Introduction: Future Consciousness in a World of Short-term Horizons

Virtually all of the serious global problems facing the planet, from climate change, through habitat destruction to use of energy and natural resources, the ability to feed and care for a rising future population and our future viability, are long-term issues with time spans varying from decades to centuries, millennia and even millions of years. For example, while addressing world poverty and resource equitability could take decades to achieve, even with the best of will, climate change will cause changes in rising ocean levels and desertification that are likely to continue to reduce viable land areas for a thousand years to come. Loss of species diversity will bring a detriment to our planetary genetic resources on a time scale since the last mass extinction of around 65 million years. Many of these losses will never be recovered.

These issues require collective action on a planetary scale and a sense of future consciousness which can weigh up needs for major and potentially costly action in the present, whose effects will only slowly be felt, because they are cumulative over much longer time scales and the capacity to balance immediate priorities against much longer term goals. Yet all the evidence is that as the pace of change accelerates, our future time horizons are shrinking towards rapid reaction on ever shortening time scales as technology and communication provide more rapid ways of reacting to accelerating changes and instabilities, which dominate our crisis management and tantalize our investment opportunities.

We have entered an age where it has become demonstrably obvious that the time scale of major decision-making has shortened to the detriment of our long-term planetary futures. We are depleting non-renewable resources that have taken hundreds of millions of years to accumulate in a matter of decades, precipitating climate change whose effects will exacerbate for a thousand years and a mass extinction of the diversity of life that will deplete the living resources of future generations for millions of years to come.

At the same time our investment horizons are ever shortening, both in terms of national and global economic management and in terms of the dynamics of commodity trading and investment to the point where future horizons look forward no more than six months and light-speed commodities trading using computer algorithms on a time scale of milliseconds has become a norm, causing instabilities like the ‘flash crash’ in which over a thousand points were abruptly wiped off the US stock exchange in a matter of seconds due to predatory computer trading algorithms, only to recover minutes later.
The rich get richer

The percentage increase in share of income of the richest one percent

United States
Australia
Sweden
Norway
Ireland
Italy
Japan
New Zealand
Singapore
Denmark
Spain
France
Mauritius

Lower charts: The extent to which global wealth has become corralled by a virtual handful of the so-called 'global elite' (2014 Oxfam). The richest 85 people on the globe control $1 trillion, as much wealth as the poorest half of the 7 billion global population put together. The wealth of the one percent of richest people in the world amounts to $110 trillion, 65 times as much as the poorest half of the world and the situation has clearly been getting more inequitable between 1980 and 2012, as the right hand chart shows. This is not progress. Far right super-exponential L-shaped curve of extreme affluence displayed in a logarithmic plot of US income.

Winner take all venture capital investment and its tendency to cause a tragedy of the commons through the struggle to capture resources before a competitor can do the same, and with it intellectual property rights which extend to the natural gene system of the planet hold sway over international diplomacy and the foundation of major trade agreements such as the prospective Trans Pacific Partnership (TPP). In such a climate, short term investments realizable in the immediate term take precedence over long term investments, which may themselves be unwound by short term gains of competitors, so that in a so called informed era, long-term precautionary actions essential for our long-term viability and survival are given scant attention or put in the 'too hard' basket.

The inability of even the most educated and highly-developed democratic countries to some to terms with effective long-term strategies, which can balance short-term economic growth against our long-term future survival has become a pathological feature of an electoral system where competing parties vie with one another to promote often highly emotive conflicts of agenda which will serve their short-term goals, targeted to each upcoming election cycle, to the abandonment, or even outright denial, of serious long term issues that could harm the future welfare of generations to come.

How has this situation come about? Is it a function of the failure of human intelligence to deal with completely understandable issues in the mass, or is it a product of something deeper to do with how cultures have emerged out of an evolutionary paradigm, which until recently maintained long-term stability through generation-by-generation conservation of social patterns modulated only by gradual changes at the genetic level through mutation and natural selection over many generations.
Fig 3: Latest high accuracy predictions show no sign of population growth peak by 2100. Left: World population trends in the latest 2014 study show high confidence estimates of world population growing from the current 7 billion to 11 billion by 2100 with no sign of reduction (10% and 5% variations in darkening colours). Right: Growth by continent with Africa failing to curb population growth (Gerland P et al. 2014 World population stabilization unlikely this century doi:10.1126/science.1257469). This shows the unrestrained population growth (inset) is largely confined to Africa, with other continents stabilizing and some countries experiencing a population decline due to falling fertility.

At the same time that the world human population is reaching potentially unsustainable levels in terms of food and energy supplies, precipitating the destruction of the natural wilderness for large scale agricultural production, human reproduction rates have become highly unstable. The advent of hormonal contraception has led to a divorce between sexuality and reproduction which has resulted in educated secular populations and particularly educated intelligent women choosing not to reproduce in favor of their work and careers. At the other extreme, conservative religious followers, driven by patriarchal doctrines, try to ensure their womenfolk get pregnant at every opportunity to "go forth and multiply", expanding the utopian power of their religious hegemony and underprivileged and maladjusted individuals who fail to manage contraception continue to reproduce unabated in an age where medical science has vastly reduced the natural limits of infant mortality in all but the most deprived economies.

The end result is a series of evolutionary paradoxes where the most capable people are tending to breed themselves out of existence, while the least advantaged and most religiously traditional sectors of society are reproducing in a relatively unrestrained trajectory. Many developed countries, from Germany to Japan are failing to replace their existing populations and are likely to be gradually overtaken by migrant subcultures, while overcrowded countries such as Egypt and India are becoming even more overcrowded. This picture raises fundamental questions both about how human society got itself into this situation and how we can learn from these events to develop a sustainable culture which both respects individual freedoms and freedom of reproductive choices on the part of both sexes in a way which is also consistent with our future evolution as a species and our planetary survival as a species and a culture.

Human Emergence and the Evolutionary Paradigm

If we look back to our human origins and the societies of our sister species, we can see that stability in evolutionary epochs is maintained through the genetic process. A lion a gazelle and a shark have the form and behavior that they do because, over countless generations, small changes to their genes have been fixed through mutation and selective advantage in a paradigm which otherwise conserves the genetic pattern and with it their social behavior from generation to generation. The evolutionary process is thus cumulative on a comparable time scale to geological, and natural climatic change. A shark does not transform into a sea gull in the next generation, nor a gazelle into a lion. The greatest changes we see from generation to generation are differential - a small increase in flipper size for a mud dwelling fish as it moves out of the sea onto land over many generations, or a greater facility with talking and understanding speech.

Animal societies share many features with human societies. For example chimps like humans are female exogamous, with the females moving to join patrilinial troupes consisting of related male individuals, dominated by an alpha male. Unlike humans, chimp females are openly promiscuous and mate in estrus with all and sundry from their home troupe so as to avoid infanticide. However, like humans, females will also mate on the side with partners of their choice 'on safari' when they are out discretely foraging in the
forest. Ape societies thus maintain a genealogical paradigm not unlike a human gather-hunter band of related individuals. They learn forms of tool use for catching termites with sticks and cooperative group hunting for smaller prey. They form both hierarchies of power and cooperative coalitions and express both support for trusted comrades and retribution for individuals who have threatened their security or attacked their offspring. But the form of the society is rooted in the reproductive paradigm and in well-established ecological niches of the species in its foraging and hunting and protection from larger predators.

The relative dominance of males in chimpanzee society can be contrasted with that of bonobo societies, where a dominant female holds sway over a coalition of females who keep male aggression in check, with a young male gaining status through his mother and both female-female and male-female sexual engagement being a universal mediator of tension, in which female-female sexual intimacy can occur up to seven times more frequently than heterosexual coitus.

