Organisational Memetics?: Organisational Learning as a Selection Process

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ABSTRACT

Companies are not only systems created and controlled by those who manage them but also self-organising entities that evolve through learning. Whereas an organism is a creation of natural replicators, genes, an organisation can be seen as a product of an alternative replicator, the *meme* or *mental model,* acting, like a gene, to preserve itself in an Evolutionary Stable System. The result is an organisation which self organises around a set of unspoken and unwritten rules and assumptions.

Biological evolution is stimulated by environmental change and reproductive isolation; the process of *punctuated equilibrium*. Corporate innovation shows the same pattern. Innovations in products and processes occur in groups isolated from prevailing mental norms.

Successful organic strains possess a genetic capability for adaptation. Organisations which wish to foster learning can develop an equivalent, mental capability. Unlike their biological counterparts they can exert conscious choice and puncture the memetic codes that seek to keep them stable; the mental models of individuals, and the strategies, paradigms and unwritten rules at the company level.

INTRODUCTION

Two underlying mental models - each of which has been proffered with many variations on a theme - (see Morgan, 1986) inform much management theory, and the consequent advice proffered by consultants in the area of organisational improvement. The 'engineering' model focuses on organisations as human constructs to be planned and controlled by rational, formal, structures and procedures. The 'anthropological' or 'humanistic' model focuses on human behaviour, belief and value systems, sociological and cultural norms, and cognitive limitations.

This paper sets out to examine a third, commonly stated but less rigorously explored, alternative by comparing organisational learning with organic evolution by natural selection between genetic replicators,: a process enhanced by the punctuation of genetically imposed equilibria. Organisational evolution [learning] can be considered as a selection process between mental replicators. It is enhanced by punctuation of mental equilibria and by management capabilities analogous to those of adaptive genes. Organic evolution is blind, a selection process without conscious design, but then, despite protestations to the contrary, so is much of what passes for organisational adaptation. Perhaps, by appreciating the parallels we can convert the latter into a generative process, under the control of, rather than controlling, human beings.

The biological metaphor has long lurked in the background of management theory largely because the message of ìsurvival of the fittest; (usually wrongly attributed to Charles Darwin rather than Herbert Spencer) provides a seemingly natural model for market competition (e.g. Alchian 1950, Merrell 1984, Henderson 1989, Moore 1993), without seriously challenging the underlying paradigms of what an organisation is. More recently the new physics of chaos and self-organising systems has stimulated some writers, notably Wheatley (1993), to challenge the Newtonian thinking behind the engineering model of the organisation (see also Stacey 1993, Parker and Stacey 1994) and to recognise that organisations and economies evolve as self organising systems. Rothschild (1992) extends the market to ecosystem comparison by comparing the role of DNA with technological information and arguing for models of economic process that recognise learning, or technological evolution. Tom Lloyd (1990) goes further still, asserting that we should see companies as a genuine alien life-form, the first our species has encountered: a proposition which challenges our mental models of not only management but of life in general. The emergent discipline of complexity theory, most noticeably expressed in the work of the Santa Fe Institute (see Waldrop 1992) and in a recent book by Cohen and Stewart (1994) is revealing the parallels between the processes of self-organisation in economics, physics, biology, and the simulation of artificial life.

The fundamental parallel between evolution and learning was expressed by Gregory Bateson (1973, 1979) whilst Hull (1988) argued the case for viewing science as a process of natural selection between competing scientific ideas, and for scientific codes of behaviour as a logical, self-evolved, product of that process. The parallel can give us an extra insight into the organisational process, particularly if we approach it, not from a standpoint of *is it right or wrong?*; but rather *what lessons can we choose to draw*?

It is those lessons which concern me in this paper. Rather than being concerned with whether or not organisations are alien life-forms I am examining what insights 4 billion years of evolution in self organising systems offers for managing organisational learning. Discussing evolutionary analogies for social and economic behaviour is fraught with the difficulty of intruding value judgements and I do not want this paper to be seen as an essay on simple 'survival of the fittest', free market selection, a case for economic exploitation as an inevitable 'natural order', or for genetic determinism of human behaviour. I am suggesting that we may be better able to exercise real free-will if we understand the process of 'mental genetics' (or mentalics perhaps) that otherwise acts to prevent organisations, and individuals, learning and performing.

THE BASIC METAPHOR: NATURAL SELECTION IN ORGANISMS AND ORGANISATIONS

The fact of evolution (Darwin 1859); the progressive change over 3.6 billion years, of organic life on the planet is as well established by observation, as any fact known to science. As any number of books on the history of life on Earth testify, evolution happened. Despite debate over fine details, it is generally accepted that evolution is driven by a process of Darwinian natural selection (see the caveat below) and that DNA is the encoding mechanism for biological reproduction.

DNA [Deoxyribonucleic Acid] comprises two intertwined and cross-linked strands of sugars and phosphates; a long ladder twisted into a spiralling double-helix. The sequence of the chemical links between the two strands contains the instructions for building proteins. This chemical structure has a unique property; it can replicate itself. Given a source of energy and the right chemical feedstock the two strands of a DNA molecule will separate and assemble new twins: the process of growth and replication that is the basis of all organic life.

Different genetic codes [sets of instructions written in the sequencing of DNA 'rungs'] assemble different organic structures *[phenotypes]* as, in the crudest terms, a by-product of this chemical replication. The phenotypes exist to provide DNA with the energy and feed stocks to replicate itself and reproduce to perpetuate a particular set of genes; a particular complex of DNA instructions.

