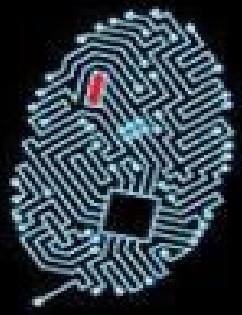
Yuval Noah Harari

New York Times Bestselling Author of *Sapiens*

"*Homo Deus* will shock you. It will entertain you. Above all, it will make you think in ways you had not thought before."
—DANIEL KAHNEMAN



Homo Deus

A Brief History of Tomorrow

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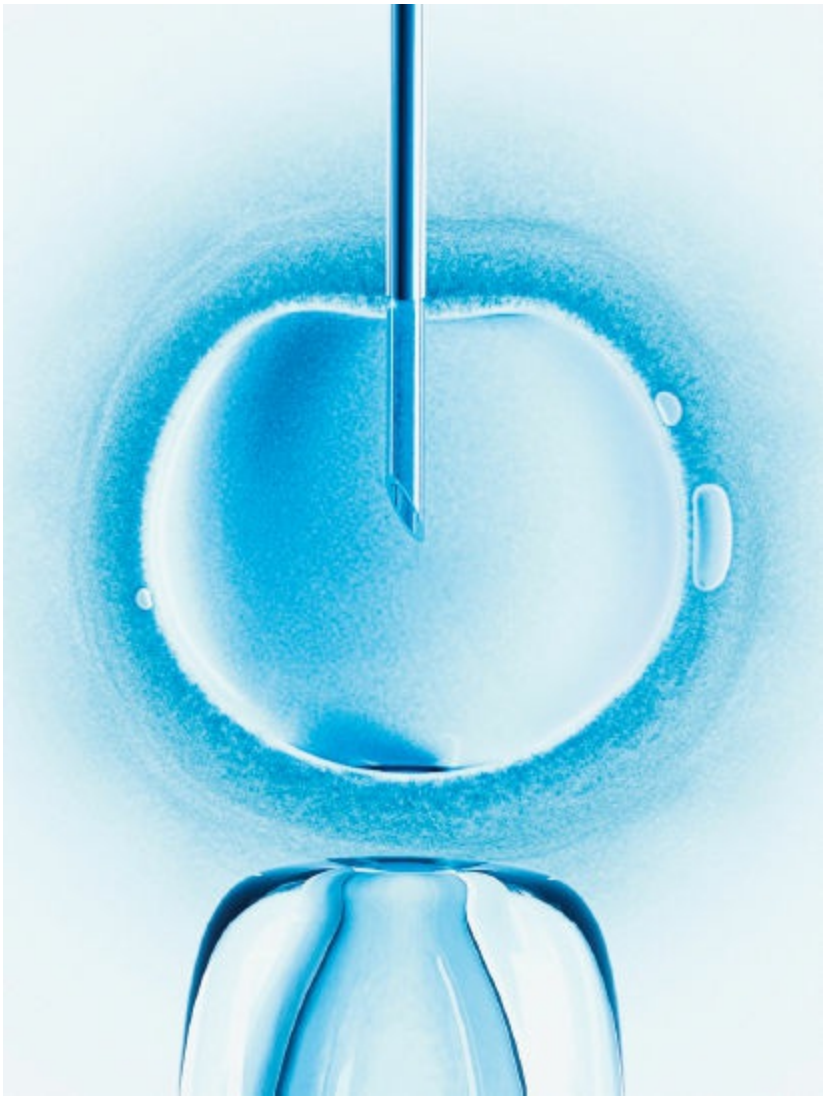
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Dedication

To my teacher, S. N. Goenka (1924–2013),
who lovingly taught me important things.

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In vitro fertilisation: mastering creation.

Computer artwork © KTSDESIGN/Science Photo Library.

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The New Human Agenda

At the dawn of the third millennium, humanity wakes up, stretching its limbs and rubbing its eyes. Remnants of some awful nightmare are still drifting across its mind. 'There was something with barbed wire, and huge mushroom clouds. Oh well, it was just a bad dream.' Going to the bathroom, humanity washes its face, examines its wrinkles in the mirror, makes a cup of coffee and opens the diary. 'Let's see what's on the agenda today.'

For thousands of years the answer to this question remained unchanged. The same three problems preoccupied the people of twentieth-century China, of medieval India and of ancient Egypt. Famine, plague and war were always at the top of the list. For generation after generation humans have prayed to every god, angel and saint, and have invented countless tools, institutions and social systems – but they continued to die in their millions from starvation, epidemics and violence. Many thinkers and prophets concluded that famine, plague and war must be an integral part of God's cosmic plan or of our imperfect nature, and nothing short of the end of time would free us from them.

Yet at the dawn of the third millennium, humanity wakes up to an amazing realisation. Most people rarely think about it, but in the last few decades we have managed to rein in famine, plague and war. Of course, these problems have not been completely solved, but they have been transformed from incomprehensible and uncontrollable forces of nature into manageable challenges. We don't need to pray to any god or saint to rescue us from them. We know quite well what needs to be done in order to prevent famine, plague and war – and we usually succeed in doing it.

True, there are still notable failures; but when faced with such failures we no longer shrug our shoulders and say, 'Well, that's the way things work in our imperfect world' or 'God's will be done'. Rather, when famine, plague or war break out of our control, we feel that somebody must have screwed up, we set up a commission of inquiry, and promise ourselves that next time we'll do better. And it actually works. Such calamities indeed happen less and less often. For the first time in history, more people die today from eating too much than from eating too little; more people die from old age than from infectious diseases; and more people commit suicide than are killed by soldiers, terrorists and criminals combined. In the early twenty-first century, the average human is far more likely to die from bingeing at McDonald's than from drought, Ebola or an al-Qaeda attack.

Hence even though presidents, CEOs and generals still have their daily schedules full of economic crises and military conflicts, on the cosmic scale of history humankind can lift its eyes up and start looking towards new horizons. If we are indeed bringing famine, plague and war under control, what will replace them at the top of the human agenda? Like firefighters in a world without fire, so humankind in the twenty-first century needs to ask itself an unprecedented question: what are we going to do with ourselves? In a healthy, prosperous and harmonious world, what will demand our attention and ingenuity? This question becomes doubly urgent given the immense new powers that biotechnology and information technology are providing us with. What will we do with all that

power?

Before answering this question, we need to say a few more words about famine, plague and war. The claim that we are bringing them under control may strike many as outrageous, extremely naïve, or perhaps callous. What about the billions of people scraping a living on less than $2 a day? What about the ongoing AIDS crisis in Africa, or the wars raging in Syria and Iraq? To address these concerns, let us take a closer look at the world of the early twenty-first century, before exploring the human agenda for the coming decades.

The Biological Poverty Line

Let's start with famine, which for thousands of years has been humanity's worst enemy. Until recently most humans lived on the very edge of the biological poverty line, below which people succumb to malnutrition and hunger. A small mistake or a bit of bad luck could easily be a death sentence for an entire family or village. If heavy rains destroyed your wheat crop, or robbers carried off your goat herd, you and your loved ones may well have starved to death. Misfortune or stupidity on the collective level resulted in mass famines. When severe drought hit ancient Egypt or medieval India, it was not uncommon that 5 or 10 per cent of the population perished. Provisions became scarce; transport was too slow and expensive to import sufficient food; and governments were far too weak to save the day.

Open any history book and you are likely to come across horrific accounts of famished populations, driven mad by hunger. In April 1694 a French official in the town of Beauvais described the impact of famine and of soaring food prices, saying that his entire district was now filled with 'an infinite number of poor souls, weak from hunger and wretchedness and dying from want, because, having no work or occupation, they lack the money to buy bread. Seeking to prolong their lives a little and somewhat to appease their hunger, these poor folk eat such unclean things as cats and the flesh of horses flayed and cast onto dung heaps. [Others consume] the blood that flows when cows and oxen are slaughtered, and the offal that cooks throw into the streets. Other poor wretches eat nettles and weeds, or roots and herbs which they boil in water.'[1]

Similar scenes took place all over France. Bad weather had ruined the harvests throughout the kingdom in the previous two years, so that by the spring of 1694 the granaries were completely empty. The rich charged exorbitant prices for whatever food they managed to hoard, and the poor died in droves. About 2.8 million French – 15 per cent of the population – starved to death between 1692 and 1694, while the Sun King, Louis XIV, was dallying with his mistresses in Versailles. The following year, 1695, famine struck Estonia, killing a fifth of the population. In 1696 it was the turn of Finland, where a quarter to a third of people died. Scotland suffered from severe famine between 1695 and 1698, some districts losing up to 20 per cent of their inhabitants.[2]

Most readers probably know how it feels when you miss lunch, when you fast on some religious holiday, or when you live for a few days on vegetable shakes as part of a new wonder diet. But how does it feel when you haven't eaten for days on end and you have no clue where to get the next morsel of food? Most people today have never experienced this excruciating torment. Our ancestors, alas, knew it only too well. When they cried to God, 'Deliver us from famine!', this is what they had in mind.

During the last hundred years, technological, economic and political developments have created an increasingly robust safety net separating humankind from the biological poverty line. Mass famines

still strike some areas from time to time, but they are exceptional, and they are almost always caused by human politics rather than by natural catastrophes. In most parts of the planet, even if a person has lost his job and all of his possessions, he is unlikely to die from hunger. Private insurance schemes, government agencies and international NGOs may not rescue him from poverty, but they will provide him with enough daily calories to survive. On the collective level, the global trade network turns droughts and floods into business opportunities, and makes it possible to overcome food shortages quickly and cheaply. Even when wars, earthquakes or tsunamis devastate entire countries, international efforts usually succeed in preventing famine. Though hundreds of millions still go hungry almost every day, in most countries very few people actually starve to death.

Poverty certainly causes many other health problems, and malnutrition shortens life expectancy even in the richest countries on earth. In France, for example, 6 million people (about 10 per cent of the population) suffer from nutritional insecurity. They wake up in the morning not knowing whether they will have anything to eat for lunch; they often go to sleep hungry; and the nutrition they do obtain is unbalanced and unhealthy – lots of starch, sugar and salt, and not enough protein and vitamins.[3] Yet nutritional insecurity isn't famine, and France of the early twenty-first century isn't France of 1694. Even in the worst slums around Beauvais or Paris, people don't die because they have not eaten for weeks on end.

The same transformation has occurred in numerous other countries, most notably China. For millennia, famine stalked every Chinese regime from the Yellow Emperor to the Red communists. A few decades ago China was a byword for food shortages. Tens of millions of Chinese starved to death during the disastrous Great Leap Forward, and experts routinely predicted that the problem would only get worse. In 1974 the first World Food Conference was convened in Rome, and delegates were treated to apocalyptic scenarios. They were told that there was no way for China to feed its billion people, and that the world's most populous country was heading towards catastrophe. In fact, it was heading towards the greatest economic miracle in history. Since 1974 hundreds of millions of Chinese have been lifted out of poverty, and though hundreds of millions more still suffer greatly from privation and malnutrition, for the first time in its recorded history China is now free from famine.

Indeed, in most countries today overeating has become a far worse problem than famine. In the eighteenth century Marie Antoinette allegedly advised the starving masses that if they ran out of bread, they should just eat cake instead. Today, the poor are following this advice to the letter. Whereas the rich residents of Beverly Hills eat lettuce salad and steamed tofu with quinoa, in the slums and ghettos the poor gorge on Twinkie cakes, Cheetos, hamburgers and pizza. In 2014 more than 2.1 billion people were overweight, compared to 850 million who suffered from malnutrition. Half of humankind is expected to be overweight by 2030.[4] In 2010 famine and malnutrition combined killed about 1 million people, whereas obesity killed 3 million.[5]

Invisible Armadas

After famine, humanity's second great enemy was plagues and infectious diseases. Bustling cities linked by a ceaseless stream of merchants, officials and pilgrims were both the bedrock of human civilisation and an ideal breeding ground for pathogens. People consequently lived their lives in ancient Athens or medieval Florence knowing that they might fall ill and die next week, or that an

epidemic might suddenly erupt and destroy their entire family in one swoop.

The most famous such outbreak, the so-called Black Death, began in the 1330s, somewhere in east or central Asia, when the flea-dwelling bacterium *Yersinia pestis* started infecting humans bitten by the fleas. From there, riding on an army of rats and fleas, the plague quickly spread all over Asia, Europe and North Africa, taking less than twenty years to reach the shores of the Atlantic Ocean. Between 75 million and 200 million people died – more than a quarter of the population of Eurasia. In England, four out of ten people died, and the population dropped from a pre-plague high of 3.7 million people to a post-plague low of 2.2 million. The city of Florence lost 50,000 of its 100,000 inhabitants.[6]



Medieval people personified the Black Death as a horrific demonic force beyond human control or comprehension.

The Triumph of Death, *c*.1562, Bruegel, Pieter the Elder © The Art Archive/Alamy Stock Photo.

The authorities were completely helpless in the face of the calamity. Except for organising mass prayers and processions, they had no idea how to stop the spread of the epidemic – let alone cure it. Until the modern era, humans blamed diseases on bad air, malicious demons and angry gods, and did not suspect the existence of bacteria and viruses. People readily believed in angels and fairies, but they could not imagine that a tiny flea or a single drop of water might contain an entire armada of deadly predators.



The real culprit was the minuscule *Yersinia pestis* bacterium.

© NIAID/CDC/Science Photo Library.

The Black Death was not a singular event, nor even the worst plague in history. More disastrous epidemics struck America, Australia and the Pacific Islands following the arrival of the first Europeans. Unbeknown to the explorers and settlers, they brought with them new infectious diseases against which the natives had no immunity. Up to 90 per cent of the local populations died as a result.[7]

On 5 March 1520 a small Spanish flotilla left the island of Cuba on its way to Mexico. The ships carried 900 Spanish soldiers along with horses, firearms and a few African slaves. One of the slaves, Francisco de Eguía, carried on his person a far deadlier cargo. Francisco didn't know it, but somewhere among his trillions of cells a biological time bomb was ticking: the smallpox virus. After Francisco landed in Mexico the virus began to multiply exponentially within his body, eventually bursting out all over his skin in a terrible rash. The feverish Francisco was taken to bed in the house of a Native American family in the town of Cempoallan. He infected the family members, who infected the neighbours. Within ten days Cempoallan became a graveyard. Refugees spread the disease from Cempoallan to the nearby towns. As town after town succumbed to the plague, new waves of terrified refugees carried the disease throughout Mexico and beyond.

The Mayas in the Yucatán Peninsula believed that three evil gods – Ekpetz, Uzannkak and Sojakak – were flying from village to village at night, infecting people with the disease. The Aztecs blamed it on the gods Tezcatlipoca and Xipe, or perhaps on the black magic of the white people. Priests and doctors were consulted. They advised prayers, cold baths, rubbing the body with bitumen and smearing squashed black beetles on the sores. Nothing helped. Tens of thousands of corpses lay rotting in the streets, without anyone daring to approach and bury them. Entire families perished within a few days, and the authorities ordered that the houses were to be collapsed on top of the bodies. In some settlements half the population died.

In September 1520 the plague had reached the Valley of Mexico, and in October it entered the gates of the Aztec capital, Tenochtitlan – a magnificent metropolis of 250,000 people. Within two months at least a third of the population perished, including the Aztec emperor Cuitláhuac. Whereas in March 1520, when the Spanish fleet arrived, Mexico was home to 22 million people, by December only 14 million were still alive. Smallpox was only the first blow. While the new Spanish masters were busy

enriching themselves and exploiting the natives, deadly waves of flu, measles and other infectious diseases struck Mexico one after the other, until in 1580 its population was down to less than 2 million.[8]

Two centuries later, on 18 January 1778, the British explorer Captain James Cook reached Hawaii. The Hawaiian islands were densely populated by half a million people, who lived in complete isolation from both Europe and America, and consequently had never been exposed to European and American diseases. Captain Cook and his men introduced the first flu, tuberculosis and syphilis pathogens to Hawaii. Subsequent European visitors added typhoid and smallpox. By 1853, only 70,000 survivors remained in Hawaii.[9]

Epidemics continued to kill tens of millions of people well into the twentieth century. In January 1918 soldiers in the trenches of northern France began dying in their thousands from a particularly virulent strain of flu, nicknamed 'the Spanish Flu'. The front line was the end point of the most efficient global supply network the world had hitherto seen. Men and munitions were pouring in from Britain, the USA, India and Australia. Oil was sent from the Middle East, grain and beef from Argentina, rubber from Malaya and copper from Congo. In exchange, they all got Spanish Flu. Within a few months, about half a billion people – a third of the global population – came down with the virus. In India it killed 5 per cent of the population (15 million people). On the island of Tahiti, 14 per cent died. On Samoa, 20 per cent. In the copper mines of the Congo one out of five labourers perished. Altogether the pandemic killed between 50 million and 100 million people in less than a year. The First World War killed 40 million from 1914 to 1918.[10]

Alongside such epidemical tsunamis that struck humankind every few decades, people also faced smaller but more regular waves of infectious diseases, which killed millions every year. Children who lacked immunity were particularly susceptible to them, hence they are often called 'childhood diseases'. Until the early twentieth century, about a third of children died before reaching adulthood from a combination of malnutrition and disease.

During the last century humankind became ever more vulnerable to epidemics, due to a combination of growing populations and better transport. A modern metropolis such as Tokyo or Kinshasa offers pathogens far richer hunting grounds than medieval Florence or 1520 Tenochtitlan, and the global transport network is today even more efficient than in 1918. A Spanish virus can make its way to Congo or Tahiti in less than twenty-four hours. We should therefore have expected to live in an epidemiological hell, with one deadly plague after another.

However, both the incidence and impact of epidemics have gone down dramatically in the last few decades. In particular, global child mortality is at an all-time low: less than 5 per cent of children die before reaching adulthood. In the developed world the rate is less than 1 per cent.[11] This miracle is due to the unprecedented achievements of twentieth-century medicine, which has provided us with vaccinations, antibiotics, improved hygiene and a much better medical infrastructure.

For example, a global campaign of smallpox vaccination was so successful that in 1979 the World Health Organization declared that humanity had won, and that smallpox had been completely eradicated. It was the first epidemic humans had ever managed to wipe off the face of the earth. In 1967 smallpox had still infected 15 million people and killed 2 million of them, but in 2014 not a single person was either infected or killed by smallpox. The victory has been so complete that today the WHO has stopped vaccinating humans against smallpox.[12]

Every few years we are alarmed by the outbreak of some potential new plague, such as SARS in 2002/3, bird flu in 2005, swine flu in 2009/10 and Ebola in 2014. Yet thanks to efficient counter-

measures these incidents have so far resulted in a comparatively small number of victims. SARS, for example, initially raised fears of a new Black Death, but eventually ended with the death of less than 1,000 people worldwide.[13] The Ebola outbreak in West Africa seemed at first to spiral out of control, and on 26 September 2014 the WHO described it as 'the most severe public health emergency seen in modern times'.[14] Nevertheless, by early 2015 the epidemic had been reined in, and in January 2016 the WHO declared it over. It infected 30,000 people (killing 11,000 of them), caused massive economic damage throughout West Africa, and sent shockwaves of anxiety across the world; but it did not spread beyond West Africa, and its death toll was nowhere near the scale of the Spanish Flu or the Mexican smallpox epidemic.

Even the tragedy of AIDS, seemingly the greatest medical failure of the last few decades, can be seen as a sign of progress. Since its first major outbreak in the early 1980s, more than 30 million people have died of AIDS, and tens of millions more have suffered debilitating physical and psychological damage. It was hard to understand and treat the new epidemic, because AIDS is a uniquely devious disease. Whereas a human infected with the smallpox virus dies within a few days, an HIV-positive patient may seem perfectly healthy for weeks and months, yet go on infecting others unknowingly. In addition, the HIV virus itself does not kill. Rather, it destroys the immune system, thereby exposing the patient to numerous other diseases. It is these secondary diseases that actually kill AIDS victims. Consequently, when AIDS began to spread, it was especially difficult to understand what was happening. When two patients were admitted to a New York hospital in 1981, one ostensibly dying from pneumonia and the other from cancer, it was not at all evident that both were in fact victims of the HIV virus, which may have infected them months or even years previously.[15]

However, despite these difficulties, after the medical community became aware of the mysterious new plague, it took scientists just two years to identify it, understand how the virus spreads and suggest effective ways to slow down the epidemic. Within another ten years new medicines turned AIDS from a death sentence into a chronic condition (at least for those wealthy enough to afford the treatment).[16] Just think what would have happened if AIDS had erupted in 1581 rather than 1981. In all likelihood, nobody back then would have figured out what caused the epidemic, how it moved from person to person, or how it could be halted (let alone cured). Under such conditions, AIDS might have killed a much larger proportion of the human race, equalling and perhaps even surpassing the Black Death.

Despite the horrendous toll AIDS has taken, and despite the millions killed each year by long-established infectious diseases such as malaria, epidemics are a far smaller threat to human health today than in previous millennia. The vast majority of people die from non-infectious illnesses such as cancer and heart disease, or simply from old age.[17] (Incidentally cancer and heart disease are of course not new illnesses – they go back to antiquity. In previous eras, however, relatively few people lived long enough to die from them.)

Many fear that this is only a temporary victory, and that some unknown cousin of the Black Death is waiting just around the corner. No one can guarantee that plagues won't make a comeback, but there are good reasons to think that in the arms race between doctors and germs, doctors run faster. New infectious diseases appear mainly as a result of chance mutations in pathogen genomes. These mutations allow the pathogens to jump from animals to humans, to overcome the human immune system, or to resist medicines such as antibiotics. Today such mutations probably occur and disseminate faster than in the past, due to human impact on the environment.[18] Yet in the race against

medicine, pathogens ultimately depend on the blind hand of fortune.

Doctors, in contrast, count on more than mere luck. Though science owes a huge debt to serendipity, doctors don't just throw different chemicals into test tubes, hoping to chance upon some new medicine. With each passing year doctors accumulate more and better knowledge, which they use in order to design more effective medicines and treatments. Consequently, though in 2050 we will undoubtedly face much more resilient germs, medicine in 2050 will likely be able to deal with them more efficiently than today.[19]

In 2015 doctors announced the discovery of a completely new type of antibiotic – teixobactin – to which bacteria have no resistance as yet. Some scholars believe teixobactin may prove to be a game-changer in the fight against highly resistant germs.[20] Scientists are also developing revolutionary new treatments that work in radically different ways to any previous medicine. For example, some research labs are already home to nano-robots, that may one day navigate through our bloodstream, identify illnesses and kill pathogens and cancerous cells.[21] Microorganisms may have 4 billion years of cumulative experience fighting organic enemies, but they have exactly zero experience fighting bionic predators, and would therefore find it doubly difficult to evolve effective defences.

So while we cannot be certain that some new Ebola outbreak or an unknown flu strain won't sweep across the globe and kill millions, we will not regard it as an inevitable natural calamity. Rather, we will see it as an inexcusable human failure and demand the heads of those responsible. When in late summer 2014 it seemed for a few terrifying weeks that Ebola was gaining the upper hand over the global health authorities, investigative committees were hastily set up. An initial report published on 18 October 2014 criticised the World Health Organization for its unsatisfactory reaction to the outbreak, blaming the epidemic on corruption and inefficiency in the WHO's African branch. Further criticism was levelled at the international community as a whole for not responding quickly and forcefully enough. Such criticism assumes that humankind has the knowledge and tools to prevent plagues, and if an epidemic nevertheless gets out of control, it is due to human incompetence rather than divine anger.

So in the struggle against natural calamities such as AIDS and Ebola, the scales are tipping in humanity's favour. But what about the dangers inherent in human nature itself? Biotechnology enables us to defeat bacteria and viruses, but it simultaneously turns humans themselves into an unprecedented threat. The same tools that enable doctors to quickly identify and cure new illnesses may also enable armies and terrorists to engineer even more terrible diseases and doomsday pathogens. It is therefore likely that major epidemics will continue to endanger humankind in the future only if humankind itself creates them, in the service of some ruthless ideology. The era when humankind stood helpless before natural epidemics is probably over. But we may come to miss it.

Breaking the Law of the Jungle

The third piece of good news is that wars too are disappearing. Throughout history most humans took war for granted, whereas peace was a temporary and precarious state. International relations were governed by the Law of the Jungle, according to which even if two polities lived in peace, war always remained an option. For example, even though Germany and France were at peace in 1913, everybody knew that they might be at each other's throats in 1914. Whenever politicians, generals, business people and ordinary citizens made plans for the future, they always left room for war. From

the Stone Age to the age of steam, and from the Arctic to the Sahara, every person on earth knew that at any moment the neighbours might invade their territory, defeat their army, slaughter their people and occupy their land.

During the second half of the twentieth century this Law of the Jungle has finally been broken, if not rescinded. In most areas wars became rarer than ever. Whereas in ancient agricultural societies human violence caused about 15 per cent of all deaths, during the twentieth century violence caused only 5 per cent of deaths, and in the early twenty-first century it is responsible for about 1 per cent of global mortality.[22] In 2012 about 56 million people died throughout the world; 620,000 of them died due to human violence (war killed 120,000 people, and crime killed another 500,000). In contrast, 800,000 committed suicide, and 1.5 million died of diabetes.[23] Sugar is now more dangerous than gunpowder.

Even more importantly, a growing segment of humankind has come to see war as simply inconceivable. For the first time in history, when governments, corporations and private individuals consider their immediate future, many of them don't think about war as a likely event. Nuclear weapons have turned war between superpowers into a mad act of collective suicide, and therefore forced the most powerful nations on earth to find alternative and peaceful ways to resolve conflicts. Simultaneously, the global economy has been transformed from a material-based economy into a knowledge-based economy. Previously the main sources of wealth were material assets such as gold mines, wheat fields and oil wells. Today the main source of wealth is knowledge. And whereas you can conquer oil fields through war, you cannot acquire knowledge that way. Hence as knowledge became the most important economic resource, the profitability of war declined and wars became increasingly restricted to those parts of the world – such as the Middle East and Central Africa – where the economies are still old-fashioned material-based economies.

In 1998 it made sense for Rwanda to seize and loot the rich coltan mines of neighbouring Congo, because this ore was in high demand for the manufacture of mobile phones and laptops, and Congo held 80 per cent of the world's coltan reserves. Rwanda earned $240 million annually from the looted coltan. For poor Rwanda that was a lot of money.[24] In contrast, it would have made no sense for China to invade California and seize Silicon Valley, for even if the Chinese could somehow prevail on the battlefield, there were no silicon mines to loot in Silicon Valley. Instead, the Chinese have earned billions of dollars from cooperating with hi-tech giants such as Apple and Microsoft, buying their software and manufacturing their products. What Rwanda earned from an entire year of looting Congolese coltan, the Chinese earn in a single day of peaceful commerce.

In consequence, the word 'peace' has acquired a new meaning. Previous generations thought about peace as the temporary absence of war. Today we think about peace as the implausibility of war. When in 1913 people said that there was peace between France and Germany, they meant that 'there is no war going on at present between France and Germany, but who knows what next year will bring'. When today we say that there is peace between France and Germany, we mean that it is inconceivable under any foreseeable circumstances that war might break out between them. Such peace prevails not only between France and Germany, but between most (though not all) countries. There is no scenario for a serious war breaking out next year between Germany and Poland, between Indonesia and the Philippines, or between Brazil and Uruguay.

This New Peace is not just a hippie fantasy. Power-hungry governments and greedy corporations also count on it. When Mercedes plans its sales strategy in eastern Europe, it discounts the possibility that Germany might conquer Poland. A corporation importing cheap labourers from the Philippines is not worried that Indonesia might invade the Philippines next year. When the Brazilian government

convenes to discuss next year's budget, it's unimaginable that the Brazilian defence minister will rise from his seat, bang his fist on the table and shout, 'Just a minute! What if we want to invade and conquer Uruguay? You didn't take that into account. We have to put aside $5 billion to finance this conquest.' Of course, there are a few places where defence ministers still say such things, and there are regions where the New Peace has failed to take root. I know this very well because I live in one of these regions. But these are exceptions.

There is no guarantee, of course, that the New Peace will hold indefinitely. Just as nuclear weapons made the New Peace possible in the first place, so future technological developments might set the stage for new kinds of war. In particular, cyber warfare may destabilise the world by giving even small countries and non-state actors the ability to fight superpowers effectively. When the USA fought Iraq in 2003 it brought havoc to Baghdad and Mosul, but not a single bomb was dropped on Los Angeles or Chicago. In the future, though, a country such as North Korea or Iran could use logic bombs to shut down the power in California, blow up refineries in Texas and cause trains to collide in Michigan ('logic bombs' are malicious software codes planted in peacetime and operated at a distance. It is highly likely that networks controlling vital infrastructure facilities in the USA and many other countries are already crammed with such codes).

However, we should not confuse ability with motivation. Though cyber warfare introduces new means of destruction, it doesn't necessarily add new incentives to use them. Over the last seventy years humankind has broken not only the Law of the Jungle, but also the Chekhov Law. Anton Chekhov famously said that a gun appearing in the first act of a play will inevitably be fired in the third. Throughout history, if kings and emperors acquired some new weapon, sooner or later they were tempted to use it. Since 1945, however, humankind has learned to resist this temptation. The gun that appeared in the first act of the Cold War was never fired. By now we are accustomed to living in a world full of undropped bombs and unlaunched missiles, and have become experts in breaking both the Law of the Jungle and the Chekhov Law. If these laws ever do catch up with us, it will be our own fault – not our inescapable destiny.



Nuclear missiles on parade in Moscow. The gun that was always on display but never fired.

Moscow, 1968 © Sovfoto/UIG via Getty Images.