The evidence from human sexual evolution implies that female reproductive choice has been pivotal in the emergence of human culture and super-intelligence. Lower center: The human female makes one of the greatest parenting investments of all mammal species in a pregnancy which comes at great risk because of the large human baby's head. She is also highly vulnerable. It is thus essential for her to be selective about who she gets pregnant with to ensure enough support and protection. Female sexual characteristics include voluptuous breasts, not shared by the apes, and an hour-glass physique emphasizing her fecundity. Unlike the overt ape estrus, human females are permanently sexually receptive, except perhaps during menstruation, have clandestine ovulation and display lunar-coupled menstrual synchrony (lower left). It has been suggested this was linked to granting of sexual favours for meat. It was noted in 19th century South Africa that Bushmen were driven to steal cattle to satisfy their women's demands for meat for sex. The related Sandawe have a fertility rite called phek'umo resembling the San eland dance of menarche, in which the women twerk their buttocks at the men in the full moon. All these factors imply that in early human societies, female coalitions, who provided 85% of the diet through gathering, were astute in their sexual choices of men who were skilled hunters who provided meat for pregnancy, while also being resourceful and entertaining partners. Top-left: The human vagina and clitoris is ecstatically orgasmic, providing human females with an ultra-sensitive measure of how intimate they feel with a sexual partner. Top right: The human penis, by contrast with the muscular bony ones of the chimp and bonobo (illustrated) are larger and entirely tumescent, requiring both virility and good communication - a genuine evolutionary indicator of fitness evolved through sexual selection by the female. Lower-right female bonobos have an enlarged clitoris and mediate tensions by frequent orgasmic sex with both sexes.

The evidence from our own sexual evolution suggests that the large tumescent human penis, which differs from the more voluntary muscular boned penises of apes has been selected as a genuine indicator of fitness by human female reproductive choice, and that the ecstatically orgasmic clitoris, perpetual sexual receptiveness, expanded fatty breasts and hour-glass torso indicating nubile fecundity, concealed estrus making it hard for a male to know when a female is ovulating, and lunar phased menstrual synchrony are human features of sexual selection demonstrating the key role of female reproductive choice and female coalitions in the emergence of Homo sapiens as a super-intelligent culture-forming species.

With the advent of human culture, cumulative genetic change has given way to much more rapid changes. While we share 98% of our DNA with chimps although splitting from their line around five million years ago. About 1.5-2 million years ago Homo erectus emerged and by 500,000 years ago we find the divergence of Homo sapiens and Neanderthal and Denisovan lines. We can also see back 150,000 years to founding
forms of human culture with the mitochondrial division of the San Bushmen into two lines separated by the arid Kalahari between 150,000 years ago and about 70,000 years. The discovery of shell ornaments and ochre dating back a similar period, along with evidence of ceremonial cave use, shows humans of the time valued their beauty and fecundity and had already entered the cultural era. However, like chimpanzee and bonobo societies, these early forms of human culture remained highly attuned to the ecological niches of their natural environment, in which the females contributed 85% of the diet through astute gathering, while the males hunted game as meat in return for sexual favours, displaying their targeting prowess, complementing their musical and story-telling skills around the campfire.

Fig 5: Top left: Scored ochre block. Blombos (c 77,000). Pea-sized *Nassarius kraussianus* shells pierced and showing wear from leather thongs (Blombos cave c 75,000). Second row: Hundreds of small scale-like carvings on a snake-shaped rock along with 70,000-year-old spearheads nearby from a cave in the Tsodilo Hills of Botswana, sacred to the local San people, who call it the Mountain of the Gods, has dramatically pushed back the earliest evidence for ‘religious’ ritual behavior. Center: Genographic project study of mitochondrial origins shows a deep split separating Khoisan mitochondrial inheritance from other groups, including those migrating out of Africa, and a deep division between two Khoisan types L0k (*) and L0d (#) going back 140,000 years, suggesting a separation of some 100,000 years possibly caused by long term drought in Africa (Behar et al. 2008 *The Dawn of Human Matrilineal Diversity* doi:10.1016/j.ajhg.2008.04.002). Right: Fulton cave drawing 1000 BC celebrating the first menstrual rite, Drakensberg Mountains, Natal (van der Post). The central figure is a young robed woman undergoing her first menstruation ceremony in a special shelter. Circling her are clapping women, female dancers and (in the outer ring) men with their hunting equipment. Two figures hold sticks; the women bend over and display ‘tails’ as they imitate the mating behaviour of elands. Among living San, such rituals are intimately connected with success in hunting. Each male figure has a bar across his penis, suggesting abstinence associated with menstruation valued for hunting luck. The surrounding figures, are all bending over, their buttocks playfully thrust in the direction of the menstruating girl. Left lower row: These details match those still practiced by San and related groups in the Eland dance ritual at menarche.

The San have preserved their gatherer-hunter culture throughout this long period partly because their reproduction rates have maintained parity with existing population sizes, through measures such as prolonged breast-feeding, which tends to suppress ovulation, and through forms of gathering and hunting which depend on taking from the natural environment, through ones knowledge of plant diversity and hunting skills, only those resources required to keep the existing population fed. While the San currently live on arid land in the semi-desert, which takes great skill and effort to eke out a surviving diet, eight thousand years ago they occupied more fertile lands across the southern half of Africa, yet the deep trenches in their mitochondrial diversity attest to an almost static population living off gatherer-hunting in a stable ecological paradigm over periods of a hundred thousand years.

Moreover San peoples show many archetypes of features we might often associate with modern emancipated culture, individual autonomy and even spiritual attainment. They are loath to censure their children because they need to be able to grow up resourceful in an environment where individual prowess and good social judgment is essential. While they are nominally patriarchal and have male elders, it is traditional for a young woman delivering her first child to do so with the maternal family. They celebrate menarche as a sacred rite of power and significance to the whole group in a manner also depicted in cave paintings lasting back thousands of years. While they are skilled hunters with potent poisons that can kill a man or large beast even using a small dart, they mitigate personal violence through living in small partially related bands in which emotional or physical violence is quickly reacted to. Although men will mistreat
women, women are able to make choices about whom they care to be with in a manner not unlike the hard-won gains of women in modern culture. They share a mystic experience in the trance dance and have religious notions of a creator deity and a deity of misfortune, along with shadowy sexual consorts, whom they regard in philosophical terms, without slavishly worshipping them, and share a concept of the afterlife not unlike those of the theological notions of major world religions.

It is thus clear that human culture emerged as an extension of ecologically attuned animal sociobiology and that well into the cultural era, and the development of language, this attunement continued through the ethos of gatherer-hunter culture which sought to survive in the natural environment by consuming only what it could sustain to feed a small human population, without straining it to the point of depleting the natural supply.

Founding Civilizations, Religion and the Patriarchal Reproductive Imperative

However with the advent of agriculture, triggered by discoveries by the female gatherers and animal husbandry as an extension of hunting, the emphasis shifted to intervening in the environment and ecology on a massive scale. We then enter a period of rapid change, in which the time scales of evolutionary and geological change become disrupted by vastly more rapid cultural changes. Spoken languages diversify rapidly and written languages emerge on a time scale of transformation vastly faster than evolutionary change. Cultures and civilizations rise and fall even more rapidly due to conflict between populations as new resources are exploited.

Agriculture and animal husbandry resulted in a sudden ballooning of human populations, although the evidence of deficiency diseases points to a qualitative reduction in human dietary health, and denser populations became subject to the emergence of epidemic diseases. This also had major repercussions for social stability. As populations grew, so did the conflicts between burgeoning societies, leading to increasing militarization and the formation of male armies, which could protect a large population against invasion, but also served to repress social unrest internally in favour of dominant male leaders. The biological basis of morality is a reduction of intra-social strife through foregoing individual advantages over one another so that a society can maintain internal vitality and dominance in the event of inter-social conflicts. As urban societies grew, the cycle and pace of inter-social conflict increased, setting the process into overdrive, with large empires, from Assyria and Rome to the later conquests of leaders such as Genghis Khan. Such leaders almost without exception used their power to enhance their own reproductive dissemination. Currently around one in 200 people worldwide share the Y-chromosome of Genghis Khan, and up to 8% in wide areas of Central Asia, due to he and his next two generations of male heirs siring a hugely disproportionate number of offspring. Likewise Udayama was said to keep 16,000 virgins behind flaming walls (R577, R735 99 and Solomon had seven hundred wives of royal birth and three hundred concubines (1 Kings 11:3). In this sense, monarchy is and has always been a reproductive paradigm intended to be dynastic and pass on sovereignty to the royal line. The same hierarchical reproductive paradigm applies to rule by a clan strongman and to feudal rule by a local military land-holder.