Genes which build phenotypes that succeed in accessing enough food and energy to reproduce survive. Those that don't do not. Hence Darwin's basic argument; the incremental advantage, over several generations, of small differences in biological competitiveness will produce all the rich diversity of organic life.

The modern restatement of Darwin's theory grants a greater role than could Darwin to genetics. It's best known popular expression is probably *The Selfish Gene* (Dawkins 1976, 1989), though the interested reader can find a wealth of other excellent and accessible books by major evolutionary theorists. Essentially there are genes, the replicators, and their phenotypes, the vehicles they build so as to replicate. Genes which build organisms with a reproductive advantage in a particular ecological niche succeed. Other don't. Any genetic 'strategy' [no conscious foresight is involved] that conveys advantage on its host can carve out a niche for itself. Evolution strives for an evolutionary stable strategy [an ESS]; a system of genetic strategies that cannot be successfully invaded and will not change whilst their external environment remains stable.

As I am grateful to a reviewer of an earlier version of this paper for pointing out, a caveat is necessary here. The debate over evolutionary theory has been and is, fraught with nuances comprehensively reported by Hull (1988). As he points out, and substantiates by empirical observation, the debate is not free of the mental models and political value judgements of its protagonists. In particular the 'neo-Darwinist' school, of which Dawkins has become the best known exponent has been criticised as overly reductionist or deterministic; a discussion which can be difficult to disentangle from strongly entrenched views on socio-biology (again see Hull 1988 for a complete review). Many evolutionary scholars have pointed out the role of contingency in the evolutionary process (see especially Gould 1989, 1993a, 1993b) and the systemic or co-evolutionary nature of the selection process. In essence the very process of evolution shifts the rules of ecological competition, the process Cohen and Stewart (1994) offer as an example of what they term complicity; the emergence of complex order in co-evolving systems.

None of this debate denies the fundamental role of selection between genetic replicators, the basis of Lloyd's (1990) comparison between organisms and organisations. Successful genetic strategies, those which allow their reproductive vehicles to compete for resources, will survive and evolve: others are history.

Successful corporate strategies that allow the companies some advantage in the market place survive, because their reproductive vehicles - companies - survive. Unsuccessful strategies are history. Economic and ecological selection produce the same effect.

But, and it is the big but, the parallel is not sufficient without considering the historical dimension. The competitive environment changes with time. New technologies and new resources open new economic opportunities and introduce new competitive factors. The success of particular corporate strategies, and competitive natural selection in science and technology change the game that companies must play. A very simple positive feedback loop operates. Evolution of individual strategies drives evolution of the wider market place, which in turn promotes, or forces, corporate evolution. Economic co-evolution rules. Those with the upper hand are those generating the future rather than simply responding to it. No corporate strategy can remain as an ESS. Organisations must learn and adapt to survive. ìAn *organisation's capability to learn is its only sustainable source of competitive advantage;* (De Geus 1988).

The current 'fashion' for companies as learning organisations hides the fact organisational evolution is not fundamentally new (c.f. Chandler 1977). What has changed is the rate at which companies must evolve to remain competitive. The inevitability of change, and the basic process of change remain. To understand the process, and its implications for the learning organisation, we must revisit the organic domain but dwell not on the biologist's view of evolution by genetic competition but on the geological view of evolution as a historical process.

PUNCTUATED EQUILIBRIUM: SPECIATION AND STEP CHANGE

Biological speciation

One of Darwin's principal mentors, Charles Lyell, a pillar of the 19th century scientific establishment and the self-ordained father of geology after his textbook *Principles of Geology* (Lyell 1830) gets most of the credit for formulating what became known as the Principle of Uniformitarianism: the view that the physical processes we see operating today can - at unchanged rate - explain all the products of the physical past by steady state, gradual change. Over the last 20 years geologists have come to realise that Lyell was only half right. Constancy of process can produce discontinuous rates of change (Ager 1973, Gould 1987). The physical features of the earth derive from the complex interaction of several processes. The result is periodic, abrupt [on the time scale of a geologist where abrupt might mean a few thousand as opposed to a few million years] change in physical environments interspersed with long periods of geological stability. The new metaphor for the history of life on earth is Ager's Life of a Soldier - *Long periods of boredom interspersed with short moments of Terror.* The metaphor also serves to describe the life of many a modern corporate executive albeit on a shorter time scale; abrupt shifts in the external environment occur as a result of the complex interaction of steadily varying processes in the wider economic system (Stacey 1993, Stacey and Parker 1994).

The clearest evidence of evolution, marshalled by Darwin and his predecessors, is the undoubted fact that life on earth has changed. More than 90% of the organic species

that once lived are not alive today (Raup 1990, Gould 1993 Ed.). The problem is, or rather the perceived problem was, that these changes are not gradual. One set of fossils simply replaces another. Darwin was aware of the problem as the greatest obstacle to his theory of natural selection. He circumvented it by calling on the imperfections of the fossil record; in his metaphor *"a few fragments of a few chapters preserved from the whole book of life"*.

In the first half of the twentieth century, with the discovery of genetics, a conventional paradigm of biologists held that gradual, Darwinian, evolution was impossible because small mutations would be bred out of large populations (see reviews by, for example, Maynard-Smith 1975, 1989, Mayr 1982). What became today's orthodox view only triumphed when biologists realised that evolution thrives on the reproductive isolation of smaller groups (Mayr's 1942 theory of peripheral isolates). Offshore islands provide many of the classic examples. Meanwhile geologists , operating from a paradigm of uniformitarianism, continued to search for a non-existent record of gradual change.

