

EVOLUTION'S GAMBLERS

Reg Morrison



FAMILY NAME: Hominidae

AGE: about 2.5 million years old

PROFESSION: gambling

MAIN BET: that they have 'dual existence'

ODDS AGAINST: 20 million to one (minimum)

*'Our timebomb is mysticism. Its delivery system is language.
And its hiding place? The unfathomable coils of our DNA.'*

"The Spirit in the Gene" (1999)

GAMBLING ON GOD

(It's the old family profession)

When modern members of this family bet on racehorses they tend to recoil from bets that involve odds much greater than 50 to one, and they would scorn punters who habitually make bets at vastly greater odds—at 500:1 for example. Such gamblers are dismissed as exceptionally naive, even delusional to the point of insanity.

Yet when members of this family consider the enigmas of biological existence, most of them make one particular bet against vastly greater odds without hesitation. They bet that, unlike the other 20 million to 100 million species on the planet, they live a dual existence, one physical and the other mental or spiritual.

As in horse racing, you can bet to 'Win', or place an 'Each-way' bet:

1. WIN: this extreme option bets that there is some unseen supernatural power that will arrange matters in the gambler's favour if the gambler plays his or her cards right. An even bigger payoff is promised in a mystical afterlife when the gambler is supposed to become similarly unseen and endowed with unnatural wisdom and eternal life.

2. EACH-WAY: this moderate option bets that the gambler's species is unique within the biota because evolution has endowed it with three crucial assets: complex language, high intelligence, and a rational brain that can juggle abstractions. Even some scientists make this bet without hesitation.



Homo habilis KNM-ER 1470
(1.88 m.y.old, Africa)



HOMINIDAE

Homo sapiens

Homo erectus

Homo habilis

TRADITIONAL BET: 'Humans are unique'

Most humans bet that they are fundamentally distinct from all other animals because they believe that they exist on two separate planes, one physical and the other spiritual. This dual existence then bestows the ability to choose their behaviour on a moral basis. Of the 20 to 100 million species that inhabit this planet no others are thought to possess this 'duality'. *

The bet has two forms:

1. Most humans bet that their spirituality is a unique attribute bestowed on them by an unseen supernatural intelligence. This asset automatically involves the responsibility to comply with moral rules that help to minimise the possibility of misfortune, supernatural displeasure, and possibly, eternal damnation during an 'afterlife'. Meticulous compliance with these rules is believed to bring great rewards in this 'afterlife'.

2. In similar fashion many scientists believe that modern humans have achieved a unique duality of existence, but via a process of selective evolution. They believe that by about 40,000 years ago the rational cortex of their evolutionary ancestors had grown so large and efficient that it was able to take on a life of its own and assume behavioural control on a semi-continuous basis. This bestowed on them a uniquely rational 'consciousness' that allowed them to overrule at will, their 'baser' animal instincts.

EVOLUTIONARY STATUS

The two **anthropocentric** propositions outlined above contribute to the general perception that humans are the 'highest', most 'advanced' form of Earthly life, either by divine appointment or via 'evolutionary progress'. Either way, humans are duty-bound to take responsible control of the natural world and are entitled to utilise whatever natural assets and resources they think might benefit them. Consequently, they believe that humans are not bound by the evolutionary rules that govern all other species; and being a 'special case' they are exempt from most of evolution's penalties.

***Odds against this bet: at least 20 million to 1**

THE EVIDENCE: 'Humans are NOT unique'

The biological evidence suggest that humans are not unique in any fundamental aspect of their structure or behaviour. This is corroborated by the universal nature of the genetic material that builds and orchestrates the behaviour of all species, including humans. *

In other words, there is no hard evidence to support the propositions: [a] that human bodies incorporate any unique chemistry or structures, [b] that they exhibit any behavioural imperatives that lie outside the standard genetic repertoire—'survive and reproduce'. All behaviour, whether plant or animal, originates in the genes via the proteins expressed by their DNA. This means that there is no such thing as 'human behaviour', since humans display only primate behaviour that has been selectively modified to suit their evolutionary circumstances.

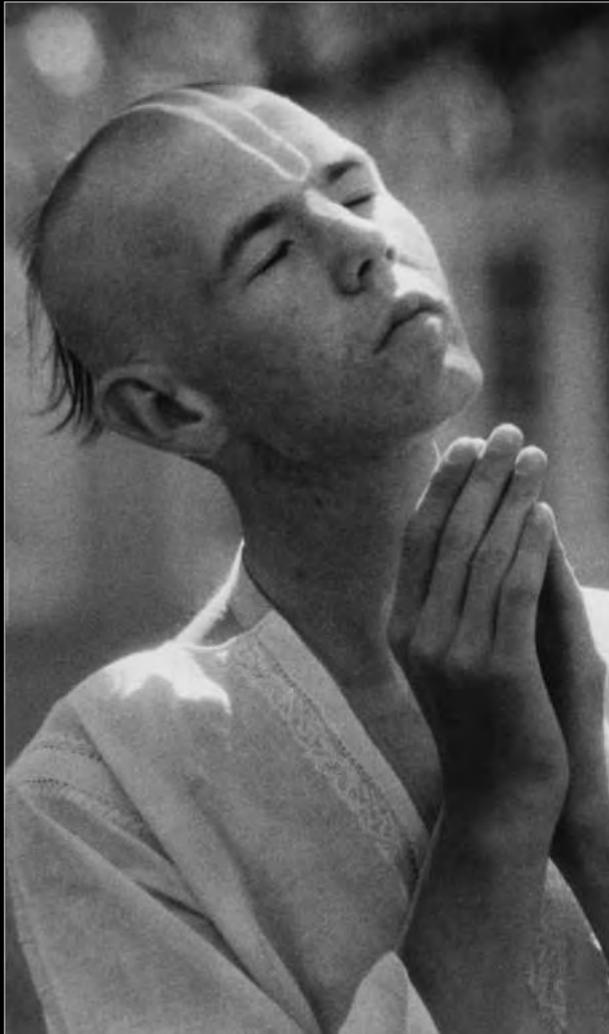
The clearest evidence of the genetic origin of human behaviour appears in a society's 'morality'. Operating in committee-like groups, genes are often forced to 'lobby' for conflicting strategies. These conflicts arise from discords between strategies that contribute to the short-term survival of the individual's genes versus those that aid the long-term survival of gene counterparts that exist in related individuals. These discords underpin the 'moral dilemmas' that arise throughout our lives (see p.17).

EVOLUTIONARY STATUS

These biological facts suggests that the evolution of life is an artefact of Earth's energy-loaded crust. It therefore represents an aspect of the planet's energy dissipation within the chaotic process of cosmic entropy. It also suggests that the evolutionary process has nothing to do with 'Progress' or 'Improvement', but merely expresses the tendency of all species to diversify and gain complexity in their struggle to harvest energy and resources that lie beyond the reach of simpler competitors. Humans are therefore not 'Special' and are entirely bound by evolution's rules.

***Odds against this bet: shorter than 1 : 1**

THE ULTIMATE ENIGMA



Members of our species tend to ignore the abundant evidence that we are typical animals, and we bet instead on the improbable proposition that we represent the ultimate pinnacle of evolution; a species distinct from all others ... a 'paragon of animals'.

All our perceptions proclaim it: we are 'Special'!

TWO CRUCIAL QUESTIONS THEN ARISE...

1. How do our genes manipulate our perceptions to this extraordinary degree?
2. Why do our genes manipulate our perceptions to this extraordinary degree?

To explore these questions we first need to look beyond our genes to our:

EPIGENETICS ...

DNA's Mastercode

It has only recently become clear that all DNA is subject to an overriding 'epigenetic' code in the form of hydrogen-loaded carbon 'tags' that are attached at various points along the side rails of the double helix. These carbon tags determine whether or not particular genes or groups of genes are available for transcription. The pattern of their attachment therefore determines which genes are expressed and which ones are 'switched off'.

If all of the DNA present in each of our cells was stretched out in a line, it would be almost 3 meters (10 feet) long, so DNA must be folded up and compressed to fit inside the cell nucleus. In general, genes in tightly compressed DNA are not readily expressed, while DNA that is more loosely packed is more accessible to the machinery involved in transcribing its genes into messenger RNA (mRNA), and thereby into protein. Appropriate DNA methylation is therefore essential for protein production and for the appropriate development and functioning of an organism.

This mastercode is highly flexible in that there are both internal and external factors that are able to interfere with the sequence of its methyl tags. Some viruses, bacteria and chemical pollutants are able to disturb an organism's basic patterns of methylation, as does the body's immune system, its hormonal response to stress, and the process of aging. Such factors are thereby able to produce, via these subtle interventions, small changes in the structure and behaviour of an organism in response to changes in its environment.

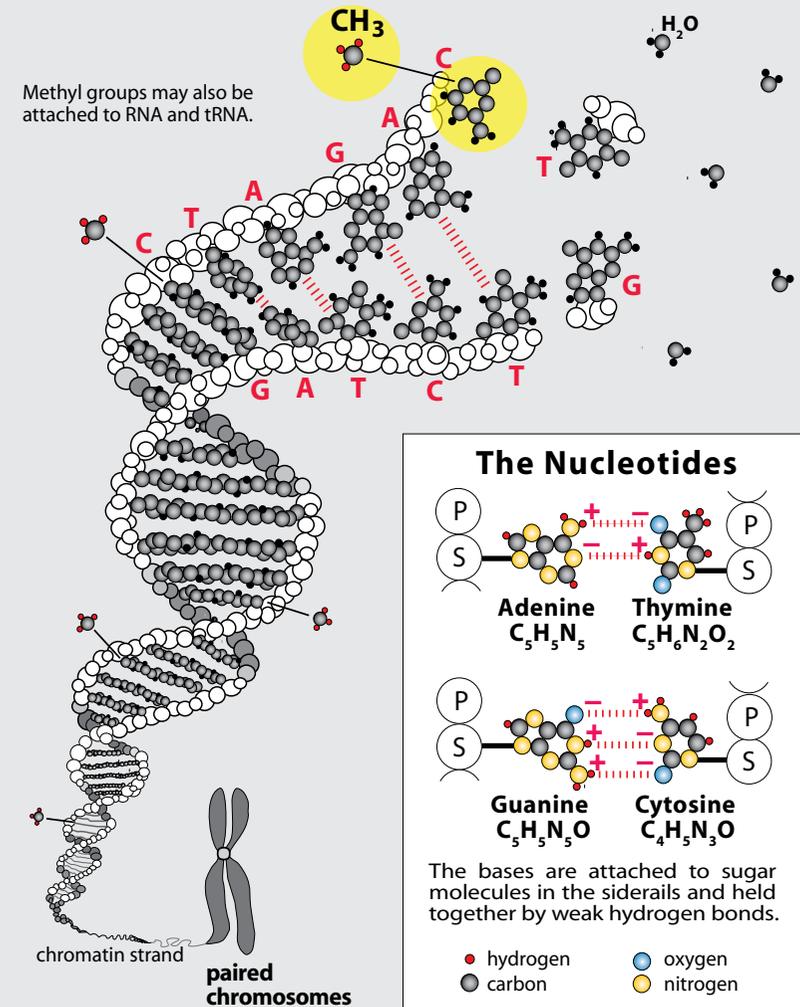
Our species offers no exception to this rule.