Recent genetic evidence points to a massive change in the reproductive paradigm across all cultures and continents, from the establishment of agriculture 10,000 years ago. Only 3% of mammals are socially monogamous due to the females delivering live young and having a principal reproductive investment in parenting, while males have a principal investment in fertilization. The variance in male reproductive success is thus always much greater than that of females, due to male competition for reproductive success among the available females, all of whom can get pregnant unless they are physically infertile. And social monogamy means just that, not reproductive or genetic monogamy. In socially monogamous species, from the albatross to the prairie vole, where circumstances favour a parenting resource from both sexes, females exert reproductive choice through clandestine sex with other males of superior genetic fitness as the opportunity arises, because, given the much greater parental investment of the female, it is counterproductive in evolutionary terms for females to literally put all their eggs in one resourcing partner's basket. Humans share with such species a pattern where between 10 and 20% of offspring, allegedly of the resource-bearing partner, are sired by another male.

Although humans do show traits of strong pair bonding, and mutual partner choice as a function of the need of human infants for full-time care up to the age of about four, when they become socially and physically competent enough to fend for themselves as active members of an extended family, female reproductive choice is essential for the long-term viability of the human germ line because astute female
choice of which male to entrust their huge parenting investment is key to maintaining the mammalian XY based sexual selection, where the male has a single X and thus manifests the X-linked genes, many of which are involved in brain function in a unique pattern unmasked by the paired alleles of female double X. Astute female reproductive choice thus plays a pivotal role in evolutionary selection.

Humans and most traditional human cultures still share mammalian features of polygyny if a male has the prowess and resources to support (or even seduce) more than one female to reproduce with him, he will do so. Thus in such societies around one in eight men have two wives. In Western culture serial monogamy also serves as a clandestine form of polygyny, with men seeking new younger nubile partners to sire a second family with on divorcing their original wives whom they will generally have already had children with.

Fig 6: Reproductive bottleneck in Y-chromosome diversity began about 10,000 years ago and continued for several millennia (Karmin M et al. 2015 A recent bottleneck of Y chromosome diversity coincides with a global change in culture (doi:10.1101/gr.186684.114).

Because of these factors, over all time in human genetic emergence, from our last common human ancestors, the mitochondrial Eve dating back 176,000 years and Y-chromosome Adam dating back some 73,000 years (Wild et al. doi:10.1093/molbev/msh214), one can verify a sexual reproduction ratio of around one reproducing male to every two females, with half of the males failing to find reproductive partners. This leads to manifest differences between the evolutionary trees of the Y-chromosome carried only down the male line, and the mitochondrial DNA carried only through the ovum of the mother to her children. However, with the emergence of agriculture and animal husbandry, the reproductive sex ratios became wildly skewed to a value of 17:1 over the entire period from 10,000 years ago to around 4,000, so that powerful agricultural landlords had their pick of an average of 17 female reproducing partners, while the other men effectively had no offspring, existing only as slaves, serfs, or soldiers maintaining the military domination of the mighty lords. The result was a precipitous decline in Y-chromosome diversity unparalleled in mitochondrial evolution that became apparent only when extensive genetic studies of many populations were completed in 2015. Neither is the effect confined to one historical culture, but extends to very degrees of severity across all the populated continents of the planet, confirming this has been a species-wide phenomenon, as shown in fig 6 (Karmin et al. doi:10.1101/gr.186684.114).

Human cultures have been predominantly of patriarchal ‘chimpanzee-like’ patrilinial pattern, in which a woman moves to her husbands locale, and joins his patrilineal line, however there have also been significant matriarchal cultures, following a more ‘bonobo-like’ paradigm, in which women remain with the maternal family, sometimes having only transient encounters with their partners as lovers, in a so-called ‘walking marriage’, while maternal uncles act as surrogate fathers. The root reason this became an issue of violent conflict, as we shall see, is not just that men like to live with their wives in conjugal intimacy, but the uncertainty that comes from men never being sure who their offspring really are, while a woman is absolutely certain that each natural born child that comes out of her womb is hers. Thus while jealousy in a woman is primarily about losing her relationship resourcing, jealousy in a man evokes potentially homicidal emotions because he fears his partner has been ‘polluted’ by another man’s sperm and may give birth to a child who is not his.
Paternity certainty is the probability that you are your children's father. At the critical figure of 1/3 the following two calculations for patriarchal and matriarchal societies are equal:

1. You are therefore related to your own children by \((1/2)(1/3) = 1/6\), since if you were certain you were the father and half your child's genes come from the mother, the value is 1/2.
2. Your relatedness to your "full" sister is at least 1/4 (representing your common mother) plus 1/4 (your putative common father) times the paternity certainty of 1/3, totaling \(1/4 + (1/4)(1/3) = 1/3\). Since you thus share 1/3 of your genes with your sister and she provides 1/2 the genes of her children, you are related to her children by \((1/2)(1/3) = 1/6\).

Thus patriarchal societies enforce marriage to a husband to try to ensure paternity certainty is as close as possible to 1 even though this comes at the expense of curtailing female reproductive choice.

There is clear evidence for early violent conflict between these two traditions in the founding civilizations of the Fertile Crescent. The Book of Genesis notes that polygynous Jacob had to tarry for seven years for each wife with Laban's maternal family before being ordained by God to depart with Rachel and Leah and his cattle to found the twelve patriarchal tribes of Israel. Rachel steals the maternal teraphim (house gods) and tellingly hides them under her menstrual skirt when Laban comes to search for them, confirming the women have also made the transition to religious patriarchy.

This is followed by a severe warning in Judges 19, that matrilineal patterns were to be violently overthrown by a zealous patriliny. The concubine of Bethlehem-Judah is accused of 'whoring' by going back to live with her father-in-law for four months. When the Levite returns to claim her, the father-in-law keeps saying to stay a little longer, for six days, nigh on a week. When the couple leave and turn in at Gibeah of the Benjaminites, men of Belial ask to 'know the man within'. In an attempt to avoid sodomy, the host offers his daughter, to which they refuse. The Levite then offers his concubine. She is raped and abused all night and dies on the doorstep, while her master sleeps peacefully. The story is a glaring affront to those matriarchal traditions, which expected the son-in-law to stay with the wife's family as Jacob did. He then cuts her in twelve pieces and sends them to all the coasts of Israel setting off the Benjaminites wars. These are finally resolved in moving four hundred virgins of Jabesh-Gilead to their husbands homes, capped by the abduction of the daughters of Shiloh dancing at a festival, to satisfy the remaining Benjaminites men.

Religions in successive cultures have acted to reinforce the patriarchal reproductive paradigm, to ensure male control of female reproductive choice and the hyper-fertility of the religious community. While the Code of Hammurabi ordains drowning for adultery, but allows for forgiveness, Deuteronomic law invokes the cruel and unusual punishment of stoning:

22:20 But if this thing be true, and the tokens of virginity be not found for the damsel: Then they shall bring out the damsel to the door of her father's house, and the men of her city shall stone her with stones that she die.

22:23 If a damsel be betrothed unto an husband, and a man find her in the city, and lie with her; Then ye shall bring them both out unto the gate of that city, and ye shall stone them with stones that they die; the damsel, because she cried not, being in the city.