We see here incidentally two glorious examples of mental models, prevailing views of how the world should be, acting as barriers to learning and discovery of how it actually is. The paradox was only finally resolved when Niles Eldredge and Stephen Gould (1972) produced evidence of rapid [geologically rapid that is] evolution of new species in small isolated populations and the subsequent rapid colonisation of new environments by new species when changes in the prevailing physical environment permitted; the theory of evolution [or more strictly the evolution of new species] which they termed *Punctuated Equilibrium*.

Eldredge and Gould were not disputing the fundamental process of evolution by natural selection; they were observing that the effect of the process is to produce sporadic step changes, biological innovations, rather than a constant, steady state, variation. We thus reach a modern view of two scales of evolution, steady background change due to continuing natural selection, acceleration of the selection process producing new species when conditions permit reproductive isolation (Eldredge 1991). Background evolution has an inexorable tendency to the status quo of evolutionary stable strategies (Dawkins 1976 citing original work by J. Maynard Smith and W.D. Hamilton)

Step change in organisations

The same pattern of punctuated equilibrium repeats itself in organisations (Gersynk 1990, Price and Evans, 1993) whether it is the development of new processes and capabilities, the formulation of successful new strategies, or the introduction of new concepts from an R&D lab. Changes do not happen by the simultaneous introduction of new procedures, new training programmes and new initiatives. At best these practices yield the slow steady state adaptation that is background continuous improvement. Real innovation is fastest in small groups, in branch offices, and in isolated projects, not in large R&D labs and centralised Change Programmes.

There is much evidence in the literature (e.g. Tushman and Romanelli 1985, Beer et al. 1990, Pascale 1991, Schaffer and Thompson 1992), and in practice, supporting the observation that innovation and learning happens most easily in isolated populations.

The most innovative product development companies do most of their applied R&D in the factory, not in a central laboratory. A wonderful example comes from Canon's entry into the personal copier business; a move that revolutionised the copier market. According to Hamel and Prahalad (1989) the impetus came from an overseas sales subsidiary, not from planners in Japan. Companies that have made a capability of their rate of learning, like Banc-One in the USA, gear themselves to local, not central innovation (Randall pers. comm.).

Step changes and innovations occur when individual teams, or departments, or plants, or operating centres commit to a different result. The pattern so closely mirrors evolution by punctuated equilibrium; that it leads to a question:

If genetic processes impede step changes in evolutionary stable strategies, what is their equivalent in organisations?

An answer seems to lie in comparing the mental barriers of individual and organisational defensive routines, of mental models, and of the unwritten rules of organisations, to the genetics of an evolutionary stable system.

BARRIERS TO INDIVIDUAL AND ORGANISATIONAL LEARNING

The most succinct insight into the management of change may still be Machiavelli's 500 year old observation that *"Change is difficult because of the incredulity of mankind who do not truly believe in anything new until they have experienced it for themselves".* People do not seem to learn, at least not at level that generates different actions, from the lectures, advice and papers of others. Energy for change is released when people discover a new possibility for themselves: Machiavelli's point, re-stated by Goldratt and Cox (1989).

The quotation shows the longevity of what we have come to recognise, thanks to Argyris (1982, 1991) and his colleagues, as defensive routines. Real learning, 'double-loop learning', only occurs when people enquire of their own role in causing the situation. Double-loop learning requires that we unlearn some deeply ingrained beliefs about ourselves. The need to confront those beliefs almost immediately provokes sub-conscious defensive routines, shooting the messenger, ducking the issue, blaming others and the like.

Senge (1990) offers a concise definition of mental models as *"deeply held images about how the world works, images that limit us to familiar ways of thinking and acting"*. He quotes Argyris *"Although people do not* [always] *behave congruently with their espoused theories* [what they say] *they do behave congruently with their theories-in-use* [their mental models]".

Collective mental models become a paradigm (Kuhn 1962): a prevailing orthodoxy that rules a branch of science until, with startling rapidity the dam bursts in the face of new evidence and the literature is thick with ardent espousals of the new orthodoxy. Marketing of new products has a similar dynamic, as does the acceptance of changes in an organisation, but the early adoption of a new paradigm, the defence of a different view of the world in the face of accepted wisdom, is, as Kuhn reminds us, *"an act of faith and conviction"* a response to feelings and values not logic on behalf

of its adherents. Given the unwritten rules of scientific orthodoxy, it can be a career limiting move for the would be paradigm buster. Science evolves through the competitive selection between what are in effect, though he does not use the term, mental models (Hull 1988).

Paradigms and mental models pervade organisations, and create particular sets of unwritten rules, unstated models of how the world is and what constitutes accepted behaviour in a particular organisation. Over the last few years Peter Scott-Morgan of Arthur D. Little, has codified and tested a process for exposing, and changing, such rules (Scott-Morgan 1994, Scott-Morgan and Price 1994).

Organisations develop surprisingly common sets of dominant motivators. People who don't share them don't join, or don't get on, or are the first to leave [or to be let go] when the going gets tough. The modal motivators, the people or systems that enable them or prevent them, and the key events that deliver motivation create a powerful framework of rules; rules that govern what constitutes smart behaviour in a company. People play by those rules and the unintended side-effects dictate how the company actually performs. The net corporate culture is a black-box that transforms formal managerial policies into what really happens.

Unwritten rules show up as barriers to learning in surprising ways. In companies where individual profile and reputation is critical, reflecting on, and learning from, the past is reputation damaging. Asking for help is a sign of weakness and giving it a sign that your help is not worth having. In project based companies, where challenge and 'buzz' is part of the motivation, pausing to reflect is simply boring. In other 'cultures', with far higher values of teamwork and a sense of co-operative loyalty frank and open discussion - a necessary precursor for learning - can simply come across as disloyal.