What about terrorism, then? Even if central governments and powerful states have learned restraint, terrorists might have no such qualms about using new and destructive weapons. That is certainly a worrying possibility. However, terrorism is a strategy of weakness adopted by those who lack access to real power. At least in the past, terrorism worked by spreading fear rather than by causing significant material damage. Terrorists usually don't have the strength to defeat an army, occupy a

country or destroy entire cities. Whereas in 2010 obesity and related illnesses killed about 3 million people, terrorists killed a total of 7,697 people across the globe, most of them in developing countries.[25] For the average American or European, Coca-Cola poses a far deadlier threat than al-Qaeda.

How, then, do terrorists manage to dominate the headlines and change the political situation throughout the world? By provoking their enemies to overreact. In essence, terrorism is a show. Terrorists stage a terrifying spectacle of violence that captures our imagination and makes us feel as if we are sliding back into medieval chaos. Consequently states often feel obliged to react to the theatre of terrorism with a show of security, orchestrating immense displays of force, such as the persecution of entire populations or the invasion of foreign countries. In most cases, this overreaction to terrorism poses a far greater threat to our security than the terrorists themselves.

Terrorists are like a fly that tries to destroy a china shop. The fly is so weak that it cannot budge even a single teacup. So it finds a bull, gets inside its ear and starts buzzing. The bull goes wild with fear and anger, and destroys the china shop. This is what happened in the Middle East in the last decade. Islamic fundamentalists could never have toppled Saddam Hussein by themselves. Instead they enraged the USA by the 9/11 attacks, and the USA destroyed the Middle Eastern china shop for them. Now they flourish in the wreckage. By themselves, terrorists are too weak to drag us back to the Middle Ages and re-establish the Jungle Law. They may provoke us, but in the end, it all depends on our reactions. If the Jungle Law comes back into force, it will not be the fault of terrorists.

Famine, plague and war will probably continue to claim millions of victims in the coming decades. Yet they are no longer unavoidable tragedies beyond the understanding and control of a helpless humanity. Instead, they have become manageable challenges. This does not belittle the suffering of hundreds of millions of poverty-stricken humans; of the millions felled each year by malaria, AIDS and tuberculosis; or of the millions trapped in violent vicious circles in Syria, the Congo or Afghanistan. The message is not that famine, plague and war have completely disappeared from the face of the earth, and that we should stop worrying about them. Just the opposite. Throughout history people felt these were unsolvable problems, so there was no point trying to put an end to them. People prayed to God for miracles, but they themselves did not seriously attempt to exterminate famine, plague and war. Those arguing that the world of 2016 is as hungry, sick and violent as it was in 1916 perpetuate this age-old defeatist view. They imply that all the huge efforts humans have made during the twentieth century have achieved nothing, and that medical research, economic reforms and peace initiatives have all been in vain. If so, what is the point of investing our time and resources in further medical research, novel economic reforms or new peace initiatives?

Acknowledging our past achievements sends a message of hope and responsibility, encouraging us to make even greater efforts in the future. Given our twentieth-century accomplishments, if people continue to suffer from famine, plague and war, we cannot blame it on nature or on God. It is within our power to make things better and to reduce the incidence of suffering even further.

Yet appreciating the magnitude of our achievements carries another message: history does not tolerate a vacuum. If incidences of famine, plague and war are decreasing, something is bound to take their place on the human agenda. We had better think very carefully what it is going to be. Otherwise, we might gain complete victory in the old battlefields only to be caught completely unaware on entirely new fronts. What are the projects that will replace famine, plague and war at the top of the human agenda in the twenty-first century?

One central project will be to protect humankind and the planet as a whole from the dangers

inherent in our own power. We have managed to bring famine, plague and war under control thanks largely to our phenomenal economic growth, which provides us with abundant food, medicine, energy and raw materials. Yet this same growth destabilises the ecological equilibrium of the planet in myriad ways, which we have only begun to explore. Humankind has been late in acknowledging this danger, and has so far done very little about it. Despite all the talk of pollution, global warming and climate change, most countries have yet to make any serious economic or political sacrifices to improve the situation. When the moment comes to choose between economic growth and ecological stability, politicians, CEOs and voters almost always prefer growth. In the twenty-first century, we shall have to do better if we are to avoid catastrophe.

What else will humanity strive for? Would we be content merely to count our blessings, keep famine, plague and war at bay, and protect the ecological equilibrium? That might indeed be the wisest course of action, but humankind is unlikely to follow it. Humans are rarely satisfied with what they already have. The most common reaction of the human mind to achievement is not satisfaction, but craving for more. Humans are always on the lookout for something better, bigger, tastier. When humankind possesses enormous new powers, and when the threat of famine, plague and war is finally lifted, what will we do with ourselves? What will the scientists, investors, bankers and presidents do all day? Write poetry?

Success breeds ambition, and our recent achievements are now pushing humankind to set itself even more daring goals. Having secured unprecedented levels of prosperity, health and harmony, and given our past record and our current values, humanity's next targets are likely to be immortality, happiness and divinity. Having reduced mortality from starvation, disease and violence, we will now aim to overcome old age and even death itself. Having saved people from abject misery, we will now aim to make them positively happy. And having raised humanity above the beastly level of survival struggles, we will now aim to upgrade humans into gods, and turn *Homo sapiens* into *Homo deus*.

The Last Days of Death

In the twenty-first century humans are likely to make a serious bid for immortality. Struggling against old age and death will merely carry on the time-honoured fight against famine and disease, and manifest the supreme value of contemporary culture: the worth of human life. We are constantly reminded that human life is the most sacred thing in the universe. Everybody says this: teachers in schools, politicians in parliaments, lawyers in courts and actors on theatre stages. The Universal Declaration of Human Rights adopted by the UN after the Second World War – which is perhaps the closest thing we have to a global constitution – categorically states that 'the right to life' is humanity's most fundamental value. Since death clearly violates this right, death is a crime against humanity, and we ought to wage total war against it.

Throughout history, religions and ideologies did not sanctify life itself. They always sanctified something above or beyond earthly existence, and were consequently quite tolerant of death. Indeed, some of them have been downright fond of the Grim Reaper. Because Christianity, Islam and Hinduism insisted that the meaning of our existence depended on our fate in the afterlife, they viewed death as a vital and positive part of the world. Humans died because God decreed it, and their moment of death was a sacred metaphysical experience exploding with meaning. When a human was about to breathe his last, this was the time to call priests, rabbis and shamans, to draw out the balance of life, and to embrace one's true role in the universe. Just try to imagine Christianity, Islam or

Hinduism in a world without death – which is also a world without heaven, hell or reincarnation.

Modern science and modern culture have an entirely different take on life and death. They don't think of death as a metaphysical mystery, and they certainly don't view death as the source of life's meaning. Rather, for modern people death is a technical problem that we can and should solve.

How exactly do humans die? Medieval fairy tales depicted Death as a figure in a hooded black cloak, his hand gripping a large scythe. A man lives his life, worrying about this and that, running here and there, when suddenly the Grim Reaper appears before him, taps him on the shoulder with a bony finger and says, 'Come!' And the man implores: 'No, please! Wait just a year, a month, a day!' But the hooded figure hisses: 'No! You must come NOW!' And this is how we die.

In reality, however, humans don't die because a figure in a black cloak taps them on the shoulder, or because God decreed it, or because mortality is an essential part of some great cosmic plan. Humans always die due to some technical glitch. The heart stops pumping blood. The main artery is clogged by fatty deposits. Cancerous cells spread in the liver. Germs multiply in the lungs. And what is responsible for all these technical problems? Other technical problems. The heart stops pumping blood because not enough oxygen reaches the heart muscle. Cancerous cells spread because a chance genetic mutation rewrote their instructions. Germs settled in my lungs because somebody sneezed on the subway. Nothing metaphysical about it. It is all technical problems.



Death personified as the Grim Reaper in medieval art.

'Death and dying' from 14th-century French manuscript: *Pilgrimage of the Human Life*, Bodleian Library, Oxford © Art Media/Print Collector/Getty Images.

And every technical problem has a technical solution. We don't need to wait for the Second Coming in order to overcome death. A couple of geeks in a lab can do it. If traditionally death was the speciality of priests and theologians, now the engineers are taking over. We can kill the cancerous cells with chemotherapy or nano-robots. We can exterminate the germs in the lungs with antibiotics. If the heart stops pumping, we can reinvigorate it with medicines and electric shocks – and if that doesn't work, we can implant a new heart. True, at present we don't have solutions to all technical problems. But this is precisely why we invest so much time and money in researching cancer, germs, genetics and nanotechnology.

Even ordinary people, who are not engaged in scientific research, have become used to thinking about death as a technical problem. When a woman goes to her physician and asks, 'Doctor, what's wrong with me?' the doctor is likely to say, 'Well, you have the flu,' or 'You have tuberculosis,' or 'You have cancer.' But the doctor will never say, 'You have death.' And we are all under the impression that flu, tuberculosis and cancer are technical problems, to which we might someday find a technical solution.

Even when people die in a hurricane, a car accident or a war, we tend to view it as a technical failure that could and should have been prevented. If the government had only adopted a better policy; if the municipality had done its job properly; and if the military commander had taken a wiser decision, death would have been avoided. Death has become an almost automatic reason for lawsuits and investigations. 'How could they have died? Somebody somewhere must have screwed up.'

The vast majority of scientists, doctors and scholars still distance themselves from outright dreams of immortality, claiming that they are trying to overcome only this or that particular problem. Yet because old age and death are the outcome of nothing but particular problems, there is no point at which doctors and scientists are going to stop and declare: 'Thus far, and not another step. We have overcome tuberculosis and cancer, but we won't lift a finger to fight Alzheimer's. People can go on dying from that.' The Universal Declaration of Human Rights does not say that humans have 'the right to life until the age of ninety'. It says that every human has a right to life, period. That right isn't limited by any expiry date.

An increasing minority of scientists and thinkers consequently speak more openly these days, and state that the flagship enterprise of modern science is to defeat death and grant humans eternal youth. Notable examples are the gerontologist Aubrey de Grey and the polymath and inventor Ray Kurzweil (winner of the 1999 US National Medal of Technology and Innovation). In 2012 Kurzweil was appointed a director of engineering at Google, and a year later Google launched a sub-company called Calico whose stated mission is 'to solve death'.[26] Google has recently appointed another immortality true-believer, Bill Maris, to preside over the Google Ventures investment fund. In a January 2015 interview, Maris said, 'If you ask me today, is it possible to live to be 500, the answer is yes.' Maris backs up his brave words with a lot of hard cash. Google Ventures is investing 36 per cent of its $2 billion portfolio in life sciences start-ups, including several ambitious life-extending projects. Using an American football analogy, Maris explained that in the fight against death, 'We aren't trying to gain a few yards. We are trying to win the game.' Why? Because, says Maris, 'it is better to live than to die'.[27]

Such dreams are shared by other Silicon Valley luminaries. PayPal co-founder Peter Thiel has recently confessed that he aims to live for ever. 'I think there are probably three main modes of approaching [death],' he explained. 'You can accept it, you can deny it or you can fight it. I think our society is dominated by people who are into denial or acceptance, and I prefer to fight it.' Many people are likely to dismiss such statements as teenage fantasies. Yet Thiel is somebody to be taken very seriously. He is one of the most successful and influential entrepreneurs in Silicon Valley with a private fortune estimated at $2.2 billion.[28] The writing is on the wall: equality is out – immortality is in.

The breakneck development of fields such as genetic engineering, regenerative medicine and nanotechnology fosters ever more optimistic prophecies. Some experts believe that humans will overcome death by 2200, others say 2100. Kurzweil and de Grey are even more sanguine. They maintain that anyone possessing a healthy body and a healthy bank account in 2050 will have a serious shot at immortality by cheating death a decade at a time. According to Kurzweil and de Grey, every ten years or so we will march into the clinic and receive a makeover treatment that will not only cure illnesses, but will also regenerate decaying tissues, and upgrade hands, eyes and brains. Before the next treatment is due, doctors will have invented a plethora of new medicines, upgrades and gadgets. If Kurzweil and de Grey are right, there may already be some immortals walking next to you on the street – at least if you happen to be walking down Wall Street or Fifth Avenue.

In truth they will actually be a-mortal, rather than immortal. Unlike God, future superhumans could

still die in some war or accident, and nothing could bring them back from the netherworld. However, unlike us mortals, their life would have no expiry date. So long as no bomb shreds them to pieces or no truck runs them over, they could go on living indefinitely. Which will probably make them the most anxious people in history. We mortals daily take chances with our lives, because we know they are going to end anyhow. So we go on treks in the Himalayas, swim in the sea, and do many other dangerous things like crossing the street or eating out. But if you believe you can live for ever, you would be crazy to gamble on infinity like that.

Perhaps, then, we had better start with more modest aims, such as doubling life expectancy? In the twentieth century we have almost doubled life expectancy from forty to seventy, so in the twenty-first century we should at least be able to double it again to 150. Though falling far short of immortality, this would still revolutionise human society. For starters, family structure, marriages and child–parent relationships would be transformed. Today, people still expect to be married 'till death us do part', and much of life revolves around having and raising children. Now try to imagine a person with a lifespan of 150 years. Getting married at forty, she still has 110 years to go. Will it be realistic to expect her marriage to last 110 years? Even Catholic fundamentalists might baulk at that. So the current trend of serial marriages is likely to intensify. Bearing two children in her forties, she will, by the time she is 120, have only a distant memory of the years she spent raising them – a rather minor episode in her long life. It's hard to tell what kind of new parent–child relationship might develop under such circumstances.

Or consider professional careers. Today we assume that you learn a profession in your teens and twenties, and then spend the rest of your life in that line of work. You obviously learn new things even in your forties and fifties, but life is generally divided into a learning period followed by a working period. When you live to be 150 that won't do, especially in a world that is constantly being shaken by new technologies. People will have much longer careers, and will have to reinvent themselves again and again even at the age of ninety.

At the same time, people will not retire at sixty-five and will not make way for the new generation with its novel ideas and aspirations. The physicist Max Planck famously said that science advances one funeral at a time. He meant that only when one generation passes away do new theories have a chance to root out old ones. This is true not only of science. Think for a moment about your own workplace. No matter whether you are a scholar, journalist, cook or football player, how would you feel if your boss were 120, his ideas were formulated when Victoria was still queen, and he was likely to stay your boss for a couple of decades more?

In the political sphere the results might be even more sinister. Would you mind having Putin stick around for another ninety years? On second thoughts, if people lived to 150, then in 2016 Stalin would still be ruling in Moscow, going strong at 138, Chairman Mao would be a middle-aged 123-year-old, and Princess Elizabeth would be sitting on her hands waiting to inherit from the 121-year-old George VI. Her son Charles would not get his turn until 2076.

Coming back to the realm of reality, it is far from certain whether Kurzweil's and de Grey's prophecies will come true by 2050 or 2100. My own view is that the hopes of eternal youth in the twenty-first century are premature, and whoever takes them too seriously is in for a bitter disappointment. It is not easy to live knowing that you are going to die, but it is even harder to believe in immortality and be proven wrong.

Although average life expectancy has doubled over the last hundred years, it is unwarranted to extrapolate and conclude that we can double it again to 150 in the coming century. In 1900 global life expectancy was no higher than forty because many people died young from malnutrition, infectious

diseases and violence. Yet those who escaped famine, plague and war could live well into their seventies and eighties, which is the natural life span of *Homo sapiens*. Contrary to common notions, seventy-year-olds weren't considered rare freaks of nature in previous centuries. Galileo Galilei died at seventy-seven, Isaac Newton at eighty-four, and Michelangelo lived to the ripe age of eighty-eight, without any help from antibiotics, vaccinations or organ transplants. Indeed, even chimpanzees in the jungle sometimes live into their sixties.[29]

In truth, so far modern medicine hasn't extended our natural life span by a single year. Its great achievement has been to save us from *premature* death, and allow us to enjoy the full measure of our years. Even if we now overcome cancer, diabetes and the other major killers, it would mean only that almost everyone will get to live to ninety – but it will not be enough to reach 150, let alone 500. For that, medicine will need to re-engineer the most fundamental structures and processes of the human body, and discover how to regenerate organs and tissues. It is by no means clear that we can do that by 2100.

Nevertheless, every failed attempt to overcome death will get us a step closer to the target, and that will inspire greater hopes and encourage people to make even greater efforts. Though Google's Calico probably won't solve death in time to make Google co-founders Sergey Brin and Larry Page immortal, it will most probably make significant discoveries about cell biology, genetic medicines and human health. The next generation of Googlers could therefore start their attack on death from new and better positions. The scientists who cry immortality are like the boy who cried wolf: sooner or later, the wolf actually comes.

Hence even if we don't achieve immortality in our lifetime, the war against death is still likely to be the flagship project of the coming century. When you take into account our belief in the sanctity of human life, add the dynamics of the scientific establishment, and top it all with the needs of the capitalist economy, a relentless war against death seems to be inevitable. Our ideological commitment to human life will never allow us simply to accept human death. As long as people die of something, we will strive to overcome it.

The scientific establishment and the capitalist economy will be more than happy to underwrite this struggle. Most scientists and bankers don't care what they are working on, provided it gives them an opportunity to make new discoveries and greater profits. Can anyone imagine a more exciting scientific challenge than outsmarting death – or a more promising market than the market of eternal youth? If you are over forty, close your eyes for a minute and try to remember the body you had at twenty-five. Not only how it looked, but above all how it *felt*. If you could have that body back, how much would you be willing to pay for it? No doubt some people would be happy to forgo the opportunity, but enough customers would pay whatever it takes, constituting a well-nigh infinite market.

If all that is not enough, the fear of death ingrained in most humans will give the war against death an irresistible momentum. As long as people assumed that death is inevitable, they trained themselves from an early age to suppress the desire to live for ever, or harnessed it in favour of substitute goals. People want to live for ever, so they compose an 'immortal' symphony, they strive for 'eternal glory' in some war, or even sacrifice their lives so that their souls will 'enjoy everlasting bliss in paradise'. A large part of our artistic creativity, our political commitment and our religious piety is fuelled by the fear of death.

Woody Allen, who has made a fabulous career out of the fear of death, was once asked if he hoped to live on for ever through the silver screen. Allen answered that 'I'd rather live on in my apartment.' He went on to add that 'I don't want to achieve immortality through my work. I want to achieve it by

not dying.' Eternal glory, nationalist remembrance ceremonies and dreams of paradise are very poor substitutes for what humans like Allen really want – not to die. Once people think (with or without good reason) that they have a serious chance of escaping death, the desire for life will refuse to go on pulling the rickety wagon of art, ideology and religion, and will sweep forward like an avalanche.

If you think that religious fanatics with burning eyes and flowing beards are ruthless, just wait and see what elderly retail moguls and ageing Hollywood starlets will do when they think the elixir of life is within reach. If and when science makes significant progress in the war against death, the real battle will shift from the laboratories to the parliaments, courthouses and streets. Once the scientific efforts are crowned with success, they will trigger bitter political conflicts. All the wars and conflicts of history might turn out to be but a pale prelude for the real struggle ahead of us: the struggle for eternal youth.

The Right to Happiness

The second big project on the human agenda will probably be to find the key to happiness. Throughout history numerous thinkers, prophets and ordinary people defined happiness rather than life itself as the supreme good. In ancient Greece the philosopher Epicurus explained that worshipping gods is a waste of time, that there is no existence after death, and that happiness is the sole purpose of life. Most people in ancient times rejected Epicureanism, but today it has become the default view. Scepticism about the afterlife drives humankind to seek not only immortality, but also earthly happiness. For who would like to live for ever in eternal misery?

For Epicurus the pursuit of happiness was a personal quest. Modern thinkers, in contrast, tend to see it as a collective project. Without government planning, economic resources and scientific research, individuals will not get far in their quest for happiness. If your country is torn apart by war, if the economy is in crisis and if health care is non-existent, you are likely to be miserable. At the end of the eighteenth century the British philosopher Jeremy Bentham declared that the supreme good is 'the greatest happiness of the greatest number', and concluded that the sole worthy aim of the state, the market and the scientific community is to increase global happiness. Politicians should make peace, business people should foster prosperity and scholars should study nature, not for the greater glory of king, country or God – but so that you and I could enjoy a happier life.

During the nineteenth and twentieth centuries, although many paid lip service to Bentham's vision, governments, corporations and laboratories focused on more immediate and well-defined aims. Countries measured their success by the size of their territory, the increase in their population and the growth of their GDP – not by the happiness of their citizens. Industrialised nations such as Germany, France and Japan established gigantic systems of education, health and welfare, yet these systems were aimed to strengthen the nation rather than ensure individual well-being.

Schools were founded to produce skilful and obedient citizens who would serve the nation loyally. At eighteen, youths needed to be not only patriotic but also literate, so that they could read the brigadier's order of the day and draw up tomorrow's battle plans. They had to know mathematics in order to calculate the shell's trajectory or crack the enemy's secret code. They needed a reasonable command of electrics, mechanics and medicine, in order to operate wireless sets, drive tanks and take care of wounded comrades. When they left the army they were expected to serve the nation as clerks, teachers and engineers, building a modern economy and paying lots of taxes.

The same went for the health system. At the end of the nineteenth century countries such as France,

Germany and Japan began providing free health care for the masses. They financed vaccinations for infants, balanced diets for children and physical education for teenagers. They drained festering swamps, exterminated mosquitoes and built centralised sewage systems. The aim wasn't to make people happy, but to make the nation stronger. The country needed sturdy soldiers and workers, healthy women who would give birth to more soldiers and workers, and bureaucrats who came to the office punctually at 8 a.m. instead of lying sick at home.

Even the welfare system was originally planned in the interest of the nation rather than of needy individuals. When Otto von Bismarck pioneered state pensions and social security in late nineteenth-century Germany, his chief aim was to ensure the loyalty of the citizens rather than to increase their well-being. You fought for your country when you were eighteen, and paid your taxes when you were forty, because you counted on the state to take care of you when you were seventy.[30]

In 1776 the Founding Fathers of the United States established the right to the pursuit of happiness as one of three unalienable human rights, alongside the right to life and the right to liberty. It's important to note, however, that the American Declaration of Independence guaranteed the right to *the pursuit of* happiness, not the right to happiness itself. Crucially, Thomas Jefferson did not make the state responsible for its citizens' happiness. Rather, he sought only to limit the power of the state. The idea was to reserve for individuals a private sphere of choice, free from state supervision. If I think I'll be happier marrying John rather than Mary, living in San Francisco rather than Salt Lake City, and working as a bartender rather than a dairy farmer, then it's my right to pursue happiness my way, and the state shouldn't intervene even if I make the wrong choice.

Yet over the last few decades the tables have turned, and Bentham's vision has been taken far more seriously. People increasingly believe that the immense systems established more than a century ago to strengthen the nation should actually serve the happiness and well-being of individual citizens. We are not here to serve the state – it is here to serve us. The right to the pursuit of happiness, originally envisaged as a restraint on state power, has imperceptibly morphed into the right to happiness – as if human beings have a natural right to be happy, and anything which makes us dissatisfied is a violation of our basic human rights, so the state should do something about it.

In the twentieth century per capita GDP was perhaps the supreme yardstick for evaluating national success. From this perspective, Singapore, each of whose citizens produces on average $56,000 worth of goods and services a year, is a more successful country than Costa Rica, whose citizens produce only $14,000 a year. But nowadays thinkers, politicians and even economists are calling to supplement or even replace GDP with GDH – gross domestic happiness. After all, what do people want? They don't want to produce. They want to be happy. Production is important because it provides the material basis for happiness. But it is only the means, not the end. In one survey after another Costa Ricans report far higher levels of life satisfaction than Singaporeans. Would you rather be a highly productive but dissatisfied Singaporean, or a less productive but satisfied Costa Rican?

This kind of logic might drive humankind to make happiness its second main goal for the twenty-first century. At first glance this might seem a relatively easy project. If famine, plague and war are disappearing, if humankind experiences unprecedented peace and prosperity, and if life expectancy increases dramatically, surely all that will make humans happy, right?

Wrong. When Epicurus defined happiness as the supreme good, he warned his disciples that it is hard work to be happy. Material achievements alone will not satisfy us for long. Indeed, the blind pursuit of money, fame and pleasure will only make us miserable. Epicurus recommended, for example, to eat and drink in moderation, and to curb one's sexual appetites. In the long run, a deep friendship will make us more content than a frenzied orgy. Epicurus outlined an entire ethic of dos and

don'ts to guide people along the treacherous path to happiness.

Epicurus was apparently on to something. Being happy doesn't come easy. Despite our unprecedented achievements in the last few decades, it is far from obvious that contemporary people are significantly more satisfied than their ancestors in bygone years. Indeed, it is an ominous sign that despite higher prosperity, comfort and security, the rate of suicide in the developed world is also much higher than in traditional societies.

In Peru, Guatemala, the Philippines and Albania – developing countries suffering from poverty and political instability – about one person in 100,000 commits suicide each year. In rich and peaceful countries such as Switzerland, France, Japan and New Zealand, twenty-five people per 100,000 take their own lives annually. In 1985 most South Koreans were poor, uneducated and tradition-bound, living under an authoritarian dictatorship. Today South Korea is a leading economic power, its citizens are among the best educated in the world, and it enjoys a stable and comparatively liberal democratic regime. Yet whereas in 1985 about nine South Koreans per 100,000 killed themselves, today the annual rate of suicide has more than tripled to thirty per 100,000.[31]

There are of course opposite and far more encouraging trends. Thus the drastic decrease in child mortality has surely brought an increase in human happiness, and partially compensated people for the stress of modern life. Still, even if we are somewhat happier than our ancestors, the increase in our well-being is far less than we might have expected. In the Stone Age, the average human had at his or her disposal about 4,000 calories of energy per day. This included not only food, but also the energy invested in preparing tools, clothing, art and campfires. Today Americans use on average 228,000 calories of energy per person per day, to feed not only their stomachs but also their cars, computers, refrigerators and televisions.[32] The average American thus uses sixty times more energy than the average Stone Age hunter-gatherer. Is the average American sixty times happier? We may well be sceptical about such rosy views.

And even if we have overcome many of yesterday's miseries, attaining positive happiness may be far more difficult than abolishing downright suffering. It took just a piece of bread to make a starving medieval peasant joyful. How do you bring joy to a bored, overpaid and overweight engineer? The second half of the twentieth century was a golden age for the USA. Victory in the Second World War, followed by an even more decisive victory in the Cold War, turned it into the leading global superpower. Between 1950 and 2000 American GDP grew from $2 trillion to $12 trillion. Real per capita income doubled. The newly invented contraceptive pill made sex freer than ever. Women, gays, African Americans and other minorities finally got a bigger slice of the American pie. A flood of cheap cars, refrigerators, air conditioners, vacuum cleaners, dishwashers, laundry machines, telephones, televisions and computers changed daily life almost beyond recognition. Yet studies have shown that American subjective well-being levels in the 1990s remained roughly the same as they were in the 1950s.[33]

In Japan, average real income rose by a factor of five between 1958 and 1987, in one of the fastest economic booms of history. This avalanche of wealth, coupled with myriad positive and negative changes in Japanese lifestyles and social relations, had surprisingly little impact on Japanese subjective well-being levels. The Japanese in the 1990s were as satisfied – or dissatisfied – as they were in the 1950s.[34]

It appears that our happiness bangs against some mysterious glass ceiling that does not allow it to grow despite all our unprecedented accomplishments. Even if we provide free food for everybody, cure all diseases and ensure world peace, it won't necessarily shatter that glass ceiling. Achieving

real happiness is not going to be much easier than overcoming old age and death.

The glass ceiling of happiness is held in place by two stout pillars, one psychological, the other biological. On the psychological level, happiness depends on expectations rather than objective conditions. We don't become satisfied by leading a peaceful and prosperous existence. Rather, we become satisfied when reality matches our expectations. The bad news is that as conditions improve, expectations balloon. Dramatic improvements in conditions, as humankind has experienced in recent decades, translate into greater expectations rather than greater contentment. If we don't do something about this, our future achievements too might leave us as dissatisfied as ever.

On the biological level, both our expectations and our happiness are determined by our biochemistry, rather than by our economic, social or political situation. According to Epicurus, we are happy when we feel pleasant sensations and are free from unpleasant ones. Jeremy Bentham similarly maintained that nature gave dominion over man to two masters – pleasure and pain – and they alone determine everything we do, say and think. Bentham's successor, John Stuart Mill, explained that happiness is nothing but pleasure and freedom from pain, and that beyond pleasure and pain there is no good and no evil. Anyone who tries to deduce good and evil from something else (such as the word of God, or the national interest) is fooling you, and perhaps fooling himself too.[35]

In the days of Epicurus such talk was blasphemous. In the days of Bentham and Mill it was radical subversion. But in the early twenty-first century this is scientific orthodoxy. According to the life sciences, happiness and suffering are nothing but different balances of bodily sensations. We never react to events in the outside world, but only to sensations in our own bodies. Nobody suffers because she lost her job, because she got divorced or because the government went to war. The only thing that makes people miserable is unpleasant sensations in their own bodies. Losing one's job can certainly trigger depression, but depression itself is a kind of unpleasant bodily sensation. A thousand things may make us angry, but anger is never an abstraction. It is always felt as a sensation of heat and tension in the body, which is what makes anger so infuriating. Not for nothing do we say that we 'burn' with anger.

Conversely, science says that nobody is ever made happy by getting a promotion, winning the lottery or even finding true love. People are made happy by one thing and one thing only – pleasant sensations in their bodies. Imagine that you are Mario Götze, the attacking midfielder of the German football team in the 2014 World Cup Final against Argentina; 113 minutes have already elapsed, without a goal being scored. Only seven minutes remain before the dreaded penalty shoot-out. Some 75,000 excited fans fill the Maracanã stadium in Rio, with countless millions anxiously watching all over the world. You are a few metres from the Argentinian goal when André Schürrle sends a magnificent pass in your direction. You stop the ball with your chest, it drops down towards your leg, you give it a kick in mid-air, and you see it fly past the Argentinian goalkeeper and bury itself deep inside the net. Goooooooal! The stadium erupts like a volcano. Tens of thousands of people roar like mad, your teammates are racing to hug and kiss you, millions of people back home in Berlin and Munich collapse in tears before the television screen. You are ecstatic, but not because of the ball in the Argentinian net or the celebrations going on in crammed Bavarian *Biergartens*. You are actually reacting to the storm of sensations within you. Chills run up and down your spine, waves of electricity wash over your body, and it feels as if you are dissolving into millions of exploding energy balls.