So although our genes determine our fundamental structure and behaviour, our overriding epigenetic code orchestrates all the finer details of our mental and physical existence.

DNA Methylation

Methyl tags (CH₃) are most commonly attached to cytosine, but occasionally to adenine and other sites, including the histone 'bollards' about which the strands of chromatin are wrapped.

Adenine (A)  (T) Thymine
Guanine (G)  (C) Cytosine
hydrogen bond 



By regulating the folding pattern of DNA's chromatin strands its methyl tags determine which genes can be transcribed and which are 'switched off'. DNA's epigenetic code thereby constitutes a highly flexible gene-management system that is sensitive to external and internal interference initiated by environmental factors.

Methylation in corn

The most dramatic illustration of methylation occurs in ornamental corn. Its kernels are dark purple if a 'Red' gene is inherited from the egg (female), but they are blotchy lavender if the same gene is transmitted via sperm. This observation was first made in 1910. Today we know that in corn pollen, which contains the plant's sperm cells, the Red gene is methylated. During kernel development the methyl tags are successively removed, thereby allowing full genetic expression to gradually appear as it matures.

In the human fetus, methylation determines what type of cell each one becomes, for example whether it is a red blood cell, a brain cell, a muscle cell, or a skin cell. Every cell in our bodies contains two copies of every one of our genes, with one copy of each gene coming from our mother and one copy from our father. Each gene is thereby 'imprinted' with its parent's peculiar pattern of methylation (exceptions to this rule are genes on X or Y chromosomes, the sex chromosomes that determine whether we develop as males or females.)

When a cell's methylation machinery malfunctions it can often cause serious developmental problems.

People with mutations that cause abnormal function of the methyltransferase enzyme Dnmt3b develop a disease called ICF syndrome. These people have abnormal, semi-dysfunctional immune systems plus a few other genetic problems. Similarly, those with abnormalities in a methyl-binding protein called MeCP2 develop Rett syndrome, a form of mental retardation affecting young girls. Rett males just die.

To put it bluntly, we, like all other species, cannot develop or function normally unless we have the appropriate DNA methylation.



The colour variations in ornamental corn graphically display the process of gradual de-methylation as the cob ages.





Unbridled Emotion

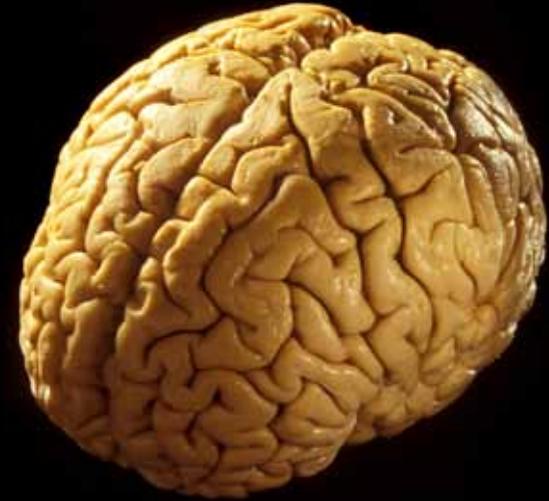
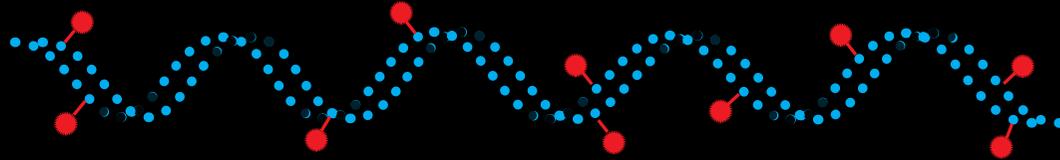
A powerful rush of inappropriate emotion, such as the rage shown by the autistic boy in this picture, may well be a by-product of inappropriate methylation.

New research shows that many autistics have brains that are larger than normal and appear to have produced an excessive number of cortical neurones during a very early stage of their brain development. This could be caused by aberrant methylation that switches off the normal controls.

The overproduction of cortical cells would result in varying degrees of disruption to the normal pattern of dendrite connections throughout the cortical regions of the brain. This hypothesis offers a persuasive explanation for the extraordinary range of abilities and disabilities that autistics display. [1]

Traumatic stress in childhood, or a lack of appropriate parental nurturing during our developmental years has also been shown to slightly alter our methylation patterns. Such changes can significantly alter our perceptions of the world around us, and thereby remould our adult behaviour to a significant degree.

Methylation



MEMORIES ARE MADE OF THIS ...

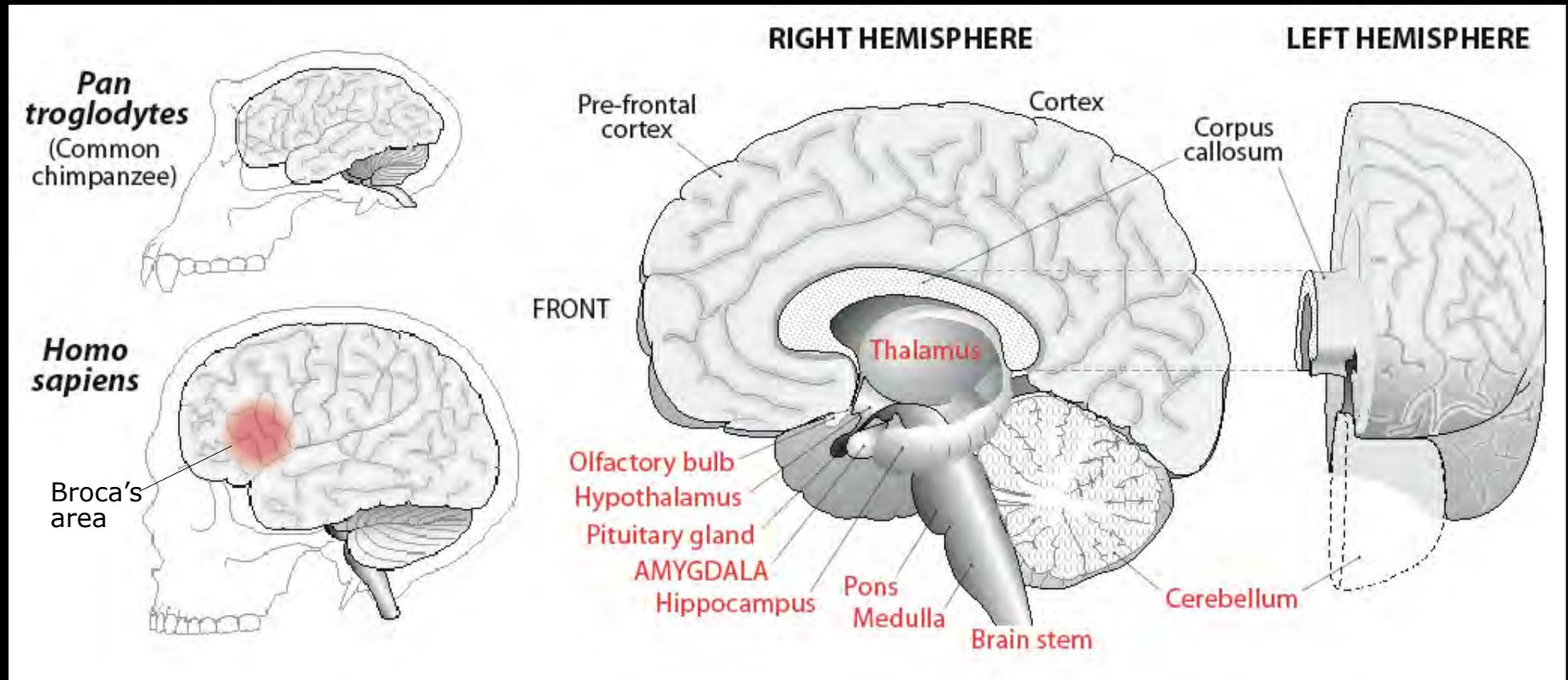
SHORT-TERM MEMORY: This mammalian characteristic appears to be based on epigenetic changes that emerge in the DNA of neurons in the brain's hippocampus in response to environmental stimuli. The resulting methylation pattern and its associated memory tends to disintegrate within a few days.

LONG-TERM MEMORY: This appears to be a faint cortical echo of the short-lived hippocampal changes, but these changes are much more permanent and become semi fossilised in the methylation patterns of cortical DNA. [2]

The human cortex has doubled its volume and quadrupled its surface area during the past three million years and is now able to archive a large number of these minor changes. This archive constitutes a very useful form of long-term memory—fragmentary, error-prone and malleable though it may be.

Consequently, DNA methylation plays a major role in manipulating our perceptions of the world around us and thereby helps to shape our day-to-day behaviour.

Evolution of the human brain



The structures labelled in red are the brain's ancient mammalian-reptilian components. Incoming sensory information is immediately assessed in these regions, and if urgent behavioural responses are required, such as 'fight' or 'flight', these orders are fired directly to the motor control system, bypassing the rational cortex entirely. Information that does not involve any hint of threat is passed on to cortical regions for rational consideration and decision making.

In short then, we are typical animals driven by genetic decisions that have already been thrashed out in the secret parliament of genes that is housed in the ancient, unconscious basement of the brain. These decisions only enter our consciousness some 500 milliseconds later, after they have been relayed into the 'conscious', cortical regions of the brain. Unaware as we are of the primary assessment that occurred in the brain's basement, we are then easily fooled into the belief that we are thinking them out for ourselves, consciously and rationally. [3]

We can now return to our primary questions:

- 1. HOW do our genes manipulate our perceptions?**
- 2. WHY do our genes manipulate our perceptions?**



Vietnam Moratorium, Perth, 1969.