Unwritten rules and mental models create a corporate mindset which - without conscious design - acts to preserve the status quo. Once a stable mindset has evolved it seeks to maintain itself, even in the face of conflicting needs from the external environment. Here we see again the parallel with the genetics of DNA based systems. The corporate mindset seeks, without predetermined purpose, to maintain itself in exactly the same way as does a 'geneset'. Both create self-perpetuating, self-replicating systems. Genetic replication is, of course blind. No genetic 'strategy' is a function of predetermined choice. Few corporate strategies are either (Mintzberg 1994). They are controlled by blind mindsets. The difference is that corporate behaviour does not have to be that way. The comparison will point us towards conditions for successful organisational learning but we first need to step back to biology and neurology and examine the theory on mental replicators.

MEMES

The Selfish Gene (Dawkins 1976) has been criticised as a sociobiological essay that paints too bleak a picture of a world ruled by self-interest with no place for altruistic behaviour, a world in which genetics determines human behaviour without a role for free-will. I chose to read it differently. Dawkins reminds us that nature is indeed bleak, but not that self-interest cannot produce collaboration. He also reminds us, in a particularly powerful closing sentence that humans, and humans alone, "*can if we choose free ourselves from the tyranny of the selfish replicators"*. Creating and

managing learning organisations, is I believe achieving exactly that: save that the replicators are mental, not genetic.

It is to Dawkins that we owe the suggestion that the evolution of the human brain, an organ of far greater processing power relative to body weight than any previous species has achieved, created the conditions for the evolution of a second natural replicator: ***the meme***. Memes, he proposes, are *"the new replicators in the soup of Human Culture",* units of cultural transmission as genes are units of biological transmission. An idea or belief that catches on propagates itself from brain to brain. As Dawkins puts it *"When you plant a fertile meme in my mind you literally parasitize my brain, turning it into a vehicle for the meme's propagation in just the way that a virus may parasitize the genetic mechanism of a host cell"*

Viruses are essentially free strands of DNA. They replicate not by constructing their own bodies but by modifying the DNA of a host such that they can multiply. Incidentally this allows them to mutate and evolve at a far faster rate than more complex organisms. Many viruses have evolved mutually beneficial symbiotic relationships with their hosts. Not all are malignant. If we ignore the negative connotations of the viral metaphor and admit that memes can be beneficial as well as harmful then the idea of a meme infecting our minds, or of memic 'antibodies' triggering defensive routines creates a powerful metaphor and a tenable hypothesis for the process of learning.

Dawkins explores sets of ideas or beliefs as co-adapted sets of memes, exactly as an organism's total chromosome is a co-adapted set of genes. Once we make this adjustment of scale and think of a meme as a composite mind-set, a paradigm, or a mental model I find it difficult to distinguish them. Memes, paradigms or mental-models are different expressions of the same concept; a self-replicating mental entity which 'infects' a brain and seeks to defend itself against competing memes. The collective mindset of an organisation is a memetic ESS, a self-stabilising belief set that resists invasion by a competing mental system.

Organisms evolve defensive routines, antibodies, against viruses. Viruses evolve new strains in the face of disease resistant hosts. Similarly we evolve defensive routines against new idea sets. We are not truly committed, not believers in something new, until we have caught it, been "infected", or made a switch that is ultimately an act of faith rather than of rational acceptance.

The neurology of cognition is one of modern science's great frontiers (Edelman 1992). Whilst much remains unknown there exists evidence that there is some biochemical process that enables thought and cognition, and that the stimuli of new ideas can trigger that process in the cerebral cortex. It is not hard to imagine brains, set or encoded by one pattern of ideas, one meme or mental model, finding it difficult neurologically to adapt to another nor that memes should generate immune systems just as genes do, or, more precisely as genes code for.

The comparison between belief systems and viruses, and between allergies and phobias - mental defensive routines - also occurs in the school of counselling and change therapy based on neurolinguistic programming (e.g. Dilts et al. 1990); not surprisingly because the founders of NLP drew inspiration from, among others,

Bateson's ideas of evolution as learning. Thus we can see learning as an evolutionary process: a selection based competition between competing memes or mental models (see Hull 1988 for a complete discussion)

Lloyd (1990) makes the case for considering organisations as, literally, independent, alien, organisms. Whether that is 'true' in an absolute sense is a philosophical discussion beyond the scope and intention of this paper. The question would take us back towards belief systems and mental models of what organisations are, and of what organisms are or life is, and even of what truth is. It is more practical to explore the power of an organic mental model for understanding and managing learning organisations.

IMPLICATIONS OF AN ORGANIC VIEW OF THE LEARNING ORGANISATION

The model

This section makes the assumption that companies are creatures of their memes in the same way that organisms are creatures of their genes, that is vehicles which the memes, or the genes, the replicators, create in order to perpetuate themselves. What concerns us are the lessons from the facts of genetic evolution for the processes by which organisations learn or, more often, don't learn. I will offer a series of comparisons. A fuller discussion of each is presented by Price (1994b)

Punctuated equilibrium

New species evolve by natural selection operating in small, reproductively isolated, populations. They then displace a preceding species, either by outright competition, or, and it may be that this is the more normal method, by simply winning a race to establish themselves in a new ecological niche, opened by events outside their control. Luck may be as important as genetic fitness (e.g. Raup 1991).

As the winners of the ever increasing competition to change are realising change does not happen in large corporate meme pools any more than it happens in large gene pools. Change programmes usually don't change anything (Schaffer and Thompson 1992). Fully seventy per cent of corporate re-engineering programmes fail.