Islam has taken this homicidal tradition, which had centuries before been discontinued by the Jews, and applied it to Muslims as well:

**Narrated 'Abdullah bin Umar:** The Jews brought to the Prophet a man and a woman from among them who had committed adultery. The Prophet said to them, "How do you usually punish the one amongst you?" They replied, "We blacken their faces and beat them," He said, "You have told a lie! Bring here the Torah and recite it if you are truthful." So the Prophet ordered the two adulterers to be stoned to death, and they were stoned to death near the place where biers used to be placed near the Mosque. I saw her companion bowing over her so as to protect her from the stones.

To this day women suffer this diabolical form of torture and homicide at the hands of Muslim men, buried to their waists and slowly knocked to pieces. These crimes against women and against the sanctity of all humanity occur both in Sunni countries such as Saudi Arabia and in Shiite Iran. They are an unforgivable stain on the Muslim tradition, which has an endless river of blood of women on its hands throughout history. It is compounded by patriarchal tribal customs enshrined in the Quran and more restrictively in dubious hadith, that a woman is only half the value of a man in law and that women have to be veiled because their bodies are almost entirely sexual pudenda seductive enough to corrupt all men, to be confined to the home and sequestered by their male relatives to avoid any chance of them being impregnated. Honour killings abound if a woman so much as touches a man of her own choice.
Fig 7: Islam is unique among world religions for invoking violent and homicidal penalties for non-lethal and sometimes harmless offences to society, completely inconsistent with its claim to be a religion of peace. Left: Genocide and sexual slavery. Seven hundred Jews were beheaded in the souk of Medina, despite not actually betraying the Muslims to the Meccan Quraysh, and their womenfolk taken into sexual slavery, after Muhammad appointed a mortally wounded fighter as judge over their fates. Right: Both Shiite Iran and Sunni Afghanistan are among several Muslim countries that stone women to death for alleged adultery. Both apostasy and so-called 'crimes against God' incur the death penalty making it difficult or impossible for a Muslim to 'switch out'. Center: Muslim women are required to cover themselves, sometimes including their entire face, because Muslim culture fears unveiled women are too sexually attractive. They are sequestered and in many countries not allowed to associate socially without a male member of their family chaperoning them. The world needs to consider whether such homicidal crimes against humanity can be allowed to continue as an institutional manifestation of 'freedom of religion'.

This severity of repression of women and female reproductive choice has to be understood historically in glaring contrast to the fact that Mecca and its surrounding centers such as Taif were places of worship of the goddesses, al-Lat, Manat and al-Uzza. Meccan culture before Islam respected both religious diversity and women's status. This shows claims that Islam improved the lives of women to be a strategic deception. In fact women were killed or maimed for opposing the Muslim take over, as Nawal el Sadaawi in "The Naked Face of Eve" attests:

"Sarah was a famous slave singer who aimed her barbed words against the Moslems. She was among those whom Mahomet ordered to be executed on the day of his victorious entry into Mecca. In the region of El Nagir, it was recounted that some women had rejoiced when the Prophet died and Abu Bake, the first of the Caliphs, ordered their hands and feet to be cut off. Thus women who dared to give voice to their protest or opposition could be exposed to cruel punishment. Their hands might be cut off, or their teeth pulled out, or their tongues torn from their mouths. This last form of punishment was usually reserved for those who were singers. It was said of these women that they used to dye their hands with henna, brazenly display the seductions of their beauty, and beat time with their fingers on tambourines and drums in defiance of God, and in derision towards the rights of God and his Prophet. It was therefore necessary to cut off their hands and tear out their tongues".

Fig 7b: Women are less evident in the workforce in conservative Muslim countries than anywhere else in the world.

According to al-Tabari Muhammad had already murdered Om Kerfa (Mother of Kerfa), one of the most revered Meccan matriarchs who was torn in half by camels at the age of 90 for writing poetry ridiculing him:

"Mother of Kerfa married a prince of the tribe of Hathila and bore for him 13 children the first of whom was Kerfa by whom she is summed. All her children became leaders of their tribes. She was the dearest of all Arabs, and an example of honor and pride to them. It was said if two tribes fought and Mother of Kerfa sent her sholl on a spear that was displayed to both parties, then they would reconcile out of respect for her. She used to annoy the prophet with her
poetry so in the sixth year of the Hijra (638 AD) he sent Zaid son of Haritha on a military expedition to kill her in the most heinous of ways. For he tied her legs with ropes and tied each of the ropes to a camel so that she was split in two. She was an old woman when this happened and her head was severed as proof to all that she had died. "

Although Judaism still adheres to the biological reality that a person is a Jew by birthright only if their mother is Jewish, Jewish culture nevertheless has subjected women to severe ritual confinement. The second chapter of Genesis, although beginning in the Edenic garden of gatherer-hunter integration with nature, casts a shadow of sexual guilt over the entire female sex, because Eve - the mother of all living - enticed Adam to eat the forbidden fruit of the knowledge of good and evil, when assured by the serpent that it would make one wise, so that they both became conscious of carnal knowledge and covered themselves with fig leaves. Yahweh then withdraws the Tree of Life and shuts them out of primal paradise - "Thorns also and thistles shall it bring forth to thee; and thou shalt eat the herb of the field" - with woman to be ruled over by her husband and to go travail in the pain of childbirth. Nevertheless, the central command of God is "go forth and multiply".

A woman thus takes an intermediate position in the Commandments between a man's house and cattle:

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\text{Thou shalt not covet thy neighbour's house, thou shalt not covet thy neighbour's wife, nor his manservant, nor his maidservant, nor his ox, nor his ass, nor any thing that is thy neighbour's.}
\]

Note however that the commandment to honour one's parents is not simply a dictate for obedience to authority, but an insightful statement about how inter-generational consciousness engenders an enduring life process through the passage of the generations, central to this article's thesis:

\[
\text{Honour thy father and thy mother: that thy days may be long upon the land which the Lord thy God giveth thee.}
\]

Christianity has taken up on the theme of the Fall from Eden, to accuse women of being 'the devil's gateway', placing all humanity in the shadow of 'original sin', with women to be seen but not heard in the church, and priests of the Catholic tradition being required to be celibate men. It regards sex as purely to reproduce and that pleasure outside fertilization is sinful, and treats contraception as a crime against God. It has enforced monogamous marriage and outlawed divorce in the shadow of Jesus' statement: "Have ye not read, that he which made them at the beginning made them male and female - for this cause shall a man leave father and mother, and shall cleave to his wife: and they twain shall be one flesh? What therefore God hath joined together, let no man put asunder."

However this does not imply monogamy. Jewish midrash claims that Eve of Genesis 2 was Adam's second wife, while the woman made female with him in Genesis 1 was Lilith, who took flight when he insisted she take the subservient 'missionary' position.

These biased reproductive traditions extend to many other patriarchal cultures, from Hindu India, where wives were expected to throw themselves on their husband's funeral pyre in the rite of Suttee, and brides are regularly burned to death over the dowry, through China where women's feet were bound and a wife's principal task was to be subservient and produce a son for the family line, to the Warrior cultures of the Americas, where, among some tribes, such as the Yanomamo, up to 20% of women are forcibly abducted and have to bear the burden of hard physical work, and to countries from Egypt to Sierra Leone, where girls are genitally mutilated to cut off at the source their ability to enjoy sex to ensure they will remain faithful. An estimated 130 million women, averaging 6000 a day have undergone sexual mutilation.