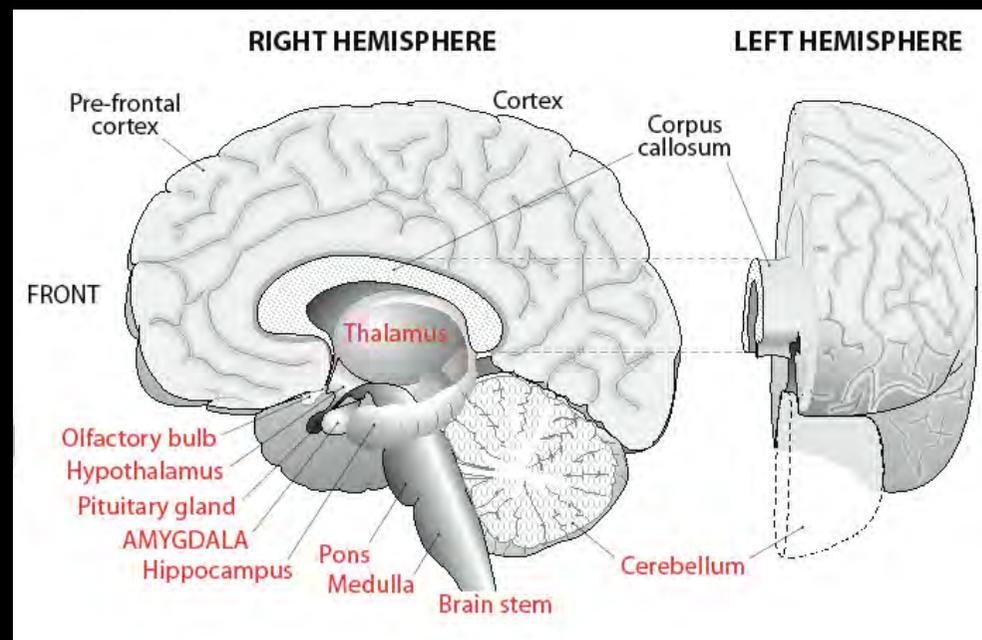
The mechanics of delusion

The brain structures that enable us to tune out rational thought and resort to ancient patterns of behaviour have been largely identified. They lie, as might be expected, in the older structures at the core of the brain (labelled in red). Central to these are the hypothalamus, the pituitary gland and the small, almond-shaped amygdala.

The amygdala is primarily involved in appraising the genetic significance of situations in which an immediate threat might be involved. In other words, it governs our 'fight-or-flight' reflexes and determines the particular thresholds of aggression and discretion that characterise each one of us.

The hypothalamus meanwhile acts as the control centre for a wide diversity of other phenomena, including the physical expression of mental states. It achieves this in conjunction with the amygdala and the pituitary gland that sit just below and in front of it. Electrical stimulation of one part of the hypothalamus can unleash rage and a full-blown attack response, both in humans and other mammals, while stimulation of a neighbouring part of the hypothalamus can elicit feelings of intense pleasure—leading occasionally, to addiction.

All of these ancient mammalian-reptilian structures at the core of the brain are directly linked to our sensory systems as well as to the autonomic nervous system. This ancient neuronal machinery is known as the Limbic System. When triggered, these ancient brain structures act corroboratively, and like a petrol-engine 'choke', they are able to flood the entire body with the appropriate hormonal chemistry for violent action at a moment's notice, by-passing the rational brain entirely. [4]



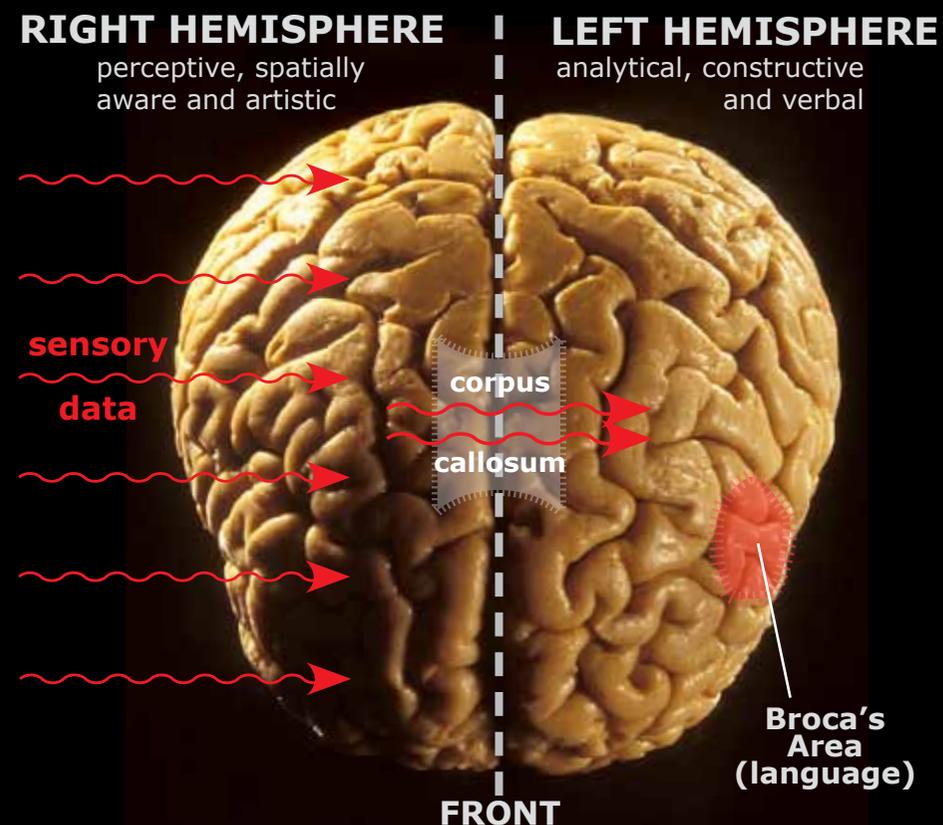
ABOVE: Limbic systems hard at work, 'by-passing the rational brain entirely.'

Our split brain - 1

After a long series of experiments in the 1960s with patients whose brain hemispheres had been surgically separated (by cutting the strap-like *corpus callosum* that directly links them), neurobiologist Roger Sperry found himself forced to conclude that: "surgery has left these people with two separate minds, that is, two separate spheres of consciousness." And: "This mental dimension has been demonstrated in regard to perception, cognition, volition, learning and memory."

In most cases, severing the *corpus callosum* separated the right hemisphere from its only means of communication with the outside world, the left hemisphere's language factory known as Broca's Area. In one extraordinary case however, a split-brain patient who had sustained some left-hemisphere brain damage as a child revealed verbal competence in both hemispheres after surgery. Sperry and his colleagues were then able to communicate with each hemisphere separately, and during extensive tests designed to reveal the patient's personality, discovered that **two entirely separate and distinct characters inhabited the two hemispheres.** [5]

Equipped in this fashion with the capacity to operate on two levels of awareness while being 'conscious' of only one, our hominid ancestors were sitting ducks for the evolutionary sting that followed. That gap between the two spheres of human awareness left genes with precisely the loophole they needed to retain ultimate control of the body's entire communications system. If the analytical and constructive hemisphere, the left, was not at all times fully aware of the wide range of perceptive activity occurring in the right hemisphere, then here was a gap in the cortical defences through which whole truckloads of mystical nonsense might pass virtually unchallenged.



Of the torrent of sensory data that enters the receptive right hemisphere relatively little is accurately transferred via the *corpus callosum* to the analytical and communicative left hemisphere. Significantly, the one area of the brain where sexual dimorphism is most evident is the corpus callosum. The female version is thicker and more bulbous than the male version, and has far more nerve fibres linking the two hemispheres than has the male. Consequently men have poorer communication between the left and right sides of their brain. [6] It is as if evolution specifically widened the 'brain gap' in men to ease the birth of their elaborate mystical fantasies.

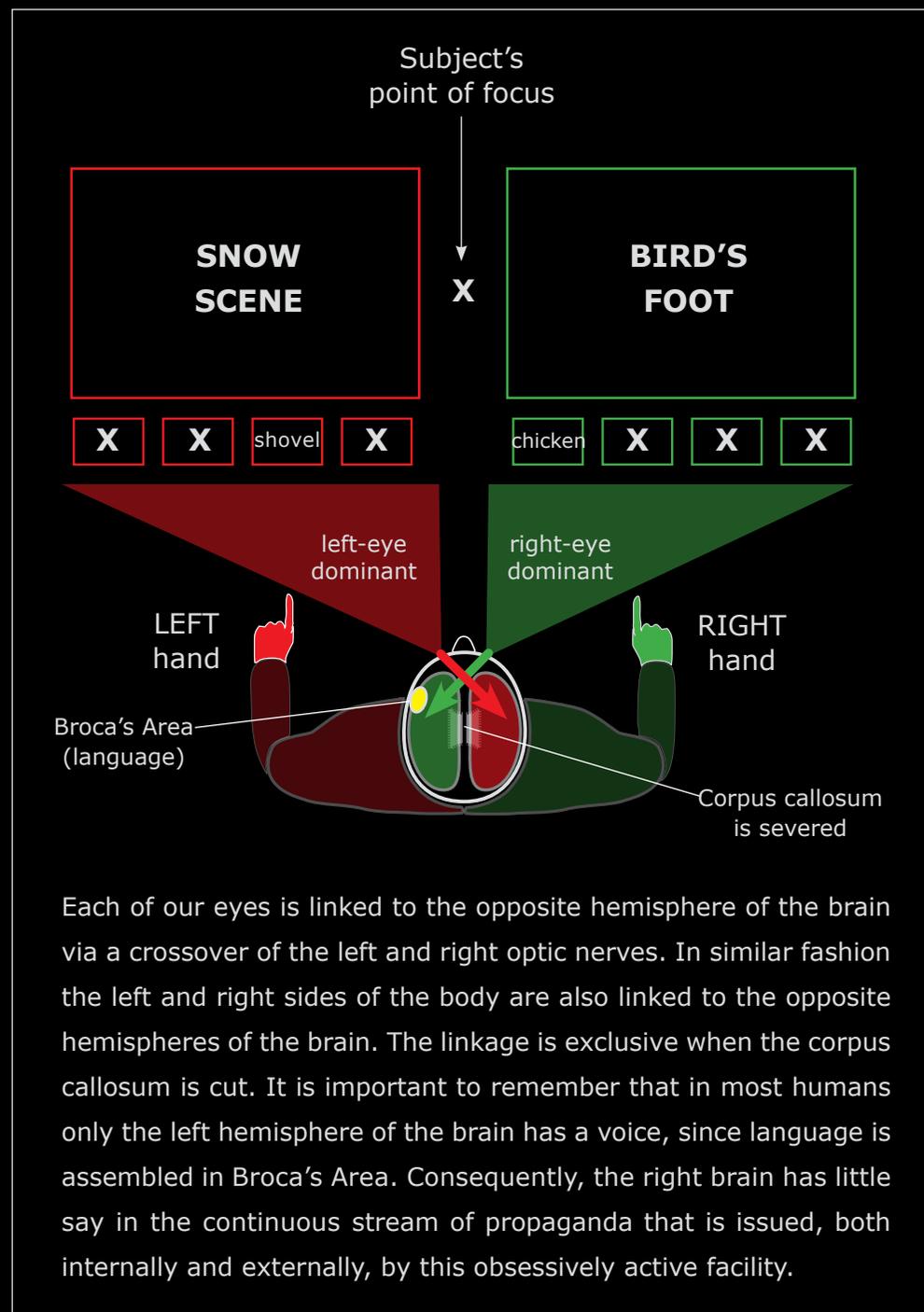
Our split brain - 2

During experiments with a split-brained patient conducted in the 1970s by Michael Gazzaniga in collaboration with Roger Sperry, a picture of a bird's foot was flashed to the patient's left hemisphere via his right eye, and a picture of a snow scene was presented to his right hemisphere via his left eye. Below these images were four smaller pictures, only one of which could be readily associated with the main image. When asked to identify these connections he correctly chose a shovel with his left hand (controlled by the right hemisphere) and a chicken with his right hand (controlled by the left hemisphere). When asked to explain his choices, he responded: "Oh, that's simple. The chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed." [7]

Gazzaniga concluded that the left brain observed the left hand's choice of a shovel—which stemmed from the right brain's nonverbal, inaccessible knowledge—and offered a fictional explanation to conceal its ignorance of the real reasons for that choice.