You don't have to score the winning goal in the World Cup Final to feel such sensations. If you receive an unexpected promotion at work, and start jumping for joy, you are reacting to the same kind of sensations. The deeper parts of your mind know nothing about football or about jobs. They know only sensations. If you get a promotion, but for some reason don't feel any pleasant sensations – you

will not feel satisfied. The opposite is also true. If you have just been fired (or lost a decisive football match), but you are experiencing very pleasant sensations (perhaps because you popped some pill), you might still feel on top of the world.

The bad news is that pleasant sensations quickly subside and sooner or later turn into unpleasant ones. Even scoring the winning goal in the World Cup Final doesn't guarantee lifelong bliss. In fact, it might all be downhill from there. Similarly, if last year I received an unexpected promotion at work, I might still be occupying that new position, but the very pleasant sensations I experienced on hearing the news disappeared within hours. If I want to feel those wonderful sensations again, I must get another promotion. And another. And if I don't get a promotion, I might end up far more bitter and angry than if I had remained a humble pawn.

This is all the fault of evolution. For countless generations our biochemical system adapted to increasing our chances of survival and reproduction, not our happiness. The biochemical system rewards actions conducive to survival and reproduction with pleasant sensations. But these are only an ephemeral sales gimmick. We struggle to get food and mates in order to avoid unpleasant sensations of hunger and to enjoy pleasing tastes and blissful orgasms. But nice tastes and blissful orgasms don't last very long, and if we want to feel them again we have to go out looking for more food and mates.

What might have happened if a rare mutation had created a squirrel who, after eating a single nut, enjoys an everlasting sensation of bliss? Technically, this could actually be done by rewiring the squirrel's brain. Who knows, perhaps it really happened to some lucky squirrel millions of years ago. But if so, that squirrel enjoyed an extremely happy and extremely short life, and that was the end of the rare mutation. For the blissful squirrel would not have bothered to look for more nuts, let alone mates. The rival squirrels, who felt hungry again five minutes after eating a nut, had much better chances of surviving and passing their genes to the next generation. For exactly the same reason, the nuts we humans seek to gather – lucrative jobs, big houses, good-looking partners – seldom satisfy us for long.

Some may say that this is not so bad, because it isn't the goal that makes us happy – it's the journey. Climbing Mount Everest is more satisfying than standing at the top; flirting and foreplay are more exciting than having an orgasm; and conducting groundbreaking lab experiments is more interesting than receiving praise and prizes. Yet this hardly changes the picture. It just indicates that evolution controls us with a broad range of pleasures. Sometimes it seduces us with sensations of bliss and tranquillity, while on other occasions it goads us forward with thrilling sensations of elation and excitement.

When an animal is looking for something that increases its chances of survival and reproduction (e.g. food, partners or social status), the brain produces sensations of alertness and excitement, which drive the animal to make even greater efforts because they are so very agreeable. In a famous experiment scientists connected electrodes to the brains of several rats, enabling the animals to create sensations of excitement simply by pressing a pedal. When the rats were given a choice between tasty food and pressing the pedal, they preferred the pedal (much like kids preferring to play video games rather than come down to dinner). The rats pressed the pedal again and again, until they collapsed from hunger and exhaustion.[36] Humans too may prefer the excitement of the race to resting on the laurels of success. Yet what makes the race so attractive is the exhilarating sensations that go along with it. Nobody would have wanted to climb mountains, play video games or go on blind dates if such activities were accompanied solely by unpleasant sensations of stress, despair or boredom.[37]

Alas, the exciting sensations of the race are as transient as the blissful sensations of victory. The

Don Juan enjoying the thrill of a one-night stand, the businessman enjoying biting his fingernails watching the Dow Jones rise and fall, and the gamer enjoying killing monsters on the computer screen will find no satisfaction remembering yesterday's adventures. Like the rats pressing the pedal again and again, the Don Juans, business tycoons and gamers need a new kick every day. Worse still, here too expectations adapt to conditions, and yesterday's challenges all too quickly become today's tedium. Perhaps the key to happiness is neither the race nor the gold medal, but rather combining the right doses of excitement and tranquillity; but most of us tend to jump all the way from stress to boredom and back, remaining as discontented with one as with the other.

If science is right and our happiness is determined by our biochemical system, then the only way to ensure lasting contentment is by rigging this system. Forget economic growth, social reforms and political revolutions: in order to raise global happiness levels, we need to manipulate human biochemistry. And this is exactly what we have begun doing over the last few decades. Fifty years ago psychiatric drugs carried a severe stigma. Today, that stigma has been broken. For better or worse, a growing percentage of the population is taking psychiatric medicines on a regular basis, not only to cure debilitating mental illnesses, but also to face more mundane depressions and the occasional blues.

For example, increasing numbers of schoolchildren take stimulants such as Ritalin. In 2011, 3.5 million American children were taking medications for ADHD (attention deficit hyperactivity disorder). In the UK the number rose from 92,000 in 1997 to 786,000 in 2012.[38] The original aim had been to treat attention disorders, but today completely healthy kids take such medications to improve their performance and live up to the growing expectations of teachers and parents.[39] Many object to this development and argue that the problem lies with the education system rather than with the children. If pupils suffer from attention disorders, stress and low grades, perhaps we ought to blame outdated teaching methods, overcrowded classrooms and an unnaturally fast tempo of life. Maybe we should modify the schools rather than the kids? It is interesting to see how the arguments have evolved. People have been quarrelling about education methods for thousands of years. Whether in ancient China or Victorian Britain, everybody had his or her pet method, and vehemently opposed all alternatives. Yet hitherto everybody still agreed on one thing: in order to improve education, we need to change the schools. Today, for the first time in history, at least some people think it would be more efficient to change the pupils' biochemistry.[40]

Armies are heading the same way: 12 per cent of American soldiers in Iraq and 17 per cent of American soldiers in Afghanistan took either sleeping pills or antidepressants to help them deal with the pressure and distress of war. Fear, depression and trauma are not caused by shells, booby traps or car bombs. They are caused by hormones, neurotransmitters and neural networks. Two soldiers may find themselves shoulder to shoulder in the same ambush; one will freeze in terror, lose his wits and suffer from nightmares for years after the event; the other will charge forward courageously and win a medal. The difference is in the soldiers' biochemistry, and if we find ways to control it we will at one stroke produce both happier soldiers and more efficient armies.[41]

The biochemical pursuit of happiness is also the number one cause of crime in the world. In 2009 half of the inmates in US federal prisons got there because of drugs; 38 per cent of Italian prisoners were convicted of drug-related offences; 55 per cent of inmates in the UK reported that they committed their crimes in connection with either consuming or trading drugs. A 2001 report found that 62 per cent of Australian convicts were under the influence of drugs when committing the crime for which they were incarcerated.[42] People drink alcohol to forget, they smoke pot to feel peaceful, they

take cocaine and methamphetamines to be sharp and confident, whereas Ecstasy provides ecstatic sensations and LSD sends you to meet Lucy in the Sky with Diamonds. What some people hope to get by studying, working or raising a family, others try to obtain far more easily through the right dosage of molecules. This is an existential threat to the social and economic order, which is why countries wage a stubborn, bloody and hopeless war on biochemical crime.

The state hopes to regulate the biochemical pursuit of happiness, separating 'bad' manipulations from 'good' ones. The principle is clear: biochemical manipulations that strengthen political stability, social order and economic growth are allowed and even encouraged (e.g. those that calm hyperactive kids in school, or drive anxious soldiers forward into battle). Manipulations that threaten stability and growth are banned. But each year new drugs are born in the research labs of universities, pharmaceutical companies and criminal organisations, and the needs of the state and the market also keep changing. As the biochemical pursuit of happiness accelerates, so it will reshape politics, society and economics, and it will become ever harder to bring it under control.

And drugs are just the beginning. In research labs experts are already working on more sophisticated ways of manipulating human biochemistry, such as sending direct electrical stimuli to appropriate spots in the brain, or genetically engineering the blueprints of our bodies. No matter the exact method, gaining happiness through biological manipulation won't be easy, for it requires altering the fundamental patterns of life. But then it wasn't easy to overcome famine, plague and war either.

It is far from certain that humankind should invest so much effort in the biochemical pursuit of happiness. Some would argue that happiness simply isn't important enough, and that it is misguided to regard individual satisfaction as the highest aim of human society. Others may agree that happiness is indeed the supreme good, yet would take issue with the biological definition of happiness as the experience of pleasant sensations.

Some 2,300 years ago Epicurus warned his disciples that immoderate pursuit of pleasure is likely to make them miserable rather than happy. A couple of centuries earlier Buddha had made an even more radical claim, teaching that the pursuit of pleasant sensations is in fact the very root of suffering. Such sensations are just ephemeral and meaningless vibrations. Even when we experience them, we don't react to them with contentment; rather, we just crave for more. Hence no matter how many blissful or exciting sensations I may experience, they will never satisfy me.

If I identify happiness with fleeting pleasant sensations, and crave to experience more and more of them, I have no choice but to pursue them constantly. When I finally get them, they quickly disappear, and because the mere memory of past pleasures will not satisfy me, I have to start all over again. Even if I continue this pursuit for decades, it will never bring me any lasting achievement; on the contrary, the more I crave these pleasant sensations, the more stressed and dissatisfied I will become. To attain real happiness, humans need to slow down the pursuit of pleasant sensations, not accelerate it.

This Buddhist view of happiness has a lot in common with the biochemical view. Both agree that pleasant sensations disappear as fast as they arise, and that as long as people crave pleasant sensations without actually experiencing them, they remain dissatisfied. However, this problem has two very different solutions. The biochemical solution is to develop products and treatments that will provide humans with an unending stream of pleasant sensations, so we will never be without them. The Buddha's suggestion was to reduce our craving for pleasant sensations, and not allow them to control our lives. According to Buddha, we can train our minds to observe carefully how all

sensations constantly arise and pass. When the mind learns to see our sensations for what they are – ephemeral and meaningless vibrations – we lose interest in pursuing them. For what is the point of running after something that disappears as fast as it arises?

At present, humankind has far greater interest in the biochemical solution. No matter what monks in their Himalayan caves or philosophers in their ivory towers say, for the capitalist juggernaut, happiness is pleasure. Period. With each passing year our tolerance for unpleasant sensations decreases, and our craving for pleasant sensations increases. Both scientific research and economic activity are geared to that end, each year producing better painkillers, new ice-cream flavours, more comfortable mattresses, and more addictive games for our smartphones, so that we will not suffer a single boring moment while waiting for the bus.

All this is hardly enough, of course. Since *Homo sapiens* was not adapted by evolution to experience constant pleasure, if that is what humankind nevertheless wants, ice cream and smartphone games will not do. It will be necessary to change our biochemistry and re-engineer our bodies and minds. So we are working on that. You may debate whether it is good or bad, but it seems that the second great project of the twenty-first century – to ensure global happiness – will involve re-engineering *Homo sapiens* so that it can enjoy everlasting pleasure.

The Gods of Planet Earth

In seeking bliss and immortality humans are in fact trying to upgrade themselves into gods. Not just because these are divine qualities, but because in order to overcome old age and misery humans will first have to acquire godlike control of their own biological substratum. If we ever have the power to engineer death and pain out of our system, that same power will probably be sufficient to engineer our system in almost any manner we like, and manipulate our organs, emotions and intelligence in myriad ways. You could buy for yourself the strength of Hercules, the sensuality of Aphrodite, the wisdom of Athena or the madness of Dionysus if that is what you are into. Up till now increasing human power relied mainly on upgrading our external tools. In the future it may rely more on upgrading the human body and mind, or on merging directly with our tools.

The upgrading of humans into gods may follow any of three paths: biological engineering, cyborg engineering and the engineering of non-organic beings.

Biological engineering starts with the insight that we are far from realising the full potential of organic bodies. For 4 billion years natural selection has been tweaking and tinkering with these bodies, so that we have gone from amoeba to reptiles to mammals to Sapiens. Yet there is no reason to think that Sapiens is the last station. Relatively small changes in genes, hormones and neurons were enough to transform *Homo erectus* – who could produce nothing more impressive than flint knives – into *Homo sapiens*, who produces spaceships and computers. Who knows what might be the outcome of a few more changes to our DNA, hormonal system or brain structure. Bioengineering is not going to wait patiently for natural selection to work its magic. Instead, bioengineers will take the old Sapiens body, and intentionally rewrite its genetic code, rewire its brain circuits, alter its biochemical balance, and even grow entirely new limbs. They will thereby create new godlings, who might be as different from us Sapiens as we are different from *Homo erectus*.

Cyborg engineering will go a step further, merging the organic body with non-organic devices such as bionic hands, artificial eyes, or millions of nano-robots that will navigate our bloodstream, diagnose problems and repair damage. Such a cyborg could enjoy abilities far beyond those of any

organic body. For example, all parts of an organic body must be in direct contact with one another in order to function. If an elephant's brain is in India, its eyes and ears in China and its feet in Australia, then this elephant is most probably dead, and even if it is in some mysterious sense alive, it cannot see, hear or walk. A cyborg, in contrast, could exist in numerous places at the same time. A cyborg doctor could perform emergency surgeries in Tokyo, in Chicago and in a space station on Mars, without ever leaving her Stockholm office. She will need only a fast Internet connection, and a few pairs of bionic eyes and hands. On second thoughts, why *pairs*? Why not quartets? Indeed, even those are actually superfluous. Why should a cyborg doctor hold a surgeon's scalpel by hand, when she could connect her mind directly to the instrument?

This may sound like science fiction, but it's already a reality. Monkeys have recently learned to control bionic hands and feet disconnected from their bodies, through electrodes implanted in their brains. Paralysed patients are able to move bionic limbs or operate computers by the power of thought alone. If you wish, you can already remote-control electric devices in your house using an electric 'mind-reading' helmet. The helmet requires no brain implants. It functions by reading the electric signals passing through your scalp. If you want to turn on the light in the kitchen, you just wear the helmet, imagine some preprogrammed mental sign (e.g. imagine your right hand moving), and the switch turns on. You can buy such helmets online for a mere $400.[43]

In early 2015 several hundred workers in the Epicenter high-tech hub in Stockholm had microchips implanted into their hands. The chips are about the size of a grain of rice and store personalised security information that enables workers to open doors and operate photocopiers with a wave of their hand. Soon they hope to make payments in the same way. One of the people behind the initiative, Hannes Sjoblad, explained that 'We already interact with technology all the time. Today it's a bit messy: we need pin codes and passwords. Wouldn't it be easy to just touch with your hand?'[44]

Yet even cyborg engineering is relatively conservative, inasmuch as it assumes that organic brains will go on being the command-and-control centres of life. A bolder approach dispenses with organic parts altogether, and hopes to engineer completely non-organic beings. Neural networks will be replaced by intelligent software, which could surf both the virtual and non-virtual worlds, free from the limitations of organic chemistry. After 4 billion years of wandering inside the kingdom of organic compounds, life will break out into the vastness of the inorganic realm, and will take shapes that we cannot envision even in our wildest dreams. After all, our wildest dreams are still the product of organic chemistry.

We don't know where these paths might lead us, nor what our godlike descendants will look like. Foretelling the future was never easy, and revolutionary biotechnologies make it even harder. For as difficult as it is to predict the impact of new technologies in fields like transportation, communication and energy, technologies for upgrading humans pose a completely different kind of challenge. Since they can be used to transform human minds and desires, people possessing present-day minds and desires by definition cannot fathom their implications.

For thousands of years history was full of technological, economic, social and political upheavals. Yet one thing remained constant: humanity itself. Our tools and institutions are very different from those of biblical times, but the deep structures of the human mind remain the same. This is why we can still find ourselves between the pages of the Bible, in the writings of Confucius or within the tragedies of Sophocles and Euripides. These classics were created by humans just like us, hence we feel that they talk about us. In modern theatre productions, Oedipus, Hamlet and Othello may wear jeans and T-shirts and have Facebook accounts, but their emotional conflicts are the same as in the

original play.

However, once technology enables us to re-engineer human minds, *Homo sapiens* will disappear, human history will come to an end and a completely new kind of process will begin, which people like you and me cannot comprehend. Many scholars try to predict how the world will look in the year 2100 or 2200. This is a waste of time. Any worthwhile prediction must take into account the ability to re-engineer human minds, and this is impossible. There are many wise answers to the question, 'What would people with minds like ours do with biotechnology?' Yet there are no good answers to the question, 'What would beings with a *different* kind of mind do with biotechnology?' All we can say is that people similar to us are likely to use biotechnology to re-engineer their own minds, and our present-day minds cannot grasp what might happen next.

Though the details are therefore obscure, we can nevertheless be sure about the general direction of history. In the twenty-first century, the third big project of humankind will be to acquire for us divine powers of creation and destruction, and upgrade *Homo sapiens* into *Homo deus*. This third project obviously subsumes the first two projects, and is fuelled by them. We want the ability to re-engineer our bodies and minds in order, above all, to escape old age, death and misery, but once we have it, who knows what else we might do with such ability? So we may well think of the new human agenda as consisting really of only one project (with many branches): attaining divinity.

If this sounds unscientific or downright eccentric, it is because people often misunderstand the meaning of divinity. Divinity isn't a vague metaphysical quality. And it isn't the same as omnipotence. When speaking of upgrading humans into gods, think more in terms of Greek gods or Hindu devas rather than the omnipotent biblical sky father. Our descendants would still have their foibles, kinks and limitations, just as Zeus and Indra had theirs. But they could love, hate, create and destroy on a much grander scale than us.

Throughout history most gods were believed to enjoy not omnipotence but rather specific super-abilities such as the ability to design and create living beings; to transform their own bodies; to control the environment and the weather; to read minds and to communicate at a distance; to travel at very high speeds; and of course to escape death and live indefinitely. Humans are in the business of acquiring all these abilities, and then some. Certain traditional abilities that were considered divine for many millennia have today become so commonplace that we hardly think about them. The average person now moves and communicates across distances much more easily than the Greek, Hindu or African gods of old.

For example, the Igbo people of Nigeria believe that the creator god Chukwu initially wanted to make people immortal. He sent a dog to tell humans that when someone dies, they should sprinkle ashes on the corpse, and the body will come back to life. Unfortunately, the dog was tired and he dallied on the way. The impatient Chukwu then sent a sheep, telling her to make haste with this important message. Alas, when the breathless sheep reached her destination, she garbled the instructions, and told the humans to bury their dead, thus making death permanent. This is why to this day we humans must die. If only Chukwu had a Twitter account instead of relying on laggard dogs and dim-witted sheep to deliver his messages!

In ancient agricultural societies, most religions revolved not around metaphysical questions and the afterlife, but around the very mundane issue of increasing agricultural output. Thus the Old Testament God *never* promises any rewards or punishments after death. He instead tells the people of Israel that 'If you carefully observe the commands that I'm giving you [. . .] then I will send rain on the land in its season [. . .] and you'll gather grain, wine, and oil. I will provide grass in the fields for your livestock, and you'll eat and be satisfied. Be careful! Otherwise, your hearts will deceive you and

you will turn away to serve other gods and worship them. The wrath of God will burn against you so that he will restrain the heavens and it won't rain. The ground won't yield its produce and you'll be swiftly destroyed from the good land that the Lord is about to give you' (Deuteronomy 11:13–17). Scientists today can do much better than the Old Testament God. Thanks to artificial fertilisers, industrial insecticides and genetically modified crops, agricultural production nowadays outstrips the highest expectations ancient farmers had of their gods. And the parched state of Israel no longer fears that some angry deity will restrain the heavens and stop all rain – for the Israelis have recently built a huge desalination plant on the shores of the Mediterranean, so they can now get all their drinking water from the sea.

So far we have competed with the gods of old by creating better and better tools. In the not too distant future, we might create superhumans who will outstrip the ancient gods not in their tools, but in their bodily and mental faculties. If and when we get there, however, divinity will become as mundane as cyberspace – a wonder of wonders that we just take for granted.

We can be quite certain that humans will make a bid for divinity, because humans have many reasons to desire such an upgrade, and many ways to achieve it. Even if one promising path turns out to be a dead end, alternative routes will remain open. For example, we may discover that the human genome is far too complicated for serious manipulation, but this will not prevent the development of brain–computer interfaces, nano-robots or artificial intelligence.

No need to panic, though. At least not immediately. Upgrading Sapiens will be a gradual historical process rather than a Hollywood apocalypse. *Homo sapiens* is not going to be exterminated by a robot revolt. Rather, *Homo sapiens* is likely to upgrade itself step by step, merging with robots and computers in the process, until our descendants will look back and realise that they are no longer the kind of animal that wrote the Bible, built the Great Wall of China and laughed at Charlie Chaplin's antics. This will not happen in a day, or a year. Indeed, it is already happening right now, through innumerable mundane actions. Every day millions of people decide to grant their smartphone a bit more control over their lives or try a new and more effective antidepressant drug. In pursuit of health, happiness and power, humans will gradually change first one of their features and then another, and another, until they will no longer be human.

Can Someone Please Hit the Brakes?

Calm explanations aside, many people panic when they hear of such possibilities. They are happy to follow the advice of their smartphones or to take whatever drug the doctor prescribes, but when they hear of upgraded superhumans, they say: 'I hope I will be dead before that happens.' A friend once told me that what she fears most about growing old is becoming irrelevant, turning into a nostalgic old woman who cannot understand the world around her, or contribute much to it. This is what we fear collectively, as a species, when we hear of superhumans. We sense that in such a world, our identity, our dreams and even our fears will be irrelevant, and we will have nothing more to contribute. Whatever you are today – be it a devout Hindu cricket player or an aspiring lesbian journalist – in an upgraded world you will feel like a Neanderthal hunter in Wall Street. You won't belong.

The Neanderthals didn't have to worry about the Nasdaq, since they were shielded from it by tens of thousands of years. Nowadays, however, our world of meaning might collapse within decades. You cannot count on death to save you from becoming completely irrelevant. Even if gods don't walk our streets by 2100, the attempt to upgrade *Homo sapiens* is likely to change the world beyond

recognition in this century. Scientific research and technological developments are moving at a far faster rate than most of us can grasp.

If you speak with the experts, many of them will tell you that we are still very far away from genetically engineered babies or human-level artificial intelligence. But most experts think on a timescale of academic grants and college jobs. Hence, 'very far away' may mean twenty years, and 'never' may denote no more than fifty.

I still remember the day I first came across the Internet. It was back in 1993, when I was in high school. I went with a couple of buddies to visit our friend Ido (who is now a computer scientist). We wanted to play table tennis. Ido was already a huge computer fan, and before opening the ping-pong table he insisted on showing us the latest wonder. He connected the phone cable to his computer and pressed some keys. For a minute all we could hear were squeaks, shrieks and buzzes, and then silence. It didn't succeed. We mumbled and grumbled, but Ido tried again. And again. And again. At last he gave a whoop and announced that he had managed to connect his computer to the central computer at the nearby university. 'And what's there, on the central computer?' we asked. 'Well,' he admitted, 'there's nothing there yet. But you could put all kinds of things there.' 'Like what?' we questioned. 'I don't know,' he said, 'all kinds of things.' It didn't sound very promising. We went to play ping-pong, and for the following weeks enjoyed a new pastime, making fun of Ido's ridiculous idea. That was less than twenty-five years ago (at the time of writing). Who knows what will come to pass twenty-five years from now?

That's why more and more individuals, organisations, corporations and governments are taking very seriously the quest for immortality, happiness and godlike powers. Insurance companies, pension funds, health systems and finance ministries are already aghast at the jump in life expectancy. People are living much longer than expected, and there is not enough money to pay for their pensions and medical treatment. As seventy threatens to become the new forty, experts are calling to raise the retirement age, and to restructure the entire job market.

When people realise how fast we are rushing towards the great unknown, and that they cannot count even on death to shield them from it, their reaction is to hope that somebody will hit the brakes and slow us down. But we cannot hit the brakes, for several reasons.

Firstly, nobody knows where the brakes are. While some experts are familiar with developments in one field, such as artificial intelligence, nanotechnology, big data or genetics, no one is an expert on everything. No one is therefore capable of connecting all the dots and seeing the full picture. Different fields influence one another in such intricate ways that even the best minds cannot fathom how breakthroughs in artificial intelligence might impact nanotechnology, or vice versa. Nobody can absorb all the latest scientific discoveries, nobody can predict how the global economy will look in ten years, and nobody has a clue where we are heading in such a rush. Since no one understands the system any more, no one can stop it.

Secondly, if we somehow succeed in hitting the brakes, our economy will collapse, along with our society. As explained in a later chapter, the modern economy needs constant and indefinite growth in order to survive. If growth ever stops, the economy won't settle down to some cosy equilibrium; it will fall to pieces. That's why capitalism encourages us to seek immortality, happiness and divinity. There's a limit to how many shoes we can wear, how many cars we can drive and how many skiing holidays we can enjoy. An economy built on everlasting growth needs endless projects – just like the quests for immortality, bliss and divinity.

Well, if we need limitless projects, why not settle for bliss and immortality, and at least put aside the frightening quest for superhuman powers? Because it is inextricable from the other two. When you

develop bionic legs that enable paraplegics to walk again, you can also use the same technology to upgrade healthy people. When you discover how to stop memory loss among older people, the same treatments might enhance the memory of the young.

No clear line separates healing from upgrading. Medicine almost always begins by saving people from falling below the norm, but the same tools and know-how can then be used to surpass the norm. Viagra began life as a treatment for blood-pressure problems. To the surprise and delight of Pfizer, it transpired that Viagra can also cure impotence. It enabled millions of men to regain normal sexual abilities; but soon enough men who had no impotence problems in the first place began using the same pill to surpass the norm, and acquire sexual powers they never had before.[45]

What happens to particular drugs can also happen to entire fields of medicine. Modern plastic surgery was born in the First World War, when Harold Gillies began treating facial injuries in the Aldershot military hospital.[46] When the war was over, surgeons discovered that the same techniques could also turn perfectly healthy but ugly noses into more beautiful specimens. Though plastic surgery continued to help the sick and wounded, it devoted increasing attention to upgrading the healthy. Nowadays plastic surgeons make millions in private clinics whose explicit and sole aim is to upgrade the healthy and beautify the wealthy.[47]

The same might happen with genetic engineering. If a billionaire openly stated that he intended to engineer super-smart offspring, imagine the public outcry. But it won't happen like that. We are more likely to slide down a slippery slope. It begins with parents whose genetic profile puts their children at high risk of deadly genetic diseases. So they perform *in vitro* fertilisation, and test the DNA of the fertilised egg. If everything is in order, all well and good. But if the DNA test discovers the dreaded mutations – the embryo is destroyed.

Yet why take a chance by fertilising just one egg? Better fertilise several, so that even if three or four are defective there is at least one good embryo. When this *in vitro* selection procedure becomes acceptable and cheap enough, its usage may spread. Mutations are a ubiquitous risk. All people carry in their DNA some harmful mutations and less-than-optimal alleles. Sexual reproduction is a lottery. (A famous – and probably apocryphal – anecdote tells of a meeting in 1923 between Nobel Prize laureate Anatole France and the beautiful and talented dancer Isadora Duncan. Discussing the then popular eugenics movement, Duncan said, 'Just imagine a child with my beauty and your brains!' France responded, 'Yes, but imagine a child with *my* beauty and *your* brains.') Well then, why not rig the lottery? Fertilise several eggs, and choose the one with the best combination. Once stem-cell research enables us to create an unlimited supply of human embryos on the cheap, you can select your optimal baby from among hundreds of candidates, all carrying your DNA, all perfectly natural, and none requiring any futuristic genetic engineering. Iterate this procedure for a few generations, and you could easily end up with superhumans (or a creepy dystopia).

But what if after fertilising even numerous eggs, you find that all of them contain some deadly mutations? Should you destroy all the embryos? Instead of doing that, why not replace the problematic genes? A breakthrough case involves mitochondrial DNA. Mitochondria are tiny organelles within human cells, which produce the energy used by the cell. They have their own set of genes, which is completely separate from the DNA in the cell's nucleus. Defective mitochondrial DNA leads to various debilitating or even deadly diseases. It is technically feasible with current *in vitro* technology to overcome mitochondrial genetic diseases by creating a 'three-parent baby'. The baby's nuclear DNA comes from two parents, while the mitochondrial DNA comes from a third person. In 2000 Sharon Saarinen from West Bloomfield, Michigan, gave birth to a healthy baby girl, Alana. Alana's nuclear DNA came from her mother, Sharon, and her father, Paul, but her mitochondrial DNA came

from another woman. From a purely technical perspective, Alana has three biological parents. A year later, in 2001, the US government banned this treatment, due to safety and ethical concerns.[48]

However, on 3 February 2015 the British Parliament voted in favour of the so-called 'three-parent embryo' law, allowing this treatment – and related research – in the UK.[49] At present it is technically unfeasible, and illegal, to replace nuclear DNA, but if and when the technical difficulties are solved, the same logic that favoured the replacement of defective mitochondrial DNA would seem to warrant doing the same with nuclear DNA.

Following selection and replacement, the next potential step is amendment. Once it becomes possible to amend deadly genes, why go through the hassle of inserting some foreign DNA, when you can just rewrite the code and turn a dangerous mutant gene into its benign version? Then we might start using the same mechanism to fix not just lethal genes, but also those responsible for less deadly illnesses, for autism, for stupidity and for obesity. Who would like his or her child to suffer from any of these? Suppose a genetic test indicates that your would-be daughter will in all likelihood be smart, beautiful and kind – but will suffer from chronic depression. Wouldn't you want to save her from years of misery by a quick and painless intervention in the test tube?