![Image](image_url)

Fig 8: Left: Female genital mutilation in Muslim Egypt where 75% of women are mutilated, but it also extends to non-Muslim areas of Africa. Right: Bride burning in India. Contrast between ages of female burning victims in the UK and India, where there is a huge peak at marriageable age, shows the cumulative affect of bride burning, which involves around 25,000 deaths a year, a three times higher per-capita rate than the UK. Between 1994 and 2001 the proportion of burned women in post-mortem rises from 12% to 30%.
Electoral Democracy, Capitalism and Reproductive Conflict

The advent of democracy in Greece represented a fundamental change in this picture, in which the dominance of a single male leader prone to tyranny, became replaced by collective decision-making by a vote of the male bearers of arms defending a city state. This form of democracy was 'pure' in the sense that all members of the civic aristocracy participated collectively in all significant decision-making. But the females would remain excluded from it for millennia to come.

This development took place in a highly patriarchal culture where, despite the obvious resemblance of a woman's children to their mother as much as their father, the Greeks thought of women as simply fertile ground to lay exclusively male seed. There are two terms representing the capacity of human fertility to engender offspring, neither of which captures its essential truth. To the Greeks it was procreation, rather than co-creation, implying it is the only man who makes new life. Our scientific term reproduction is little better as it implies the offspring is a clonal reproduction of the parents, when each offspring is a unique genetic individual with half of each parent's genes, recombined in ways which have never occurred before. Without sexual recombination, complex organisms could never have evolved. Sexuality, far from being a betrayal of God's will, resulting in sinful mortality, is the most altruistic compromise in the entire history of conscious life. Rather than being parthenogenetic immortals, we exist as unique individuals whose biological fulfillment is to recombine, in fertility with our sexual partner, to create a new life form, merging aspects of each of our identities, in a new individual with their own autonomous will.

In England we can trace to origin of collective government to 1066, when after the conquest of England, William of Normandy established a feudal system, by which he sought the advice of a council of tenants-in-chief (a person who held land) and ecclesiastics before making laws. In 1215, the tenants-in-chief secured the Magna Carta from King John, which established that the king may not levy or collect any [new] taxes, save with the consent of his royal council, which gradually developed into a parliament.

From the 1400s England had an electoral franchise where only [male] property owners holding forty shillings or more could vote. After a suffragette campaign lasting from 1871, interrupted by the First World War, in 1918 a coalition government enfranchised women over the age of 30 who met minimum property qualifications. In 1928, the Conservative government gave the vote to all women over the age of 21. France instituted universal male suffrage abolishing all property requirements to allow men to vote in 1792. Ironically woman didn't get the vote in France until 1945 and in Switzerland women gained the vote in 1971 and in cantonal elections in Appenzell, which still follows a form of pure democracy, only in 1990, underscoring how deep and long the association between patriarchal dominance and democracy has been.

With the advent of modern democracies, in social revolutions stemming from the end of the Dark Ages, the Renaissance and the Age of Enlightenment, with the rise of merchant middle classes in the Industrial Revolution, this pure form of democracy became too unwieldy for governing a large national population. Democracy became a two-headed monster, on the one hand collectively egalitarian on election day, and on the other an archetype for male reproductive combat for the overwhelming majority of the time. Pure democracy gave way to the growth of executive governments ruled by politicians elected by a select group of male landowners and taxpaying merchants, resulting in the growth of dominant political parties, and the
rise of the two-party first past the post form of democracy. This form of two party politics became increasingly adversarial, with a major political divide between the collective socialist aims of the left, conflicting with the more hierarchical aims of the capitalist right as representative of elites, from the aristocracy to big business interests. Further to each side of the divide, we have totalitarian forms of dictatorship, from communism on the left, to fascism on the right.

Adversarial two-party democracy in effect became a realization of male reproductive combat rather than an evolutionary genetic paradigm. Characteristic of adversarial democracy is tyranny of the majority, where politicians play into the hands of a dominant majority to effectively deny large minorities any consideration in the running of the country, disenfranchising up to 50% of the population, or more if gerrymandering enables the election of a government with the support of less than half the electorate. By reducing the genetic paradigm of long-term survival to the reproductive contests of male animals crossing horns, political democracy has divested itself of the evolutionary survival paradigm and become concerned only with the short term Prisoners' Dilemma game of how to win the next election on a time scale of no more than 3 to 4 years, while doomed to coexist with its opponents to maintain a credible democratic system. Longer term considerations, such as climate change, global habitat destruction and the mass extinction of biodiversity become shelved in favour of short-term economic growth and populist issues which often play into a calculated social division perceived to further a given party's interests, such as law and order.

A clear indication of how this has come to model male reproductive conflicts, in contradiction to the notion of an informed electorate, comes from studies which show that, no matter the sex of the politician, or the voter, those with lower voices, indicating greater testosterone-based male reproductive vitality, gain between 60 and 80% of the vote when equivalent issues and indicators of trustworthiness are expressed in voices of varying pitch (Klofstad et al. 2015 Perceptions of Competence, Strength, and Age Influence Voters to Select Leaders with Lower-Pitched Voices doi:10.1371/journal.pone.0133779).

There are various ways of modifying the adversarial two-party system, including a variety of voting paradigms, from MMP, or mixed member proportional, where each elector gets a party vote as well as a vote for a reduced number of direct candidates, sometimes with an arbitrary party threshold such as 5% of the vote, to STV, or single transferable vote, where losing votes are able to be transferred to more leading candidates on the elimination of clear losers. MMP in particular serves to aid smaller parties getting members into parliament and fosters more frequent coalition governments, but also invokes more back room arrangements, sometimes producing a government which is a result of smaller parties who hold the balance of power being able to apply influence which becomes unrepresentative of the electorate. Social reproductive themes also enter here because MMP promotes the growth of coalitions in a manner reminiscent of the contrast between alpha male hierarchical dominance and the female coalition building characterized by both bonobos and human females protecting their interests against patriarchally dominant hierarchies. In the US and some other countries there have been attempts to mitigate the instability of adversarial democracy by having up to three chambers of government such as the US Congress, Senate and President, but these systems simply tend to complicate the process without alleviating it and lead to a cumbersome top-heavy government prone to corruption and back-room lobbying.

Further into the wings in either side of the political spectrum are other forms of government, including the one-party-states of communist and fascist governments. These sometimes mount a sham of election-holding but generally succumb to nepotistic government by a committee of cronies, or outright leadership by a dictator. While the West has taken centuries to unravel the connection between government and Christian religion to advance fundamental civil rights, many Muslim countries hanker after renewing the Caliphas stemming from the seventh century in a monolithic theocracy combining scripture (the Quran), the law (sharia) and the feudal state into one religious utopia, again of a totalitarian type. Such a system is designed to suppress all forms of dissent with concomitant lethal penalties such as death for apostasy. The Shiites of Iran, in protest against the historical unjustness of the Caliphs, have set up an alternative theocracy run by ayatollah's, fragmenting decision making into exclusive theological committees, whose powers ultimately flow to the supreme leader, rather than the elected president, effectively governing by force of a vigilante corps of republican guards. Winston Churchill's comment "It has been said that democracy is the worst form of government, except all those others that have been tried" stands as a reminder that, while electoral democracy is not ideal, it does hold the keys to our planetary future.

Capitalism, as a financial investment complement to democracy is based on company law. In effect each company, which is a collective investment by the shareholders as a body corporate, forms a mini-
democracy, with a general meeting of shareholders governed by a board of directors. Generally, like
electoral democracy, this is complemented by an executive branch handling the day-to-day operations,
governed by a CEO with a hierarchical line-management structure, accountable to the board as overall
policy-maker. The end result is that capitalism is a fragmented set of electoral democracies, where the
direction of operations is accountable solely to the shareholders, but neither to the national electorate, nor
in general to the workers, nor indeed to the potential affected parties including consumers and anyone who
might suffer collateral damage through accident or contamination as a result of company practices.

Fig 10: Bestial conflict for alpha-
male dominance between the
Democrat donkey and the
Republican elephant, while
Democracy plays chess with the
devil of capitalism.