Further work indicates that the left-brain can influence memory—sometimes for the worse. In one study, Gazzaniga and his colleagues presented an assortment of novel pictures to the left hemisphere of split-brain patients. Where these new pictures shared elements or themes with a picture that the patients had already studied, the patients often mistakenly identified the new ones as having been seen previously.

It seems that our Broca's Area cannot abide a vacuum, so wherever there is an information gap, it constructs a fictional narrative that might reasonably account for the right-brain's inexplicable activity. Here then, is the curious brain machinery that underpins our mystic visions, religious experiences and spiritual fantasies, and here too, is a mechanism that enables us to dispose of factual information that does not suit our genetic agenda . . .



EMOTION: THE BATTLE-CRY OF THREATENED GENES

The appearance of emotion signals that our genes have been stung into action by some external threat, explicit or implied. From that moment on, any other judgements made by our rational cortex may be overridden or remoulded in favour of ancient genetic behaviour that has survived in human genomes for a million years or more. The switching device is known as the "Suspension of Disbelief". *

The only real problem arises when there is a major discord between behaviour that might help an individual's to survive and reproduce, and behaviour that contributes to the tribe's survival. Such discords lie at the very core of the 'hero's dilemma', and in varying degrees, they represent the genetic foundation of all human 'morality'.

Looked at in this light, all culture is blatantly genetic. It is preserved by emotions that disengage rational thought whenever our genes perceive the slightest threat to themselves or to their alleles.¹

This allelic imperative is typically reinforced by a regime of social carrots and sticks designed to lock our behaviour into patterns that best preserve our alleles in other members of the 'tribe'.

Since genes tend to replicate, cooperate, and survive in groups, and since alleles therefore tend to cooperate and replicate in similar groups, this helps to explain some of the powerful allegiances that form between 'like-minded' people, whether directly related or not.

It explains the strong loyalty bonds that often exist within social, commercial and political sub-groups, steering them towards aggressive responses that might, in hindsight, seem disproportionate. And it explains our indecent haste to respond with lethal force whenever family, tribe or territory comes under the slightest threat.



The 'Spirit' is in the Gene

"Although our species' conquest of the planet might appear to represent the gradual triumph of the intellect over our brutish nature, in fact, precisely the reverse is true. Being primarily founded on, and driven by, mystical beliefs of one kind or another, human civilisation represents not so much a triumph of the mind over the body as the triumph of the gene over gene-threatening rational thought."

'The Spirit in the Gene' / 'Plague Species'

* See next page

¹ An allele is a corresponding gene (not necessarily identical) that occurs in genetically similar individuals within the population.

'Suspension Of Disbelief': Birthplace of Daydreams and Nightmares

Whenever our genes need to squeeze our perceptions into a shape that better suits their purpose they rely on a curious neuronal phenomenon known in theatrical circles as 'suspension of disbelief'. The term refers to the brain's ability to switch out uncomfortable reality and replace it with a fictional scenario that sits more comfortably with our genetic imperatives.

The world of entertainment utterly depends on this 'suspension of disbelief' facility to enable the viewer to 'believe' that the fictional characters and scenarios that are portrayed by the author are, in fact, entirely true and real. This is the neuronal device that enables the viewer to switch off rational thought in an instant, and instead of watching actors playing roles in fictional situations, the viewer then sees only 'real' people reacting to 'real situations from that point on.

This ancient neuronal short-circuit switches in the moment a fictional character or event touches one of the multitude of mental buttons that are linked to our basic genetic imperatives to survive and reproduce. Touch one of those buttons and a stew of hormones and neurotransmitters flood the body and brain, generating a rush of emotion that switches out the neuronal cortex, and brings rational assessment to a halt. The imagination fires up, transforming fantasy into 'reality', and in that extraordinary instant almost anything becomes mentally possible. In that bizarre moment even the most trivial event may be transformed into something 'divine'.

Here is our genes' secret weapon in their age-old struggle to survive and reproduce in a hazardous and unstable environment. Here is

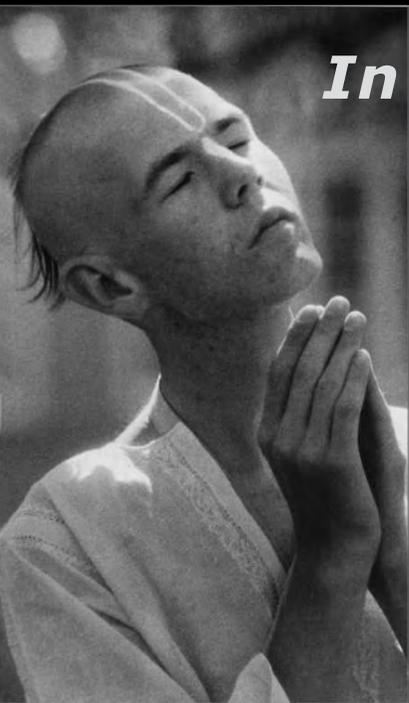
the shrewd old genetic midwife that delivers passionate belief in the patently ridiculous—in witchcraft and spells, in gods, miracles, angels and devils; in the validity of religious dogma and astrological predictions; in sustainable development, 'market forces', alien abductions and perpetual economic growth.

In essence then, here is the device that bestows peculiar mystical significance on 'the home team', 'the political party', 'the Church', and 'the Flag', thereby bonding us into families, tribes, nations, religions and ethnic groups; into teenage and criminal gangs, and into political parties and their childish factions. And it was this same dream-making facility that allowed 19 al Qa'eda terrorists to see only heroic martyrdom in their suicidal attacks on New York and Washington on the 11th of September, 2001.

As our social stress levels grow, so will the level of emotion throughout society. And in consequence, our ability to censor reality will grow stronger, nurturing more nightmares in the form of religious, ethnic and political extremism. In this fashion our genes will keep us largely oblivious to the threat of extinction that faces our species as it slides headlong into resource depletion, climate change and population collapse. Our ancient ability to switch off rational thought and believe genetically engendered 'visions' will nurture only more of the same old tribal paranoia—religious, political and pathological.

Indeed, our genes have contrived to lock us so securely into the plague cycle that they almost seem to have been specifically crafted for that purpose. Gaia is running like a Swiss watch.

In times of stress ...



... the genes assume control ...



... and reason disappears.



THE BIRTH OF CULTURE

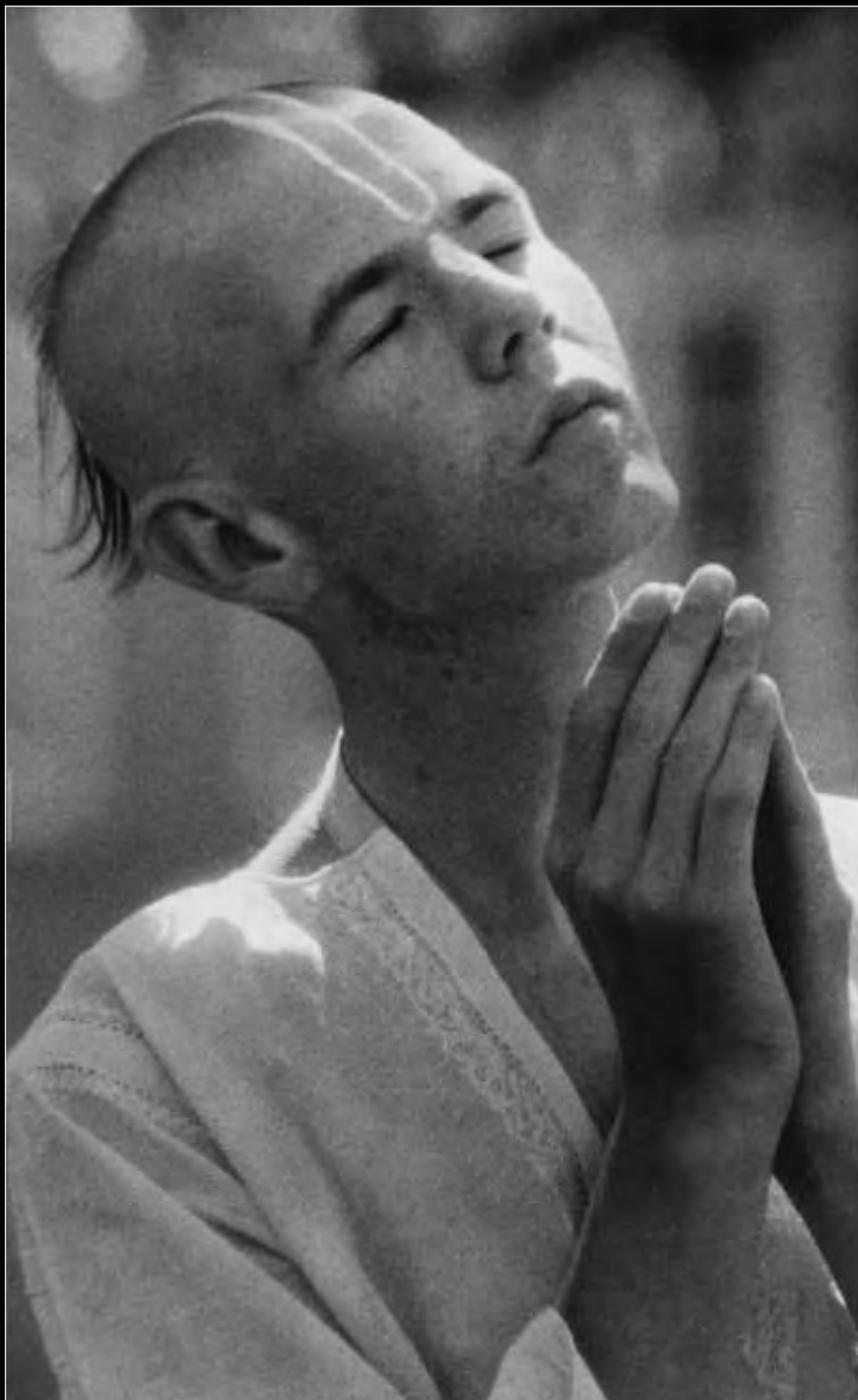
Two million years ago the key to human survival would have been membership of a tribe. Lone warriors, roaming the dangerous plains of East Africa, would have enjoyed very short lives indeed. Slow, puny, and bereft of fur, claws or fighting teeth, even the bravest and strongest of them would have been no match for the ice-age predators of those times. But by hunting in packs that prized and rewarded tribal loyalty and heroic cooperation above all, our physically incompetent ancestors gradually became one of Africa's most formidable predators. The key to that social cohesion was founded on a series of mystical beliefs, a belief in the tribe's creation legends and in the primacy of their tribal group.

