Michelson and Morley's experiments to measure the speed of light suggested something was amiss and the Empire of Certainty - the empire of the mechanical, Newtonian, universe began to crumble. Einstein, a God-fearing Jew, tried to patch it all together again but soon Heisenberg (with uncertainty) and Godel (with incompleteness) put a stop to that. During the 20th century that empire of certainty has been further eroded and nothing has contributed more to its demise than the new theories of Chaos.

Chaos is profoundly simple and, perhaps in consequence, much misunderstood and maligned. Chaos demonstrates that even the simplest of deterministic systems can produce behavior that cannot be predicted and is therefore termed chaotic. Note that chaos in this sense is not synonymous with randomness: Chaos does not directly oppose the empire of certainty. It does, however, insist that in order to be certain about some thing one must know everything about that thing. (Which is, of course, a tautology). Knowledge of a subset of everything, however rich that subset may be, won't help. It's all or nothing. Seemingly insignificant variations in the input (what is known) conditions to a system can, and often do, lead to major variations in the output. This difference cannot be predicted. Chaos theory does however provide us with clues and, in particular, the concept of Self Similarity. Chaos theory has given science an important, perhaps indispensable, attribute - a proof of unknowing, of mystery:

The way that can be told
Is not the constant way;

The name that can be named
Is not the constant name.

The nameless was the beginning of heaven and of earth;
The named was the mother of the myriad creatures.

Hence always rid yourself of desires in order to observe its secrets;
But always allow yourself to have desires in order to observe its
manifestations.

These two are the same
But diverge as they issue forth.
Being the same they are called mysteries,
Mystery upon mystery -
The gateway of the manifold secrets. (6)

Along with Chaos has come the concept of information transaction as a fundamental physical paradigm. The universe may be considered as a virtually infinite multi-dimensional cellular automaton. Discussion of this interesting area is beyond the scope of this essay however those who would like to pursue this concept further may like to read Poundstone's intriguing and amusing extrapolation of John Horton Conway's Game of Life (7).

It is perhaps worth reiterating that our understanding of Chaos, which has essentially invoked a new paradigm of mathematical and physical modeling of the universe, is a direct consequence of digital computing machines. As I have discussed elsewhere (8) we have already witnessed revolutions that have been a consequence of the introduction of information technology. We should expect to see many more as the technology becomes fundamental to many other disciplines.

The techno-belief that states that: whatever happens we can invent ourselves out of trouble has been a guiding principle of the market forces economy. Its consequences are everywhere: the planet is massively overpopulated and polluted. Chaos theory introduced a valuable new element that addresses the expansionist bias of the previous technological belief system. In demonstrating that very small changes in input can lead to unpredictable and potentially large changes in output (like for example the greenhouse effect or other similarly catastrophic "natural" events) Chaos bring a measure of much needed "common sense" back into play. But the principal contribution of Chaos to the techno-religion is its inherent mystery. All good religions require mystery and mysticism (the unknowable, the one, the holy ghost, etc. ...). Thanks to Chaos science and technology now encompass this essential component. Chaos also brings an integrating effect:

They said to Him: Shall we then, being children,
enter the Kingdom? Jesus said to them:
When you make the two one, and

when you make the inner as the outer
and the outer as the inner and the above
as the below, and when
you make the male and the female into a single one,
so that the male will not be male and
the female not be female, when you make
eyes in the place of an eye, and a hand
in the place of a hand, and a foot in the place
of a foot, and an image in the place of an image
then shall you enter. (9)

Despite the nature of the subject that gives rise to the label Chaos there are a number of similarities, of constants, that cross subjects and disciplines with ease. Self similarity is one. Feigenbaum's constant, which measure the rate of period doubling in any number of chaotic processes is another.