Punctuated equilibrium theory suggests precisely this. Real changes are more likely to happen when smaller populations can evolve free from prevailing, and stabilising corporate mentalics. Results and challenges, not programmes and theories, drive real learning.

Breaking self-stabilising codes

Genes seek to replicate themselves, not to transform themselves for the good of other genes. For evolutionary change to happen the genetic code must change. Mutations have to lead to genetically superior, or at least luckier, strategies.

For companies to learn they have to change their mental codes, their prevailing mental models and the unwritten rules that these create. Change the rules and a new set of behaviours will evolve. The organisation will self organise to a new equilibrium.

There are five ways to change an animal. Not all apply to plants. All have parallels in organisations.

One is random natural selection. Companies that do not change are victims of the natural selection of the market place. Stable genes that are unfortunate enough to code for a particular structure lose out through no fault of their own when the environment changes or when a superior genetic technology appears. The current fashion for making organisations change endorses the view that managers do not wish to suffer the same fate.

The second is conditioning. We have been doing this to animals for thousands of years, rewarding the behaviour we wish to encourage and punishing that which we do not want. Much classical management theory operated on the same principle; break a task down into its components and condition a workforce to perform them. In agriculture conditioning failed as a sufficient mechanism for change at least four hundred years ago. In modern manufacturing we have only learnt the same lesson in the last fifteen years.

The third is training. Training animals extends conditioning to a wider repertoire of responses to a range of signals or instructions. Repeat the same task enough times and you can train a rat to run round a maze, or at least a young dog to perform new tricks - but the dog is still the same dog. Unfortunately many of our prescriptions for bringing about more fundamental change through training are about as effective. Instruct the workforce that this is how it is done, with implied reward for compliance and penalty for failure and - so the training paradigm has it - you have a world beating learning organisation. Countless thousands of failed initiatives on standards, and quality, and benchmarking later we know that too much training does not work. At worst it is has not escaped the Taylorist paradigm. At best it leaves little room for people to discover and own their personal solutions; little room, in a word, for learning.

The fourth is selective breeding. The agricultural revolution happened when plant and animal breeders learnt to breed better stocks. About 150 years later Darwin drew on the lessons of practical animal breeding for the theory of evolution. Theory, as ever, lagged practical application. Selective breeding produces far more radical changes, but slowly. It is also susceptible to recessive genes [throwbacks] and to the risk of genetic leakage whenever the pedigree stock is interfered with. Perhaps the greatest risk is in-breeding, producing stock that cannot survive in an independent state (Price, 1994a).

The mental equivalent of selective breeding is the movement to slowly build shared values: the pundits who assert the impossibility of creating sustained change without first building a new culture of shared values and purpose. Without wishing to detract from the importance of values and purpose, the fact is it is slow and difficult in a fast changing world. It can also produce cultures so dependant on being nurtured that they have a difficult time adapting to changing markets.

The last approach to changing organisms is genetic engineering, still in its infancy but capable - if we chose - of far reaching changes, and harbouring far reaching dangers.

In the memetic world of the organisation we genetically engineer a company when we modify its unwritten rules. Changing the rules allows and indeed forces different behaviour to evolve. It allows, for example, cross-functional collaboration, allows objective learning, allows objective decision making, allows proper use of helpful systems and allows the development of the managerial capability of facilitating learning to name but a few examples (Scott-Morgan 1994, Scott-Morgan and Price 1994).

Strategic possibilities are limited by genetic or mentalics

An organism's "strategy" is the way its phenotype develops a particular advantage in the competition for resources; how it fits into to an environment and relates to prey, to energy, to predators, to parasites and to other species with which it has a mutually beneficial relationship. Whether and how it does this is a question of how it exploits its biological capabilities. Barracuda, sharks, killer whales, and sea-eagles have all evolved very successful strategies for eating fish. The capabilities they employ, the basic organic equipment, are different. Other species that lack even the basic capability of a backbone and an internal skeleton simply did not have the genetic capability to evolve a successful fish chasing strategy. Strategic capability can never be more than the genes, or memes, that encode it.

Classical rational thinking on strategy (e.g. Porter 1980) explains a firm's niche in a similar fashion. The presumption of an almost unlimited ability for the rational financial manager to move between industries has, in recent years, been challenged by the 'core competency' or capability based view of strategy (Hamel and Prahlahad 1989).

The genetic analogy points to a deeper level at which to understand strategic competitiveness. An organism is a product of its genes and, whatever opportunities it faces, it cannot evolve capabilities that are not inherent in its design. It is a prisoner of its genes. A company trapped in the frame of its mental genes is likewise unable to change. Mental models limit strategic possibility unless a company's management can make the choice to see the world differently. Unless challenged, the shadow of the past ordains the future.

The commitment and sense of purpose that a company can generate and which its managers chose to express can exert a powerful leverage on strategy. Companies that unite behind a particular strategic intent; a purpose truly declared to the point where it 'infects' the corporate mind have, as has been demonstrated by the strategic purpose school of strategic thinking (Pascale 1991) the demonstrated ability to release extraordinary performance behind a deep sense of commitment. In this way we see that, to summarise Mintzberg (1994) strategic thinking is more important than strategic planning.

The parallels between strategic, or economic, evolution and biological, or bio-geological evolution merit further investigation; a discussion beyond the limits of this paper. Contingent chance may play a significant part in both systems (Gould 1989, or

for example Mockler 1994 and references therein). In neither system can the players evolve independently of other competing entities. The dynamics of co-evolution drive the emergence of order, and of new forms, in both systems (Cohen and Stewart 1994) and produce a similar tension between the tendency of the replication process to, on the one hand, seek to create order and stability (a goal seeking property inherent in the concept of replication) and on the other to introduce turbulence and change (Pascale, 1991). The possibility of a different view of the economic process is opened if a fundamental similarity; two sets of competing replicators, is taken as a starting point.