All of the negative aspects of
business-as-usual, both locally
and globally, in terms of tragedy
of the commons, and winner-
take-all monopolization of
resources, come down to the
failure of company law to include
a wider contract of responsibility,
other than to regulation under
the law and accountability to the shareholders. The need for commercial secrecy and the capacity of the
executive branch to engage activities not even transparent to the shareholders underscores why and how
business-as-usual can become a corrupt exploitative predatory process in society at large. In turn
corporations strategically intervene in political democracy through lobbying, financing candidates and back
room influence, so that democratic government is frequently corrupted by the fragmenting expedient forces
of capitalism.

Another key flaw in both company law and electoral democracy is that neither process is genetically
cumulative. A company can thus exploit a resource, causing extensive collateral damage physically or
financially, gain windfall profits and then dissolve its operations to take up a new activity completely
unrelated to the previous one, or even declare bankruptcy and form a shell to be used for another purpose
altogether. Companies are also highly prone to take-over, disrupting their strategies and rationalizing their
resources. Highly successful operations are liable to be rapidly bought out by larger corporations to ensure
their strategic dominance, and failing enterprises with negative liquidity are frequently taken over for asset-
stripping. Under some older forms of company law the articles of association were complemented by a
memorandum which did set out the activities the company was incorporated to pursue, but current
legislation tends to have only a written constitution setting out the legal basis for the general meeting,
board and executive branch to convene, giving the company nill genetic identity. Evolutionary stability is
based on gradual cumulative genetic change. Neither electoral democracy nor comp
any law thus pass the
acid test for long-term viability as an evolutionarily stable strategy. This is the critical flaw that the world
needs to solve for a viable planetary future.

Medical Revolutions and the Divorce of Sexuality from Reproduction

A further factor resulting in a disconnection from the cumulative genetic basis of human society has been
the scientific revolution and its impact on human reproduction. Before the advent of the contraceptive pill
sexuality was closely tied to the reproductive process. Having sex at all was a risky process for a woman,
both because she could immediately become pregnant, and because the ongoing mores of traditional
societies in almost all parts of the planet, outside a few matriarchal societies, frowned on a single woman
becoming pregnant, and many had dire penalties for falling pregnant out of wedlock, such as honour
killings. In ancient Egypt, Greece, and Rome, pregnancy prevention was generally seen as a woman's
responsibility, and the only well documented contraception methods were female-controlled devices,
although women had discovered various means for avoiding pregnancy from herbal suppositories and
douches to forms of physical intervention at great risk to the person. The idea of blocking the cervix to
prevent pregnancy is thousands of years old. Various cultures have used cervix-shaped devices such as
Although glans-covering devices were used by the aristocracy in Asia before the 15th century, the first demographic record of population wide reproductive contraception occurred in 1666, when the English Birth Rate Commission attributed a recent downward fertility rate to use of "condons". From at least the 18th century, condom use was opposed in some legal, religious, and medical circles for essentially the same reasons that are given today: condoms reduce the likelihood of pregnancy, which some thought immoral or undesirable for the nation; they do not provide full protection against sexually transmitted infections, while belief in their protective powers was thought to encourage sexual promiscuity; and, they are not used consistently due to inconvenience, expense, or loss of sensation.

In the developed world, women who previously would have been assuming they would have a family and children by their early twenties, in a single generation began to seek life opportunities which didn't immediately tie them to the home, including academic and professional careers and occupations in senior management positions which meant they postponed pregnancy into their middle and late thirties. Suddenly medical science had to catch up with issues of maintaining fertility closer to menopause, including IVF and a host of technologies to keep fertility on hold such as frozen ovarian tissue.

Attitudes to sexuality in the developed world changed from primarily revolving around reproduction and the family, to issues of civil rights. Sexual and reproductive choice now became purely a question of social sexuality between consenting adults, leading to a new social mores where same-sex relationships have largely gained equivalent status to traditional reproductive heterosexual relationships in laws which ban discrimination on grounds of sexual orientation and have by degrees instituted civil unions and then gay marriages as legitimate equivalents of traditional marriage of a woman and a man. This has of course been met with consistent opposition from religious people and institutions but in the West these objections have been largely set aside in the interests of civil rights.

Over this period reproduction rates in the developed world have fallen precipitously, so that in a wide swathe of countries, from Italy (1.43) and Germany (1.36) to Taiwan (0.9) Korea (1.19) and Japan (1.41),
the reproduction rates have fallen far below the approximately 2.1 per 1000 women required to maintain the population at par in an era of medical science. Notably Italy and Japan both have inadequate provisions to support working and professional women having children. Contrast this with the US (2.06), and with UK (1.89) and Sweden (1.94) where there is adequate child care provisions for working women, with higher values in Muslim countries with an ethos of reproduction, Indonesia (2.6), Egypt (3.5), Saudi Arabia (3.8) and Gaza (4.24), where Muslim populations are exhorted to reproduce, and in Africa, where populations have traditionally depended on a high fertility rate to survive, Mali (6.1) and Niger (6.6).

Fig 12: Left: Fertility rates in selected countries. Right: Fertility rates as a function of GDP per capita.

Each medical advance in reproductive technology has come with potentially global side effects. The advent of ultrasound and genetic tests which can currently tell the sex 7 weeks after conception, has resulted in countless girl children aborted in India and China, both of which have a serious gender imbalance due to cultural factors which favour a boy child. Worldwide, the average sex ratio at birth is about 105 male births to every 100 female births. This compensates for a higher death rate in males from accident, homicide and disease common in mammal species, but in some age groups in areas of India and China the number exceeds 120.

In patriarchal societies, high born sons have strategic reproductive advantage, so boys are favoured. Low born families attempt to marry their daughters 'up' by forming an arranged marriage with a higher status family's son in a pattern called hypergamy. In India this has resulted in a bride's family having to pay a dowry to the grooms, giving girls of low born families a crippling disadvantage and resulting in bride burnings when the patriarchal in-laws dislike the new bride. In Arabic societies the situation is reversed and the groom pays a dowry to the bride, as a 'bride price'. This has the effect of making the bride a chattel of the husband. Hence Muslim men can divorce their wives simply by saying "I divorce you" three times - "talaq talaq talaq." In China a bride price of gifts to be bestowed to the bride's family also made the woman a possession of the man, although occasionally a dowry of clothing, furniture, or jewelry from the family of the bride was also given her for use in her new home.

Fig 13: Millions of girl children are estimated to have been killed since the advent of pre-natal sex-determination and the situation is clearly getting worse rather then better.
In India, cultural preferences stemming from the caste system, hypergamy and the female dowry have led people to favour sons across the board, leading to a surplus of males. In China there are 117 boys under 15 and in some age groups 122 boys for every 100 girls, consistent with 12-17% of all girls being killed at or before birth. In a study of clinics in Bombay, of 8,000 abortions, 7,997 were of female foetuses, leading to a move to ban ultra-sound for sexual differentiation. India has an under 15 sex ratio of 113 boys to 100 girls, with rates in Haryana and the Punjab rising to 126 and 135, consistent with 8% nationally and up to 30% female infanticide rate in the North West. Globally, 163 million girls have gone “missing” from the world’s population due to sex selective abortions in the last thirty years, according to the calculations of Mara Hvistendahl, author of ”Unnatural Selection”, resulting in men being unable to find sexual partners, and human trafficking of brides e.g. from countries neighbouring China.

At the same time Caesarian section rates have soared across the developed world far beyond the levels consistent with surgical need for the health of the mother or offspring and safe limits to ensure future human reproductive viability. In some countries less than half women are delivering naturally, leading to questions over the future viability of the human race, where mothers have traditionally had a high death rate because of delivering a large human infant's head.