The powerful discord that arose between the personal genetic imperatives to survive and reproduce, and the genetic imperative to defend the tribal gene-pool—with life and limb, if necessary—remains with us still. This discord and its attendant tides of emotion characterise all of the moral dilemmas of today, just as they did on Africa's dangerous plains a million years ago.

But although culture and its morality is plainly a by-product of our genes, it was essential that we remain blind to this fact. If we could see its genetic origins more clearly we would be unable to manufacture sufficient emotion to make our moralistic tribal cultures work. Our genes therefore prefer that we take the 1 in 20 million bet and believe in the imaginary forces of 'Goodness' and 'Evil', and in one or more of their unlikely agents—gods, devils, angels, witches, astrologers, psychics, clerics and politicians, to name but a few.

But an old evolutionary problem remains: how do you marry such spectacularly irrational beliefs with an unusual talent for rational thought, and still keep the primate brain running relatively smoothly? . . .





Solving the 'Rational' dilemma

In order to properly accommodate a vital streak of mysticism in an increasingly rational brain it was first necessary for humans to perceive, quite accurately, that their genetic imperatives—in the form of instincts, feelings and desires—represented a source of considerable wisdom and 'super-natural' power; and second, to believe, quite irrationally, that this inner wisdom had its roots in an invisible world of super-intelligence, a mystical world that lay beyond rational comprehension.

Evolution had here hit upon the sweetest of solutions. Such perceptions were guaranteed to produce a faith-dependent species that believed itself to be thoroughly separate from the rest of the animal kingdom, but followed its genetic instructions to the letter—and left more offspring as a consequence.

Here was a gene-driven animal just like any other, and yet one that believed itself to be under special guidance that was not merely 'spiritual', but in most instances 'divine'. Here was a very practical insanity indeed, one that eventually enabled this physically under-endowed 'paragon of animals' to devour the planet like a ripe fruit.

(Homo sapiens currently appropriates almost 40% percent of the solar energy that is photosynthetically trapped by the world's terrestrial vegetation.)

So here at last was a substitute for the fur, claws and fighting teeth that evolution had failed to provide, and here in the guise of mysticism, was the Excalibur that would eventually catapult our species from the brink of extinction to global domination and evolutionary stardom. It might even be argued that human mysticism evolved specifically to counter the development of the rational cortex, in that it was clearly aimed at circumventing our talent for critical analysis and reasoned thought whenever any of our genes perceived a hint of threat to them—or to their alleles.

THE PEACOCK EFFECT

Evolution's great strength lies in the fact that even the most efficient and fecund species are available for culling. This universal vulnerability hinges on what might be called the Peacock Effect. In peacock society the male's spectacular tail is a major reproductive asset, but only in the species' birthplace—a forest. Should the forest disappear, the peacock's cumbersome tail instantly doubles as a gaudy advertisement for fast food in the eyes of any passing predator.

All species possesses adaptive specialisations that have enabled them to survive and reproduce within the habitat that nurtured their specialisation. But change the environment, and such specialisations become handicaps—the more extreme the specialisation, the more lethal the handicap. In other words, each species has its own personal peacock tail, even that paragon of animals, *Homo sapiens*. In an evolutionary sense our peacock tail is just as spectacular as the bird's. The difference is that it is entirely intangible and very well concealed, residing as it does in the three billion base pairs of our DNA.

Our peacock tail is our inherently mystical nature. It is expressed in our peculiar capacity to believe implicitly in the patently unbelievable, and to attribute unnatural power or mystical significance to anything that either contributes to, or threatens, our genetic survival—thereby revealing its true origin. Mysticism's universality and its umbilical links to DNA's primal imperatives, 'survive and reproduce', clearly identify it as a genetic artefact. Whether our mysticism relies on a belief in supernatural forces such as gods, angels, witchcraft, astrology and intergalactic aliens, or whether we believe in luck, tea leaves, memes or market forces, the precise nature of the belief is of little consequence to our genes. The only thing that matters to them is the quality and strength of the tribal passion that those beliefs generate. Darwinian selection does the rest. Two million years of hunter-gatherer hardship has honed human mysticism into an evolutionary Excalibur of unrivalled power . . .



MYSTICISM: OUR FAUSTIAN WEAPON

Here then, is our *Excalibur*, our invincible weapon. But here too, is a terrible price-tag. Concealed within the gaudy verbal packaging is evolution's insurance against our overwhelming success.



Although language and imagination armed our tribal ancestors with mysticism, the most formidable weapon that evolution had ever unleashed on this fertile planet, our recent flurry of technological and reproductive success has triggered the lethal penalty clause that lay buried inside this former asset. Having helped to midwife our unbridled reproduction, mysticism will now cripple and fragment our civilisation directly in the path of evolution's climate change juggernaut. There is nothing new in this: it has all happened many times in the past . . .



The First Cultural Collapse: on Malta, 5000 years ago . . .

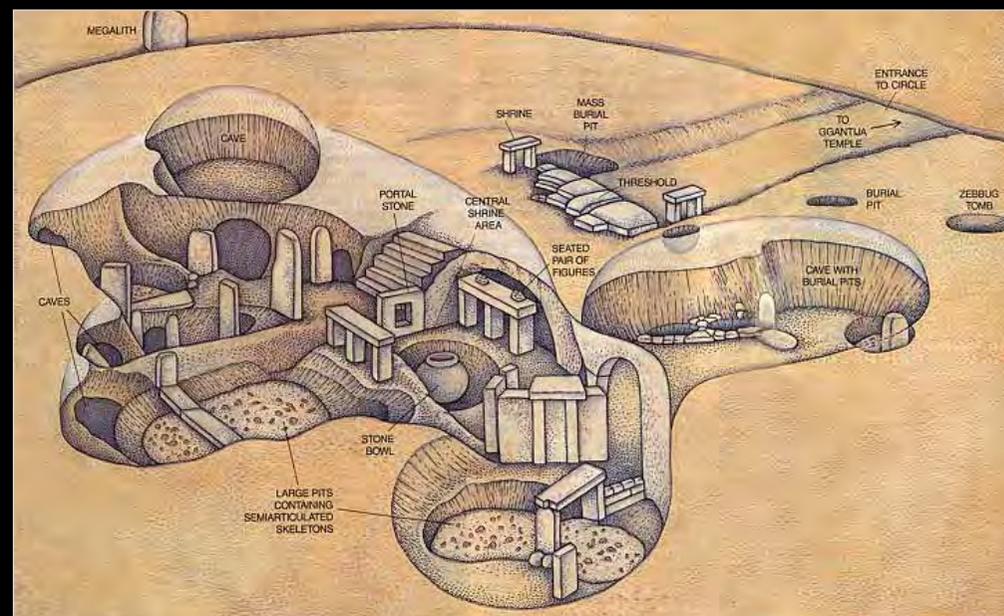
Archaeological excavations on the Island of Malta in the Mediterranean suggest that a disturbingly similar progression of events occurred there more than 5,000 years ago.

The Maltese Islands are rocky and barren today, with little vegetation and less water, yet the geological evidence suggests that 6,000–7,000 years ago, when the islands were first colonised, a very different landscape greeted the early settlers. The islands' abundant timber, good water and fertile soils would help to launch them on the road to spectacular cultural success—and ultimately, to disaster.

Under the onslaught of these vigorous colonists, much of the land was cleared, farming became intensive, and the population exploded. Blessed with such abundance the people built small temples and gave thanks to their several gods.

But by little more than 4,000 years ago the islands' three primary assets—forests, water and fertile soils—had disappeared. Once the trees had been cleared in order to farm the land, rainfall declined, erosion robbed their fields of soil, and the abundant harvests of the past had shrivelled to mere subsistence. By about 4,000 years ago the islands were virtually deserted.

What finally became of the people is not known. All that is left of them is the massive evidence of their obsessive mysticism. It consists of an array of monumental temple ruins that were clustered into about 20 groups, each of which includes at least two or three massive stone structures, and a series of extensive underground burial chambers. According to a team of British and Maltese archaeologists



This is an artist's impression of the largest of Malta's multi-purpose temples that were equally dedicated to venerating death, pregnancy and birth.

who recently re-excavated the sites, radiocarbon dating unequivocally assigned all of the temples to the latter stages of the culture, after about 5,000 years ago—when the best of the soil had blown away and hardship had set in.

In earlier times the caves and underground tombs, like all the grave artifacts they contained, had been relatively simple and undecorated, paralleling those of a contemporary culture in Sicily. However, the abundance of carved figurines depicting obese or pregnant females suggests that the society was already preoccupied with achieving and maintaining fertility. . . .

Malta's cultural collapse (cont.) . . .

About 4,500 years ago however, the culture underwent a dramatic ... change, and a 'cult of the dead' appears to have taken over. Old burial sites, originally dedicated to small, simple family funerals, appear to have been commandeered by a powerful priesthood who enlarged and redesigned these underground temples to cope with large, and very elaborate death ceremonies.

At some sites the main chamber was furnished with a semicircle of massive stone slabs arranged about a large stone bowl, with rows of burial compartments carved into the rock walls behind them. One of the largest of these burial sites housed the remains of between 6,000 and 7,000 individuals, while another incorporated a huge burial pit that served either as a mass grave or a bone repository.

Artifacts from this period consistently depict obesity in humans and animals, and also include numerous phallic symbols, either carved in stone or bone, or modelled in clay, pointing to an obsession with the living world and its successful propagation. According to the archaeological team 'vast amounts of human time and energy were invested in temple building, artistic endeavours and ritual feasts.' Meanwhile, 'the people seem to have expended relatively little effort on the building of villages or domestic structures, on terracing or on developing better farming techniques.