Chaos then brings both mystery and unity to the new techno-religion. Both are essential characteristics of a holistic religion. Chaos has developed in parallel with scientific visualization which has been a major contributing factor to our exploration, development and understanding of these new universes of interest. Visualization has also helped to bring these concepts to a wide audience and science popularization has become a major component of modern entertainment. Benoit Mandelbrot was in Australia in early 1990 and when he visited the relatively small community of Canberra over 1700 people turned up to the 150-seater lecture theater where he was booked to speak. This adulation of a figure who, in many other periods, would have probably remained obscure, is a characteristic of the popular identification with Chaos Theory and is, incidentally a classic example of the development of a cargo cult.

Images of Chaos fill our television screens in programs from science to music videos. Exhibitions in art galleries are devoted to the subject. Science and technology have, after a long period of popular rejection, been brought back into the mainstream of public interest in a way that is unparalleled by the popularity of the theories and images of chaos. Mandelbrot together with many of the other pioneers are often treated like gurus - prophets of the millennium who foretell of the imminent death of our planet from pollution and overpopulation unless we act immediately to remedy the error of our ways. This is pure cargo cultism and the Information Cargo Cults are here already, established and have a growing number of followers, particularly amongst the young.

The major characteristic currently missing from this emergent religion is Communion: the need for an individual member of the religion to consolidate their belief via an intense and personal link-up with the source or godhead of that religion. It would seem to me that developments in the computer human interface (CHI), driven by the escalating performance of computing systems, will soon provide a relatively intimate communication pathway between human and machine (10). Graphics as a basis for CHI is already becoming too slow and recent developments of so-called "virtual realities" can be seen as attempts to

utilize whole body language, including speech, hearing, gesture, vision and, in some leading-edge research touch, in order to increase the bandwidth of communication and interaction.

This intimacy will be the basis for a closely coupled symbiosis between human and machine intelligence. If this potential offends any reader they should bear in mind that even today computer systems control most of our essential services. If this technology should fail our supply of money, goods, basic services and communication would also soon fall over leading to widespread starvation and death. We have already established a symbiotic relationship with technology and what I'm suggesting here is only a change in degree.

With this intimate symbiosis comes the potential for nirvana on demand. A modern games arcade has sophisticated flight simulator technology which just a few years ago would have cost millions of dollars and only be available to a elite few. Now anyone with a dollar in their pocket can sample these delights. The VPL Data-Glove which, three years ago, was an expensive, made to order, research tool has now been emulated by Nintendo who offer it as a \$160 peripheral to their domestic games systems.

I can't believe it will be long before a merger of neuroscience, cognitive science and machine intelligence offers the possibility of an intimate communication between human and machine intelligence and with it the potential of communion, of a "once-in-a-lifetime" spiritual experience, for just a few dollars in the slot. Plug in and tune in. The elitist mystical experience can become democratized and available to much larger numbers than ever before. Information Cargo Cults, unlike the predecessors, may, via simulation and stimulation, actually deliver the goods.

If electronic Zen courtesy of the local games arcade is a worry then imagine how the TV evangelists, who have proved their success with a relatively simple, non-interactive, broadcast medium, will attempt to use the technology. And lets not forget that many religions, who will almost certainly move in on this new dynamic communication medium and method of enlisting recruits, do not have the intrinsic benevolence that is supposedly at the roots of Christianity and its offshoots. The inquisitors as they burned young girls who didn't conform to the mores of the day did so for the principles of love, fellowship and forgiveness. Other religions have no such qualms: in some killing unbelievers actually earns brownie points in heaven. He who dies in the holy jihad with the name of Allah on his lips goes immediately to the highest heaven where there is an eternity of bodily pleasures to be sampled (11).

If we look for a role for art in the service of the new techno-religion we find it has already been established and follows a traditional pattern. The Renaissance Teams described by Donna Cox (12) are already fulfilling much the same role as did their renaissance forbearers in the service of the Church of Rome. Giotto and other journeyman artists painted cartoons of the bible stories on the walls of the churches in order to communicate their lessons to the illiterate parishioners.

Now Cox and others bring images from the new religion, via visualization, in order to communicate a new order of ideas to a largely innumerate public.