Unlike organisms, companies can choose to evolve and to learn. To do so they must breakthrough the limitation of their memes. Strategic capability is a function of mental capacity.

New markets and new opportunities

Bursts in biological evolution occur when, either an earlier extinction has left an ecological niche open for new families [for example the rise of mammals after the demise of the dinosaurs], when the evolution of a new biological capability opens new territory to exploitation [as when fish mutated to survive on land] or when geological changes rearrange the environment [as with hominid evolution in East Africa].

The corporate parallel is obviously with new technological capabilities and, less obviously with the evolution of new commercial capabilities. Modern joint stock-holding corporations and divisional structures only evolved around the beginning of the century (Chandler 1977, Kaplan 1987). They changed, and accelerated the rules of economic competition. We are seeing a similar change now with the evolution of smaller more flexible corporate structures and with networks and partnerships rather than integrated firms. The patterns of change when new markets evolve are identical to those of evolutionary blooms: burst of experimentation and radiation and progressive stability around a dominant set of organisms, or a dominant 'web' of firms (c.f. Gould 1989 and Moore 1993)

When we interpret nature we tend towards post-hoc rationalisation. The surviving organic designs are, we argue, superior because they survived. Victors write history. Gould (1993a) reminds us to beware of this simple circular argument. Simple luck may play a large part in determining the future course of a new organic system. In times of punctuation of the economic equilibrium companies have, if they choose to take it, the opportunity to lower the odds in their favour which brings us to the question: What is it that lucky species have? What is it that makes some organisms more adaptable than others?

Two observations stand out from modern evolutionary theory. Both offer powerful lessons for the would be evolving organisation. The first, drawn more from palaeontology is surplus capability. The second, drawn more from genetics, is the existence of facilitative genes.

Surplus genetic capability

The dinosaurs apparently perished in a 'nuclear winter' following the impact of a large asteroid some 65 million years ago (e.g. Raup, 1991). The same event accounted for

most of the marine species of the seas of that time. Most groups of marine plankton were decimated. One group, survived relatively unscathed because they happened to possess a biological survival trick evolved for other reasons in normal times; the ability to lie dormant as cysts (Gould 1993b).

Here is a first lesson about adaptive capability. Sometimes, when the external rules change, it helps to have simply the right capability that may exist for another reason entirely. The organisms get no choice. The lucky survive. The learning organisation can draw a different message - What is an incidental capability today can become core to survival when the world around you is changing. Flexibility is the key.

To evolve a new competitive organ some surplus capability is essential. Whilst fish were evolving lungs they still needed to go on breathing. Lungs evolved from buoyancy structures, internal 'airbags', not from gills. Birds did not evolve wings because possessing a small prototype wing gave them competitive advantage. They evolved wings as a new use for cooling fins. Most genes in multi-celled organisms contain far more genetic material than is absolutely necessary to reconstruct a particular organic design. It is only such excess genetic capability which allows them to change.

The perfectly honed, lean-mean gene, which has all the information needed and only the information needed, to carry out its 'mission' and replicate its host, is stuck as the world around it changes. It lacks the capability to simultaneously change and carry on business as usual. The living species with least surplus genetic capability are also those with few near biologic relatives. They are niche players whose underlying strategic capability has held them back.

Here is a lesson of fundamental importance for companies who want to retain the ability to evolve and learn. In honing the functions of the company [the body that the gene builds] to be perfectly adapted to its competitive niche, to be efficient and specialised there is a grave danger of losing the capability to adapt; capability that is not found in redundant plant or large R&D labs kept there 'in case we need them' but in a surplus and diversity of mental models, in a flexibility and an encouragement of learning in the unwritten rules. The use of external consultants - as 'meme adjusters' is an option for organisations, denied to their genetic analogues.

This is not saying that 'focus', 'efficiency' and 'core-business only', are not perfectly correct, necessary conditions for survival in today's world. Excess body-weight does not confer biological advantage. Excess genetic capacity does. The problem for companies is that efficiency drives are also great occasions for reducing diversity and focusing down on the common mental-model. Those that don't fit leave. All to often efficiency drives start a downward spiral. Two years later the old paradigm is under even more pressure, and is more firmly established. Adaptation is even harder in what is already a focused organisation so everybody renews the drive to focus and, guess what; another round of lay-offs. Peter Scott-Morgan (1994) calls it the *'Honey I shrank the Business'* syndrome.

The lesson is not that downsizing and focusing is wrong. Organisations that have never lost their focus find it a lot easier to learn. The lesson is that in improving the focus and efficiency of the corporate body it is vital not to destroy the flexibility of

the corporate mind. The cheetah, fastest of all land animals, is the most specialised, leanest and fittest member of the cat family. It is also a genus of its own in that family and it possesses less surplus genetic material than other big cats. The genetically lean cheetah 'strategy' has proved far less adaptable than the more genetically diverse mainstream gene of the lions, tigers, leopards and wild cats (Wills 1989).

Facilitative genes

Some groups of organisms, higher order organic designs, are, like the cheetah, represented by only a few, specialised species. Others such as beetles have shown an amazing ability to adapt and evolve. One of the great discoveries of genetics over the last few years has been that the successful designs, those which have displayed the greatest ability to evolve numerous sub-groups, also posses an inherent genetic capability to mutate.