Where a powerful culture threatens to overwhelm its natural resources, the magical potion of mysticism comes to the biosphere's rescue, intoxicating and immobilising the offenders, so that the environment can step in and deliver the coup de grace. In this sense then, it seems that our golden chalice also carries with it the antidote

to evolution's most dangerous innovation, human intelligence. The main reason the same kind of total collapse did not befall all early civilisations seems to be that they were not all physically isolated and people could usually move elsewhere when living conditions deteriorated. If Malta does indeed represent our Earth-bound civilisation in a test tube, then the prognosis is not a pretty one.

This is the sequence of events that leads to cultural collapse:

- 1. Agriculture intensifies**
- 2. Population explodes**
- 3. G.A.S. halts population growth**
- 4. Energy and resources become scarce**
- 5. Climate deteriorates and extinction rate rises**
- 6. Starvation and disease become commonplace**
- 7. Mystical discords erupt into warfare**
- 8. Population collapses**

The best known cultural collapse in recent time occurred on Easter Island in the 17th and 18th centuries. It replicated in ominous detail the Maltese collapse of 4,000 years ago. And since this same sequence of precursive symptoms has now begun to appear on a global scale, we have good reason to fear that history is about to repeat itself—on a similarly global scale . . .

EASTER ISLAND: The modern Icon for 'Cultural Collapse'

The Polynesians explorers who colonised Easter Island more than 1000 years ago brought their pets and domestic livestock with them. Among the animals were pigs, chickens and a few rats. The humans, and their animal companions, were about to play out a human and environmental tragedy of Shakespearian proportions

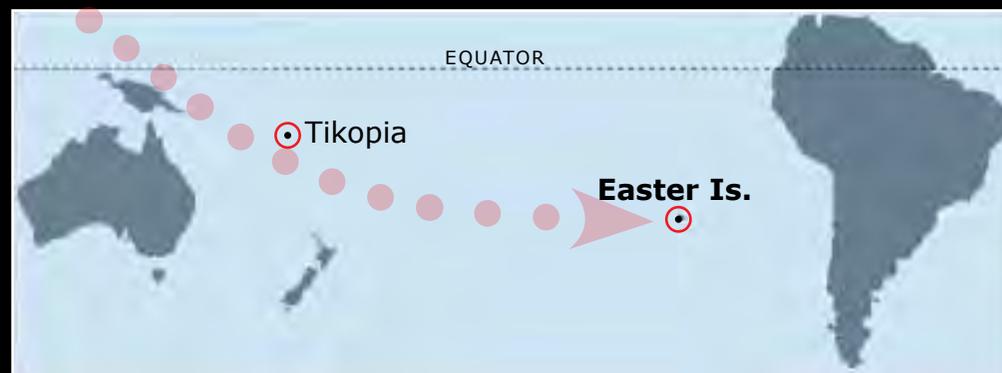
In traditional fashion the islanders set about clearing the island's dense palm forests to provide cropland and logs for their canoes and their cooking fires. They were rewarded by an abundance of food and a satisfying growth in the population.

When most of the island had been cleared however, food and timber became increasingly scarce. It appears they failed to recognise that by continuing their traditional pattern of farming, hunting and timber-harvesting they were sealing their evolutionary fate.

As their habitat deteriorated, the population became increasingly mystical and aggressively tribalised. But they continued cutting logs to roll their stone figurines from the quarry to their chosen sites.

When the last trees fell however, they could no longer roll their statues into place, or build new houses or new boats. Erosion accelerated and their harvests shrank. And with no timber to repair their aging fleet they could no longer escape their evolutionary fate. Subjected to these multiplying stresses their mysticism became obsessive, and internecine warfare soon followed.

By the end of the 18th century the island's vibrant culture had largely disintegrated and the population had collapsed. They had paid the standard price that evolution imposes on any species that extracts disproportionate energy from a finite habitat.



Genetic analysis suggests that the first colonisers of the South Pacific region originated from the Taiwan region more than 3,000 years ago. They reached the limit of their eastward migration more than 2,000 years later when they discovered and colonised Easter Island, the most isolated island in the world.



Easter Island's Moai

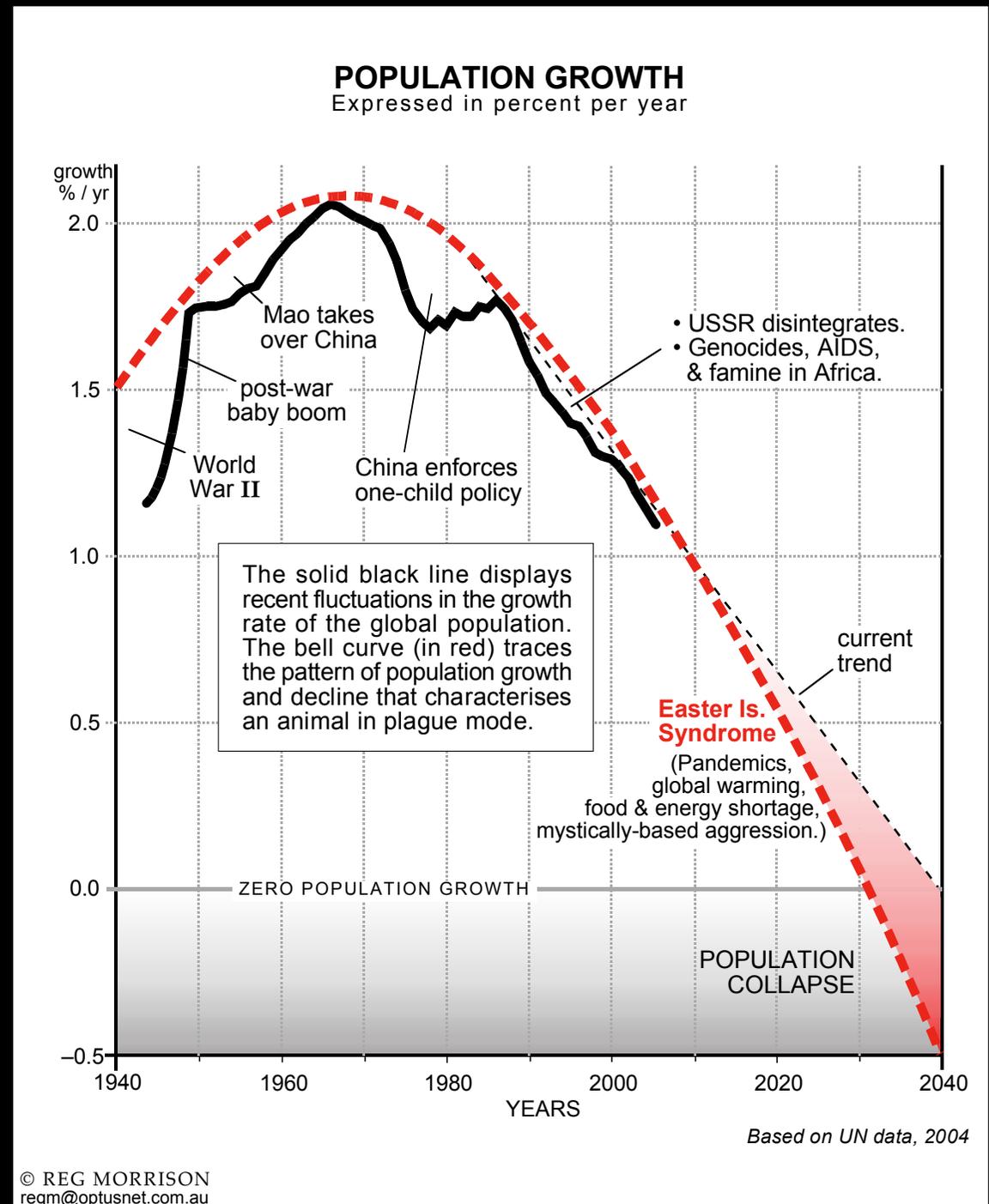
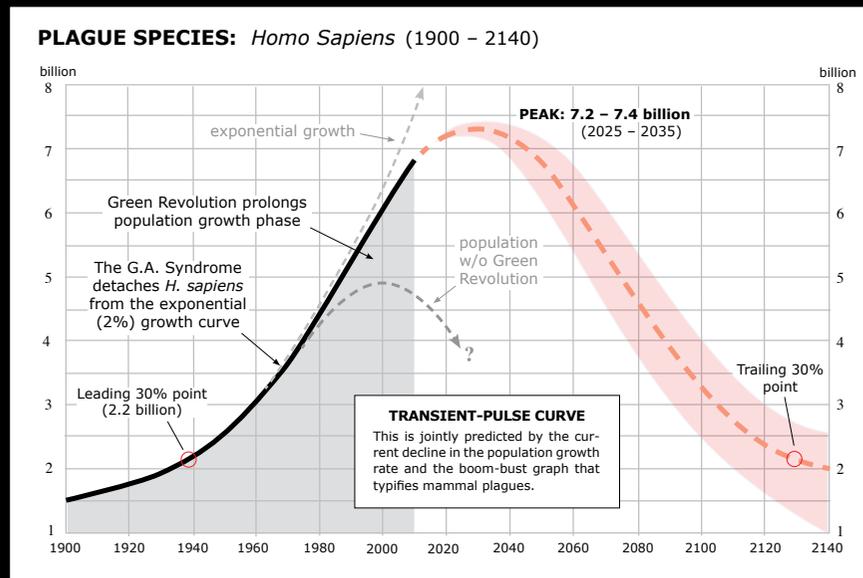
Almost 400 of these massive stone sculptures, or Moai, are scattered around the island. The largest of the figures lies unfinished in the island's quarry. Carved from volcanic 'tuff', it is 20 metres long and weighs about 245 tonnes—far too large and heavy to have been moved by the few islanders who were left alive at that time.

THE EASTER ISLAND SYNDROME

This is the standard pattern of exponential boom and bust that defines all animal plagues. Its graph describes what is known as a transient pulse, or more simply, a 'bell curve'.

Our species detached itself from its exponential growth trajectory in the late 1960s, but instead of swiftly peaking and declining as other plagues do, our fecundity became prolonged by the abundance of food that was generated by the so-called Green Revolution.

This technology-boostered abundance has finally come to an end, however, and as the looming shortage of gross energy (food and fuel) begins to bite, so our fecundity will decline, producing a population peak of somewhere between 7.2 and 7.4 billion people around 2030. An accelerating decline in fecundity will then launch our species into a standard plague collapse that mirrors our explosive growth phase.