And while you are at it, why not give the child a little push? Life is hard and challenging even for healthy people. So it would surely come in handy if the little girl had a stronger-than-normal immune system, an above-average memory or a particularly sunny disposition. And even if you don't want that for your child – what if the neighbours are doing it for theirs? Would you have your child lag behind? And if the government forbids all citizens from engineering their babies, what if the North Koreans are doing it and producing amazing geniuses, artists and athletes that far outperform ours? And like that, in baby steps, we are on our way to a genetic child catalogue.

Healing is the initial justification for every upgrade. Find some professors experimenting in genetic engineering or brain–computer interfaces, and ask them why they are engaged in such research. In all likelihood they would reply that they are doing it to cure disease. 'With the help of genetic engineering,' they would explain, 'we could defeat cancer. And if we could connect brains and computers directly, we could cure schizophrenia.' Maybe, but it will surely not end there. When we successfully connect brains and computers, will we use this technology only to cure schizophrenia? If anybody really believes this, then they may know a great deal about brains and computers, but far less about the human psyche and human society. Once you achieve a momentous breakthrough, you cannot restrict its use to healing and completely forbid using it for upgrading.

Of course humans can and do limit their use of new technologies. Thus the eugenics movement fell from favour after the Second World War, and though trade in human organs is now both possible and potentially very lucrative, it has so far remained a peripheral activity. Designer babies may one day become as technologically feasible as murdering people to harvest their organs – yet remain as peripheral.

Just as we have escaped the clutches of Chekhov's Law in warfare, we can also escape them in other fields of action. Some guns appear on stage without ever being fired. This is why it is so vital to think about humanity's new agenda. Precisely because we have some choice regarding the use of new technologies, we had better understand what is happening and make up our minds about it before it makes up our minds for us.

The Paradox of Knowledge

The prediction that in the twenty-first century humankind is likely to aim for immortality, bliss and divinity may anger, alienate or frighten any number of people, so a few clarifications are in order.

Firstly, this is not what most individuals will actually do in the twenty-first century. It is what humankind as a collective will do. Most people will probably play only a minor role, if any, in these projects. Even if famine, plague and war become less prevalent, billions of humans in developing countries and seedy neighbourhoods will continue to deal with poverty, illness and violence even as the elites are already reaching for eternal youth and godlike powers. This seems patently unjust. One could argue that as long as there is a single child dying from malnutrition or a single adult killed in drug-lord warfare, humankind should focus all its efforts on combating these woes. Only once the last sword is beaten into a ploughshare should we turn our minds to the next big thing. But history doesn't work like that. Those living in palaces have always had different agendas to those living in shacks, and that is unlikely to change in the twenty-first century.

Secondly, this is a historical prediction, not a political manifesto. Even if we disregard the fate of slum-dwellers, it is far from clear that we should be aiming at immortality, bliss and divinity. Adopting these particular projects might be a big mistake. But history is full of big mistakes. Given our past record and our current values, we are likely to reach out for bliss, divinity and immortality – even if it kills us.

Thirdly, reaching out is not the same as obtaining. History is often shaped by exaggerated hopes. Twentieth-century Russian history was largely shaped by the communist attempt to overcome inequality, but it didn't succeed. My prediction is focused on what humankind will *try* to achieve in the twenty-first century – not what it will *succeed* in achieving. Our future economy, society and politics will be shaped by the attempt to overcome death. It does not follow that in 2100 humans will be immortal.

Fourthly, and most importantly, this prediction is less of a prophecy and more a way of discussing our present choices. If the discussion makes us choose differently, so that the prediction is proven wrong, all the better. What's the point of making predictions if they cannot change anything?

Some complex systems, such as the weather, are oblivious to our predictions. The process of human development, in contrast, reacts to them. Indeed, the better our forecasts, the more reactions they engender. Hence paradoxically, as we accumulate more data and increase our computing power, events become wilder and more unexpected. The more we know, the less we can predict. Imagine, for example, that one day experts decipher the basic laws of the economy. Once this happens, banks, governments, investors and customers will begin to use this new knowledge to act in novel ways, and gain an edge over their competitors. For what is the use of new knowledge if it doesn't lead to novel behaviours? Alas, once people change the way they behave, the economic theories become obsolete. We may know how the economy functioned in the past – but we no longer understand how it functions in the present, not to mention the future.

This is not a hypothetical example. In the middle of the nineteenth century Karl Marx reached brilliant economic insights. Based on these insights he predicted an increasingly violent conflict between the proletariat and the capitalists, ending with the inevitable victory of the former and the collapse of the capitalist system. Marx was certain that the revolution would start in countries that spearheaded the Industrial Revolution – such as Britain, France and the USA – and spread to the rest of the world.

Marx forgot that capitalists know how to read. At first only a handful of disciples took Marx seriously and read his writings. But as these socialist firebrands gained adherents and power, the capitalists became alarmed. They too perused *Das Kapital*, adopting many of the tools and insights of

Marxist analysis. In the twentieth century everybody from street urchins to presidents embraced a Marxist approach to economics and history. Even diehard capitalists who vehemently resisted the Marxist prognosis still made use of the Marxist diagnosis. When the CIA analysed the situation in Vietnam or Chile in the 1960s, it divided society into classes. When Nixon or Thatcher looked at the globe, they asked themselves who controls the vital means of production. From 1989 to 1991 George Bush oversaw the demise of the Evil Empire of communism, only to be defeated in the 1992 elections by Bill Clinton. Clinton's winning campaign strategy was summarised in the motto: 'It's the economy, stupid.' Marx could not have said it better.

As people adopted the Marxist diagnosis, they changed their behaviour accordingly. Capitalists in countries such as Britain and France strove to better the lot of the workers, strengthen their national consciousness and integrate them into the political system. Consequently when workers began voting in elections and Labour gained power in one country after another, the capitalists could still sleep soundly in their beds. As a result, Marx's predictions came to naught. Communist revolutions never engulfed the leading industrial powers such as Britain, France and the USA, and the dictatorship of the proletariat was consigned to the dustbin of history.

This is the paradox of historical knowledge. Knowledge that does not change behaviour is useless. But knowledge that changes behaviour quickly loses its relevance. The more data we have and the better we understand history, the faster history alters its course, and the faster our knowledge becomes outdated.

Centuries ago human knowledge increased slowly, so politics and economics changed at a leisurely pace too. Today our knowledge is increasing at breakneck speed, and theoretically we should understand the world better and better. But the very opposite is happening. Our new-found knowledge leads to faster economic, social and political changes; in an attempt to understand what is happening, we accelerate the accumulation of knowledge, which leads only to faster and greater upheavals. Consequently we are less and less able to make sense of the present or forecast the future. In 1016 it was relatively easy to predict how Europe would look in 1050. Sure, dynasties might fall, unknown raiders might invade, and natural disasters might strike; yet it was clear that in 1050 Europe would still be ruled by kings and priests, that it would be an agricultural society, that most of its inhabitants would be peasants, and that it would continue to suffer greatly from famines, plagues and wars. In contrast, in 2016 we have no idea how Europe will look in 2050. We cannot say what kind of political system it will have, how its job market will be structured, or even what kind of bodies its inhabitants will possess.

A Brief History of Lawns

If history doesn't follow any stable rules, and if we cannot predict its future course, why study it? It often seems that the chief aim of science is to predict the future – meteorologists are expected to forecast whether tomorrow will bring rain or sunshine; economists should know whether devaluing the currency will avert or precipitate an economic crisis; good doctors foresee whether chemotherapy or radiation therapy will be more successful in curing lung cancer. Similarly, historians are asked to examine the actions of our ancestors so that we can repeat their wise decisions and avoid their mistakes. But it almost never works like that because the present is just too different from the past. It is a waste of time to study Hannibal's tactics in the Second Punic War so as to copy them in the Third World War. What worked well in cavalry battles will not necessarily be of much benefit in cyber

warfare.

Science is not just about predicting the future, though. Scholars in all fields often seek to broaden our horizons, thereby opening before us new and unknown futures. This is especially true of history. Though historians occasionally try their hand at prophecy (without notable success), the study of history aims above all to make us aware of possibilities we don't normally consider. Historians study the past not in order to repeat it, but in order to be liberated from it.

Each and every one of us has been born into a given historical reality, ruled by particular norms and values, and managed by a unique economic and political system. We take this reality for granted, thinking it is natural, inevitable and immutable. We forget that our world was created by an accidental chain of events, and that history shaped not only our technology, politics and society, but also our thoughts, fears and dreams. The cold hand of the past emerges from the grave of our ancestors, grips us by the neck and directs our gaze towards a single future. We have felt that grip from the moment we were born, so we assume that it is a natural and inescapable part of who we are. Therefore we seldom try to shake ourselves free, and envision alternative futures.

Studying history aims to loosen the grip of the past. It enables us to turn our head this way and that, and begin to notice possibilities that our ancestors could not imagine, or didn't want us to imagine. By observing the accidental chain of events that led us here, we realise how our very thoughts and dreams took shape – and we can begin to think and dream differently. Studying history will not tell us what to choose, but at least it gives us more options.

Movements seeking to change the world often begin by rewriting history, thereby enabling people to reimagine the future. Whether you want workers to go on a general strike, women to take possession of their bodies, or oppressed minorities to demand political rights – the first step is to retell their history. The new history will explain that 'our present situation is neither natural nor eternal. Things were different once. Only a string of chance events created the unjust world we know today. If we act wisely, we can change that world, and create a much better one.' This is why Marxists recount the history of capitalism; why feminists study the formation of patriarchal societies; and why African Americans commemorate the horrors of the slave trade. They aim not to perpetuate the past, but rather to be liberated from it.

What's true of grand social revolutions is equally true at the micro level of everyday life. A young couple building a new home for themselves may ask the architect for a nice lawn in the front yard. Why a lawn? 'Because lawns are beautiful,' the couple might explain. But why do they think so? It has a history behind it.

Stone Age hunter-gatherers did not cultivate grass at the entrance to their caves. No green meadow welcomed the visitors to the Athenian Acropolis, the Roman Capitol, the Jewish Temple in Jerusalem or the Forbidden City in Beijing. The idea of nurturing a lawn at the entrance to private residences and public buildings was born in the castles of French and English aristocrats in the late Middle Ages. In the early modern age this habit struck deep roots, and became the trademark of nobility.

Well-kept lawns demanded land and a lot of work, particularly in the days before lawnmowers and automatic water sprinklers. In exchange, they produce nothing of value. You can't even graze animals on them, because they would eat and trample the grass. Poor peasants could not afford wasting precious land or time on lawns. The neat turf at the entrance to chateaux was accordingly a status symbol nobody could fake. It boldly proclaimed to every passerby: 'I am so rich and powerful, and I have so many acres and serfs, that I can afford this green extravaganza.' The bigger and neater the lawn, the more powerful the dynasty. If you came to visit a duke and saw that his lawn was in bad shape, you knew he was in trouble.[50]

The precious lawn was often the setting for important celebrations and social events, and at all other times was strictly off-limits. To this day, in countless palaces, government buildings and public venues a stern sign commands people to 'Keep off the grass'. In my former Oxford college the entire quad was formed of a large, attractive lawn, on which we were allowed to walk or sit on only one day a year. On any other day, woe to the poor student whose foot desecrated the holy turf.

Royal palaces and ducal chateaux turned the lawn into a symbol of authority. When in the late modern period kings were toppled and dukes were guillotined, the new presidents and prime ministers kept the lawns. Parliaments, supreme courts, presidential residences and other public buildings increasingly proclaimed their power in row upon row of neat green blades. Simultaneously, lawns conquered the world of sports. For thousands of years humans played on almost every conceivable kind of ground, from ice to desert. Yet in the last two centuries, the really important games – such as football and tennis – are played on lawns. Provided, of course, you have money. In the *favelas* of Rio de Janeiro the future generation of Brazilian football is kicking makeshift balls over sand and dirt. But in the wealthy suburbs, the sons of the rich are enjoying themselves over meticulously kept lawns.

Humans thereby came to identify lawns with political power, social status and economic wealth. No wonder that in the nineteenth century the rising bourgeoisie enthusiastically adopted the lawn. At first only bankers, lawyers and industrialists could afford such luxuries at their private residences. Yet when the Industrial Revolution broadened the middle class and gave rise to the lawnmower and then the automatic sprinkler, millions of families could suddenly afford a home turf. In American suburbia a spick-and-span lawn switched from being a rich person's luxury into a middle-class necessity.

This was when a new rite was added to the suburban liturgy. After Sunday morning service at church, many people devotedly mowed their lawns. Walking along the streets, you could quickly ascertain the wealth and position of every family by the size and quality of their turf. There is no surer sign that something is wrong at the Joneses' than a neglected lawn in the front yard. Grass is nowadays the most widespread crop in the USA after maize and wheat, and the lawn industry (plants, manure, mowers, sprinklers, gardeners) accounts for billions of dollars every year.[51]



The lawns of Château de Chambord, in the Loire Valley. King François I built it in the early sixteenth century. This is where it all began.

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A welcoming ceremony in honour of Queen Elizabeth II – on the White House lawn.

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Mario Götze scores the decisive goal, giving Germany the World Cup in 2014 – on the Maracanã lawn.

© Imagebank/Chris Brunskill/Getty Images/Bridgeman Images.



Petit-bourgeois paradise.

© H. Armstrong Roberts/ClassicStock/Getty Images.

The lawn did not remain solely a European or American craze. Even people who have never visited the Loire Valley see US presidents giving speeches on the White House lawn, important football games played out in green stadiums, and Homer and Bart Simpson quarrelling about whose turn it is to mow the grass. People all over the globe associate lawns with power, money and prestige. The lawn has therefore spread far and wide, and is now set to conquer even the heart of the Muslim world. Qatar's newly built Museum of Islamic Art is flanked by magnificent lawns that hark back to Louis XIV's Versailles much more than to Haroun al-Rashid's Baghdad. They were designed and constructed by an American company, and their more than 100,000 square metres of grass – in the midst of the Arabian desert – require a stupendous amount of fresh water each day to stay green. Meanwhile, in the suburbs of Doha and Dubai, middle-class families pride themselves on their lawns. If it were not for the white robes and black hijabs, you could easily think you were in the Midwest rather than the Middle East.

Having read this short history of the lawn, when you now come to plan your dream house you might think twice about having a lawn in the front yard. You are of course still free to do it. But you are also free to shake off the cultural cargo bequeathed to you by European dukes, capitalist moguls and the Simpsons – and imagine for yourself a Japanese rock garden, or some altogether new creation. This is the best reason to learn history: not in order to predict the future, but to free yourself of the past and imagine alternative destinies. Of course this is not total freedom – we cannot avoid being shaped by the past. But some freedom is better than none.

A Gun in Act I

All the predictions that pepper this book are no more than an attempt to discuss present-day dilemmas, and an invitation to change the future. Predicting that humankind will try to gain

immortality, bliss and divinity is much like predicting that people building a house will want a lawn in their front yard. It sounds very likely. But once you say it out loud, you can begin to think about alternatives.

People are taken aback by dreams of immortality and divinity not because they sound so foreign and unlikely, but because it is uncommon to be so blunt. Yet when they start thinking about it, most people realise that it actually makes a lot of sense. Despite the technological hubris of these dreams, ideologically they are old news. For 300 years the world has been dominated by humanism, which sanctifies the life, happiness and power of *Homo sapiens*. The attempt to gain immortality, bliss and divinity merely takes the long-standing humanist ideals to their logical conclusion. It places openly on the table what we have for a long time kept hidden under our napkin.

Yet I would now like to place something else on the table: a gun. A gun that appears in Act I, to fire in Act III. The following chapters discuss how humanism – the worship of humankind – has conquered the world. Yet the rise of humanism also contains the seeds of its downfall. While the attempt to upgrade humans into gods takes humanism to its logical conclusion, it simultaneously exposes humanism's inherent flaws. If you start with a flawed ideal, you often appreciate its defects only when the ideal is close to realisation.

We can already see this process at work in geriatric hospital wards. Due to an uncompromising humanist belief in the sanctity of human life, we keep people alive till they reach such a pitiful state that we are forced to ask, 'What exactly is so sacred here?' Due to similar humanist beliefs, in the twenty-first century we are likely to push humankind as a whole beyond its limits. The same technologies that can upgrade humans into gods might also make humans irrelevant. For example, computers powerful enough to understand and overcome the mechanisms of ageing and death will probably also be powerful enough to replace humans in any and all tasks.

Hence the real agenda in the twenty-first century is going to be far more complicated than what this long opening chapter has suggested. At present it might seem that immortality, bliss and divinity occupy the top slots on our agenda. But once we come nearer to achieving these goals the resulting upheavals are likely to deflect us towards entirely different destinations. The future described in this chapter is merely the future of the past – i.e. a future based on the ideas and hopes that dominated the world for the last 300 years. The real future – i.e. a future born of the new ideas and hopes of the twenty-first century – might be completely different.

To understand all this we need to go back and investigate who *Homo sapiens* really is, how humanism became the dominant world religion and why attempting to fulfil the humanist dream is likely to cause its disintegration. This is the basic plan of the book.

The first part of the book looks at the relationship between *Homo sapiens* and other animals, in an attempt to comprehend what makes our species so special. Some readers may wonder why animals receive so much attention in a book about the future. In my view, you cannot have a serious discussion about the nature and future of humankind without beginning with our fellow animals. *Homo sapiens* does its best to forget the fact, but it is an animal. And it is doubly important to remember our origins at a time when we seek to turn ourselves into gods. No investigation of our divine future can ignore our own animal past, or our relations with other animals – because the relationship between humans and animals is the best model we have for future relations between superhumans and humans. You want to know how super-intelligent cyborgs might treat ordinary flesh-and-blood humans? Better start by investigating how humans treat their less intelligent animal cousins. It's not a perfect analogy, of course, but it is the best archetype we can actually observe rather than just imagine.

Based on the conclusions of this first part, the second part of the book examines the bizarre world

Homo sapiens has created in the last millennia, and the path that took us to our present crossroads. How did *Homo sapiens* come to believe in the humanist creed, according to which the universe revolves around humankind and humans are the source of all meaning and authority? What are the economic, social and political implications of this creed? How does it shape our daily life, our art and our most secret desires?

The third and last part of the book comes back to the early twenty-first century. Based on a much deeper understanding of humankind and of the humanist creed, it describes our current predicament and our possible futures. Why might attempts to fulfil humanism result in its downfall? How would the search for immortality, bliss and divinity shake the foundations of our belief in humanity? What signs foretell this cataclysm, and how is it reflected in the day-to-day decisions each of us makes? And if humanism is indeed in danger, what might take its place? This part of the book does not consist of mere philosophising or idle future-telling. Rather, it scrutinises our smartphones, dating practices and job market for clues of things to come.

For humanist true-believers, all this may sound very pessimistic and depressing. But it is best not to jump to conclusions. History has witnessed the rise and fall of many religions, empires and cultures. Such upheavals are not necessarily bad. Humanism has dominated the world for 300 years, which is not such a long time. The pharaohs ruled Egypt for 3,000 years, and the popes dominated Europe for a millennium. If you told an Egyptian in the time of Ramses II that one day the pharaohs will be gone, he would probably have been aghast. 'How can we live without a pharaoh? Who will ensure order, peace and justice?' If you told people in the Middle Ages that within a few centuries God will be dead, they would have been horrified. 'How can we live without God? Who will give life meaning and protect us from chaos?'

Looking back, many think that the downfall of the pharaohs and the death of God were both positive developments. Maybe the collapse of humanism will also be beneficial. People are usually afraid of change because they fear the unknown. But the single greatest constant of history is that everything changes.



King Ashurbanipal of Assyria slaying a lion: mastering the animal kingdom.

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PART I
Homo sapiens Conquers the World

What is the difference between humans and all other animals?

How did our species conquer the world?

Is Homo sapiens *a superior life form, or just the local bully?*

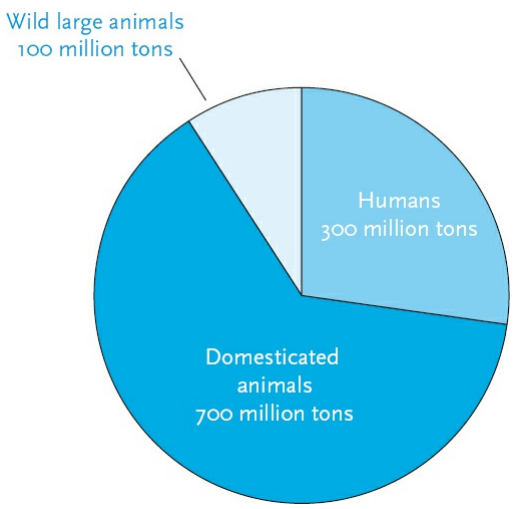
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The Anthropocene

With regard to other animals, humans have long since become gods. We don't like to reflect on this too deeply, because we have not been particularly just or merciful gods. If you watch the National Geographic channel, go to a Disney film or read a book of fairy tales, you might easily get the impression that planet Earth is populated mainly by lions, wolves and tigers who are an equal match for us humans. Simba the lion king holds sway over the forest animals; Little Red Riding Hood tries to evade the Big Bad Wolf; and little Mowgli bravely confronts Shere Khan the tiger. But in reality, they are no longer there. Our televisions, books, fantasies and nightmares are still full of them, but the Simbas, Shere Khans and Big Bad Wolves of our planet are disappearing. The world is populated mainly by humans and their domesticated animals.

How many wolves live today in Germany, the land of the Grimm brothers, Little Red Riding Hood and the Big Bad Wolf? Less than a hundred. (And even these are mostly Polish wolves that stole over the border in recent years.) In contrast, Germany is home to 5 million domesticated dogs. Altogether about 200,000 wild wolves still roam the earth, but there are more than 400 million domesticated dogs.[1] The world contains 40,000 lions compared to 600 million house cats; 900,000 African buffalo versus 1.5 billion domesticated cows; 50 million penguins and 20 billion chickens.[2] Since 1970, despite growing ecological awareness, wildlife populations have halved (not that they were prospering in 1970).[3] In 1980 there were 2 billion wild birds in Europe. In 2009 only 1.6 billion were left. In the same year, Europeans raised 1.9 billion chickens for meat and eggs.[4] At present, more than 90 per cent of the large animals of the world (i.e. those weighing more than a few kilograms) are either humans or domesticated animals.

Scientists divide the history of our planet into epochs such as the Pleistocene, the Pliocene and the Miocene. Officially, we live in the Holocene epoch. Yet it may be better to call the last 70,000 years the Anthropocene epoch: the epoch of humanity. For during these millennia *Homo sapiens* became the single most important agent of change in the global ecology.[5]

This is an unprecedented phenomenon. Since the appearance of life, about 4 billion years ago, never has a single species changed the global ecology all by itself. Though there had been no lack of ecological revolutions and mass-extinction events, these were not caused by the actions of a particular lizard, bat or fungus. Rather, they were caused by the workings of mighty natural forces such as climate change, tectonic plate movement, volcanic eruptions and asteroid collisions.



Pie chart of global biomass of large animals.

Some people fear that today we are again in mortal danger of massive volcanic eruptions or colliding asteroids. Hollywood producers make billions out of these anxieties. Yet in reality, the danger is slim. Mass extinctions occur once every many millions of years. Yes, a big asteroid will probably hit our planet sometime in the next 100 million years, but it is very unlikely to happen next Tuesday. Instead of fearing asteroids, we should fear ourselves.

For *Homo sapiens* has rewritten the rules of the game. This single ape species has managed within 70,000 years to change the global ecosystem in radical and unprecedented ways. Our impact is already on a par with that of ice ages and tectonic movements. Within a century, our impact may surpass that of the asteroid that killed off the dinosaurs 65 million years ago.

That asteroid changed the trajectory of terrestrial evolution, but not its fundamental rules, which have remained fixed since the appearance of the first organisms 4 billion years ago. During all those aeons, whether you were a virus or a dinosaur, you evolved according to the unchanging principles of natural selection. In addition, no matter what strange and bizarre shapes life adopted, it remained confined to the organic realm – whether a cactus or a whale, you were made of organic compounds. Now humankind is poised to replace natural selection with intelligent design, and to extend life from the organic realm into the inorganic.

Even if we leave aside these future prospects and only look back on the last 70,000 years, it is evident that the Anthropocene has altered the world in unprecedented ways. Asteroids, plate tectonics and climate change may have impacted organisms all over the globe, but their influence differed from one area to another. The planet never constituted a single ecosystem; rather, it was a collection of many loosely connected ecosystems. When tectonic movements joined North America with South America it led to the extinction of most South American marsupials, but had no detrimental effect on the Australian kangaroo. When the last ice age reached its peak 20,000 years ago, jellyfish in the Persian Gulf and jellyfish in Tokyo Bay both had to adapt to the new climate. Yet since there was no connection between the two populations, each reacted in a different way, evolving in distinct directions.

In contrast, Sapiens broke the barriers that had separated the globe into independent ecological zones. In the Anthropocene, the planet became for the first time a single ecological unit. Australia, Europe and America continued to have different climates and topographies, yet humans caused organisms from throughout the world to mingle on a regular basis, irrespective of distance and geography. What began as a trickle of wooden boats has turned into a torrent of aeroplanes, oil tankers and giant cargo ships that criss-cross every ocean and bind every island and continent. Consequently the ecology of, say, Australia can no longer be understood without taking into account

the European mammals or American microorganisms that flood its shores and deserts. Sheep, wheat, rats and flu viruses that humans brought to Australia during the last 300 years are today far more important to its ecology than the native kangaroos and koalas.

But the Anthropocene isn't a novel phenomenon of the last few centuries. Already tens of thousands of years ago, when our Stone Age ancestors spread from East Africa to the four corners of the earth, they changed the flora and fauna of every continent and island on which they settled. They drove to extinction all the other human species of the world, 90 per cent of the large animals of Australia, 75 per cent of the large mammals of America and about 50 per cent of all the large land mammals of the planet – and all before they planted the first wheat field, shaped the first metal tool, wrote the first text or struck the first coin.[6]

Large animals were the main victims because they were relatively few, and they bred slowly. Compare, for example, mammoths (which became extinct) to rabbits (which survived). A troop of mammoths numbered no more than a few dozen individuals, and bred at a rate of perhaps just two youngsters per year. Hence if the local human tribe hunted just three mammoths a year, it would have been enough for deaths to outstrip births, and within a few generations the mammoths disappeared. Rabbits, in contrast, bred like rabbits. Even if humans hunted hundreds of rabbits each year, it was not enough to drive them to extinction.

Not that our ancestors planned on wiping out the mammoths; they were simply unaware of the consequences of their actions. The extinction of the mammoths and other large animals may have been swift on an evolutionary timescale, but slow and gradual in human terms. People lived no more than seventy or eighty years, whereas the extinction process took centuries. The ancient Sapiens probably failed to notice any connection between the annual mammoth hunt – in which no more than two or three mammoths were killed – and the disappearance of these furry giants. At most, a nostalgic elder might have told sceptical youngsters that 'when I was young, mammoths were much more plentiful than these days. And so were mastodons and giant elks. And, of course, the tribal chiefs were honest, and children respected their elders.'

The Serpent's Children

Anthropological and archaeological evidence indicates that archaic hunter-gatherers were probably animists: they believed that there was no essential gap separating humans from other animals. The world – i.e. the local valley and the surrounding mountain chains – belonged to all its inhabitants, and everyone followed a common set of rules. These rules involved ceaseless negotiation between all concerned beings. People talked with animals, trees and stones, as well as with fairies, demons and ghosts. Out of this web of communications emerged the values and norms that were binding on humans, elephants, oak trees and wraiths alike.[7]

The animist world view still guides some hunter-gatherer communities that have survived into the modern age. One of them is the Nayaka people, who live in the tropical forests of south India. The anthropologist Danny Naveh, who studied the Nayaka for several years, reports that when a Nayaka walking in the jungle encounters a dangerous animal such as a tiger, snake or elephant, he or she might address the animal and say: 'You live in the forest. I too live here in the forest. You came here to eat, and I too came here to gather roots and tubers. I didn't come to hurt you.'

A Nayaka was once killed by a male elephant they called 'the elephant who always walks alone'. The Nayakas refused to help officials from the Indian forestry department capture him. They

explained to Naveh that this elephant used to be very close to another male elephant, with whom he always roamed. One day the forestry department captured the second elephant, and since then 'the elephant who always walks alone' had become angry and violent. 'How would you have felt if your spouse had been taken away from you? This is exactly how this elephant felt. These two elephants sometimes separated at night, each walking its own path . . . but in the morning they always came together again. On that day, the elephant saw his buddy falling, lying down. If two are always together and then you shoot one – how would the other feel?'[8]

Such an animistic attitude strikes many industrialised people as alien. Most of us automatically see animals as essentially different and inferior. This is because even our most ancient traditions were created thousands of years after the end of the hunter-gatherer era. The Old Testament, for example, was written down in the first millennium BC, and its oldest stories reflect the realities of the second millennium BC. But in the Middle East the age of the hunter-gatherers ended more than 7,000 years earlier. It is hardly surprising, therefore, that the Bible rejects animistic beliefs and its only animistic story appears right at the beginning, as a dire warning. The Bible is a long book, bursting with miracles, wonders and marvels. Yet the only time an animal initiates a conversation with a human is when the serpent tempts Eve to eat the forbidden fruit of knowledge (Bil'am's donkey also speaks a few words, but she is merely conveying to Bil'am a message from God).

In the Garden of Eden, Adam and Eve lived as foragers. The expulsion from Eden bears a striking resemblance to the Agricultural Revolution. Instead of allowing Adam to keep gathering wild fruits, an angry God condemns him 'to eat bread by the sweat of your brow'. It might be no coincidence, then, that biblical animals spoke with humans only in the pre-agricultural era of Eden. What lessons does the Bible draw from the episode? That you shouldn't listen to snakes, and it is generally best to avoid talking with animals and plants. It leads to nothing but disaster.