![Fig 14: Left: Emergency and total Caesarian rates in selected countries with infant mortalities. Right: WHO 2010 survey of C-section rates with infant mortality rates shows two distinct phenomena, with newly developing countries having C-section rates below 10% and increasing C-section rates correlating strongly with reductions in infant mortality (-0.65) while developed countries have widely varying C-section rates which overall have a low correlation (0.14) with increasing infant mortality due to the greater risks of the procedure over natural birth. Compare the right hand chart with the previous fertility and GNP chart.](image)

Within Europe C-section rates vary between a low of 16.8% in Finland and a high of 52.2% in Cyprus. In Brazil over 50% of live births are now by C-section with 85% in private hospitals. In mid 2015 new rules have come into force there aimed at reducing the country’s high number of caesarean births. Experts say that a scarcity of maternity beds and wards equipped to deal with natural births means that for many women in Brazil, caesarean birth is seen as the best option. In Brazil’s body-conscious culture, where there is little information given about childbirth, there is also huge concern that natural birth can make women sexually unattractive. In a similar vein Mexico has stopped offering free baby formula in hospitals where only one in seven mothers breastfeed exclusively during the baby’s first six months in a country where drinking water is often contaminated.

In vitro fertilization (IVF) and pre-implantation genetic diagnosis (PGD) have become key reproductive breakthroughs to enable childless couples to become fertile and have a family, but they also have led to collateral implications. Many women are currently leaving having their first child so late that they need IVF, when had they had a child in their twenties it could have happened naturally. IVF has been accompanied by increased rates of birth defects from 6.6% to 9%, although those developing normally do as well or even slightly better than natural conceptions for intelligence, possibly because the IVF parents come from a
higher achieving population to start with. There are also questions over the ability of the offspring or their descendents to have children naturally, when IVF is accompanied by intra-cytoplasmic sperm injection (ICSI) used when prospective fathers don't have adequately motile sperm, where several imprinting and other anomalies associated with birth defects have also been discovered. IVF has also resulted in an epidemic of multiple births due to the hormonal treatments, leading to issues of fetal growth and post-natal development. Egg-donating and harvesting immature eggs can lead to chromosomal and other genetic defects, although these and other similar issues can be reduced with improved genetic testing techniques. Three-parent embryos have also been generated using a third party's mitochondria to overcome mitochondrial insufficiency diseases in offspring raising further genetic questions.

The failure of women to reproduce early enough has also led to a spectrum of new reproductive technologies, including freezing ovarian tissue to keep, to be re-transplanted in mid life when a woman feels she has the time to conceive. We are also seeing womb transplants, and reproductive technology seeking to enable men to produce eggs or women to produce sperm, so that people of any sexual orientation can reproduce. The implications of this are a divestment of our intrinsic sexual complementarity, in favour of a technological android uniformity.

![Fig 15: Left: Twin infant macaques whose genomes were modified within three different genes: one that regulates metabolism, another that regulates immune cell development and a third that regulates stem cells and sex determination. The Chinese researchers injected single-cell macaque embryos with CRISPR RNAs. Center: The potential barriers of sexual imprinting have already have been breached with the successful production of mice born without fathers through manipulation of oocyte imprinting, one raised to adulthood and bearing live offspring. Right: Using stem cells, a Japanese team has created healthy eggs that, once fertilised, grow into normal mouse pups.

The advent of CRISPR technology, which can make relatively precise changes in given genes has inaugurated an expectation that couples will soon be able to genetically edit the genome of their potential offspring to enhance desirable and remove undesirable traits. While inherited genetic conditions like cystic fibrosis, muscular dystrophies or Tay-Sachs syndrome can already be avoided by genetic testing combined with IVF, the possibility of genetic editing at will presents a fundamental challenge to the entire evolutionary paradigm of the human species. Because gene regulatory systems are highly interactive and many traits come from a combined effects of many genes, it is almost impossible to know, when you try to change one characteristic, that it won't have a covert affect on another. For example editing to avoid schizophrenia might adversely affect intellectual creativity.

There is a eugenic risk that seemingly undesirable characteristics, from same sex orientation, to social dissent, might be edited out by utopian cultures aiming to create a 'brave new world'. Genetic cloning could become an irresistible temptation in some societies, leading to technological dystopias liable to catastrophic failure through a computational error, or an accumulation of irreversible changes, later leading to loss of natural vitality and resilience. The fecundity of the biosphere results from the fact that it is a data 'cloud' of genetic algorithms independently computing in parallel through reproduction, cross-fertilization and evolution in every individual organism, from a virus particle to a human organism.

The genetic diversity and algorithmic computation rate through mutation of the world's bacteria is orders of magnitude higher than our own which nevertheless exceeds that of the world's fastest supercomputer. To give a very rough idea of the computing power of the combined bacterial genome alone, taking into account bacterial soil densities (\(-10^9/g\)), effective surface area (\(-10^{18} cm^2\)), genome sizes (\(-10^6\)), combined reproduction and mutation rates (\(-10^{-3}/s\)) gives a combined presentation rate of new combinations of up to $10^{26}$ bits per second, roughly $10^{15}$ times greater than the current fastest computer at 2 petaflops or about $10^{17}$ bit ops per second. Corresponding rates for complex life forms would be much lower, at around $10^{7}$ per second because they are fewer in total number and have lower reproduction rates, but they are still vying with the computation rates of the fastest supercomputers on earth.
Religion, Fertility, Migration and the Planetary Future

An outstanding feature of monotheistic religions is the command to go forth and multiply. Islam and Christianity in particular have an ongoing pattern of maintaining reproduction of the faithful with the avowed intention of populating the planet to fulfill their utopian destinies of world dominion. Contrasting with this, non-religious or unaffiliated people tend to respond more to social circumstances, including a world that is increasingly overpopulated, thus reducing their fertility, both for ethical reasons and to pursue other creative avenues and professional careers. This raises a fundamental question of futures. If established religions continue to sponsor high fertility rates, how will the world's population look in 2050 or 2100 and how will this affect the world's capacity to address its long-term survival?

Of all the religions, Islam has the highest fertility rate of 3.1, followed by Christians 2.7 Hindus and Jews 2.3 and 2.4, just below the world average of 2.5, with all other groups, including Buddhists 1.6 and unaffiliated 1.7 well below replacement rates. Thus between 2010 and 2050 the world Muslim population is expected to grow by 73% while the Christian population will grow by only 35% due to lower fertility and higher switching out, while the unaffiliated will grow by only 9% and the number of Buddhists, who have a philosophy of physical renunciation, will actually shrink by 3%. Even in sub-Saharan Africa, where fertility rates are the highest, the Muslim rate of 5.6 is in self-serving excess of the total very high rate of 4.8.

Given laws of exponential growth, if there is no change in these circumstances, over time this will result in eventual domination of the world population by Muslims, and the unaffiliated will increasingly become a small ineffective minority. The Pew research does predict a small decline in Muslim fertility consistent with falling fertility rates being a function of development, but not enough to alter the overall trends.

Given the difficulty desert religions have respecting the natural world and the need to preserve natural life as a sacred process, this specter gives cause for concern. Although it is reassuring that Christian leaders including both the current Catholic Pope, in a major encyclical "On Care for our Common Home", and a day later the Anglicans in the "Lambeth Declaration on Climate Change" and two months later a group of Muslim scholars in the "Islamic Declaration on Global Climate Change" have in 2015 put forward moral positions that seek to reduce, or terminate the use of fossil fuels, and to act to preserve the natural biosphere and its living diversity. This is particularly relevant for Muslim countries, which are divided between big oil producers and emitters such as Saudi Arabia and Indonesia and those threatened by rising oceans such as Bangla Desh and areas of Pakistan. However these recommendations clearly do not extend to responsible measures for population control on the part of either religion.

This raises the question whether the world needs a new ethical covenant that can embrace all humanity, religious and non-religious alike, based on the needs to balance population and fertility between competing religious followings and the unaffiliated, and to cherish and replenish the Earth and safeguard our evolutionary future.