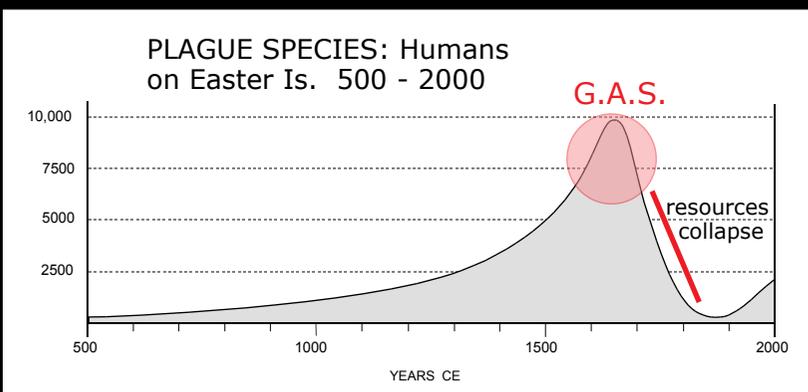
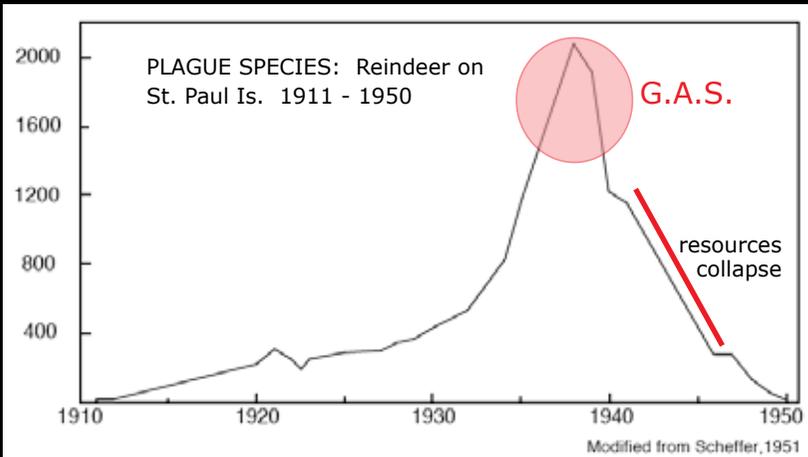
EVOLUTION'S AUTOMATIC PLAGUE LIMITER (G.A.S.)

Exponential population growth by a highly successful species threatens the survival of other species that share its habitat and compete for its energy resources. Inevitably, an automatic plague-limiting device has evolved. It consists of a combination of hormones, enzymes and epigenetic switches that interact to bring exponential growth to a halt and reduce the fecundity rate below replacement level.

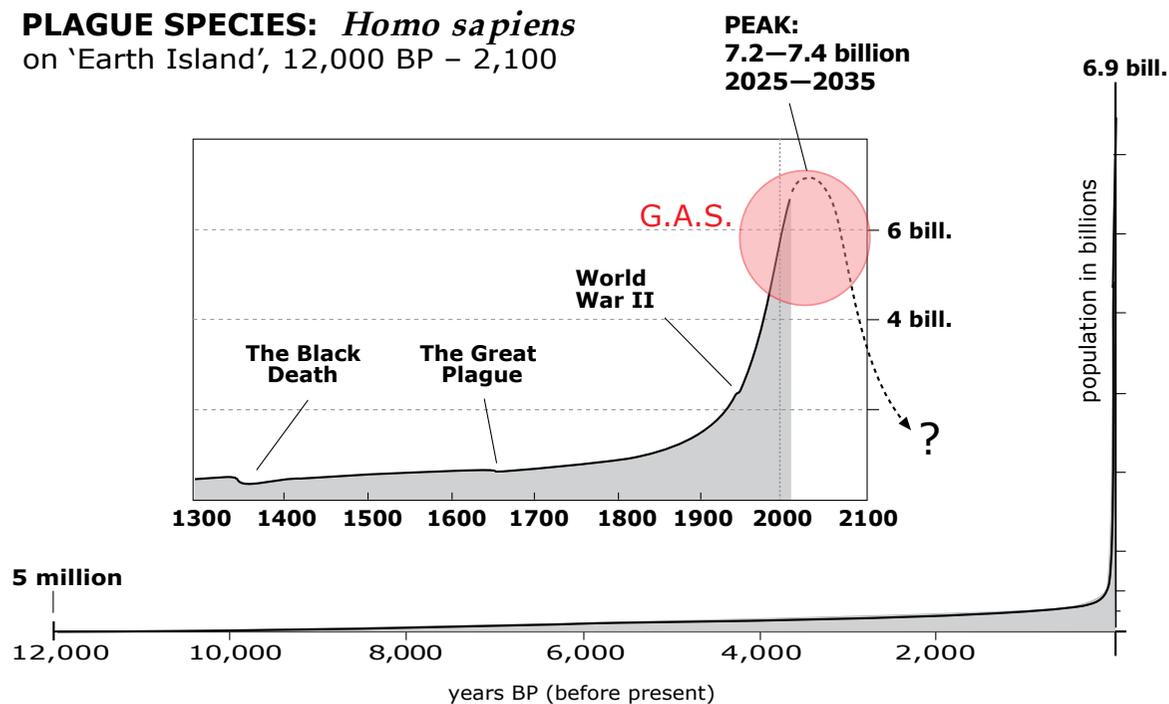
This little-known reproduction brake cuts in well before the environment collapses and food shortage launches the final culling process. Known as the **General Adaptation Syndrome (GAS)**,

this evolutionary safeguard was first defined in rodents by Canadian endocrinologist Hans Selye in 1936. He realised this was a stress related response to exponential population growth, and his data showed that it occurred regularly in rodents, both in the wild and in laboratory populations. It later became clear to him that it also applied to many other species, especially humans.

By applying an automatic brake to exponential population growth during an animal plague the General Adaptation Syndrome (GAS) imposes a crucial upper limit to the degree of damage that such events might otherwise inflict on the regional biota.



PLAGUE SPECIES: *Homo sapiens* on 'Earth Island', 12,000 BP - 2,100



Assuming that our species is a typical by-product of genetic and Darwinian evolution this is the kind of graph we should expect to see. The period of explosive exponential growth between about 1800 and 1967 makes the label 'Plague Species' unavoidable.

EVOLUTION'S HIDDEN PENALTY

By 1960 our global population had reached three billion and was growing exponentially at 2% a year. This rate of growth was consistently outrunning the growth in agriculture, and as Malthus had warned, global starvation loomed ahead, possibly as early as the mid 1970s.

But science and technology came to the rescue—or so it seemed at the time. The development of high-yield crop species and a liberal application of petroleum-based fertilizers tripled the global harvest between 1960 and 2000. This not only averted a global food crisis, it boosted harvests to the point where human reproduction could safely go into top gear. As a consequence, the global population doubled in just 35 years—in accordance with Malthus' population proposition. Technology appeared to have saved us once again.

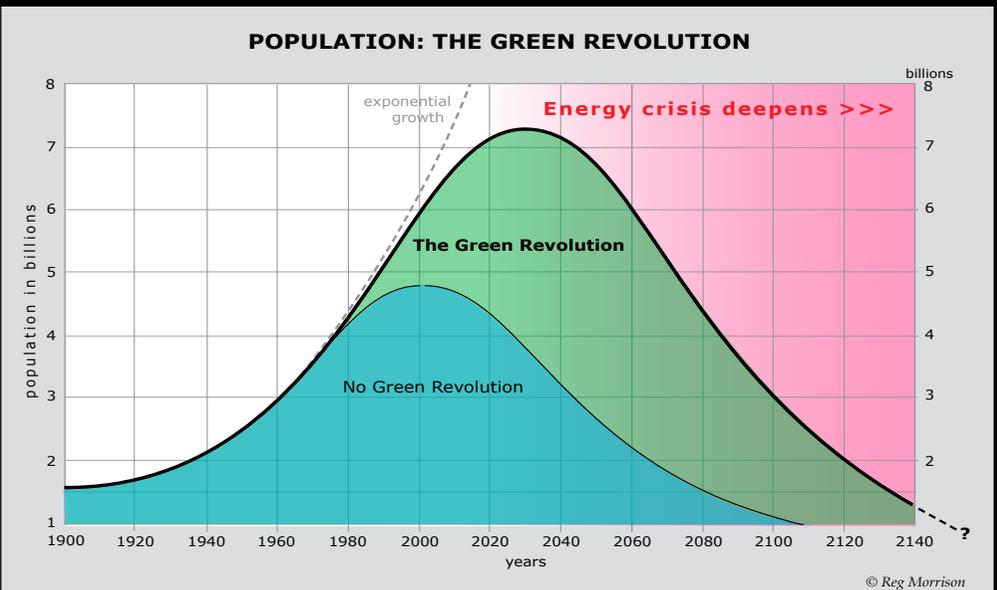
Cosmic laws determine that energy can neither be created nor destroyed, so 'high yield' is just a euphemism for 'high cost'. Inevitably then, the high per-capita harvests of the 1980s gradually disappeared in the 1990s as soil fertility shrank, fertilizer responses declined, and the population continued to explode. Our species has now returned to the evolutionary precipice on which it stood in 1965 ... but with two crucial exceptions. We are now wholly dependent on oil for motor fuel, lubricants and fertilizer, and twice as many people now face the spectre of starvation as global oil supplies begin to shrink. Hydrogen, the generator of life, is about to become its breaker once again.

When pandemic disease, Selye's GAS, and the backlash of a bruised environment begin to fulfil their standard anti-plague roles we will face collapse once more, but having overshot Earth's carrying capacity and drained our cheap energy sources, this time there will be no escape.