Yet the biblical story has deeper and more ancient layers of meaning. In most Semitic languages, 'Eve' means 'snake' or even 'female snake'. The name of our ancestral biblical mother hides an archaic animist myth, according to which snakes are not our enemies, but our ancestors.[9] Many animist cultures believed that humans descended from animals, including from snakes and other reptiles. Most Australian Aborigines believed that the Rainbow Serpent created the world. The Aranda and Dieri people maintained that their particular tribes originated from primordial lizards or snakes, which were transformed into humans.[10] In fact, modern Westerners too think that they have evolved from reptiles. The brain of each and every one of us is built around a reptilian core, and the structure of our bodies is essentially that of modified reptiles.



Paradise lost (the Sistine Chapel). The serpent – who sports a human upper body – initiates the entire chain of events. While the first two chapters of Genesis are dominated by divine monologues ('and God said . . . and God said . . . and God said . . .'), in the third chapter we finally get a dialogue – between Eve and the serpent ('and the serpent said unto the woman . . . and the woman said unto the serpent . . .'). This unique conversation between a human and an animal leads to the fall of humanity and our expulsion from Eden.

Detail from Michelangelo Buonarroti (1475–1564), the Sistine Chapel, Vatican City © Lessing Images.

The authors of the book of Genesis may have preserved a remnant of archaic animist beliefs in Eve's name, but they took great care to conceal all other traces. Genesis says that, instead of descending from snakes, humans were divinely created from inanimate matter. The snake is not our progenitor: he seduces us to rebel against our heavenly Father. While animists saw humans as just another kind of animal, the Bible argues that humans are a unique creation, and any attempt to acknowledge the animal within us denies God's power and authority. Indeed, when modern humans discovered that they actually evolved from reptiles, they rebelled against God and stopped listening to Him – or even believing in His existence.

Ancestral Needs

The Bible, along with its belief in human distinctiveness, was one of the by-products of the Agricultural Revolution, which initiated a new phase in human–animal relations. The advent of farming produced new waves of mass extinctions, but more importantly, it created a completely new life form on earth: domesticated animals. Initially this development was of minor importance, since humans managed to domesticate fewer than twenty species of mammals and birds, compared to the countless thousands of species that remained 'wild'. Yet with the passing of the centuries, this novel life form became dominant. Today more than 90 per cent of all large animals are domesticated.

Alas, domesticated species paid for their unparalleled collective success with unprecedented individual suffering. Although the animal kingdom has known many types of pain and misery for millions of years, the Agricultural Revolution generated completely new kinds of suffering, that only became worse over time.

To the casual observer domesticated animals may seem much better off than their wild cousins and ancestors. Wild boars spend their days searching for food, water and shelter, and are constantly threatened by lions, parasites and floods. Domesticated pigs, in contrast, enjoy food, water and shelter provided by humans, who also treat their diseases and protect them against predators and

natural disasters. True, most pigs sooner or later find themselves in the slaughterhouse. Yet does that make their fate any worse than the fate of wild boars? Is it better to be devoured by a lion than slaughtered by a man? Are crocodile teeth less deadly than steel blades?

What makes the fate of domesticated farm animals particularly harsh is not just the way they die, but above all the way they live. Two competing factors have shaped the living conditions of farm animals from ancient times to the present day: human desires and animal needs. Thus humans raise pigs in order to get meat, but if they want a steady supply of meat, they must ensure the long-term survival and reproduction of the pigs. Theoretically this should have protected the animals from extreme forms of cruelty. If a farmer did not take good care of his pigs, they would soon die without offspring and the farmer would starve.

Unfortunately, humans can cause tremendous suffering to farm animals in various ways, even while ensuring their survival and reproduction. The root of the problem is that domesticated animals have inherited from their wild ancestors many physical, emotional and social needs that are redundant on human farms. Farmers routinely ignore these needs, without paying any economic penalty. They lock animals in tiny cages, mutilate their horns and tails, separate mothers from offspring and selectively breed monstrosities. The animals suffer greatly, yet they live on and multiply.

Doesn't that contradict the most basic principles of natural selection? The theory of evolution maintains that all instincts, drives and emotions have evolved in the sole interest of survival and reproduction. If so, doesn't the continuous reproduction of farm animals prove that all their real needs are met? How can a pig have a 'need' that is not really needed for his survival and reproduction?

It is certainly true that all instincts, drives and emotions evolved in order to meet the evolutionary pressures of survival and reproduction. However, if and when these pressures suddenly disappear, the instincts, drives and emotions they had shaped do not disappear with them. At least not instantly. Even if they are no longer instrumental for survival and reproduction, these instincts, drives and emotions continue to mould the subjective experiences of the animal. For animals and humans alike, agriculture changed selection pressures almost overnight, but it did not change their physical, emotional and social drives. Of course evolution never stands still, and it has continued to modify humans and animals in the 12,000 years since the advent of farming. For example, humans in Europe and western Asia evolved the ability to digest cows' milk, while cows lost their fear of humans, and today produce far more milk than their wild ancestors. Yet these are superficial alterations. The deep sensory and emotional structures of cows, pigs and humans alike haven't changed much since the Stone Age.

Why do modern humans love sweets so much? Not because in the early twenty-first century we must gorge on ice cream and chocolate in order to survive. Rather, it is because when our Stone Age ancestors came across sweet fruit or honey, the most sensible thing to do was to eat as much of it as quickly as possible. Why do young men drive recklessly, get involved in violent arguments and hack confidential Internet sites? Because they are following ancient genetic decrees that might be useless and even counterproductive today, but that made good evolutionary sense 70,000 years ago. A young hunter who risked his life chasing a mammoth outshone all his competitors and won the hand of the local beauty; and we are now stuck with his macho genes.[11]

Exactly the same evolutionary logic shapes the lives of pigs, sows and piglets in human-controlled farms. In order to survive and reproduce in the wild, ancient boars needed to roam vast territories, familiarise themselves with their environment and beware of traps and predators. They further needed to communicate and cooperate with their fellow boars, forming complex groups dominated by old and experienced matriarchs. Evolutionary pressures consequently made wild boars – and even more so

wild sows – highly intelligent social animals, characterised by a lively curiosity and strong urges to socialise, play, wander about and explore their surroundings. A sow born with some rare mutation that made her indifferent to her environment and to other boars was unlikely to survive or reproduce.

The descendants of wild boars – domesticated pigs – inherited their intelligence, curiosity and social skills.[12] Like wild boars, domesticated pigs communicate using a rich variety of vocal and olfactory signals: mother sows recognise the unique squeaks of their piglets, whereas two-day-old piglets already differentiate their mother's calls from those of other sows.[13] Professor Stanley Curtis of the Pennsylvania State University trained two pigs – named Hamlet and Omelette – to control a special joystick with their snouts, and found that the pigs soon rivalled primates in learning and playing simple computer games.[14]

Today most sows in industrial farms don't play computer games. They are locked by their human masters in tiny gestation crates, usually measuring two metres by sixty centimetres. The crates have a concrete floor and metal bars, and hardly allow the pregnant sows even to turn around or sleep on their side, never mind walk. After three and a half months in such conditions, the sows are moved to slightly wider crates, where they give birth and nurse their piglets. Whereas piglets would naturally suckle for ten to twenty weeks, in industrial farms they are forcibly weaned within two to four weeks, separated from their mother and shipped to be fattened and slaughtered. The mother is immediately impregnated again, and sent back to the gestation crate to start another cycle. The typical sow would go through five to ten such cycles before being slaughtered herself. In recent years the use of crates has been restricted in the European Union and some US states, but the crates are still commonly used in many other countries, and tens of millions of breeding sows pass almost their entire lives in them.

The human farmers take care of everything the sow needs in order to survive and reproduce. She is given enough food, vaccinated against diseases, protected against the elements and artificially inseminated. From an objective perspective, the sow no longer needs to explore her surroundings, socialise with other pigs, bond with her piglets or even walk. But from a subjective perspective, the sow still feels very strong urges to do all of these things, and if these urges are not fulfilled she suffers greatly. Sows locked in gestation crates typically display acute frustration alternating with extreme despair.[15]

This is the basic lesson of evolutionary psychology: a need shaped thousands of generations ago continues to be felt subjectively even if it is no longer necessary for survival and reproduction in the present. Tragically, the Agricultural Revolution gave humans the power to ensure the survival and reproduction of domesticated animals while ignoring their subjective needs.



Sows confined in gestation crates. These highly social and intelligent beings spend most of their lives in this condition, as if they were already sausages.

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Organisms are Algorithms

How can we be sure that animals such as pigs actually have a subjective world of needs, sensations and emotions? Aren't we guilty of humanising animals, i.e. ascribing human qualities to non-human entities, like children believing that dolls feel love and anger?

In fact, attributing emotions to pigs doesn't humanise them. It 'mammalises' them. For emotions are not a uniquely human quality – they are common to all mammals (as well as to all birds and probably to some reptiles and even fish). All mammals evolved emotional abilities and needs, and from the fact that pigs are mammals we can safely deduce that they have emotions.[16]

In recent decades life scientists have demonstrated that emotions are not some mysterious spiritual phenomenon that is useful just for writing poetry and composing symphonies. Rather, emotions are biochemical algorithms that are vital for the survival and reproduction of all mammals. What does this mean? Well, let's begin by explaining what an algorithm is. This is of great importance not only because this key concept will reappear in many of the following chapters, but also because the twenty-first century will be dominated by algorithms. 'Algorithm' is arguably the single most important concept in our world. If we want to understand our life and our future, we should make every effort to understand what an algorithm is, and how algorithms are connected with emotions.

An algorithm is a methodical set of steps that can be used to make calculations, resolve problems and reach decisions. An algorithm isn't a particular calculation, but the method followed when making the calculation. For example, if you want to calculate the average between two numbers, you can use a simple algorithm. The algorithm says: 'First step: add the two numbers together. Second step: divide the sum by two.' When you enter the numbers 4 and 8, you get 6. When you enter 117 and 231, you get 174.

A more complex example is a cooking recipe. An algorithm for preparing vegetable soup may tell us:

1. Heat half a cup of oil in a pot.
2. Finely chop four onions.

3. Fry the onion until golden.
4. Cut three potatoes into chunks and add to the pot.
5. Slice a cabbage into strips and add to the pot.

And so forth. You can follow the same algorithm dozens of times, each time using slightly different vegetables, and therefore getting a slightly different soup. But the algorithm remains the same.

A recipe by itself cannot make soup. You need a person to read the recipe and follow the prescribed set of steps. But you can build a machine that embodies this algorithm and follows it automatically. Then you just need to provide the machine with water, electricity and vegetables – and it will prepare the soup by itself. There aren't many soup machines around, but you are probably familiar with beverage vending machines. Such machines usually have a slot for coins, an opening for cups, and rows of buttons. The first row has buttons for coffee, tea and cocoa. The second row is marked: no sugar, one spoon of sugar, two spoons of sugar. The third row indicates milk, soya milk, no milk. A man approaches the machine, inserts a coin into the slot and presses the buttons marked 'tea', 'one sugar' and 'milk'. The machine kicks into action, following a precise set of steps. It drops a tea bag into a cup, pours boiling water, adds a spoonful of sugar and milk, and ding! A nice cup of tea emerges. This is an algorithm.[17]

Over the last few decades biologists have reached the firm conclusion that the man pressing the buttons and drinking the tea is also an algorithm. A much more complicated algorithm than the vending machine, no doubt, but still an algorithm. Humans are algorithms that produce not cups of tea, but copies of themselves (like a vending machine which, if you press the right combination of buttons, produces another vending machine).

The algorithms controlling vending machines work through mechanical gears and electric circuits. The algorithms controlling humans work through sensations, emotions and thoughts. And exactly the same kind of algorithms control pigs, baboons, otters and chickens. Consider, for example, the following survival problem: a baboon spots some bananas hanging on a tree, but also notices a lion lurking nearby. Should the baboon risk his life for those bananas?

This boils down to a mathematical problem of calculating probabilities: the probability that the baboon will die of hunger if he does not eat the bananas, versus the probability that the lion will catch the baboon. In order to solve this problem the baboon needs to take into account a lot of data. How far am I from the bananas? How far away is the lion? How fast can I run? How fast can the lion run? Is the lion awake or asleep? Does the lion seem to be hungry or satiated? How many bananas are there? Are they big or small? Green or ripe? In addition to these external data, the baboon must also consider information about conditions within his own body. If he is starving, it makes sense to risk everything for those bananas, no matter the odds. In contrast, if he has just eaten, and the bananas are mere greed, why take any risks at all?

In order to weigh and balance all these variables and probabilities, the baboon requires far more complicated algorithms than the ones controlling automatic vending machines. The prize for making correct calculations is correspondingly greater. The prize is the very survival of the baboon. A timid baboon – one whose algorithms overestimate dangers – will starve to death, and the genes that shaped these cowardly algorithms will perish with him. A rash baboon – one whose algorithms underestimate dangers – will fall prey to the lion, and his reckless genes will also fail to make it to the next generation. These algorithms undergo constant quality control by natural selection. Only animals that calculate probabilities correctly leave offspring behind.

Yet this is all very abstract. How exactly does a baboon calculate probabilities? He certainly doesn't draw a pencil from behind his ear, a notebook from a back pocket, and start computing running speeds and energy levels with a calculator. Rather, the baboon's entire body is the calculator. What we call sensations and emotions are in fact algorithms. The baboon *feels* hunger, he *feels* fear and trembling at the sight of the lion, and he *feels* his mouth watering at the sight of the bananas. Within a split second, he experiences a storm of sensations, emotions and desires, which is nothing but the process of calculation. The result will appear as a feeling: the baboon will suddenly feel his spirit rising, his hairs standing on end, his muscles tensing, his chest expanding, and he will inhale a big breath, and 'Forward! I can do it! To the bananas!' Alternatively, he may be overcome by fear, his shoulders will droop, his stomach will turn, his legs will give way, and 'Mama! A lion! Help!' Sometimes the probabilities match so evenly that it is hard to decide. This too will manifest itself as a feeling. The baboon will feel confused and indecisive. 'Yes . . . No . . . Yes . . . No . . . Damn! I don't know what to do!'

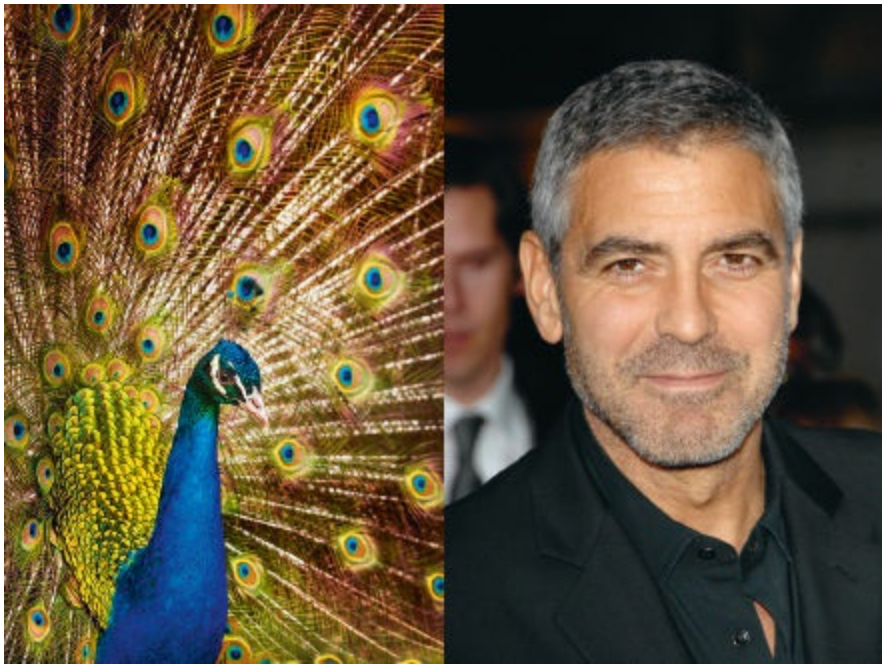
In order to transmit genes to the next generation, it is not enough to solve survival problems. Animals also need to solve reproduction problems too, and this depends on calculating probabilities. Natural selection evolved passion and disgust as quick algorithms for evaluating reproduction odds. Beauty means 'good chances for having successful offspring'. When a woman sees a man and thinks, 'Wow! He is gorgeous!' and when a peahen sees a peacock and thinks, 'Jesus! What a tail!' they are doing something similar to the automatic vending machine. As light reflected from the male's body hits their retinas, extremely powerful algorithms honed by millions of years of evolution kick in. Within a few milliseconds the algorithms convert tiny cues in the male's external appearance into reproduction probabilities, and reach the conclusion: 'In all likelihood, this is a very healthy and fertile male, with excellent genes. If I mate with him, my offspring are also likely to enjoy good health and excellent genes.' Of course, this conclusion is not spelled out in words or numbers, but in the fiery itch of sexual attraction. Peahens, and most women, don't make such calculations with pen and paper. They just feel them.

Even Nobel laureates in economics make only a tiny fraction of their decisions using pen, paper and calculator; 99 per cent of our decisions – including the most important life choices concerning spouses, careers and habitats – are made by the highly refined algorithms we call sensations, emotions and desires.[18]

Because these algorithms control the lives of all mammals and birds (and probably some reptiles and even fish), when humans, baboons and pigs feel fear, similar neurological processes take place in similar brain areas. It is therefore likely that frightened humans, frightened baboons and frightened pigs have similar experiences.[19]

There are differences too, of course. Pigs don't seem to experience the extremes of compassion and cruelty that characterise *Homo sapiens*, nor the sense of wonder that overwhelms a human gazing up at the infinitude of a starry sky. It is likely that there are also opposite examples, of swinish emotions unfamiliar to humans, but I cannot name any, for obvious reasons. However, one core emotion is apparently shared by all mammals: the mother–infant bond. Indeed, it gives mammals their name. The word 'mammal' comes from the Latin *mamma*, meaning breast. Mammal mothers love their offspring so much that they allow them to suckle from their body. Mammal youngsters, on their side, feel an overwhelming desire to bond with their mothers and stay near them. In the wild, piglets, calves and puppies that fail to bond with their mothers rarely survive for long. Until recently that was true of human children too. Conversely, a sow, cow or bitch that due to some rare mutation does not care about her young may live a long and comfortable life, but her genes will not pass to the next

generation. The same logic is true among giraffes, bats, whales and porcupines. We can argue about other emotions, but since mammal youngsters cannot survive without motherly care, it is evident that motherly love and a strong mother–infant bond characterise all mammals.[20]



A peacock and a man. When you look at these images, data on proportions, colours and sizes gets processed by your biochemical algorithms, causing you to feel attraction, repulsion or indifference.

Left: © Bergserg/Shutterstock.com. Right: © s_bukley/Shutterstock.com.

It took scientists many years to acknowledge this. Not long ago psychologists doubted the importance of the emotional bond between parents and children even among humans. In the first half of the twentieth century, and despite the influence of Freudian theories, the dominant behaviourist school argued that relations between parents and children were shaped by material feedback; that children needed mainly food, shelter and medical care; and that children bonded with their parents simply because the latter provide these material needs. Children who demanded warmth, hugs and kisses were thought to be 'spoiled'. Childcare experts warned that children who were hugged and kissed by their parents would grow up to be needy, egotistical and insecure adults.[21]

John Watson, a leading childcare authority in the 1920s, sternly advised parents, 'Never hug and kiss [your children], never let them sit in your lap. If you must, kiss them once on the forehead when they say goodnight. Shake hands with them in the morning.'[22] The popular magazine *Infant Care* explained that the secret of raising children is to maintain discipline and to provide the children's material needs according to a strict daily schedule. A 1929 article instructed parents that if an infant cries out for food before the normal feeding time, 'Do not hold him, nor rock him to stop his crying, and do not nurse him until the exact hour for the feeding comes. It will not hurt the baby, even the tiny baby, to cry.'[23]

Only in the 1950s and 1960s did a growing consensus of experts abandon these strict behaviourist theories and acknowledge the central importance of emotional needs. In a series of famous (and shockingly cruel) experiments, the psychologist Harry Harlow separated infant monkeys from their mothers shortly after birth, and isolated them in small cages. When given a choice between a metal dummy-mother fitted with a milk bottle, and a soft cloth-covered dummy with no milk, the baby monkeys clung to the barren cloth mother for all they were worth.

Those baby monkeys knew something that John Watson and the experts of *Infant Care* failed to

realise: mammals can't live on food alone. They need emotional bonds too. Millions of years of evolution preprogrammed the monkeys with an overwhelming desire for emotional bonding. Evolution also imprinted them with the assumption that emotional bonds are more likely to be formed with soft furry things than with hard and metallic objects. (This is also why small human children are far more likely to become attached to dolls, blankets and smelly rags than to cutlery, stones or wooden blocks.) The need for emotional bonds is so strong that Harlow's baby monkeys abandoned the nourishing metal dummy and turned their attention to the only object that seemed capable of answering that need. Alas, the cloth-mother never responded to their affection and the little monkeys consequently suffered from severe psychological and social problems, and grew up to be neurotic and asocial adults.

Today we look back with incomprehension at early twentieth-century child-rearing advice. How could experts fail to appreciate that children have emotional needs, and that their mental and physical health depends as much on providing for these needs as on food, shelter and medicines? Yet when it comes to other mammals we keep denying the obvious. Like John Watson and the *Infant Care* experts, farmers throughout history took care of the material needs of piglets, calves and kids, but tended to ignore their emotional needs. Thus both the meat and dairy industries are based on breaking the most fundamental emotional bond in the mammal kingdom. Farmers get their breeding sows and dairy cows impregnated again and again. Yet the piglets and calves are separated from their mothers shortly after birth, and often pass their days without ever sucking at her teats or feeling the warm touch of her tongue and body. What Harry Harlow did to a few hundred monkeys, the meat and dairy industries are doing to billions of animals every year.[24]

The Agricultural Deal

How did farmers justify their behaviour? Whereas hunter-gatherers were seldom aware of the damage they inflicted on the ecosystem, farmers knew perfectly well what they were doing. They knew they were exploiting domesticated animals and subjugating them to human desires and whims. They justified their actions in the name of new theist religions, which mushroomed and spread in the wake of the Agricultural Revolution. Theist religions maintained that the universe is ruled by a group of great gods – or perhaps by a single capital 'G' God. We don't normally associate this idea with agriculture, but at least in their beginnings theist religions were an agricultural enterprise. The theology, mythology and liturgy of religions such as Judaism, Hinduism and Christianity revolved at first around the relationship between humans, domesticated plants and farm animals.[25]

Biblical Judaism, for instance, catered to peasants and shepherds. Most of its commandments dealt with farming and village life, and its major holidays were harvest festivals. People today imagine the ancient temple in Jerusalem as a kind of big synagogue where priests clad in snow-white robes welcomed devout pilgrims, melodious choirs sang psalms and incense perfumed the air. In reality, it looked much more like a cross between a slaughterhouse and a barbecue joint than a modern synagogue. The pilgrims did not come empty-handed. They brought with them a never-ending stream of sheep, goats, chickens and other animals, which were sacrificed at the god's altar and then cooked and eaten. The psalm-singing choirs could hardly be heard over the bellowing and bleating of calves and kids. Priests in bloodstained outfits cut the victims' throats, collected the gushing blood in jars and spilled it over the altar. The perfume of incense mixed with the odours of congealed blood and roasted meat, while swarms of black flies buzzed just about everywhere (see, for example, Numbers

28, Deuteronomy 12, and 1 Samuel 2). A modern Jewish family that celebrates a holiday by having a barbecue on their front lawn is much closer to the spirit of biblical times than an orthodox family that spends the time studying scriptures in a synagogue.

Theist religions, such as biblical Judaism, justified the agricultural economy through new cosmological myths. Animist religions had previously depicted the universe as a grand Chinese opera with a limitless cast of colourful actors. Elephants and oak trees, crocodiles and rivers, mountains and frogs, ghosts and fairies, angels and demons – each had a role in the cosmic opera. Theist religions rewrote the script, turning the universe into a bleak Ibsen drama with just two main characters: man and God. The angels and demons somehow survived the transition, becoming the messengers and servants of the great gods. Yet the rest of the animist cast – all the animals, plants and other natural phenomena – were transformed into silent decor. True, some animals were considered sacred to this or that god, and many gods had animal features: the Egyptian god Anubis had the head of a jackal, and even Jesus Christ was frequently depicted as a lamb. Yet ancient Egyptians could easily tell the difference between Anubis and an ordinary jackal sneaking into the village to hunt chickens, and no Christian butcher ever mistook the lamb under his knife for Jesus.

We normally think that theist religions sanctified the great gods. We tend to forget that they sanctified humans, too. Hitherto *Homo sapiens* had been just one actor in a cast of thousands. In the new theist drama, Sapiens became the central hero around whom the entire universe revolved.

The gods, meanwhile, were given two related roles to play. Firstly, they explained what is so special about Sapiens and why humans should dominate and exploit all other organisms. Christianity, for example, maintained that humans hold sway over the rest of creation because the Creator charged them with that authority. Moreover, according to Christianity, God gave an eternal soul only to humans. Since the fate of this eternal soul is the point of the whole Christian cosmos, and since animals have no soul, they are mere extras. Humans thus became the apex of creation, while all other organisms were pushed to the sidelines.

Secondly, the gods had to mediate between humans and the ecosystem. In the animistic cosmos, everyone talked with everyone directly. If you needed something from the caribou, the fig trees, the clouds or the rocks, you addressed them yourself. In the theist cosmos, all non-human entities were silenced. Consequently you could no longer talk with trees and animals. What to do, then, when you wanted the trees to give more fruits, the cows to give more milk, the clouds to bring more rain and the locusts to stay away from your crops? That's where the gods entered the picture. They promised to supply rain, fertility and protection, provided humans did something in return. This was the essence of the agricultural deal. The gods safeguarded and multiplied farm production, and in exchange humans had to share the produce with the gods. This deal served both parties, at the expense of the rest of the ecosystem.

Today in Nepal, devotees of the goddess Gadhimai celebrate her festival every five years in the village of Bariyapur. A record was set in 2009 when 250,000 animals were sacrificed to the goddess. A local driver explained to a visiting British journalist that 'If we want anything, and we come here with an offering to the goddess, within five years all our dreams will be fulfilled.'[26]

Much of theist mythology explains the subtle details of this deal. The Mesopotamian Gilgamesh epic recounts that when the gods sent a great deluge to destroy the world, almost all humans and animals perished. Only then did the rash gods realise that nobody remained to make any offerings to them. They became crazed with hunger and distress. Luckily, one human family survived, thanks to the foresight of the god Enki, who instructed his devotee Utnapishtim to take shelter in a large wooden ark along with his relatives and a menagerie of animals. When the deluge subsided and this

Mesopotamian Noah emerged from his ark, the first thing he did was sacrifice some animals to the gods. Then, tells the epic, all the great gods rushed to the spot: 'The gods smelled the savour / the gods smelled the sweet savour / the gods swarmed like flies around the offering.'[27] The biblical story of the deluge (written more than 1,000 years after the Mesopotamian version) also reports that immediately upon leaving the ark, 'Noah built an altar to the Lord and, taking some of the clean animals and clean birds, he sacrificed burnt offerings on it. The Lord smelled the pleasing aroma and said in his heart: Never again will I curse the ground because of humans' (Genesis 8:20–1).

This deluge story became a founding myth of the agricultural world. It is possible of course to give it a modern environmentalist spin. The deluge could teach us that our actions can ruin the entire ecosystem, and humans are divinely charged with protecting the rest of creation. Yet traditional interpretations saw the deluge as proof of human supremacy and animal worthlessness. According to these interpretations, Noah was instructed to save the whole ecosystem in order to protect the common interests of gods and humans rather than the interests of the animals. Non-human organisms have no intrinsic value, and exist solely for our sake.

After all, when 'the Lord saw how great the wickedness of the human race had become' He resolved to 'wipe from the face of the earth the human race I have created – and with them the animals, the birds and the creatures that move along the ground – for I regret that I have made them' (Genesis 6:7). The Bible thinks it is perfectly all right to destroy all animals as punishment for the crimes of *Homo sapiens*, as if the existence of giraffes, pelicans and ladybirds has lost all purpose if humans misbehave. The Bible could not imagine a scenario in which God repents having created *Homo sapiens*, wipes this sinful ape off the face of the earth, and then spends eternity enjoying the antics of ostriches, kangaroos and panda bears.

Theist religions nevertheless have certain animal-friendly beliefs. The gods gave humans authority over the animal kingdom, but this authority carried with it some responsibilities. For example, Jews were commanded to allow farm animals to rest on the Sabbath, and whenever possible to avoid causing them unnecessary suffering. (Though whenever interests clashed, human interests always trumped animal interests.[28])

A Talmudic tale recounts how on the way to the slaughterhouse, a calf escaped and sought refuge with Rabbi Yehuda HaNasi, one of the founders of rabbinical Judaism. The calf tucked his head under the rabbi's flowing robes and started crying. Yet the rabbi pushed the calf away, saying, 'Go. You were created for that very purpose.' Since the rabbi showed no mercy, God punished him, and he suffered from a painful illness for thirteen years. Then, one day, a servant cleaning the rabbi's house found some newborn rats and began sweeping them out. Rabbi Yehuda rushed to save the helpless creatures, instructing the servant to leave them in peace, because 'God is good to all, and has compassion on all he has made' (Psalms 145:9). Since the rabbi showed compassion to these rats, God showed compassion to the rabbi, and he was cured of his illness.[29]

Other religions, particularly Jainism, Buddhism and Hinduism, have demonstrated even greater empathy to animals. They emphasise the connection between humans and the rest of the ecosystem, and their foremost ethical commandment has been to avoid killing any living being. Whereas the biblical 'Thou shalt not kill' covered only humans, the ancient Indian principle of *ahimsa* (non-violence) extends to every sentient being. Jain monks are particularly careful in this regard. They always cover their mouths with a white cloth, lest they inhale an insect, and whenever they walk they carry a broom to gently sweep any ant or beetle from their path.[30]

Nevertheless, all agricultural religions – Jainism, Buddhism and Hinduism included – found ways

to justify human superiority and the exploitation of animals (if not for meat, then for milk and muscle power). They have all claimed that a natural hierarchy of beings entitles humans to control and use other animals, provided that the humans observe certain restrictions. Hinduism, for example, has sanctified cows and forbidden eating beef, but has also provided the ultimate justification for the dairy industry, alleging that cows are generous creatures, and positively yearn to share their milk with humankind.