We can also draw a parallel between the way that the first world treats the traditional cargo cult artifacts (by inflating their material value in an inappropriate way that denies or overlooks their intrinsic value) with the way the art mainstream has reacted to the images of chaos (and other computer aided artifacts) that appear in galleries. The curators and critics pontificate about colour, form, construction and even the framing without any respect for the inherent meaning of the work or its larger scientific and social context (13).

Welcome to the Pleasure Dome

Virtual reality has been adopted nowhere more eagerly than by the computer games manufacturers. Already, as indicated above, sophisticated simulation technology is now integrated into the games arcade where it's available for just a few dollars. Multiply those few dollars by the millions of games played daily and we appreciate big business and the highly competitive nature of the companies involved. They generate the kind of profits that allow for immediate exploitation of leading edge technologies - witness Nintendo's development of the data-glove. Both Nintendo and Mattoy are now believed to be developing their own low-cost versions of a stereo, head-mounted vision system.

These producers also train a new generation of consumers. The children's market is a significant force in the economy. These kids are being conditioned to accept a high level of technological sophistication and, even more important - access to that technology - as a birthright.

High-tech is also hitting other major consumer niche marketplaces like pornography. There are any number of similarities with the games market - in particular a constantly evolving level of satiety - consumers are rarely content for long and always desire more and superior stimulation. With the advent of intimate computer human symbiosis comes the potential for toll-free infinite orgasms as a promotional medium with guaranteed success. Or, for a fee, select your favoured sex, age and activity then plug in and experience your pleasures at first hand with complete sensory feedback and amplification.

More traditional and social forms of entertainment like cinema will also be effected by this new simulation technology. Lucasfilm founded their games division several years ago and most of the major studios now have a presence in the area. Art has always had a role as entertainment and the new art will be no different.

Politics and Control

Art in the service of authority has a long history. It's strewn with portraits of first religious and then secular leaders and with allegories that espouse their philosophies and images that communicate their messages. Authority has

always been a major developer of the current new technologies - they are essential tools in the management of large institutions from multi-national industry to governments. The tools give an unprecedented access to personal data and parasitic companies have evolved to exploit this potential. In Australia a company specializing in on-line financial searches faces indictment for a precedent setting court ruling. Their clients, major national banks and international credit-card companies who paid for this work are, surprisingly, exempt from the litigation.

I have long held the opinion that our concept of personal freedom is nothing more than a measure of the incompetence of the institutions that govern us. Modern information processing and networking promise to remove those levels of inadequacy and civil rights groups are rightly concerned by the new opportunities for abuse if not for outright corruption.

It would seem to me that trying to oppose this new order is fruitless - these are, after all, essential tools for administration and regulation. Our concern is not with their regular use but rather with their potential for abuse. An interesting example comes from the 1970's in the United Kingdom where a group of parliamentary opposition members tried to oppose police access to a new social security database. Despite the fact that the Home Secretary assured them that this would not be allowed just one week later the opposition members were able to demonstrate that every police station in the UK had regular access to the system.

What we need to be doing is looking at ways that such a ubiquitous system, which could cause so much damage if it fell into the hands of an unethical and corrupt authority, can be regulated from outside. Our concern should, as always, be with access and opportunity, the keystones of democracy and consultation. Here again I believe that the mechanism we seek is already established and has been developed by, amongst others, the games manufacturers: the computer kids are already active in the networks.

Art in the service of authority acts to encourage the conformity which simplifies government. What we seek is the mechanism for encouraging a requisite diversity - an art of democracy.

Hacking out the New Frontier

Information technology has generated a debate concerning its intrinsic nature. Clearly it is not just a tool, nor is it a medium. Its chameleon nature has led to many identifying it in the post-modernist mainstream. This definition is, I suggest, more a consequence of misunderstanding by people who are more acquainted with the limited results of application-based systems rather than those who have a deeper understanding of the technology itself and of its social, commercial, aesthetic and political implications. Our early applications of the technology include simulations of traditional media like typography, page-make-up, paint and photo-collage systems which offer the ability to copy and manipulate borrowed images ad infinitum. The computer is a copyists tool

without precedent. Whilst this encourages the post-modernist interpretation it represents only a limited, and in my opinion, backward looking, approach to the technology.