Transposons, or jumping genes, or as geneticist Christopher Wills (1989) calls them "Facilitative Genes", work to shuffle the genetic deck by re-arranging the instructions coded in particular DNA molecules, by splicing in new segments and changing the code. They are not actually carrying instructions to 'build body'. They are there to make changing the design easier. A genetic capability to re-arrange the genetic capability seems to be a true property of the adaptable organism.

This points us to another significant analogy. The ability to re-arrange mental models and to reshape unwritten rules is the equivalent in the memetic world of the work of the facilitative gene. Do this successfully and you can manage your own evolution rather than have it be managed by you. In the successful and adaptable organisation of the future 'facilitation' will cease to be merely something the training department, and perhaps the quality advisors, do. It will become a critical management skill encompassing not just the ability to run good meetings but also to the ability to work deeply with the defensive routines, the mental models and the unwritten rules built into the genes of an organisation. Without the ability to facilitate a change to the appropriate replicator, genetic or memetic, the odds are stacked against adaptation and learning.

The evolution of co-operation

With the ability to evolve, and the isolation of innovation at the coal-face level, the learning organisation faces a challenge that individual species do not. How to spread innovation around [cross pollinate] without setting up a central elite that stifles the innovation it is supposed to share? Again the biological world offers an insight.

One of the great paradoxes of biological evolution is that the self-interested,'selfish', competition between genes can produce amazing examples of symbiosis and collaboration. One of the great needs of the learning corporation is to foster similar symbiosis, within and outwith the company. All too often companies that have created autonomous local operating units, in a perfectly correct search for greater inventiveness and responsiveness to local markets, lose half the benefits because the local units cannot, or will not, collaborate and learn from one another.

Political Scientist Robert Axelrod (1984), with the help of evolutionary biologist W.D. Hamilton [originator of the ESS concept] explored the evolution of co-operation using a computerised prisoners dilemma tournament [the game where two players have a choice between collaborating or defecting and gain a greater net prize by collaborating but a higher chance of individual benefit by defecting]. Axelrod showed how a strategy of not being the first to defect could succeed provided the rules of the overall game allowed repeated interactions and the scores were set to give the whole game a positive sum.

There is not space here to explore, at length, the implications of Axelrod's work for corporate strategy. Tom Lloyd does so in *The Nice Company* (Lloyd 1990). Companies that have succeeded in combining local innovation with overall sharing and learning have all evolved cultures where the interest of the individual [sharing and building a bigger game] is served by being open to giving and receiving new ideas from peers. Those where individual systems of recognition and reward still flourish in the unwritten culture, even where the formal policy, and the beautifully engraved corporate mission statement, endorse 'our Commitment to Learning, or Teamwork, or Quality, or ... have the odds stacked against them when a need for faster adaptation hits their particular market.

Feedback in biologic and corporate evolution

Unlike biological, Darwinian, evolution, where the pace of genetic mutation transmitted only through reproduction governs the rate of change, mental evolution is capable of passing on acquired, learnt characteristics. Mental evolution therefor exerts a rapid and powerful feedback into its environment, stimulating faster environmental change and hence faster evolution.

Over the last say 500 years companies and technologies have co-evolved at an exponentially increasing rate, a phenomenon I attribute to positive feedback between technological and corporate evolution. The periods of stasis between the moments of terror have shortened to the point where continued corporate change has become a necessary way of life for companies who wish to survive, let alone to generate their own futures. The half-life of corporate evolution now falls within the strategic time frame of all but the most short sighted company.

The constraints on biological evolution are the Malthusian effects of limited resources and, at times in the planet's history, the feedback between the biological and the physical spheres. It is as these limits are approached that the dark side, from the standpoint of human ethics, of the "survival of the fittest" process comes most forcibly into play. Selfish self-interest and collaboration can coincide when evolution as a whole is a positive sum process. Dog-eat-dog strategies will evolve if the game becomes zero or negative-sum

On the macro scale, in a world created by accelerating technological and corporate evolution we face dangers of a crisis of feedback between biological and geological spheres [pollution] and a looming crisis of limits to resources. The unchecked response to such crises has always been mass extinction and an increase in ruthless competition. Application of evolutionary principles to social issues has had an unacceptable face because of what were seen as socio-biological justifications of

unbridled competition within our species. I offer the paradox that it is only by accepting such evolutionary competition between mental replicators, understanding it and fostering 'real' organisational learning that society also has a fighting chance of avoiding its worst outcomes.

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REFERENCES

Ager D.V. (1973) *The nature of the stratigraphical record* . Macmillan Press, London

Alchian, A. A. (1950) 'Uncertainty, evolution and economic theory' *Journal of Political Economy* 58:211-221

Argyris, C. (1982) *Reasoning, Learning and Action: Individual and Organisational* . Jossey-Bass San Francisco

Argyris, C. (1991) 'Teaching Smart People How to Learn'. *Harvard Business Review* May June 1991: 99-109

Axelrod, R . (1984) *The Evolution of Co-operation,*. Basic Books Inc., New York.