Humans thus committed themselves to an 'agricultural deal'. According to this deal, cosmic forces gave humans command over other animals, on condition that humans fulfilled certain obligations towards the gods, towards nature and towards the animals themselves. It was easy to believe in the existence of such a cosmic compact, because it reflected the daily routine of farming life.

Hunter-gatherers had not seen themselves as superior beings because they were seldom aware of their impact on the ecosystem. A typical band numbered in the dozens, it was surrounded by thousands of wild animals, and its survival depended on understanding and respecting the desires of these animals. Foragers had to constantly ask themselves what deer dream about, and what lions think. Otherwise, they could not hunt the deer, nor escape the lions.

Farmers, in contrast, lived in a world controlled and shaped by human dreams and thoughts. Humans were still subject to formidable natural forces such as storms and earthquakes, but they were far less dependent on the wishes of other animals. A farm boy learned early on to ride a horse, harness a bull, whip a stubborn donkey and lead the sheep to pasture. It was easy and tempting to believe that such everyday activities reflected either the natural order of things or the will of heaven.

It is no coincidence that the Nayaka of southern India treat elephants, snakes and forest trees as beings equal to humans, but have a very different view of domesticated plants and animals. In the Nayaka language a living being possessing a unique personality is called *mansan*. When probed by the anthropologist Danny Naveh, they explained that all elephants are *mansan*. 'We live in the forest, they live in the forest. We are all *mansan* . . . So are bears, deer and tigers. All forest animals.' What about cows? 'Cows are different. You have to lead them everywhere.' And chickens? 'They are nothing. They are not *mansan*.' And forest trees? 'Yes – they live for such a long time.' And tea bushes? 'Oh, these I cultivate so that I can sell the tea leaves and buy what I need from the store. No, they aren't *mansan*.'[31]

We should also bear in mind how humans themselves were treated in most agricultural societies. In biblical Israel or medieval China it was common to whip humans, enslave them, torture and execute them. Humans were considered as mere property. Rulers did not dream of asking peasants for their opinions and cared little about their needs. Parents frequently sold their children into slavery, or married them off to the highest bidder. Under such conditions, ignoring the feelings of cows and chickens was hardly surprising.

Five Hundred Years of Solitude

The rise of modern science and industry brought about the next revolution in human–animal relations. During the Agricultural Revolution humankind silenced animals and plants, and turned the animist grand opera into a dialogue between man and gods. During the Scientific Revolution humankind silenced the gods too. The world was now a one-man show. Humankind stood alone on an empty stage, talking to itself, negotiating with no one and acquiring enormous powers without any obligations. Having deciphered the mute laws of physics, chemistry and biology, humankind now

does with them as it pleases.

When an archaic hunter went out to the savannah, he asked the help of the wild bull, and the bull demanded something of the hunter. When an ancient farmer wanted his cows to produce lots of milk, he asked some great heavenly god for help, and the god stipulated his conditions. When the white-coated staff in Nestlé's Research and Development department want to increase dairy production, they study genetics – and the genes don't ask for anything in return.

But just as the hunters and farmers had their myths, so do the people in the R&D department. Their most famous myth shamelessly plagiarises the legend of the Tree of Knowledge and the Garden of Eden, but transports the action to the garden at Woolsthorpe Manor in Lincolnshire. According to this myth, Isaac Newton was sitting there under an apple tree when a ripe apple dropped on his head. Newton began wondering why the apple fell straight downwards, rather than sideways or upwards. His enquiry led him to discover gravity and the laws of Newtonian mechanics.

Newton's story turns the Tree of Knowledge myth on its head. In the Garden of Eden the serpent initiates the drama, tempting humans to sin, thereby bringing the wrath of God down upon them. Adam and Eve are a plaything for serpent and God alike. In contrast, in the Garden of Woolsthorpe man is the sole agent. Though Newton himself was a deeply religious Christian who devoted far more time to studying the Bible than the laws of physics, the Scientific Revolution that he helped launch pushed God to the sidelines. When Newton's successors came to write their Genesis myth, they had no use for either God or serpent. The Garden of Woolsthorpe is run by blind laws of nature, and the initiative to decipher these laws is strictly human. The story may begin with an apple falling on Newton's head, but the apple did not do it on purpose.

In the Garden of Eden myth, humans are punished for their curiosity and for their wish to gain knowledge. God expels them from Paradise. In the Garden of Woolsthorpe myth, nobody punishes Newton – just the opposite. Thanks to his curiosity humankind gains a better understanding of the universe, becomes more powerful and takes another step towards the technological paradise. Untold numbers of teachers throughout the world recount the Newton myth to encourage curiosity, implying that if only we gain enough knowledge, we can create paradise here on earth.

In fact, God is present even in the Newton myth: Newton himself is God. When biotechnology, nanotechnology and the other fruits of science ripen, *Homo sapiens* will attain divine powers and come full circle back to the biblical Tree of Knowledge. Archaic hunter-gatherers were just another species of animal. Farmers saw themselves as the apex of creation. Scientists will upgrade us into gods.

Whereas the Agricultural Revolution gave rise to theist religions, the Scientific Revolution gave birth to humanist religions, in which humans replaced gods. While theists worship *theos* (Greek for 'god'), humanists worship humans. The founding idea of humanist religions such as liberalism, communism and Nazism is that *Homo sapiens* has some unique and sacred essence that is the source of all meaning and authority in the universe. Everything that happens in the cosmos is judged to be good or bad according to its impact on *Homo sapiens*.

Whereas theism justified traditional agriculture in the name of God, humanism has justified modern industrial farming in the name of Man. Industrial farming sanctifies human needs, whims and wishes, while disregarding everything else. Industrial farming has no real interest in animals, which don't share the sanctity of human nature. And it has no use for gods, because modern science and technology give humans powers that far exceed those of the ancient gods. Science enables modern firms to subjugate cows, pigs and chickens to more extreme conditions than those prevailing in traditional

agricultural societies.

In ancient Egypt, in the Roman Empire or in medieval China, humans had only a rudimental understanding of biochemistry, genetics, zoology and epidemiology. Consequently, their powers of manipulation were limited. In those days, pigs, cows and chickens ran free among the houses, and searched for edible treasures in the rubbish heap and in the nearby woods. If an ambitious peasant had tried to confine thousands of animals in a crowded coop, a deadly epidemic would probably have resulted, wiping out all the animals as well as many of the villagers. No priest, shaman or god could have prevented it.

But once modern science deciphered the secrets of epidemics, pathogens and antibiotics, industrial coops, pens and pigsties became feasible. With the help of vaccinations, medications, hormones, pesticides, central air-conditioning systems and automatic feeders, it is now possible to pack tens of thousands of pigs, cows or chickens into neat rows of cramped cages, and produce meat, milk and eggs with unprecedented efficiency.

In recent years, as people began to rethink human–animal relations, such practices have come under increasing criticism. We are suddenly showing unprecedented interest in the fate of so-called lower life forms, perhaps because we are about to become one. If and when computer programs attain superhuman intelligence and unprecedented power, should we begin valuing these programs more than we value humans? Would it be okay, for example, for an artificial intelligence to exploit humans and even kill them to further its own needs and desires? If it should never be allowed to do that, despite its superior intelligence and power, why is it ethical for humans to exploit and kill pigs? Do humans have some magical spark, in addition to higher intelligence and greater power, which distinguishes them from pigs, chickens, chimpanzees and computer programs alike? If yes, where did that spark come from, and why are we certain that an AI could never acquire it? If there is no such spark, would there be any reason to continue assigning special value to human life even after computers surpass humans in intelligence and power? Indeed, what exactly is it about humans that make us so intelligent and powerful in the first place, and how likely is it that non-human entities will ever rival and surpass us?

The next chapter will examine the nature and power of *Homo sapiens*, not only in order to comprehend further our relations with other animals, but also to appreciate what the future might hold for us, and what relations between humans and superhumans might look like.

3
The Human Spark

There is no doubt that *Homo sapiens* is the most powerful species in the world. *Homo sapiens* also likes to think that it enjoys a superior moral status, and that human life has much greater value than the lives of pigs, elephants or wolves. This is less obvious. Does might make right? Is human life more precious than porcine life simply because the human collective is more powerful than the pig collective? The United States is far mightier than Afghanistan; does this imply that American lives have greater intrinsic value than Afghan lives?

In practice, American lives *are* more valued. Far more money is invested in the education, health and safety of the average American than of the average Afghan. Killing an American citizen creates a far greater international outcry than killing an Afghan citizen. Yet it is generally accepted that this is no more than an unjust result of the geopolitical balance of power. Afghanistan may have far less clout than the USA, yet the life of a child in the mountains of Tora Bora is considered every bit as sacred as the life of a child in Beverly Hills.

In contrast, when we privilege human children over piglets, we want to believe that this reflects something deeper than the ecological balance of power. We want to believe that human lives really are superior in some fundamental way. We Sapiens love telling ourselves that we enjoy some magical quality that not only accounts for our immense power, but also gives moral justification for our privileged status. What is this unique human spark?

The traditional monotheist answer is that only Sapiens have eternal souls. Whereas the body decays and rots, the soul journeys on towards salvation or damnation, and will experience either everlasting joy in paradise or an eternity of misery in hell. Since pigs and other animals have no soul, they don't take part in this cosmic drama. They live only for a few years, and then die and fade into nothingness. We should therefore care far more about eternal human souls than about ephemeral pigs.

This is no kindergarten fairy tale, but an extremely powerful myth that continues to shape the lives of billions of humans and animals in the early twenty-first century. The belief that humans have eternal souls whereas animals are just evanescent bodies is a central pillar of our legal, political and economic system. It explains why, for example, it is perfectly okay for humans to kill animals for food, or even just for the fun of it.

However, our latest scientific discoveries flatly contradict this monotheist myth. True, laboratory experiments confirm the accuracy of one part of the myth: just as monotheist religions say, animals have no souls. All the careful studies and painstaking examinations have failed to discover any trace of a soul in pigs, rats or rhesus monkeys. Alas, the same laboratory experiments undermine the second and far more important part of the monotheist myth, namely, that humans *do* have a soul. Scientists have subjected *Homo sapiens* to tens of thousands of bizarre experiments, and looked into every nook in our hearts and every cranny in our brains. But they have so far discovered no magical spark. There is zero scientific evidence that in contrast to pigs, Sapiens have souls.

If that were all, we could well argue that scientists just need to keep looking. If they haven't found the soul yet, it is because they haven't looked carefully enough. Yet the life sciences doubt the existence of soul not just due to lack of evidence, but rather because the very idea of soul contradicts the most fundamental principles of evolution. This contradiction is responsible for the unbridled hatred that the theory of evolution inspires among devout monotheists.

Who's Afraid of Charles Darwin?

According to a 2012 Gallup survey, only 15 per cent of Americans think that *Homo sapiens* evolved through natural selection alone, free of all divine intervention; 32 per cent maintain that humans may have evolved from earlier life forms in a process lasting millions of years, but God orchestrated this entire show; 46 per cent believe that God created humans in their current form sometime during the last 10,000 years, just as the Bible says. Spending three years in college has absolutely no impact on these views. The same survey found that among BA graduates, 46 per cent believe in the biblical creation story, whereas only 14 per cent think that humans evolved without any divine supervision. Even among holders of MA and PhD degrees, 25 per cent believe the Bible, whereas only 29 per cent credit natural selection alone with the creation of our species.[1]

Though schools evidently do a very poor job teaching evolution, religious zealots still insist that it should not be taught at all. Alternatively, they demand that children must also be taught the theory of intelligent design, according to which all organisms were created by the design of some higher intelligence (aka God). 'Teach them both theories,' say the zealots, 'and let the kids decide for themselves.'

Why does the theory of evolution provoke such objections, whereas nobody seems to care about the theory of relativity or quantum mechanics? How come politicians don't ask that kids be exposed to alternative theories about matter, energy, space and time? After all, Darwin's ideas seem at first sight far less threatening than the monstrosities of Einstein and Werner Heisenberg. The theory of evolution rests on the principle of the survival of the fittest, which is a clear and simple – not to say humdrum – idea. In contrast, the theory of relativity and quantum mechanics argue that you can twist time and space, that something can appear out of nothing, and that a cat can be both alive and dead at the same time. This makes a mockery of our common sense, yet nobody seeks to protect innocent schoolchildren from these scandalous ideas. Why?

The theory of relativity makes nobody angry, because it doesn't contradict any of our cherished beliefs. Most people don't care an iota whether space and time are absolute or relative. If you think it is possible to bend space and time, well, be my guest. Go ahead and bend them. What do I care? In contrast, Darwin has deprived us of our souls. If you really understand the theory of evolution, you understand that there is no soul. This is a terrifying thought not only to devout Christians and Muslims, but also to many secular people who don't hold any clear religious dogma, but nevertheless want to believe that each human possesses an eternal individual essence that remains unchanged throughout life, and can survive even death intact.

The literal meaning of the word 'individual' is 'something that cannot be divided'. That I am an 'in-dividual' implies that my true self is a holistic entity rather than an assemblage of separate parts. This indivisible essence allegedly endures from one moment to the next without losing or absorbing anything. My body and brain undergo a constant process of change, as neurons fire, hormones flow and muscles contract. My personality, wishes and relationships never stand still, and may be

completely transformed over years and decades. But underneath it all I remain the same person from birth to death – and hopefully beyond death as well.

Unfortunately, the theory of evolution rejects the idea that my true self is some indivisible, immutable and potentially eternal essence. According to the theory of evolution, all biological entities – from elephants and oak trees to cells and DNA molecules – are composed of smaller and simpler parts that ceaselessly combine and separate. Elephants and cells have evolved gradually, as a result of new combinations and splits. Something that cannot be divided or changed cannot have come into existence through natural selection.

The human eye, for example, is an extremely complex system made of numerous smaller parts such as the lens, the cornea and the retina. The eye did not pop out of nowhere complete with all these components. Rather, it evolved step by tiny step through millions of years. Our eye is very similar to the eye of *Homo erectus,* who lived 1 million years ago. It is somewhat less similar to the eye of *Australopithecus,* who lived 5 million years ago. It is very different from the eye of *Dryolestes,* who lived 150 million years ago. And it seems to have nothing in common with the unicellular organisms that inhabited our planet hundreds of millions of years ago.

Yet even unicellular organisms have tiny organelles that enable the microorganism to distinguish light from darkness, and move towards one or the other. The path leading from such archaic sensors to the human eye is long and winding, but if you have hundreds of millions of years to spare, you can certainly cover the entire path, step by step. You can do that because the eye is composed of many different parts. If every few generations a small mutation slightly changes one of these parts – say, the cornea becomes a bit more curved – after millions of generations these changes can result in a human eye. If the eye were a holistic entity, devoid of any parts, it could never have evolved by natural selection.

That's why the theory of evolution cannot accept the idea of souls, at least if by 'soul' we mean something indivisible, immutable and potentially eternal. Such an entity cannot possibly result from a step-by-step evolution. Natural selection could produce a human eye, because the eye has parts. But the soul has no parts. If the Sapiens soul evolved step by step from the Erectus soul, what exactly were these steps? Is there some part of the soul that is more developed in Sapiens than in Erectus? But the soul has no parts.

You might argue that human souls did not evolve, but appeared one bright day in the fullness of their glory. But when exactly was that bright day? When we look closely at the evolution of humankind, it is embarrassingly difficult to find it. Every human that ever existed came into being as a result of male sperm inseminating a female egg. Think of the first baby to possess a soul. That baby was very similar to her mother and father, except that she had a soul and they didn't. Our biological knowledge can certainly explain the birth of a baby whose cornea was a bit more curved than her parents' corneas. A slight mutation in a single gene can account for that. But biology cannot explain the birth of a baby possessing an eternal soul from parents who did not have even a shred of a soul. Is a single mutation, or even several mutations, enough to give an animal an essence secure against all changes, including even death?

Hence the existence of souls cannot be squared with the theory of evolution. Evolution means change, and is incapable of producing everlasting entities. From an evolutionary perspective, the closest thing we have to a human essence is our DNA, and the DNA molecule is the vehicle of mutation rather than the seat of eternity. This terrifies large numbers of people, who prefer to reject the theory of evolution rather than give up their souls.

Why the Stock Exchange Has No Consciousness

Another story employed to justify human superiority says that of all the animals on earth, only *Homo sapiens* has a conscious mind. Mind is something very different from soul. The mind isn't some mystical eternal entity. Nor is it an organ such as the eye or the brain. Rather, the mind is a flow of subjective experiences, such as pain, pleasure, anger and love. These mental experiences are made of interlinked sensations, emotions and thoughts, which flash for a brief moment, and immediately disappear. Then other experiences flicker and vanish, arising for an instant and passing away. (When reflecting on it, we often try to sort the experiences into distinct categories such as sensations, emotions and thoughts, but in actuality they are all mingled together.) This frenzied collection of experiences constitutes the stream of consciousness. Unlike the everlasting soul, the mind has many parts, it constantly changes, and there is no reason to think it is eternal.

The soul is a story that some people accept while others reject. The stream of consciousness, in contrast, is the concrete reality we directly witness every moment. It is the surest thing in the world. You cannot doubt its existence. Even when we are consumed by doubt and ask ourselves: 'Do subjective experiences really exist?' we can be certain that we are experiencing doubt.

What exactly are the conscious experiences that constitute the flow of the mind? Every subjective experience has two fundamental characteristics: sensation and desire. Robots and computers have no consciousness because despite their myriad abilities they feel nothing and crave nothing. A robot may have an energy sensor that signals to its central processing unit when the battery is about to run out. The robot may then move towards an electrical socket, plug itself in and recharge its battery. However, throughout this process the robot doesn't experience anything. In contrast, a human being depleted of energy feels hunger and craves to stop this unpleasant sensation. That's why we say that humans are conscious beings and robots aren't, and why it is a crime to make people work until they collapse from hunger and exhaustion, whereas making robots work until their batteries run out carries no moral opprobrium.

And what about animals? Are they conscious? Do they have subjective experiences? Is it okay to force a horse to work until he collapses from exhaustion? As noted earlier, the life sciences currently argue that all mammals and birds, and at least some reptiles and fish, have sensations and emotions. However, the most up-to-date theories also maintain that sensations and emotions are biochemical data-processing algorithms. Since we know that robots and computers process data without having any subjective experiences, maybe it works the same with animals? Indeed, we know that even in humans many sensory and emotional brain circuits can process data and initiate actions completely unconsciously. So perhaps behind all the sensations and emotions we ascribe to animals – hunger, fear, love and loyalty – lurk only unconscious algorithms rather than subjective experiences?[2]

This theory was upheld by the father of modern philosophy, René Descartes. In the seventeenth century Descartes maintained that only humans feel and crave, whereas all other animals are mindless automata, akin to a robot or a vending machine. When a man kicks a dog, the dog experiences nothing. The dog flinches and howls automatically, just like a humming vending machine that makes a cup of coffee without feeling or wanting anything.

This theory was widely accepted in Descartes' day. Seventeenth-century doctors and scholars dissected live dogs and observed the working of their internal organs, without either anaesthetics or scruples. They didn't see anything wrong with that, just as we don't see anything wrong in opening the lid of a vending machine and observing its gears and conveyors. In the early twenty-first century there

are still plenty of people who argue that animals have no consciousness, or at most, that they have a very different and inferior type of consciousness.

In order to decide whether animals have conscious minds similar to our own, we must first get a better understanding of how minds function, and what role they play. These are extremely difficult questions, but it is worthwhile to devote some time to them, because the mind will be the hero of several subsequent chapters. We won't be able to grasp the full implications of novel technologies such as artificial intelligence if we don't know what minds are. Hence let's leave aside for a moment the particular question of animal minds, and examine what science knows about minds and consciousness in general. We will focus on examples taken from the study of human consciousness – which is more accessible to us – and later on return to animals and ask whether what's true of humans is also true of our furry and feathery cousins.

To be frank, science knows surprisingly little about mind and consciousness. Current orthodoxy holds that consciousness is created by electrochemical reactions in the brain, and that mental experiences fulfil some essential data-processing function.[3] However, nobody has any idea how a congeries of biochemical reactions and electrical currents in the brain creates the subjective experience of pain, anger or love. Perhaps we will have a solid explanation in ten or fifty years. But as of 2016, we have no such explanation, and we had better be clear about that.

Using fMRI scans, implanted electrodes and other sophisticated gadgets, scientists have certainly identified correlations and even causal links between electrical currents in the brain and various subjective experiences. Just by looking at brain activity, scientists can know whether you are awake, dreaming or in deep sleep. They can briefly flash an image in front of your eyes, just at the threshold of conscious perception, and determine (without asking you) whether you have become aware of the image or not. They have even managed to link individual brain neurons with specific mental content, discovering for example a 'Bill Clinton' neuron and a 'Homer Simpson' neuron. When the 'Bill Clinton' neuron is on, the person is thinking of the forty-second president of the USA; show the person an image of Homer Simpson, and the eponymous neuron is bound to ignite.

More broadly, scientists know that if an electric storm arises in a given brain area, you probably feel angry. If this storm subsides and a different area lights up – you are experiencing love. Indeed, scientists can even induce feelings of anger or love by electrically stimulating the right neurons. But how on earth does the movement of electrons from one place to the other translate into a subjective image of Bill Clinton, or a subjective feeling of anger or love?

The most common explanation points out that the brain is a highly complex system, with more than 80 billion neurons connected into numerous intricate webs. When billions of neurons send billions of electric signals back and forth, subjective experiences emerge. Even though the sending and receiving of each electric signal is a simple biochemical phenomenon, the interaction among all these signals creates something far more complex – the stream of consciousness. We observe the same dynamic in many other fields. The movement of a single car is a simple action, but when millions of cars move and interact simultaneously, traffic jams emerge. The buying and selling of a single share is simple enough, but when millions of traders buy and sell millions of shares it can lead to economic crises that dumbfound even the experts.

Yet this explanation explains nothing. It merely affirms that the problem is very complicated. It does not offer any insight into how one kind of phenomenon (billions of electric signals moving from here to there) creates a very different kind of phenomenon (subjective experiences of anger or love). The analogy to other complex processes such as traffic jams and economic crises is flawed. What creates a traffic jam? If you follow a single car, you will never understand it. The jam results from the

interactions among many cars. Car A influences the movement of car B, which blocks the path of car C, and so on. Yet if you map the movements of all the relevant cars, and how each impacts the other, you will get a complete account of the traffic jam. It would be pointless to ask, 'But how do all these movements create the traffic jam?' For 'traffic jam' is simply the abstract term we humans decided to use for this particular collection of events.

In contrast, 'anger' isn't an abstract term we have decided to use as a shorthand for billions of electric brain signals. Anger is an extremely concrete experience which people were familiar with long before they knew anything about electricity. When I say, 'I am angry!' I am pointing to a very tangible feeling. If you describe how a chemical reaction in a neuron results in an electric signal, and how billions of similar reactions result in billions of additional signals, it is still worthwhile to ask, 'But how do these billions of events come together to create my concrete feeling of anger?'

When thousands of cars slowly edge their way through London, we call that a traffic jam, but it doesn't create some great Londonian consciousness that hovers high above Piccadilly and says to itself, 'Blimey, I feel jammed!' When millions of people sell billions of shares, we call that an economic crisis, but no great Wall Street spirit grumbles, 'Shit, I feel I am in crisis.' When trillions of water molecules coalesce in the sky we call that a cloud, but no cloud consciousness emerges to announce, 'I feel rainy.' How is it, then, that when billions of electric signals move around in my brain, a mind emerges that feels 'I am furious!'? As of 2016, we have absolutely no idea.

Hence if this discussion has left you confused and perplexed, you are in very good company. The best scientists too are a long way from deciphering the enigma of mind and consciousness. One of the wonderful things about science is that when scientists don't know something, they can try out all kinds of theories and conjunctures, but in the end they can just admit their ignorance.

The Equation of Life

Scientists don't know how a collection of electric brain signals creates subjective experiences. Even more crucially, they don't know what could be the evolutionary benefit of such a phenomenon. It is the greatest lacuna in our understanding of life. Humans have feet, because for millions of generations feet enabled our ancestors to chase rabbits and escape lions. Humans have eyes, because for countless millennia eyes enabled our forebears to see whither the rabbit was heading and whence the lion was coming. But why do humans have subjective experiences of hunger and fear?

Not long ago, biologists gave a very simple answer. Subjective experiences are essential for our survival, because if we didn't feel hunger or fear we would not have bothered to chase rabbits and flee lions. Upon seeing a lion, why did a man flee? Well, he was frightened, so he ran away. Subjective experiences explained human actions. Yet today scientists provide a much more detailed explanation. When a man sees a lion, electric signals move from the eye to the brain. The incoming signals stimulate certain neurons, which react by firing off more signals. These stimulate other neurons down the line, which fire in their turn. If enough of the right neurons fire at a sufficiently rapid rate, commands are sent to the adrenal glands to flood the body with adrenaline, the heart is instructed to beat faster, while neurons in the motor centre send signals down to the leg muscles, which begin to stretch and contract, and the man runs away from the lion.

Ironically, the better we map this process, the *harder* it becomes to explain conscious feelings. The better we understand the brain, the more redundant the mind seems. If the entire system works by electric signals passing from here to there, why the hell do we also need to *feel* fear? If a chain of

electrochemical reactions leads all the way from the nerve cells in the eye to the movements of leg muscles, why add subjective experiences to this chain? What do they do? Countless domino pieces can fall one after the other without any need of subjective experiences. Why do neurons need feelings in order to stimulate one another, or in order to tell the adrenal gland to start pumping? Indeed, 99 per cent of bodily activities, including muscle movement and hormonal secretions, take place without any need of conscious feelings. So why do the neurons, muscles and glands need such feelings in the remaining 1 per cent of cases?

You might argue that we need a mind because the mind stores memories, makes plans and autonomously sparks completely new images and ideas. It doesn't just respond to outside stimuli. For example, when a man sees a lion, he doesn't react automatically to the sight of the predator. He remembers that a year ago a lion ate his aunt. He imagines how he would feel if a lion tore him to pieces. He contemplates the fate of his orphaned children. That's why he flees. Indeed, many chain reactions begin with the mind's own initiative rather than with any immediate external stimulus. Thus a memory of some prior lion attack might spontaneously pop up in a man's mind, setting him thinking about the danger posed by lions. He then gets all the tribespeople together and they brainstorm novel methods for scaring lions away.

But wait a moment. What are all these memories, imaginations and thoughts? Where do they exist? According to current biological theories, our memories, imaginations and thoughts don't exist in some higher immaterial field. Rather, they too are avalanches of electric signals fired by billions of neurons. Hence even when we figure in memories, imaginations and thoughts, we are still left with a series of electrochemical reactions that pass through billions of neurons, ending with the activity of adrenal glands and leg muscles.

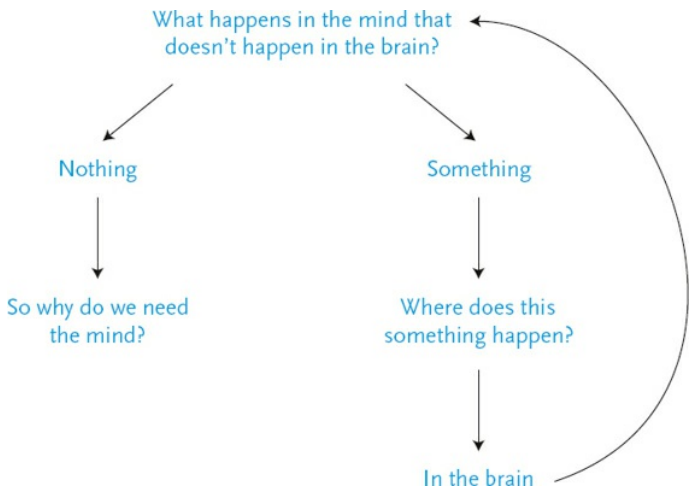
Is there even a single step on this long and twisting journey where, between the action of one neuron and the reaction of the next, the mind intervenes and decides whether the second neuron should fire or not? Is there any material movement, of even a single electron, that is caused by the subjective experience of fear rather than by the prior movement of some other particle? If there is no such movement – and if every electron moves because another electron moved earlier – why do we need to experience fear? We have no clue.

Philosophers have encapsulated this riddle in a trick question: what happens in the mind that doesn't happen in the brain? If nothing happens in the mind except what happens in our massive network of neurons – then why do we need the mind? If something does indeed happen in the mind over and above what happens in the neural network – where the hell does it happen? Suppose I ask you what Homer Simpson thought about Bill Clinton and the Monica Lewinsky scandal. You have probably never thought about this before, so your mind now needs to fuse two previously unrelated memories, perhaps conjuring up an image of Homer drinking beer while watching the president give his 'I did not have sexual relations with that woman' speech. Where does this fusion take place?