Interaction, between a human and an artificial intelligence (AI) (14) or between two humans moderated by an AI is something new, something that this technology offers uniquely. Some artists like Stephen Axelrad produce interactive work that fits clearly within the post-modernist paradigm and, as a consequence has been picked up by the art mainstream - Axelrad is now part of the Castelli stable. Others, like David Rokeby, Simon Veitch and Myron Kruger are opening up new areas and their work, like pioneering artists of the past, is often rejected by the mainstream.

The model of photography may be useful. Photography began to develop an identity as a medium in its own right when it became cheap enough for amateurs (people who had not had a professional image-making training) to get involved. In their relative innocence they broke the rules and began to isolate and identify unique aspects of the new medium.

It's tempting therefore to suggest that is only now that sophisticated low-cost computer systems, like Commodore's Amiga, are generally available that we will begin to see rules being broken and the post-modernist clichés being rejected.

The development of user-friendly computer-human-interfaces (CHI) has enabled the marketing of these systems. CHI is far too often based on the premise that human learning (a challenge) is undesirable and software should be packaged to emulate something that the human already knows about. By encouraging "the user illusion" CHI become a two-edged sword (15): on the one hand it is responsible for large numbers of people getting involved with the technology but on the other hand it actually encourages the misleading post-modernist perception.

In looking for a resolution to this dilemma I believe that we should look at those members of the community who have not yet been initiated into one or another mind-set. Since this conditioning is largely a result of education, and in particular of discipline specific higher education I suspect that we should look toward young people and children.

This group already make themselves know via the spray-can and subway walls. The images they produce have a high public profile - they exist alongside major urban commuter routes - and demonstrate several important characteristics:

- the images that they produce are often dynamic and sometimes beautiful. They demand attention;
- they are implicitly and occasionally explicitly political;
- the process is generally illegal - the work is anti-authoritarian;

- they are the work of young people who have not yet (by definition) evolved "mature" moral and ethical codes. They are free to explore in an uninhibited manner but are also often unaware of the deeper consequences of their actions;
- the work is most often an identifier - often the artists pseudoname. The work is one aspect of the maturing process - the adolescent identity crisis.

Many young people have now moved from the physical commuter routes into the information networks. Their viruses are endemic in the low-cost pc world and, as they grow older and get access to more sophisticated technology their worms are entering the global networks. Although we must be concerned about the amount of damage the artifacts of electronic graffiti are causing we should also be pleased that at least one section of the community is ahead of the pack. Art has always had a role to encourage the diversity that is requisite to the conformity pressures issued by authority.

One role of art is to encourage freedom. Graffiti is a grass roots artform that measures democracy. The western side of the Berlin Wall was covered in multicoloured political slogans. The Eastern side was gray and bleak.

Graffiti is the artform of youth and we must look increasingly to young people and children to limit the ubiquitous spread of information technology from both the commercial and political marketplaces. As the power-mongers develop more sophisticated methods of constraining freedom the graffiti hackers will find ways to limit this constraint. Whether we like it or not (and many complain about the "disfiguring" aspects of visual graffiti and most of us who use this technology get upset when the damage caused by virus and worms effects our own databases) it is in our interests to acknowledge, if not support, this democratic and freedom enhancing role of electronic art.

The Frankenstein Complex

As we are all aware the new technology is developing and being introduced at an ultra-rapid rate of change. Many are afraid and feel intimidated. A common response that I have personally witness in disciplines from graphic design to engineering is to pretend it isn't really happening. The professional reactionaries, the trade union movements, have almost consistently opposed the technology as it has developed.