Bateson, G. (1973) *Steps towards an Evolution of the Mind* . Paladin, London

Bateson, G. (1979) *Mind and Nature* . Fontana, Glasgow

Beer, M., Eisenstat, R.A. and Spector, B. (1990) 'Why Change Programs Don't Produce Change' *Harvard Business Review* Nov.-Dec.: 158-166

Chandler, A.D. (1977) *The Visible Hand: The Managerial Revolution in American Business*. Harvard University Press, Boston

Cohen, J. and Stewart, I. (1994) *The Collapse of Chaos: Discovering Simplicity in a Complex World*. Viking, London

Henderson, B.D. (1989) 'The origin of strategy', *Harvard Business Review* . Nov.- Dec.:139-143

Darwin, C. (1859) *The origin of the species*. John Murray, London

Dawkins R. (1976 and 2nd Edition 1989) *The Selfish Gene.* Oxford University Press Oxford

Dawkins R. (1986) *The Blind Watchmaker*. Longmans, London

De Geus, A. (1988) 'Planning as Learning', *Harvard Business Review* March-April 70-74

Dilts, R, Hallbom, T, and Smith S. (1990) *Beliefs. Pathways to Health and Well-being* Metamorphous Press, Portland

Edelman G.M., (1992) *Bright Air, Brilliant Fire: On the Matter of the Mind.* Basic Books New York

Eldredge N., and Gould S.J., 1972 'Punctuated Equilibrium: An Alternative to Phyletic Gradualism' in Schopf T.J.M., Ed. *Models in Paleobiology* Freeman Cooper, San Francisco

Eldredge, N. (1991) *The Miner's Canary: Unravelling the mysteries of extinction.* Simon & Schuster, New York

Gersynk, C.J.,(1991) 'Punctuated Equilibria as a Model for Organisational Change' *Academy of Management Review* 16 (1):10-23

Goldratt E M. and Cox J. (1989 Revised Edition])*The Goal* . Gower, London

Gould, S.J., (1987) *Time's Arrow Time's Cycle: Myth and Metaphor in the Discovery of Geological Time.* Harvard University Press, Boston

Gould, S.J. (1989) *Wonderful Life* . WW. Norton & Co,. New York

Gould S.J.. (1993a) 'Wheels and Wedges' Essay 21 in *Eight Little Piggies; Reflections in Natural History*. Jonathan Cape, London

Gould S.J.. (1993b) 'Tires to Sandals' Essay 22 in *Eight Little Piggies; Reflections in Natural History*. Jonathan Cape, London

Gould, S.J. (1993 Ed) The book of life. Ebury Hutchison, London

Hamel, G. and Prahalad, C.K. (1989) 'Strategic Intent ' *Harvard Business Review* May-June: 63-76

Hull, D. (1988) *Science as a Process* . University of Chicago Press, Chicago

Kaplan, R. S. (1987)*Relevance Lost: The Rise and Fall of Management Accounting* Harvard University Press, Boston

Kuhn, T.S. (1962) *The Structure of Scientific Revolutions* University of Chicago Press, Chicago

Lyell, C. (1830) *Principles of Geology*. Murray, London

Lloyd, T. (1990) *The 'Nice ' Company* . Bloomsbury, London

Maynard Smith, J. (1975) *The Theory of Evolution* 3rd Edition, Penguin Books, Harmondsworth

Maynard Smith, J. (1989) *Evolutionary Genetics*. Oxford University Press, Oxford

Mayr, E. (1942) *Systematics and the origin of the species.* Cambridge University Press, Cambridge

Mayr, E. (1982) *The growth of Biological Thought.* Harvard University Press, Boston

Merrel, D.W. (1984) 'The organization- a living system' *The Management Psychologis*t 6(3):3-14

Mintzberg, H. (1994) *The Rise and Fall of Strategic Planning*. The Free Press, New York

Mockler, R.J. (1994) Strategic Management Research and Teaching: Critical Problems and Possible Solutions. *Management Learning* 25(3) 371-386

Morgan, G. (1986) *Images of Organization.* Sage, London

Moore, J.F. (1993) Predators and Prey: A New Ecology of Competition' *Harvard Business Review* May-June: 75-86

Parker, D. and Stacey, R.D (1994) *Chaos Management and Economics.* London Institute of Economic Affairs

Pascale, R.T. (1991) *Managing on the Edge.* Simon & Schuster, New York

Porter, M.E. (1980) *Competitive Strategy: Creating and Sustaining Superior Performance*. Free Press, New York

Price, I and Evans, L, 1993. 'Punctuated Equilibrium: An Organic Metaphor for the Learning Organisation ' *European Forum for Management Development Quarterly Review* 93(1):33-35

Price, I (1994a) 'Its all in the Genes' *Management Today* June: 33

Price, I (1994b in press) 'The Genetics of the Learning Organisation' in De Potter and Canpbell T.L. Eds *Proceedings of the First Conference of the European Consortium for the Learning Organisation* , Gower, London

Raup, D. (1991 Paperback edition) *Extinction: bad genes or bad luck?* Oxford University Press, Oxford

Rothschild, M. (1992) *Bionomics: The Inevitability of Capitalism* . Futura London

Schaffer, R.H. and Thompson, H.A., (1992)Successful Change Programs Begin with Results' *Harvard Business Review* Jan-Feb: 80-89

Scott-Morgan, P. (1994) *The Unwritten Rules of the Game.* McGraw Hill New York

Scott-Morgan, P and Price I., (1994) Making Change Happen: The Unwritten Rules of the Game *International Strategic Planning Meeting,* New York

Senge, P. M. (1990) *The Fifth Discipline.* The Art and Practice of the Learning Organisation, Doubleday, New York

Stacey, R.D. (1993)*Strategic Management and Organisational Dynamics.* London, Pitman

Tushman, M.L. and Romanelli, E. (1985) 'Organisational Evolution: A metamorphosous model of convergence and reorientation' in Cummings, L.L.. and Shaw, B.M. Eds. *Research in Organizational Behaviour,* Volume 7: 171-222

Waldrop, M.M. (1992) *Complexity: The Emerging Science at the Edge of Order and Chaos*. Simon and Schuster, New York

Wheatley, M. (1993) *Leadership and the New Science.* New York, Barrett-Koehler

Wills, C. (1989) *The Wisdom of the Genes, New Pathways in Evolution* Oxford University Press, Oxford