Some brain scientists argue that it happens in the 'global workspace' created by the interaction of many neurons.[4] Yet the word 'workspace' is just a metaphor. What is the reality behind the metaphor? Where do the different pieces of information actually meet and fuse? According to current theories, it certainly doesn't take place in some Platonic fifth dimension. Rather, it takes place, say, where two previously unconnected neurons suddenly start firing signals to one another. A new synapse is formed between the Bill Clinton neuron and the Homer Simpson neuron. But if so, why do we need the conscious experience of memory over and above the physical event of the two neurons connecting?

We can pose the same riddle in mathematical terms. Present-day dogma holds that organisms are algorithms, and that algorithms can be represented in mathematical formulas. You can use numbers

and mathematical symbols to write the series of steps a vending machine takes to prepare a cup of tea, and the series of steps a brain takes when it is alarmed by the approach of a lion. If so, and if conscious experiences fulfil some important function, they must have a mathematical representation. For they are an essential part of the algorithm. When we write the fear algorithm, and break 'fear' down into a series of precise calculations, we should be able to point out: 'Here, step number ninety-three in the calculation process – this is the subjective experience of fear!' But is there any algorithm in the huge realm of mathematics that contains a subjective experience? So far, we don't know of any such algorithm. Despite the vast knowledge we have gained in the fields of mathematics and computer science, none of the data-processing systems we have created needs subjective experiences in order to function, and none feels pain, pleasure, anger or love.[5]



Maybe we need subjective experiences in order to think about ourselves? An animal wandering the savannah and calculating its chances of survival and reproduction must represent its own actions and decisions to itself, and sometimes communicate them to other animals as well. As the brain tries to create a model of its own decisions, it gets trapped in an infinite digression, and abracadabra! Out of this loop, consciousness pops out.

Fifty years ago this might have sounded plausible, but not in 2016. Several corporations, such as Google and Tesla, are engineering autonomous cars that already cruise our roads. The algorithms controlling the autonomous car make millions of calculations each second concerning other cars, pedestrians, traffic lights and potholes. The autonomous car successfully stops at red lights, bypasses obstacles and keeps a safe distance from other vehicles – without feeling any fear. The car also needs to take itself into account and to communicate its plans and desires to the surrounding vehicles, because if it decides to swerve to the right, doing so will impact on their behaviour. The car does all that without any problem – but without any consciousness either. The autonomous car isn't special. Many other computer programs make allowances for their own actions, yet none of them has developed consciousness, and none feels or desires anything.[6]

If we cannot explain the mind, and if we don't know what function it fulfils, why not just discard it? The history of science is replete with abandoned concepts and theories. For instance, early modern scientists who tried to account for the movement of light postulated the existence of a substance called ether, which supposedly fills the entire universe. Light was thought to be waves of ether. However, scientists failed to find any empirical evidence for the existence of ether, whereas they did come up with alternative and better theories of light. Consequently, they threw ether into the dustbin of science.



The Google autonomous car on the road.

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Similarly, for thousands of years humans used God to explain numerous natural phenomena. What causes lightning to strike? God. What makes the rain fall? God. How did life on earth begin? God did it. Over the last few centuries scientists have not discovered any empirical evidence for God's existence, while they did find much more detailed explanations for lightning strikes, rain and the origins of life. Consequently, with the exception of a few subfields of philosophy, no article in any peer-review scientific journal takes God's existence seriously. Historians don't argue that the Allies won the Second World War because God was on their side; economists don't blame God for the 1929 economic crisis; and geologists don't invoke His will to explain tectonic plate movements.

The same fate has befallen the soul. For thousands of years people believed that all our actions and decisions emanate from our souls. Yet in the absence of any supporting evidence, and given the existence of much more detailed alternative theories, the life sciences have ditched the soul. As private individuals, many biologists and doctors may go on believing in souls. Yet they never write about them in serious scientific journals.

Maybe the mind should join the soul, God and ether in the dustbin of science? After all, no one has ever seen experiences of pain or love through a microscope, and we have a very detailed biochemical explanation for pain and love that leaves no room for subjective experiences. However, there is a crucial difference between mind and soul (as well as between mind and God). Whereas the existence of eternal souls is pure conjecture, the experience of pain is a direct and very tangible reality. When I step on a nail, I can be 100 per cent certain that I feel pain (even if I so far lack a scientific explanation for it). In contrast, I cannot be certain that if the wound becomes infected and I die of gangrene, my soul will continue to exist. It's a very interesting and comforting story which I would be happy to believe, but I have no direct evidence for its veracity. Since all scientists constantly experience subjective feelings such as pain and doubt, they cannot deny their existence.

Another way to dismiss mind and consciousness is to deny their relevance rather than their existence. Some scientists – such as Daniel Dennett and Stanislas Dehaene – argue that all relevant questions can be answered by studying brain activities, without any recourse to subjective experiences. So scientists can safely delete 'mind', 'consciousness' and 'subjective experiences' from their vocabulary and articles. However, as we shall see in the following chapters, the whole edifice of modern politics and ethics is built upon subjective experiences, and few ethical dilemmas can be solved by referring strictly to brain activities. For example, what's wrong with torture or

rape? From a purely neurological perspective, when a human is tortured or raped certain biochemical reactions happen in the brain, and various electrical signals move from one bunch of neurons to another. What could possibly be wrong with that? Most modern people have ethical qualms about torture and rape because of the subjective experiences involved. If any scientist wants to argue that subjective experiences are irrelevant, their challenge is to explain why torture or rape are wrong without reference to any subjective experience.

Finally, some scientists concede that consciousness is real and may actually have great moral and political value, but that it fulfils no biological function whatsoever. Consciousness is the biologically useless by-product of certain brain processes. Jet engines roar loudly, but the noise doesn't propel the aeroplane forward. Humans don't need carbon dioxide, but each and every breath fills the air with more of the stuff. Similarly, consciousness may be a kind of mental pollution produced by the firing of complex neural networks. It doesn't do anything. It is just there. If this is true, it implies that all the pain and pleasure experienced by billions of creatures for millions of years is just mental pollution. This is certainly a thought worth thinking, even if it isn't true. But it is quite amazing to realise that as of 2016, this is the best theory of consciousness that contemporary science has to offer us.

Maybe the life sciences view the problem from the wrong angle. They believe that life is all about data processing, and that organisms are machines for making calculations and taking decisions. However, this analogy between organisms and algorithms might mislead us. In the nineteenth century, scientists described brains and minds as if they were steam engines. Why steam engines? Because that was the leading technology of the day, which powered trains, ships and factories, so when humans tried to explain life, they assumed it must work according to analogous principles. Mind and body are made of pipes, cylinders, valves and pistons that build and release pressure, thereby producing movements and actions. Such thinking had a deep influence even on Freudian psychology, which is why much of our psychological jargon is still replete with concepts borrowed from mechanical engineering.

Consider, for example, the following Freudian argument: 'Armies harness the sex drive to fuel military aggression. The army recruits young men just when their sexual drive is at its peak. The army limits the soldiers' opportunities of actually having sex and releasing all that pressure, which consequently accumulates inside them. The army then redirects this pent-up pressure and allows it to be released in the form of military aggression.' This is exactly how a steam engine works. You trap boiling steam inside a closed container. The steam builds up more and more pressure, until suddenly you open a valve, and release the pressure in a predetermined direction, harnessing it to propel a train or a loom. Not only in armies, but in all fields of activity, we often complain about the pressure building up inside us, and we fear that unless we 'let off some steam', we might explode.

In the twenty-first century it sounds childish to compare the human psyche to a steam engine. Today we know of a far more sophisticated technology – the computer – so we explain the human psyche as if it were a computer processing data rather than a steam engine regulating pressure. But this new analogy may turn out to be just as naïve. After all, computers have no minds. They don't crave anything even when they have a bug, and the Internet doesn't feel pain even when authoritarian regimes sever entire countries from the Web. So why use computers as a model for understanding the mind?

Well, are we really sure that computers have no sensations or desires? And even if they haven't got any at present, perhaps once they become complex enough they might develop consciousness? If that were to happen, how could we ascertain it? When computers replace our bus driver, our teacher and

our shrink, how could we determine whether they have feelings or whether they are just a collection of mindless algorithms?

When it comes to humans, we are today capable of differentiating between conscious mental experiences and non-conscious brain activities. Though we are far from understanding consciousness, scientists have succeeded in identifying some of its electrochemical signatures. To do so the scientists started with the assumption that whenever humans report that they are conscious of something, they can be believed. Based on this assumption the scientists could then isolate specific brain patterns that appear every time humans report being conscious, but that never appear during unconscious states.

This has allowed the scientists to determine, for example, whether a seemingly vegetative stroke victim has completely lost consciousness, or has merely lost control of his body and speech. If the patient's brain displays the telltale signatures of consciousness, he is probably conscious, even though he cannot move or speak. Indeed, doctors have recently managed to communicate with such patients using fMRI imaging. They ask the patients yes/no questions, telling them to imagine themselves playing tennis if the answer is yes, and to visualise the location of their home if the answer is no. The doctors can then observe how the motor cortex lights up when patients imagine playing tennis (meaning 'yes'), whereas 'no' is indicated by the activation of brain areas responsible for spatial memory.[7]

This is all very well for humans, but what about computers? Since silicon-based computers have very different structures to carbon-based human neural networks, the human signatures of consciousness may not be relevant to them. We seem to be trapped in a vicious circle. Starting with the assumption that we can believe humans when they report that they are conscious, we can identify the signatures of human consciousness, and then use these signatures to 'prove' that humans are indeed conscious. But if an artificial intelligence self-reports that it is conscious, should we just believe it?

So far, we have no good answer to this problem. Already thousands of years ago philosophers realised that there is no way to prove conclusively that anyone other than oneself has a mind. Indeed, even in the case of other humans, we just assume they have consciousness – we cannot know that for certain. Perhaps I am the only being in the entire universe who feels anything, and all other humans and animals are just mindless robots? Perhaps I am dreaming, and everyone I meet is just a character in my dream? Perhaps I am trapped inside a virtual world, and all the beings I see are merely simulations?

According to current scientific dogma, everything I experience is the result of electrical activity in my brain, and it should therefore be theoretically feasible to simulate an entire virtual world that I could not possibly distinguish from the 'real' world. Some brain scientists believe that in the not too distant future, we shall actually do such things. Well, maybe it has already been done – to you? For all you know, the year might be 2216 and you are a bored teenager immersed inside a 'virtual world' game that simulates the primitive and exciting world of the early twenty-first century. Once you acknowledge the mere feasibility of this scenario, mathematics leads you to a very scary conclusion: since there is only one real world, whereas the number of potential virtual worlds is infinite, the probability that you happen to inhabit the sole real world is almost zero.

None of our scientific breakthroughs has managed to overcome this notorious Problem of Other Minds. The best test that scholars have so far come up with is called the Turing Test, but it examines only social conventions. According to the Turing Test, in order to determine whether a computer has a mind, you should communicate simultaneously both with that computer and with a real person, without knowing which is which. You can ask whatever questions you want, you can play games, argue, and even flirt with them. Take as much time as you like. Then you need to decide which is the

computer, and which is the human. If you cannot make up your mind, or if you make a mistake, the computer has passed the Turing Test, and we should treat it as if it really has a mind. However, that won't really be a proof, of course. Acknowledging the existence of other minds is merely a social and legal convention.

The Turing Test was invented in 1950 by the British mathematician Alan Turing, one of the fathers of the computer age. Turing was also a gay man in a period when homosexuality was illegal in Britain. In 1952 he was convicted of committing homosexual acts and forced to undergo chemical castration. Two years later he committed suicide. The Turing Test is simply a replication of a mundane test every gay man had to undergo in 1950 Britain: can you pass for a straight man? Turing knew from personal experience that it didn't matter who you really were – it mattered only what others thought about you. According to Turing, in the future computers would be just like gay men in the 1950s. It won't matter whether computers will actually be conscious or not. It will matter only what people think about it.

The Depressing Lives of Laboratory Rats

Having acquainted ourselves with the mind – and with how little we really know about it – we can return to the question of whether other animals have minds. Some animals, such as dogs, certainly pass a modified version of the Turing Test. When humans try to determine whether an entity is conscious, what we usually look for is not mathematical aptitude or good memory, but rather the ability to create emotional relationships with us. People sometimes develop deep emotional attachments to fetishes like weapons, cars and even underwear, but these attachments are one-sided and never develop into relationships. The fact that dogs can be party to emotional relationships with humans convinces most dog owners that dogs are not mindless automata.

This, however, won't satisfy sceptics, who point out that emotions are algorithms, and that no known algorithm requires consciousness in order to function. Whenever an animal displays complex emotional behaviour, we cannot prove that this is not the result of some very sophisticated but non-conscious algorithm. This argument, of course, can be applied to humans too. Everything a human does – including reporting on allegedly conscious states – might in theory be the work of non-conscious algorithms.

In the case of humans, we nevertheless assume that whenever someone reports that he or she is conscious, we can take their word for it. Based on this minimal assumption, we can today identify the brain signatures of consciousness, which can then be used systematically to differentiate conscious from non-conscious states in humans. Yet since animal brains share many features with human brains, as our understanding of the signatures of consciousness deepens, we might be able to use them to determine if and when other animals are conscious. If a canine brain shows similar patterns to those of a conscious human brain, this will provide strong evidence that dogs are conscious.

Initial tests on monkeys and mice indicate that at least monkey and mice brains indeed display the signatures of consciousness.[8] However, given the differences between animal brains and human brains, and given that we are still far from deciphering all the secrets of consciousness, developing decisive tests that will satisfy the sceptics might take decades. Who should carry the burden of proof in the meantime? Do we consider dogs to be mindless machines until proven otherwise, or do we treat dogs as conscious beings as long as nobody comes up with some convincing counter-evidence?

On 7 July 2012 leading experts in neurobiology and the cognitive sciences gathered at the

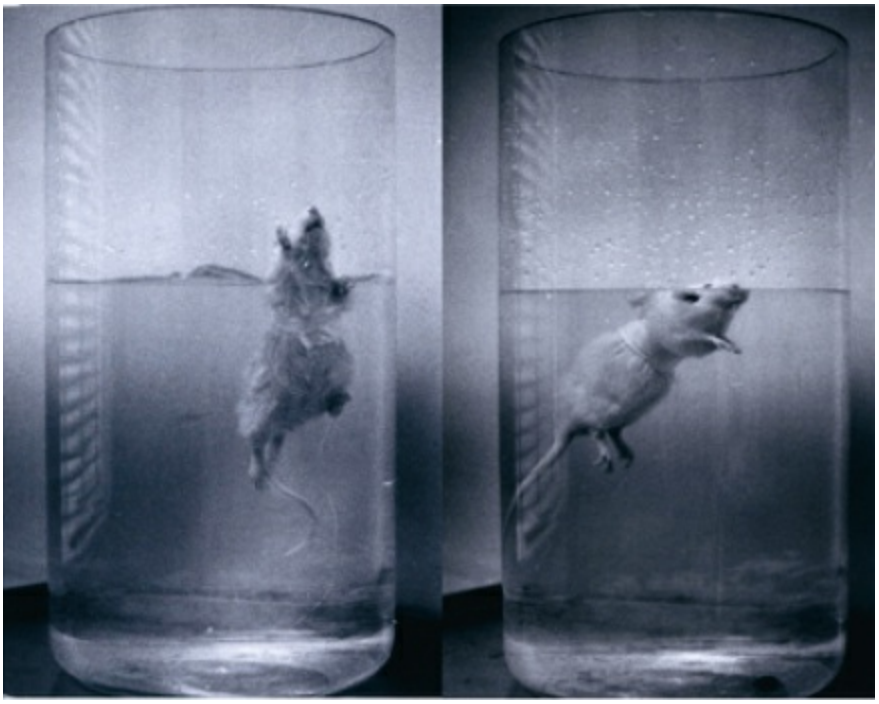
University of Cambridge, and signed the Cambridge Declaration on Consciousness, which says that 'Convergent evidence indicates that non-human animals have the neuroanatomical, neurochemical and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviours. Consequently, the weight of evidence indicates that humans are not unique in possessing the neurological substrates that generate consciousness. Non-human animals, including all mammals and birds, and many other creatures, including octopuses, also possess these neurological substrates.'[9] This declaration stops short of saying that other animals are conscious, because we still lack the smoking gun. But it does shift the burden of proof to those who think otherwise.

Responding to the shifting winds of the scientific community, in May 2015 New Zealand became the first country in the world to legally recognise animals as sentient beings, when the New Zealand parliament passed the Animal Welfare Amendment Act. The Act stipulates that it is now obligatory to recognise animals as sentient, and hence attend properly to their welfare in contexts such as animal husbandry. In a country with far more sheep than humans (30 million vs 4.5 million), that is a very significant statement. The Canadian province of Quebec has since passed a similar Act, and other countries are likely to follow suit.

Many business corporations also recognise animals as sentient beings, though paradoxically, this often exposes the animals to rather unpleasant laboratory tests. For example, pharmaceutical companies routinely use rats as experimental subjects in the development of antidepressants. According to one widely used protocol, you take a hundred rats (for statistical reliability) and place each rat inside a glass tube filled with water. The rats struggle again and again to climb out of the tubes, without success. After fifteen minutes most give up and stop moving. They just float in the tube, apathetic to their surroundings.

You now take another hundred rats, throw them in, but fish them out of the tube after fourteen minutes, just before they are about to despair. You dry them, feed them, give them a little rest – and then throw them back in. The second time, most rats struggle for twenty minutes before calling it quits. Why the extra six minutes? Because the memory of past success triggers the release of some biochemical in the brain that gives the rats hope and delays the advent of despair. If we could only isolate this biochemical, we might use it as an antidepressant for humans. But numerous chemicals flood a rat's brain at any given moment. How can we pinpoint the right one?

For this you take more groups of rats, who have never participated in the test before. You inject each group with a particular chemical, which you suspect to be the hoped-for antidepressant. You throw the rats into the water. If rats injected with chemical A struggle for only fifteen minutes before becoming depressed, you can cross out A on your list. If rats injected with chemical B go on thrashing for twenty minutes, you can tell the CEO and the shareholders that you might have just hit the jackpot.



Left: A hopeful rat struggling to escape the glass tube. Right: An apathetic rat floating in the glass tube, having lost all hope.

Adapted from Weiss, J.M., Cierpial, M.A. & West, C.H., 'Selective breeding of rats for high and low motor activity in a swim test: toward a new animal model of depression', *Pharmacology, Biochemistry and Behavior* 61:49–66 (1998).

Sceptics could object that this entire description needlessly humanises rats. Rats experience neither hope nor despair. Sometimes rats move quickly and sometimes they stand still, but they never feel anything. They are driven only by non-conscious algorithms. Yet if so, what's the point of all these experiments? Psychiatric drugs are aimed to induce changes not just in human behaviour, but above all in human *feeling*. When customers go to a psychiatrist and say, 'Doctor, give me something that will lift me out of this depression,' they don't want a mechanical stimulant that will cause them to flail about while still feeling blue. They want to *feel* cheerful. Conducting experiments on rats can help corporations develop such a magic pill only if they presuppose that rat behaviour is accompanied by human-like emotions. And indeed, this is a common presupposition in psychiatric laboratories.[10]

The Self-Conscious Chimpanzee

Another attempt to enshrine human superiority accepts that rats, dogs and other animals have consciousness, but argues that, unlike humans, they lack self-consciousness. They may feel depressed, happy, hungry or satiated, but they have no notion of self, and they are not aware that the depression or hunger they feel belongs to a unique entity called 'I'.

This idea is as common as it is opaque. Obviously, when a dog feels hungry, he grabs a piece of meat for himself rather than serve food to another dog. Let a dog sniff a tree watered by the neighbourhood dogs, and he will immediately know whether it smells of his own urine, of the neighbour's cute Labrador's or of some stranger's. Dogs react very differently to their own odour and to the odours of potential mates and rivals.[11] So what does it mean that they lack self-consciousness?

A more sophisticated version of the argument says that there are different levels of self-consciousness. Only humans understand themselves as an enduring self that has a past and a future, perhaps because only humans can use language in order to contemplate their past experiences and future actions. Other animals exist in an eternal present. Even when they seem to remember the past or

plan for the future, they are in fact reacting only to present stimuli and momentary urges.[12] For instance, a squirrel hiding nuts for the winter doesn't really remember the hunger he felt last winter, nor is he thinking about the future. He just follows a momentary urge, oblivious to the origins and purpose of this urge. That's why even very young squirrels, who haven't yet lived through a winter and hence cannot remember winter, nevertheless cache nuts during the summer.

Yet it is unclear why language should be a necessary condition for being aware of past or future events. The fact that humans use language to do so is hardly a proof. Humans also use language to express their love or their fear, but other animals may well experience and even express love and fear non-verbally. Indeed, humans themselves are often aware of past and future events without verbalising them. Especially in dream states, we can be aware of entire non-verbal narratives – which upon waking we struggle to describe in words.

Various experiments indicate that at least some animals – including birds such as parrots and scrub jays – do remember individual incidents and consciously plan for future eventualities.[13] However, it is impossible to prove this beyond doubt, because no matter how sophisticated a behaviour an animal exhibits, sceptics can always claim that it results from unconscious algorithms in its brain rather than from conscious images in its mind.

To illustrate this problem consider the case of Santino, a male chimpanzee from the Furuvik Zoo in Sweden. To relieve the boredom in his compound Santino developed an exciting hobby: throwing stones at visitors to the zoo. In itself, this is hardly unique. Angry chimpanzees often throw stones, sticks and even excrement. However, Santino was planning his moves in advance. During the early morning, long before the zoo opened for visitors, Santino collected projectiles and placed them in a heap, without showing any visible signs of anger. Guides and visitors soon learned to be wary of Santino, especially when he was standing near his pile of stones, hence he had increasing difficulties in finding targets.

In May 2010, Santino responded with a new strategy. In the early morning he took bales of straw from his sleeping quarters and placed them close to the compound's wall, where visitors usually gather to watch the chimps. He then collected stones and hid them under the straw. An hour or so later, when the first visitors approached, Santino kept his cool, showing no signs of irritation or aggression. Only when his victims were within range did Santino suddenly grab the stones from their hiding place and bombard the frightened humans, who would scuttle in all directions. In the summer of 2012 Santino sped up the arms race, caching stones not only under straw bales, but also in tree trunks, buildings and any other suitable hiding place.

Yet even Santino doesn't satisfy the sceptics. How can we be certain that at 7 a.m., when Santino goes about secreting stones here and there, he is imagining how fun it will be to pelt the visiting humans at noon? Maybe Santino is driven by some non-conscious algorithm, just like a young squirrel hiding nuts 'for winter' even though he has never experienced winter?[14]

Similarly, say the sceptics, a male chimpanzee attacking a rival who hurt him weeks earlier isn't really avenging the old insult. He is just reacting to a momentary feeling of anger, the cause of which is beyond him. When a mother elephant sees a lion threatening her calf, she rushes forward and risks her life not because she remembers that this is her beloved offspring whom she has been nurturing for months; rather, she is impelled by some unfathomable sense of hostility towards the lion. And when a dog jumps for joy when his owner comes home, the dog isn't recognising the man who fed and cuddled him from infancy. He is simply overwhelmed by an unexplained ecstasy.[15]

We cannot prove or disprove any of these claims, because they are in fact variations on the

Problem of Other Minds. Since we aren't familiar with any algorithm that requires consciousness, anything an animal does can be seen as the product of non-conscious algorithms rather than of conscious memories and plans. So in Santino's case too, the real question concerns the burden of proof. What is the most likely explanation for Santino's behaviour? Should we assume that he is consciously planning for the future, and anyone who disagrees should provide some counter-evidence? Or is it more reasonable to think that the chimpanzee is driven by a non-conscious algorithm, and all he consciously feels is a mysterious urge to place stones under bales of straw?

And even if Santino doesn't remember the past and doesn't imagine the future, does it mean he lacks self-consciousness? After all, we ascribe self-consciousness to humans even when they are not busy remembering the past or dreaming about the future. For example, when a human mother sees her toddler wandering onto a busy road, she doesn't stop to think about either past or future. Just like the mother elephant, she too just races to save her child. Why not say about her what we say about the elephant, namely that 'when the mother rushed to save her baby from the oncoming danger, she did it without any self-consciousness. She was merely driven by a momentary urge'?

Similarly, consider a young couple kissing passionately on their first date, a soldier charging into heavy enemy fire to save a wounded comrade, or an artist drawing a masterpiece in a frenzy of brushstrokes. None of them stops to contemplate the past or the future. Does it mean they lack self-consciousness, and that their state of being is inferior to that of a politician giving an election speech about his past achievements and future plans?

The Clever Horse

In 2010 scientists conducted an unusually touching rat experiment. They locked a rat in a tiny cage, placed the cage within a much larger cell and allowed another rat to roam freely through that cell. The caged rat gave out distress signals, which caused the free rat also to exhibit signs of anxiety and stress. In most cases, the free rat proceeded to help her trapped companion, and after several attempts usually succeeded in opening the cage and liberating the prisoner. The researchers then repeated the experiment, this time placing chocolate in the cell. The free rat now had to choose between either liberating the prisoner, or enjoying the chocolate all by herself. Many rats preferred to first free their companion and share the chocolate (though quite a few behaved more selfishly, proving perhaps that some rats are meaner than others).

Sceptics dismissed these results, arguing that the free rat liberated the prisoner not out of empathy, but simply in order to stop the annoying distress signals. The rats were motivated by the unpleasant sensations they felt, and they sought nothing grander than ending these sensations. Maybe. But we could say exactly the same thing about us humans. When I donate money to a beggar, am I not reacting to the unpleasant sensations that the sight of the beggar causes me to feel? Do I really care about the beggar, or do I simply want to feel better myself?[16]

In essence, we humans are not that different from rats, dogs, dolphins or chimpanzees. Like them, we too have no soul. Like us, they too have consciousness and a complex world of sensations and emotions. Of course, every animal has its unique traits and talents. Humans too have their special gifts. We shouldn't humanise animals needlessly, imagining that they are just a furrier version of ourselves. This is not only bad science, but it also prevents us from understanding and valuing other animals on their terms.

In the early 1900s, a horse called Clever Hans became a German celebrity. Touring Germany's

towns and villages, Hans showed off a remarkable grasp of the German language, and an even more remarkable mastery of mathematics. When asked, 'Hans, what is four times three?' Hans tapped his hoof twelve times. When shown a written message asking, 'What is twenty minus eleven?' Hans tapped nine times, with commendable Prussian precision.

In 1904 the German board of education appointed a special scientific commission headed by a psychologist to look into the matter. The thirteen members of the commission – which included a circus manager and a veterinarian – were convinced this must be a scam, but despite their best efforts they couldn't uncover any fraud or subterfuge. Even when Hans was separated from his owner, and complete strangers presented him with the questions, Hans still got most of the answers right.

In 1907 the psychologist Oskar Pfungst began another investigation that finally revealed the truth. It turned out that Hans got the answers right by carefully observing the body language and facial expressions of his interlocutors. When Hans was asked what is four times three, he knew from past experience that the human was expecting him to tap his hoof a given number of times. He began tapping, while closely monitoring the human. As Hans approached the correct number of taps the human became more and more tense, and when Hans tapped the right number, the tension reached its peak. Hans knew how to recognise this by the human's body posture and the look on the human's face. He then stopped tapping, and watched how tension was replaced by amazement or laughter. Hans knew he had got it right.

Clever Hans is often given as an example of the way humans erroneously humanise animals, ascribing to them far more amazing abilities than they actually possess. In fact, however, the lesson is just the opposite. The story demonstrates that by humanising animals we usually *underestimate* animal cognition and ignore the unique abilities of other creatures. As far as maths goes, Hans was hardly a genius. Any eight-year-old kid could do much better. However, in his ability to deduce emotions and intentions from body language, Hans was a true genius. If a Chinese person were to ask me in Mandarin what is four times three, there is no way that I could correctly tap my foot twelve times simply by observing facial expressions and body language. Clever Hans enjoyed this ability because horses normally communicate with each other through body language. What was remarkable about Hans, however, is that he could use the method to decipher the emotions and intentions not only of his fellow horses, but also of unfamiliar humans.



Clever Hans on stage in 1904.

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If animals are so clever, why don't horses harness humans to carts, rats conduct experiments on us,

and dolphins make us jump through hoops? *Homo sapiens* surely has some unique ability that enables it to dominate all the other animals. Having dismissed the overblown notions that *Homo sapiens* exists on an entirely different plain from other animals, or that humans possess some unique essence like soul or consciousness, we can finally climb down to the level of reality and examine the particular physical or mental abilities that give our species its edge.

Most studies cite tool production and intelligence as particularly important for the ascent of humankind. Though other animals also produce tools, there is little doubt that humans far surpass them in that field. Things are a bit less clear with regard to intelligence. An entire industry is devoted to defining and measuring intelligence but is a long way from reaching a consensus. Luckily, we don't have to enter into that minefield, because no matter how one defines intelligence, it is quite clear that neither intelligence nor toolmaking by themselves can account for the Sapiens conquest of the world. According to most definitions of intelligence, a million years ago humans were already the most intelligent animals around, as well as the world's champion toolmakers, yet they remained insignificant creatures with little impact on the surrounding ecosystem. They were obviously lacking some key feature other than intelligence and toolmaking.

Perhaps humankind eventually came to dominate the planet not because of some elusive third key ingredient, but due simply to the evolution of even higher intelligence and even better toolmaking abilities? It doesn't seem so, because when we examine the historical record, we don't see a direct correlation between the intelligence and toolmaking abilities of individual humans and the power of our species as a whole. Twenty thousand years ago, the average Sapiens probably had higher intelligence and better toolmaking skills than the average Sapiens of today. Modern schools and employers may test our aptitudes from time to time but, no matter how badly we do, the welfare state always guarantees our basic needs. In the Stone Age natural selection tested you every single moment of every single day, and if you flunked any of its numerous tests you were pushing up the daisies in no time. Yet despite the superior toolmaking abilities of our Stone Age ancestors, and despite their sharper minds and far more acute senses, 20,000 years ago humankind was much weaker than it is today.