It is my opinion that attempting to ignore or to oppose these developments is, in the long term, the most dangerous route of all. They represent an order of power that is unprecedented in human history. Our future freedom is at stake, some would argue that our very survival as a species is at issue and knowledge, involvement and participation are the only keys to our success.

The Emergent Matriarchy

There is a significant gender bias in the development of technology. I suspect that it springs from the male-dominated and patriarchal Christian religion ("go forth and multiply") and in particular from the reformed Protestantism with its emphasis on distrust (questioning - protest) and the associated "work ethic". The scientific method is associated with the reformation. The male principle also brings a hierarchical consciousness: leaders and follows; shepherd and sheep. By contrast the female principle is soft and concerned with nurturing, loving, caring and with heterarchical communications and government.

Stelarc (16) suggests that the imminent symbiosis between human and machine will make maternity obsolete and this threatens the traditional role of woman. Although this, to me, seems to contradict the "feminist" viewpoint most of the people supporting this premise have been women. Sally Pryor (17) recalls Descartes dualism of mind and body and suggests that the male is identified with the mind and the female with the body. Artificial Intelligence is without body - the mind dominates and the body - the female - is rejected. Linda Wallace (18) suggests that one consequence of male domination (and I would add also a consequence of the domination of the patriarchal Christian Church, particularly the Church of Rome, with its emphasis on "original sin") has been a loss of trust in the body. In consequence technology has developed as a search for "proofs" for previously natural phenomena and abilities that were lost along with this trust. This reiterates the popular opinion that pre-Christian religions were matriarchal and that many spirit phenomena were common practice. In this context Cyberspace can be seen as a technological implementation of astral projection.

The current leading-edge technological development is implementation of a global high-bandwidth network that will link computer to computer and people to computers. Although the technology that has made this development possible is clearly patriarchal, phallic and male dominated the network itself show characteristics that seem to be much more matriarchal. Networks are about sharing and communication - they are intrinsic heterarchical structures. Is it conceivable that a gender-shift will take place as a result of technological development - that a male dominant technology will create a dominant and ubiquitous female structure?

The network will extend over the globe and as far into space as humans have sent their remotes. In addition to suggesting that this structure is inherently feminine I also suggest that it has close correspondences with both Freud's idea of the Oceanic Consciousness and Jung's Collective Unconscious. The human symbiote in tomorrow's global network will discover that network awareness is oceanic awareness.

Toward a Conscious Planet

The global network will grow to include millions of nodes. It's even conceivable that it may include the humble minions in your pro-active credit card, or those

dinky devices that control your microwave, air conditioning, washing machine and that are now stuck on library books and consumer products to prevent theft. The growing global network represents a neural network that is evolving in a largely unstructured and indeterminate way. Is it possible that it may “wake up” and become self-aware at some time? I think so and suggest three possibilities - self awareness may result from:

- the human symbiote's contribution to the network;
- individual artificial nodes of the network achieving self awareness as a consequence of AI and super-intelligence and/or;
- the sum of all nodes - artificial and human - creating an autonomous network awareness.

In particular I believe that it's likely that humans, who have evolved as a competitive species with an embedded illusion of ego, will via the network evolve a species identity. They will transcend the ego-oriented, competitive paradigm and likely replace this with a cooperative species oriented identity. This is another aspect of the feminization intrinsic to the network. Work with other higher order mammals (19) suggests that other species may join us in this global awareness.

This network induced meta-consciousness will be a planetary intelligence that bears similarities with De Chardin's concept of the Omega Point when the sum total of Earth's intelligence - the Noosphere - achieves critical mass and “awakens” into a global consciousness and self-awareness. Jung's Collective Unconsciousness will be transcended to become a Collective Consciousness.

The prospect of a planetary consciousness with both will and identity suggests room for optimism for the solution of global ills like overpopulation and pollution. A conscious planet is likely to want to cure its sickness then ensure its future health. It also proposes a new role for art. Art may become the expression of a global awareness and consciousness. Describing the universe as an artwork is as relevant as describing it using the scientific paradigms of Newton, Einstein, Conway or Mandelbrot. This cosmogony does however bear more similarities with the Eastern religions than with proto-scientific ethic associated with Christianity.