Technology's concealed cost

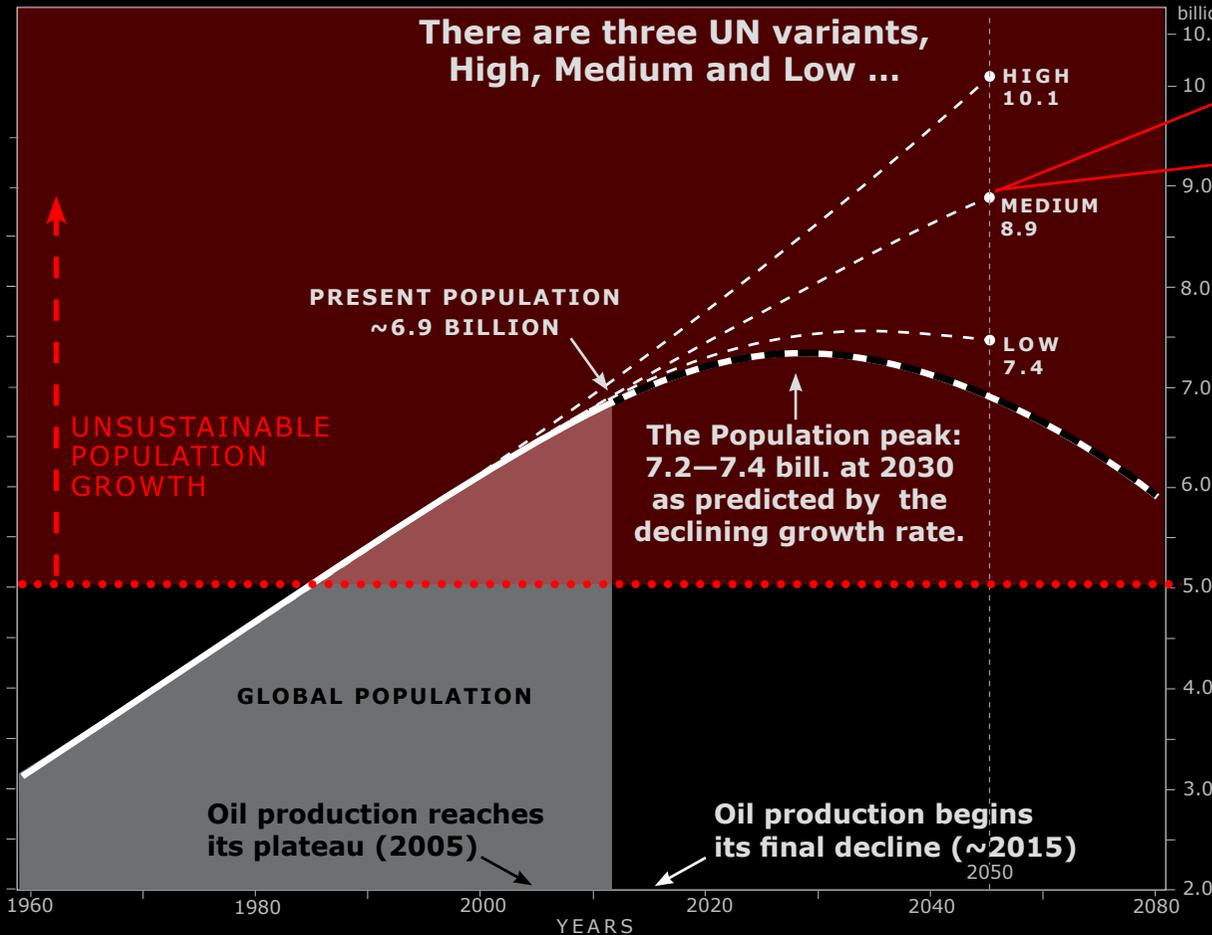
This graph reveals the Faustian face of human technology. All of the advantages it appears to offer are invariably outweighed by its hidden costs. Technology takes its 'pound of flesh' in the form of energy loss at some other place or at some later time, or via what is known as Jevon's Paradox.* It means that technology is never the panacea that it seems, and given time, it inevitably incurs a disproportionate cost, one way or another.

These are the inviolable rules of existence in a thermodynamic universe where energy only dissipates.



GLOBAL POPULATION GROWTH

United Nations' population projections



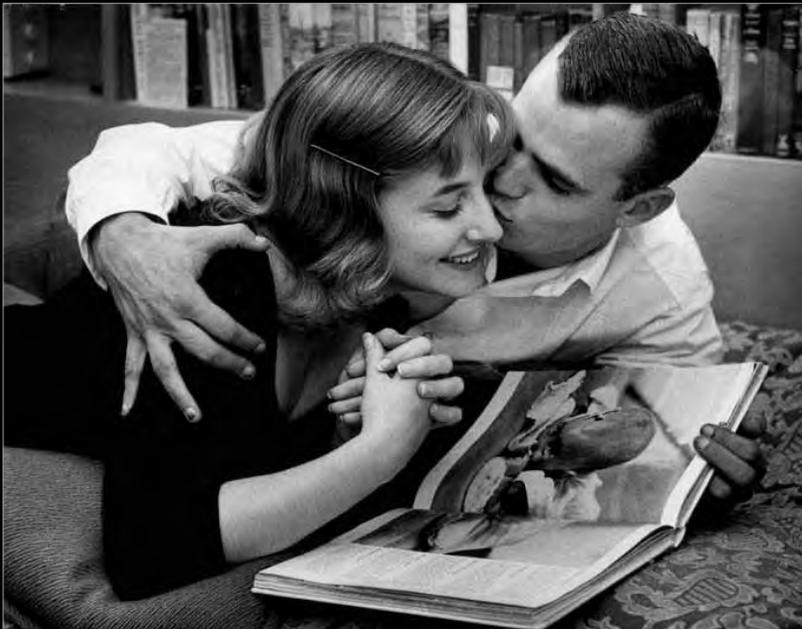
If the global population keeps growing at the rate predicted by the UN's Medium variant our species will need the resources of two Earth-like planets by 2050, just to maintain our current life styles.

Our species was barely sustainable by the mid 1980s when the global population reached five billion. Beyond that point we began systematically asset-stripping the planet.

*In 1961 the Earth's productive regions could have supported double the global population of three billion. Since then, accelerating urban sprawl, rapacious over-harvesting of the ocean, escalating pollution, the loss of forests and the erosion and impoverishment of soils caused by the Green Revolution have reduced Earth's human-carrying capacity by about one billion.**



ALL BEHAVIOUR IS GENETIC



This is the molecular reality that binds all life together.

MYSTICISM: OUR EVOLUTIONARY EXCALIBUR

"The widespread acceptance of such credos as creationism, astrology and sustainable economic growth gives adequate warning that the fraction of the population capable of applying even the most basic rules of evidence to mystically derived information is so small as to be inconsequential. It means also that the most seductive and dangerous forms of mysticism, those that underpin racism and religious fundamentalism, are totally bullet proof.

By selectively preserving the mystics among our hominid ancestors evolution not only gave us the weapon that would catapult us from obsolescence to world domination, it seems also to have taken out a shrewd insurance against our overwhelming success. Only such a deliciously rewarding and tamper-proof device as mysticism could have prevented us from foreseeing the danger of overpopulation a long, long time ago."

... **"So let us recognise human mysticism for what it really is: the rusting Excalibur of our species, an old and vital streak of genetic madness that once rescued our kind from the brink of extinction, took us to the stars, and will run us through with due dispatch when our little play is done."**

(The Spirit in the Gene, 1999.)

NOTES

AUTISM & STRESS

[1] Eric Courchesne, *et al.* University of California San Diego Autism Center of Excellence, "Autism Linked with Excess of Neurons in Prefrontal Cortex." *Journal of the American Medical Association*. "We found a really remarkable 67 per cent increase in the total number of brain cells in the prefrontal cortex," says Courchesne.

Ian Weaver, Moshe Szyf and Michael Meaney, "Maternal care effects on the hippocampal transcriptome and anxiety-mediated behaviors in the offspring that are reversible in adulthood". *Nature Neuroscience* vol.7 p.847, 2004 (Proceedings, National Academy of Sciences.)

MEMORY, SHORT AND LONG-TERM

[2] Courtney Miller and David Sweatt. "Covalent Modification of DNA Regulates Memory Formation", *Neuron*, Volume 53, Issue 6, pp.857-869, 15 March 2007

EVOLUTION OF THE HUMAN BRAIN

[3] Benjamin Libet, a Californian neurophysiologist, demonstrated in the 1990s that the brain starts responding to an external command about 500ms before a person makes a conscious decision, suggesting that free will is a rationalization produced by the mind after the fact to explain its actions. As a result of this research he was awarded the very first Nobel Prize for Psychology in 2003. Libet summarized his research in the 2004 book "Mind Time: The Temporal Factor in Consciousness."

See also: Peter Halligan and David Oakley, "The Greatest Myth of All", *New Scientist*, 18.11.2000, pp.34-39.

MECHANICS OF DELUSION

[4] Richard F. Thompson, *The Brain*, 1985, pp.19-21.

OUR SPLIT BRAIN

[5] R.W. Sperry, "Lateral specialisation in the surgically separated hemispheres." *Neurosciences: Third Study Program*, 1974, pp.5-19.

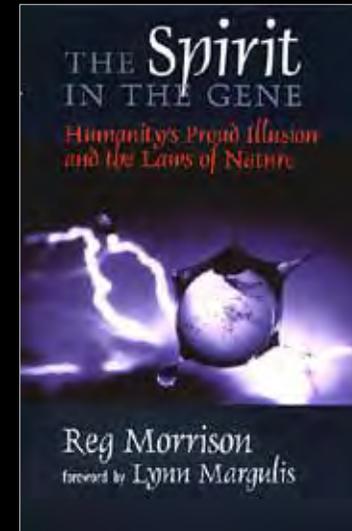
(Sperry was awarded a Nobel Prize in 1981 for his work with split-brain patients.)

[6] Anne Moir and David Jessel, *Brain Sex* (1989) 1992, pp.39-49.

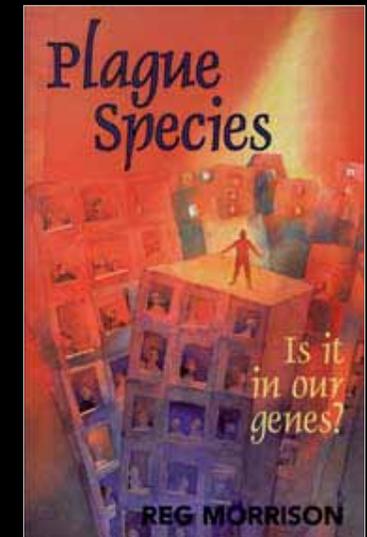
[7] Michael Gazzaniga, "The Split Brain Revisited", *Scientific American* 1998, pp.35-39.

See also M.J. Tramo *et al.*, "Hemispheric Specialisation and Interhemispheric Integration", in *Epilepsy and the Corpus Callosum*, 1995.

"*Evolution's Problem Gambler*" is based on, and also contains extracts from *The Spirit in the Gene*. (Cornell University Press, New York, 1999.)



The book summarises the massive impact that humans have had on the biosphere, and explores the evolutionary origins of the behaviour that produced this impact.



This book was revised and republished in 2003 by Reed New Holland, Sydney, under the title *Plague Species: Is it in our genes?*

"Reg Morrison offers varied and often fascinating documentation from ecology, economics and natural history to portray human history for what it is, a Greek tragedy in which our greatest strengths are no less than our most dangerous flaws."

Edward O. Wilson, Harvard University.

Unless otherwise credited, all photographs, diagrams and text are attributable to the author, Reg Morrison.

All material in this PDF is licensed under the



Attribution-Noncommercial-Share Alike

2.5 Australia License.

**Photographic prints or high resolution scans
may be obtained via email application to:**

regm@optusnet.com.au

Website: <http://regmorrison.edublogs.org/>