Bearing in mind many Christians, despite living in the scientific age, still tend to reject the scientific evidence for evolution and cling to the sabbatical creation of Genesis as gospel truth, even though it charmingly, but impossibly, creates the plants before the Sun and Moon, in the guise of creationism and its phoenix love-child 'intelligent design', it is difficult to
see how these differing views of the universe and our role in it can be realized without a day of reckoning on the part of Christian fundamentalism. This view is reinforced by a 2017 study (Schnabel L, Sean Bock S (2017) The Persistent and Exceptional Intensity of American Religion: A Response to Recent Research Sociological Science 4 686-700 doi:10.15195/v4.a28.) indicating that, rather than religion fading into irrelevance as the secularization thesis would suggest, intense religion - strong affiliation, very frequent practice, literalism, and evangelicalism - is persistent and, in fact, only moderate religion is on the decline in the United States, leading to increasing polarization.

To get a picture of the potential future through to 2050 in terms of world population and religious following, the Pew Research Center has published a prospective study The Future of World Religions: Population Growth Projections, 2010-2050 (www.pewforum.org/files/2015/03/PF_15.04.02_ProjectionsFullReport.pdf). In fig 17 is shown the global prediction for religious following in 2050. While Islam will be just overtaking Christianity around 30%, the share of the unaffiliated, including non-religious, has shrunk and would have shrunk even further had not there been a degree of switching from Christianity to unaffiliated to compensate for the low unaffiliated fertility rate. One should also note that switching rates out of Islam are much lower than for Christianity, because Islam invokes the death penalty for apostasy. In considering ethical questions of freedom of religion as a constitutional right, one could ask whether religions should also be required by the societies in which they are embedded to respect universal values of freedom of belief and worship as part of coming to terms with the closing circle of a finite planet.

Fig 17: Predictions of the population changes between 2010 and 2050 (Pew Research Institute) show the largest growth will be among Muslims, followed by Christians. The Muslim population worldwide will overtake the Christian population by a small margin due to higher fertility rates. Unaffiliated will shrink worldwide indicating a growth of religious believers despite the scientific age partly due to low fertility rates, compensated for by switching from Christian to unaffiliated. Muslims will however remain in a clear minority in every region except their home territory of the Middle East and North Africa, although they will grow to form a substantial minority of Sub-Saharan Africa, and if migration from the Middle East continues to escalate, possibly in Europe (Pew).

Nevertheless, at least through to 2050, the predictions suggest that Islam will remain a minority, albeit growing religion in all regions of the planet except for the Muslim heartland of the Middle East and North Africa, although both sub-Saharan Africa and Europe may find Muslim minorities reaching a critical level in terms of maintaining existing cultures in a non-violent atmosphere.

To elucidate the situation in more detail, fig 18 examines the predicted population changes in Europe and North America to assess the impact of changing Muslim and Christian populations on the future of Western culture. In Europe, Muslim fertility rates are significantly higher than the national average and in Norway and Finland exceed the worldwide Muslim average, but in Europe the contribution from migration is larger than that due to fertility alone. Taken together these imply that the Muslim population of Europe as a whole will grow from around 5% to 10% between 2010 and 2050, but this figure could become higher due to the steep rises in refugee migration, which has climbed by 175% or 2.75 times the 2014 level in 2015. If the Pew prediction based on 2010 rates were to double, this would carry the Muslim population of Europe to around 12%, with some countries such as Sweden experiencing even more rapid increases partly due to
their lower population density.

In North America, as of 2010, the Muslim population only accounted for one percent of the whole and the Christian population is predicted to grow even larger, underlying that in the US, Christian fundamentalism is more of a concern for establishing viable future policies to protect the living planet. Latin America likewise has almost exclusively Christian influences to contend with, exemplified in attitudes to contraception (which however do not seem to be seriously affecting fertility rates there) and abortion even when the health of the mother is threatened or the fetus is known to have serious abnormalities.

Running the simulation out to 2100, to keep our study comparable with the predictions of figs 1 and 3, on the basis that relative fertility rates remain stable but absolute rates fall across the board in line with the predicted trends of fig 3, we would arrive at the picture in fig 19. Muslims now form around 35% of a world population of 11.5 billion, while Christians represent 31%, although their very different regional distributions will mean they retain their traditional spheres of influence. Europe would have around 14.4% Muslims, or around 17.5% if migration if war in the Middle East has doubled the Pew 2010 estimates, but North America only 4%. Unaffiliated would have fallen to a strategically eclipsed 11% from 16% at present, but grow from 25% at present in North America to 33% and in Europe from 15% to 27%, making both major centers of Western Culture more secular than at present due to switching, However sub-Saharan Africa would have a continent-wide Muslim population of 38%, which could see several African countries, including Nigeria and potentially Tanzania becoming Muslim majority. The migration rate into Europe has
since fallen significantly: “Two years after more than a million people entered the EU, mostly fleeing war in the Middle East and poverty in Africa, the IOM recorded 171,635 arrivals by boat in 2017. The 2016 figure was 363,504 (Half as many migrants landed in Europe in 2017 as 2016: IOM Reuters 5 Jan 2018).

2035, and Islam will be the world's largest religion by 2075, due to a large population increase in Sub-Saharan Africa, driven by higher Muslim and to a lesser extent Christian birth rates, rather than religious switching, with a "birth dearth" among the unaffiliated, most of whom live in Asia and Pacific regions.

Conclusions

Neither religions, nor totalitarian hegemonies, nor electoral democracy, nor venture capitalism are well suited to engendering long-term future strategies and concerted human action to ensure the major global problems of population, poverty, climate change, habitat destruction, and loss of species and genetic diversity, let alone demilitarization and world peace, are addressed, because political, religious and commercial and investment paradigms lack the cumulative genetic evolutionary principles on which the stability of the Earth and its biosphere have depended throughout its 3.5 billion year lifetime.

While the world is clearly entering a phase of deleterious eco-crisis and over-population, which will stress available food and energy resources, and threaten natural habitats disrupted for agricultural and farming, as well as mining and exploitation of natural resources, the world's major religions are continuing to apply self-interest to endeavour to achieve demographic ascendency on a global footing, while at the same time asserting absolute edicts and prescribing archaic scriptural assertions as revealed truths which are wholly inconsistent with the evolutionary realities of the human species and detrimental to our future survival.

We urgently need to invest in ethical, social and political processes that respect the passage of the generations, and the genetic and fertility principles upon which conscious life depends. We need to invest in forms of government and decision-making which contain cumulative principles which will both generate a capacity to value long-term investment for the future of life and enable social change and cultural evolution to have a truly genetic character, as effective for long-term stability and survival as molecular genetics are.

All people and particularly unaffiliated and non-religious people, need to respect that fertility is a sacred process through which we all become conscious beings, that childbirth is an essential component of the passage of the generations and that, even in an era of overpopulation, we can't afford to leave producing the next generation to others in the name of prescriptive religions, and the unintelligent forces of social dereliction, and material disadvantage.

Central to this is protecting the rights of women to reproductive, social and educational choice and providing adequate social, financial and contractual employment provisions to enable women to have children without compromising their professional or entrepreneurial careers. We all have a responsibility as members of the human race to ensure, through our own fertility, that the human species prospers genetically and continues to flower in intelligence, compassion and consciousness, through those who have the capacity and insight to make the world a better place, also taking responsibility to ensure they produce sufficient offspring to enable the next generation do the same.

This is the ultimate test and end point of the scientific revolution, and is the fulfillment of the sense of living purpose religious traditions try to lay exclusive claim to, in which an ethic of living diversity and its protection must needs emerge and assert a natural morality for justice to prevail. Science has provided us with the knowledge to understand, in confounding detail, overthrowing all our preconceived assumptions, how the natural processes in the universe actually work and come together to enable the continuity of life. It is now up to us to engender a moral and ethical movement that can function to cherish and replenish the Earth throughout our generations to come.