The God of Christian tradition had purpose and created mortals in order that they could prove that they were good. The Hindu God Brahma, by contrast, was bored and divided himself into pieces (thereby creating the universe together with us mortals) in order only to amuse himself by observing our foolish antics.

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- 4 Paul Brown, *Metamedia and Cyberspace - Advanced Computers and the Future of Art*, published as a chapter in Philip Hayward (Ed.) *Culture, Technology and Creativity in the Late 20th Century*, Arts Council of Great Britain & John Lebbey Press, London 1990 and;

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See also an interesting and critical review of Moravec by Penrose which appeared in *The New York Review of Books*, 1 Feb. 1990, pp 3-5.
- 6 Lao Tsu, *Tao Te Ching*, translated by D. C. Lau, Penguin, London 1963.
- 7 William Poundstone, *The Recursive Universe*, William Morrow and Company Inc., New York 1985.
- 8 Paul Brown, *Art & the Information Revolution*, in *Computer Art in Context* pp 63-66, the catalog of the ACM SIGGRAPH 89 Art Show, published as a supplemental issue of *Leonardo*, 1989.
- 9 A. Guillaumont (et al) trans., *The Gospel According to Thomas*, Leiden: E.J. Brill; London: Collins 1959.
- 10 Paul Brown, *Metamedia and Cyberspace: Advanced Computer and the Future of Art*, (op. cit.).

- 11 These bodily pleasures are usually provided by young submissive girls and this reminds us that many established religions are undesirably sexist. Fundamentalist Islam goes so far as to suggest that women should have the pleasure parts of their genitals removed at puberty in order to ensure that they remain obedient and submissive. The World Health Authority recently estimated that up to 80 million women are currently mutilated in this way. Until quite recently fundamentalist Christians also removed a girls clitoris as a preventative "cure" for masturbation and prescribed frontal lobotomy as a cure for female promiscuity (whilst, of course encouraging the male to "sow his oats"). Needless to say these cures worked and their scientific and medical efficacy was established.
- 12 Donna Cox, *Renaissance Teams and Scientific Visualization: A Convergence of Art & Science*, Collaboration in Computer Graphics Education Course, ACM SIGGRAPH, July 1988, pp 81-104.
- 13 A good example of the misunderstanding of chaos theory by the art world comes from Jeremy Baines in a letter to the editor of *Modern Painting* (Vol. 3 No 1 Spring 1990 pp 68-69) criticizing an article on fractal's and aesthetics by Dr. W. P. Atkins which appeared in a previous issue. Baines maintains that ... "any line of Shakespeare or any part of a work of art is a seamless and organic part and reflection of the infinite whole which is artistic creation"... Although this sounds like a good defense of fractal concepts we find in the same letter Baines concluding: .."fractal's are ultimately irrelevant to art"...
- 14 I use the term artificial intelligence loosely and believe that AI like organic intelligence will evolve autonomously from its current humble status to potential super-intelligence in a very short period of time. See (4) above.
- 15 Paul Brown, *It Ain't What You Do - It's the Way That You Do It*, Proc. AUSGRAPH 89, Sydney 1989.
- 16 Stelarc, in a private Show & Tell evening arranged by the Australian Network for Art and Technology (ANAT) as part of their 1990 Summer School in CAD for Artists.
- 17 Sally Pryor, in a unpublished contribution to the panel "The Work of Art in the Age of Post Mechanical Reproduction" arranged by ANAT as a part of the Adelaide Festival Fringe 1990.
- 18 Linda Wallace, in a private correspondence (1990).
- 19 Mike Clark (et al), "Koko's Mac II: a preliminary report", a chapter on the work being done with Koko the gorilla. In: Brenda Laurel (ed.), *The Art of Computer Human Interface Design*, Addison Wesley, Massachusetts 1990. Other texts discuss research into dolphin communications.