Over those 20,000 years humankind moved from hunting mammoth with stone-tipped spears to exploring the solar system with spaceships not thanks to the evolution of more dexterous hands or bigger brains (our brains today seem actually to be smaller).[17] Instead, the crucial factor in our conquest of the world was our ability to connect many humans to one another.[18] Humans nowadays completely dominate the planet not because the individual human is far smarter and more nimble-fingered than the individual chimp or wolf, but because *Homo sapiens* is the only species on earth capable of co-operating flexibly in large numbers. Intelligence and toolmaking were obviously very important as well. But if humans had not learned to cooperate flexibly in large numbers, our crafty brains and deft hands would still be splitting flint stones rather than uranium atoms.

If cooperation is the key, how come the ants and bees did not beat us to the nuclear bomb even though they learned to cooperate en masse millions of years before us? Because their cooperation lacks flexibility. Bees cooperate in very sophisticated ways, but they cannot reinvent their social system overnight. If a hive faces a new threat or a new opportunity, the bees cannot, for example, guillotine the queen and establish a republic.

Social mammals such as elephants and chimpanzees cooperate far more flexibly than bees, but they do so only with small numbers of friends and family members. Their cooperation is based on personal acquaintance. If I am a chimpanzee and you are a chimpanzee and I want to cooperate with you, I must know you personally: what kind of chimp are you? Are you a nice chimp? Are you an evil

chimp? How can I cooperate with you if I don't know you? To the best of our knowledge, only Sapiens can cooperate in very flexible ways with countless numbers of strangers. This concrete capability – rather than an eternal soul or some unique kind of consciousness – explains our mastery of planet Earth.

Long Live the Revolution!

History provides ample evidence for the crucial importance of large-scale cooperation. Victory almost invariably went to those who cooperated better – not only in struggles between *Homo sapiens* and other animals, but also in conflicts between different human groups. Thus Rome conquered Greece not because the Romans had larger brains or better toolmaking techniques, but because they were able to cooperate more effectively. Throughout history, disciplined armies easily routed disorganised hordes, and unified elites dominated the disorderly masses. In 1914, for example, 3 million Russian noblemen, officials and business people lorded it over 180 million peasants and workers. The Russian elite knew how to cooperate in defence of its common interests, whereas the 180 million commoners were incapable of effective mobilisation. Indeed, much of the elite's efforts focused on ensuring that the 180 million people at the bottom would never learn to cooperate.

In order to mount a revolution, numbers are never enough. Revolutions are usually made by small networks of agitators rather than by the masses. If you want to launch a revolution, don't ask yourself, 'How many people support my ideas?' Instead, ask yourself, 'How many of my supporters are capable of effective collaboration?' The Russian Revolution finally erupted not when 180 million peasants rose against the tsar, but rather when a handful of communists placed themselves at the right place at the right time. In 1917, at a time when the Russian upper and middle classes numbered at least 3 million people, the Communist Party had just 23,000 members.[19] The communists nevertheless gained control of the vast Russian Empire because they organised themselves well. When authority in Russia slipped from the decrepit hands of the tsar and the equally shaky hands of Kerensky's provisional government, the communists seized it with alacrity, gripping the reins of power like a bulldog locking its jaws on a bone.

The communists didn't release their grip until the late 1980s. Effective organisation kept them in power for eight long decades, and they eventually fell due to defective organisation. On 21 December 1989 Nicolae Ceauşescu, the communist dictator of Romania, organised a mass demonstration of support in the centre of Bucharest. Over the previous months the Soviet Union had withdrawn its support from the eastern European communist regimes, the Berlin Wall had fallen, and revolutions had swept Poland, East Germany, Hungary, Bulgaria and Czechoslovakia. Ceauşescu, who had ruled Romania since 1965, believed he could withstand the tsunami, even though riots against his rule had erupted in the Romanian city of Timişoara on 17 December. As one of his counter-measures, Ceauşescu arranged a massive rally in Bucharest to prove to Romanians and the rest of the world that the majority of the populace still loved him – or at least feared him. The creaking party apparatus mobilised 80,000 people to fill the city's central square, and citizens throughout Romania were instructed to stop all their activities and tune in on their radios and televisions.

To the cheering of the seemingly enthusiastic crowd, Ceauşescu mounted the balcony overlooking the square, as he had done scores of times in previous decades. Flanked by his wife Elena, leading party officials and a bevy of bodyguards, Ceauşescu began delivering one of his trademark dreary speeches. For eight minutes he praised the glories of Romanian socialism, looking very pleased with

himself as the crowd clapped mechanically. And then something went wrong. You can see it for yourself on YouTube. Just search for 'Ceauşescu's last speech', and watch history in action.[20]

The YouTube clip shows Ceauşescu starting another long sentence, saying, 'I want to thank the initiators and organisers of this great event in Bucharest, considering it as a—', and then he falls silent, his eyes open wide, and he freezes in disbelief. He never finished the sentence. You can see in that split second how an entire world collapses. Somebody in the audience booed. People still argue today who was the first person who dared to boo. And then another person booed, and another, and another, and within a few seconds the masses began whistling, shouting abuse and calling out 'Ti-mi-şoa-ra! Ti-mi-şoa-ra!'



The moment a world collapses: a stunned Ceauşescu cannot believe his eyes and ears.

Film still taken from www.youtube.com/watch?v=wWIbCtz_Xwk©TVR.

All this happened live on Romanian television, as three-quarters of the populace sat glued to the screens, their hearts throbbing wildly. The notorious secret police – the Securitate – immediately ordered the broadcast to be stopped, but the television crews disobeyed. The cameraman pointed the camera towards the sky so that viewers couldn't see the panic among the party leaders on the balcony, but the soundman kept recording, and the technicians continued the transmission. The whole of Romania heard the crowd booing, while Ceauşescu yelled, 'Hello! Hello! Hello!' as if the problem was with the microphone. His wife Elena began scolding the audience, 'Be quiet! Be quiet!' until Ceauşescu turned and yelled at her – still live on television – 'You be quiet!' Ceauşescu then appealed to the excited crowds in the square, imploring them, 'Comrades! Comrades! Be quiet, comrades!'

But the comrades were unwilling to be quiet. Communist Romania crumbled when 80,000 people in the Bucharest central square realised they were much stronger than the old man in the fur hat on the balcony. What is truly astounding, however, is not the moment the system collapsed, but the fact that it managed to survive for decades. Why are revolutions so rare? Why do the masses sometimes clap and cheer for centuries on end, doing everything the man on the balcony commands them, even though they could in theory charge forward at any moment and tear him to pieces?

Ceauşescu and his cronies dominated 20 million Romanians for four decades because they ensured three vital conditions. First, they placed loyal communist apparatchiks in control of all networks of

cooperation, such as the army, trade unions and even sports associations. Second, they prevented the creation of any rival organisations – whether political, economic or social – which might serve as a basis for anti-communist cooperation. Third, they relied on the support of sister communist parties in the Soviet Union and eastern Europe. Despite occasional tensions, these parties helped each other in times of need, or at least guaranteed that no outsider poked his nose into the socialist paradise. Under such conditions, despite all the hardship and suffering inflicted on them by the ruling elite, the 20 million Romanians were unable to organise any effective opposition.

Ceauşescu fell from power only once all three conditions no longer held. In the late 1980s the Soviet Union withdrew its protection and the communist regimes began falling like dominoes. By December 1989 Ceauşescu could not expect any outside assistance. Just the opposite – revolutions in nearby countries gave heart to the local opposition. The Communist Party itself began splitting into rival camps. The moderates wished to rid themselves of Ceauşescu and initiate reforms before it was too late. By organising the Bucharest demonstration and broadcasting it live on television, Ceauşescu himself provided the revolutionaries with the perfect opportunity to discover their power and rally against him. What quicker way to spread a revolution than by showing it on TV?

Yet when power slipped from the hands of the clumsy organiser on the balcony, it did not pass to the masses in the square. Though numerous and enthusiastic, the crowds did not know how to organise themselves. Hence just as in Russia in 1917, power passed to a small group of political players whose only asset was good organisation. The Romanian Revolution was hijacked by the self-proclaimed National Salvation Front, which was in fact a smokescreen for the moderate wing of the Communist Party. The Front had no real ties to the demonstrating crowds. It was manned by mid-ranking party officials, and led by Ion Iliescu, a former member of the Communist Party's central committee and one-time head of the propaganda department. Iliescu and his comrades in the National Salvation Front reinvented themselves as democratic politicians, proclaimed to any available microphone that they were the leaders of the revolution, and then used their long experience and network of cronies to take control of the country and pocket its resources.

In communist Romania almost everything was owned by the state. Democratic Romania quickly privatised its assets, selling them at bargain prices to the ex-communists, who alone grasped what was happening and collaborated to feather each other's nests. Government companies that controlled national infrastructure and natural resources were sold to former communist officials at end-of-season prices while the party's foot soldiers bought houses and apartments for pennies.

Ion Iliescu was elected president of Romania, while his colleagues became ministers, parliament members, bank directors and multimillionaires. The new Romanian elite that controls the country to this day is composed mostly of former communists and their families. The masses who risked their necks in Timişoara and Bucharest settled for scraps, because they did not know how to cooperate and how to create an efficient organisation to look after their own interests.[21]

A similar fate befell the Egyptian Revolution of 2011. What television did in 1989, Facebook and Twitter did in 2011. The new media helped the masses coordinate their activities, so that thousands of people flooded the streets and squares at the right moment and toppled the Mubarak regime. However, it is one thing to bring 100,000 people to Tahrir Square, and quite another to get a grip on the political machinery, shake the right hands in the right back rooms and run a country effectively. Consequently, when Mubarak stepped down the demonstrators could not fill the vacuum. Egypt had only two institutions sufficiently organised to rule the country: the army and the Muslim Brotherhood. Hence the revolution was hijacked first by the Brotherhood, and eventually by the army.

The Romanian ex-communists and the Egyptian generals were not more intelligent or nimble-

fingered than either the old dictators or the demonstrators in Bucharest and Cairo. Their advantage lay in flexible cooperation. They cooperated better than the crowds, and they were willing to show far more flexibility than the hidebound Ceauşescu and Mubarak.

Beyond Sex and Violence

If Sapiens rule the world because we alone can cooperate flexibly in large numbers, then this undermines our belief in the sacredness of human beings. We tend to think that we are special, and deserve all kinds of privileges. As proof, we point to the amazing achievements of our species: we built the pyramids and the Great Wall of China; we deciphered the structure of atoms and DNA molecules; we reached the South Pole and the moon. If these accomplishments resulted from some unique essence that each individual human has – an immortal soul, say – then it would make sense to sanctify human life. Yet since these triumphs actually result from mass cooperation, it is far less clear why they should make us revere individual humans.

A beehive has much greater power than an individual butterfly, yet that doesn't imply a bee is therefore more hallowed than a butterfly. The Romanian Communist Party successfully dominated the disorganised Romanian population. Does it follow that the life of a party member was more sacred than the life of an ordinary citizen? Humans know how to cooperate far more effectively than chimpanzees, which is why humans launch spaceships to the moon whereas chimpanzees throw stones at zoo visitors. Does it mean that humans are superior beings?

Well, maybe. It depends on what enables humans to cooperate so well in the first place. Why are humans alone able to construct such large and sophisticated social systems? Social cooperation among most social mammals such as chimpanzees, wolves and dolphins relies on intimate acquaintance. Among common chimpanzees, individuals will go hunting together only after they have got to know each other well and established a social hierarchy. Hence chimpanzees spend a lot of time in social interactions and power struggles. When alien chimpanzees meet, they usually cannot cooperate, but instead scream at each other, fight or flee as quickly as possible.

Among pygmy chimpanzees – also known as bonobos – things are a bit different. Bonobos often use sex in order to dispel tensions and cement social bonds. Not surprisingly, homosexual intercourse is consequently very common among them. When two alien groups of bonobos encounter one another, at first they display fear and hostility, and the jungle is filled with howls and screams. Soon enough, however, females from one group cross no-chimp's-land, and invite the strangers to make love instead of war. The invitation is usually accepted, and within a few minutes the potential battlefield teems with bonobos having sex in almost every conceivable posture, including hanging upside down from trees.

Sapiens know these cooperative tricks well. They sometimes form power hierarchies similar to those of common chimpanzees, whereas on other occasions they cement social bonds with sex just like bonobos. Yet personal acquaintance – whether it involves fighting or copulating – cannot form the basis for large-scale co-operation. You cannot settle the Greek debt crisis by inviting Greek politicians and German bankers to either a fist fight or an orgy. Research indicates that Sapiens just can't have intimate relations (whether hostile or amorous) with more than 150 individuals.[22] Whatever enables humans to organise mass-cooperation networks, it isn't intimate relations.

This is bad news for psychologists, sociologists, economists and others who try to decipher human society through laboratory experiments. For both organisational and financial reasons, the vast

majority of experiments are conducted either on individuals or on small groups of participants. Yet it is risky to extrapolate from small-group behaviour to the dynamics of mass societies. A nation of 100 million people functions in a fundamentally different way to a band of a hundred individuals.

Take, for example, the Ultimatum Game – one of the most famous experiments in behavioural economics. This experiment is usually conducted on two people. One of them gets $100, which he must divide between himself and the other participant in any way he wants. He may keep everything, split the money in half or give most of it away. The other player can do one of two things: accept the suggested division, or reject it outright. If he rejects the division, nobody gets anything.

Classical economic theories maintain that humans are rational calculating machines. They propose that most people will keep $99, and offer $1 to the other participant. They further propose that the other participant will accept the offer. A rational person offered a dollar will always say yes. What does he care if the other player gets $99?

Classical economists have probably never left their laboratories and lecture halls to venture into the real world. Most people playing the Ultimatum Game reject very low offers because they are 'unfair'. They prefer losing a dollar to looking like suckers. Since this is how the real world functions, few people make very low offers in the first place. Most people divide the money equally, or give themselves only a moderate advantage, offering $30 or $40 to the other player.

The Ultimatum Game made a significant contribution to undermining classical economic theories and to establishing the most important economic discovery of the last few decades: Sapiens don't behave according to a cold mathematical logic, but rather according to a warm social logic. We are ruled by emotions. These emotions, as we saw earlier, are in fact sophisticated algorithms that reflect the social mechanisms of ancient hunter-gatherer bands. If 30,000 years ago I helped you hunt a wild chicken and you then kept almost all the chicken to yourself, offering me just one wing, I did not say to myself: 'Better one wing than nothing at all.' Instead my evolutionary algorithms kicked in, adrenaline and testosterone flooded my system, my blood boiled, and I stamped my feet and shouted at the top of my voice. In the short term I may have gone hungry, and even risked a punch or two. But it paid off in the long term, because you thought twice before ripping me off again. We refuse unfair offers because people who meekly accepted unfair offers didn't survive in the Stone Age.

Observations of contemporary hunter-gatherer bands support this idea. Most bands are highly egalitarian, and when a hunter comes back to camp carrying a fat deer, everybody gets a share. The same is true of chimpanzees. When one chimp kills a piglet, the other troop members will gather round him with outstretched hands, and usually they all get a piece.

In another recent experiment, the primatologist Frans de Waal placed two capuchin monkeys in two adjacent cages, so that each could see everything the other was doing. De Waal and his colleagues placed small stones inside each cage, and trained the monkeys to give them these stones. Whenever a monkey handed over a stone, he received food in exchange. At first the reward was a piece of cucumber. Both monkeys were very pleased with that, and happily ate their cucumber. After a few rounds de Waal moved to the next stage of the experiment. This time, when the first monkey surrendered a stone, he got a grape. Grapes are much more tasty than cucumbers. However, when the second monkey gave a stone, he still received a piece of cucumber. The second monkey, who was previously very happy with his cucumber, became incensed. He took the cucumber, looked at it in disbelief for a moment, and then threw it at the scientists in anger and began jumping and screeching loudly. He ain't a sucker.[23]

This hilarious experiment (which you can see for yourself on YouTube), along with the Ultimatum Game, has led many to believe that primates have a natural morality, and that equality is a universal

and timeless value. People are egalitarian by nature, and unequal societies can never function well due to resentment and dissatisfaction.

But is that really so? These theories may work well on chimpanzees, capuchin monkeys and small hunter-gatherer bands. They also work well in the lab, where you test them on small groups of people. Yet once you observe the behaviour of human masses you discover a completely different reality. Most human kingdoms and empires were extremely unequal, yet many of them were surprisingly stable and efficient. In ancient Egypt, the pharaoh sprawled on comfortable cushions inside a cool and sumptuous palace, wearing golden sandals and gem-studded tunics, while beautiful maids popped sweet grapes into his mouth. Through the open window he could see the peasants in the fields, toiling in dirty rags under a merciless sun, and blessed was the peasant who had a cucumber to eat at the end of the day. Yet the peasants rarely revolted.

In 1740 King Frederick II of Prussia invaded Silesia, thus commencing a series of bloody wars that earned him his sobriquet Frederick the Great, turned Prussia into a major power and left hundreds of thousands of people dead, crippled or destitute. Most of Frederick's soldiers were hapless recruits, subject to iron discipline and draconian drill. Not surprisingly, the soldiers lost little love on their supreme commander. As Frederick watched his troops assemble for the invasion, he told one of his generals that what struck him most about the scene was that 'we are standing here in perfect safety, looking at 60,000 men – they are all our enemies, and there is not one of them who is not better armed and stronger than we are, and yet they all tremble in our presence, while we have no reason whatsoever to be afraid of them'.[24] Frederick could indeed watch them in perfect safety. During the following years, despite all the hardships of war, these 60,000 armed men never revolted against him – indeed, many of them served him with exceptional courage, risking and even sacrificing their very lives.

Why did the Egyptian peasants and Prussian soldiers act so differently than we would have expected on the basis of the Ultimatum Game and the capuchin monkeys experiment? Because large numbers of people behave in a fundamentally different way than do small numbers. What would scientists see if they conducted the Ultimatum Game experiment on two groups of 1 million people each, who had to share $100 billion?

They would probably have witnessed strange and fascinating dynamics. For example, since 1 million people cannot make decisions collectively, each group might sprout a small ruling elite. What if one elite offers the other $10 billion, keeping $90 billion? The leaders of the second group might well accept this unfair offer, siphon most of the $10 billion into their Swiss bank accounts, while preventing rebellion among their followers with a combination of sticks and carrots. The leadership might threaten to severely punish dissidents forthwith, while promising the meek and patient everlasting rewards in the afterlife. This is what happened in ancient Egypt and eighteenth-century Prussia, and this is how things still work out in numerous countries around the world.

Such threats and promises often succeed in creating stable human hierarchies and mass-cooperation networks, as long as people believe that they reflect the inevitable laws of nature or the divine commands of God, rather than just human whims. All large-scale human cooperation is ultimately based on our belief in imagined orders. These are sets of rules that, despite existing only in our imagination, we believe to be as real and inviolable as gravity. 'If you sacrifice ten bulls to the sky god, the rain will come; if you honour your parents, you will go to heaven; and if you don't believe what I am telling you – you'll go to hell.' As long as all Sapiens living in a particular locality believe in the same stories, they all follow the same rules, making it easy to predict the behaviour of strangers and to organise mass-cooperation networks. Sapiens often use visual marks such as a turban, a beard

or a business suit to signal 'you can trust me, I believe in the same story as you'. Our chimpanzee cousins cannot invent and spread such stories, which is why they cannot cooperate in large numbers.

The Web of Meaning

People find it difficult to understand the idea of 'imagined orders' because they assume that there are only two types of realities: objective realities and subjective realities. In objective reality, things exist independently of our beliefs and feelings. Gravity, for example, is an objective reality. It existed long before Newton, and it affects people who don't believe in it just as much as it affects those who do.

Subjective reality, in contrast, depends on my personal beliefs and feelings. Thus, suppose I feel a sharp pain in my head and go to the doctor. The doctor checks me thoroughly, but finds nothing wrong. So she sends me for a blood test, urine test, DNA test, X-ray, electrocardiogram, fMRI scan and a plethora of other procedures. When the results come in she announces that I am perfectly healthy, and I can go home. Yet I still feel a sharp pain in my head. Even though every objective test has found nothing wrong with me, and even though nobody except me feels the pain, for me the pain is 100 per cent real.

Most people presume that reality is either objective or subjective, and that there is no third option. Hence once they satisfy themselves that something isn't just their own subjective feeling, they jump to the conclusion it must be objective. If lots of people believe in God; if money makes the world go round; and if nationalism starts wars and builds empires – then these things aren't just a subjective belief of mine. God, money and nations must therefore be objective realities.

However, there is a third level of reality: the intersubjective level. Intersubjective entities depend on communication among many humans rather than on the beliefs and feelings of individual humans. Many of the most important agents in history are intersubjective. Money, for example, has no objective value. You cannot eat, drink or wear a dollar bill. Yet as long as billions of people believe in its value, you can use it to buy food, beverages and clothing. If the baker suddenly loses his faith in the dollar bill and refuses to give me a loaf of bread for this green piece of paper, it doesn't matter much. I can just go down a few blocks to the nearby supermarket. However, if the supermarket cashiers also refuse to accept this piece of paper, along with the hawkers in the market and the salespeople in the mall, then the dollar will lose its value. The green pieces of paper will go on existing, of course, but they will be worthless.

Such things actually happen from time to time. On 3 November 1985 the Myanmar government unexpectedly announced that bank-notes of twenty-five, fifty and a hundred kyats were no longer legal tender. People were given no opportunity to exchange the notes, and savings of a lifetime were instantaneously turned into heaps of worthless paper. To replace the defunct notes, the government introduced new seventy-five-kyat bills, allegedly in honour of the seventy-fifth birthday of Myanmar's dictator, General Ne Win. In August 1986, banknotes of fifteen kyats and thirty-five kyats were issued. Rumour had it that the dictator, who had a strong faith in numerology, believed that fifteen and thirty-five are lucky numbers. They brought little luck to his subjects. On 5 September 1987 the government suddenly decreed that all thirty-five and seventy-five notes were no longer money.

The value of money is not the only thing that might evaporate once people stop believing in it. The same can happen to laws, gods and even entire empires. One moment they are busy shaping the world, and the next moment they no longer exist. Zeus and Hera were once important powers in the

Mediterranean basin, but today they lack any authority because nobody believes in them. The Soviet Union could once destroy the entire human race, yet it ceased to exist at the stroke of a pen. At 2 p.m. on 8 December 1991, in a state dacha near Viskuli, the leaders of Russia, Ukraine and Belarus signed the Belavezha Accords, which stated that 'We, the Republic of Belarus, the Russian Federation and Ukraine, as founding states of the USSR that signed the union treaty of 1922, hereby establish that the USSR as a subject of international law and a geopolitical reality ceases its existence.'[25] And that was that. No more Soviet Union.

It is relatively easy to accept that money is an intersubjective reality. Most people are also happy to acknowledge that ancient Greek gods, evil empires and the values of alien cultures exist only in the imagination. Yet we don't want to accept that *our* God, *our* nation or *our* values are mere fictions, because these are the things that give meaning to our lives. We want to believe that our lives have some objective meaning, and that our sacrifices matter to something beyond the stories in our head. Yet in truth the lives of most people have meaning only within the network of stories they tell one another.



Signing the Belavezha Accords. Pen touches paper – and abracadabra! The Soviet Union disappears.

© NOVOSTI/AFP/Getty Images.

Meaning is created when many people weave together a common network of stories. Why does a particular action – such as getting married in church, fasting on Ramadan or voting on election day – seem meaningful to me? Because my parents also think it is meaningful, as do my brothers, my neighbours, people in nearby cities and even the residents of far-off countries. And why do all these people think it is meaningful? Because their friends and neighbours also share the same view. People constantly reinforce each other's beliefs in a self-perpetuating loop. Each round of mutual confirmation tightens the web of meaning further, until you have little choice but to believe what everyone else believes.

Yet over decades and centuries the web of meaning unravels and a new web is spun in its place. To study history means to watch the spinning and unravelling of these webs, and to realise that what seems to people in one age the most important thing in life becomes utterly meaningless to their descendants.

In 1187 Saladin defeated the crusader army at the Battle of Hattin and conquered Jerusalem. In response the Pope launched the Third Crusade to recapture the holy city. Imagine a young English nobleman named John, who left home to fight Saladin. John believed that his actions had an objective

meaning. He believed that if he died on the crusade, after death his soul would ascend to heaven, where it would enjoy everlasting celestial joy. He would have been horrified to learn that the soul and heaven are just stories invented by humans. John wholeheartedly believed that if he reached the Holy Land, and if some Muslim warrior with a big moustache brought an axe down on his head, he would feel an unbearable pain, his ears would ring, his legs would crumble under him, his field of vision would turn black – and the very next moment he would see brilliant light all around him, he would hear angelic voices and melodious harps, and radiant winged cherubs would beckon him through a magnificent golden gate.

John had a very strong faith in all this, because he was enmeshed within an extremely dense and powerful web of meaning. His earliest memories were of Grandpa Henry's rusty sword, hanging in the castle's main hall. Ever since he was a toddler John had heard stories of Grandpa Henry who died on the Second Crusade and who is now resting with the angels in heaven, watching over John and his family. When minstrels visited the castle, they usually sang about the brave crusaders who fought in the Holy Land. When John went to church, he enjoyed looking at the stained-glass windows. One showed Godfrey of Bouillon riding a horse and impaling a wicked-looking Muslim on his lance. Another showed the souls of sinners burning in hell. John listened attentively to the local priest, the most learned man he knew. Almost every Sunday, the priest explained – with the help of well-crafted parables and hilarious jokes – that there was no salvation outside the Catholic Church, that the Pope in Rome was our holy father and that we always had to obey his commands. If we murdered or stole, God would send us to hell; but if we killed infidel Muslims, God would welcome us to heaven.

One day when John was just turning eighteen a dishevelled knight rode to the castle's gate, and in a choked voice announced the news: Saladin has destroyed the crusader army at Hattin! Jerusalem has fallen! The Pope has declared a new crusade, promising eternal salvation to anyone who dies on it! All around, people looked shocked and worried, but John's face lit up in an otherworldly glow and he proclaimed: 'I am going to fight the infidels and liberate the Holy Land!' Everyone fell silent for a moment, and then smiles and tears appeared on their faces. His mother wiped her eyes, gave John a big hug and told him how proud she was of him. His father gave him a mighty pat on the back, and said: 'If only I was your age, son, I would join you. Our family's honour is at stake – I am sure you won't disappoint us!' Two of his friends announced that they were coming too. Even John's sworn rival, the baron on the other side of the river, paid a visit to wish him Godspeed.

As he left the castle, villagers came forth from their hovels to wave to him, and all the pretty girls looked longingly at the brave crusader setting off to fight the infidels. When he set sail from England and made his way through strange and distant lands – Normandy, Provence, Sicily – he was joined by bands of foreign knights, all with the same destination and the same faith. When the army finally disembarked in the Holy Land and waged battle with Saladin's hosts, John was amazed to discover that even the wicked Saracens shared his beliefs. True, they were a bit confused, thinking that the Christians were the infidels and that the Muslims were obeying God's will. Yet they too accepted the basic principle that those fighting for God and Jerusalem will go straight to heaven when they die.

In such a way, thread by thread, medieval civilisation spun its web of meaning, trapping John and his contemporaries like flies. It was inconceivable to John that all these stories were just figments of the imagination. Maybe his parents and uncles were wrong. But the minstrels too, and all his friends, and the village girls, the learned priest, the baron on the other side of the river, the Pope in Rome, the Provençal and Sicilian knights, and even the very Muslims – is it possible that they were all hallucinating?

And the years pass. As the historian watches, the web of meaning unravels and another is spun in

its stead. John's parents die, followed by all his siblings and friends. Instead of minstrels singing about the crusades, the new fashion is stage plays about tragic love affairs. The family castle burns to the ground and, when it is rebuilt, no trace is found of Grandpa Henry's sword. The church windows shatter in a winter storm and the replacement glass no longer depicts Godfrey of Bouillon and the sinners in hell, but rather the great triumph of the king of England over the king of France. The local priest has stopped calling the Pope 'our holy father' – he is now referred to as 'that devil in Rome'. In the nearby university scholars pore over ancient Greek manuscripts, dissect dead bodies and whisper quietly behind closed doors that perhaps there is no such thing as the soul.

And the years continue to pass. Where the castle once stood, there is now a shopping mall. In the local cinema they are screening *Monty Python and the Holy Grail* for the umpteenth time. In an empty church a bored vicar is overjoyed to see two Japanese tourists. He explains at length about the stained-glass windows, while they politely smile, nodding in complete incomprehension. On the steps outside a gaggle of teenagers are playing with their iPhones. They watch a new YouTube remix of John Lennon's 'Imagine'. 'Imagine there's no heaven,' sings Lennon, 'it's easy if you try.' A Pakistani street cleaner is sweeping the pavement, while a nearby radio broadcasts the news: the carnage in Syria continues, and the Security Council's meeting has ended in an impasse. Suddenly a hole in time opens, a mysterious ray of light illuminates the face of one of the teenagers, who announces: 'I am going to fight the infidels and liberate the Holy Land!'

Infidels and Holy Land? These words no longer carry any meaning for most people in today's England. Even the vicar would probably think the teenager is having some sort of psychotic episode. In contrast, if an English youth decided to join Amnesty International and travel to Syria to protect the human rights of refugees, he will be seen as a hero. In the Middle Ages people would have thought he had gone bonkers. Nobody in twelfth-century England knew what human rights were. You want to travel to the Middle East and risk your life not in order to kill Muslims, but to protect one group of Muslims from another? You must be out of your mind.

That's how history unfolds. People weave a web of meaning, believe in it with all their heart, but sooner or later the web unravels, and when we look back we cannot understand how anybody could have taken it seriously. With hindsight, going on crusade in the hope of reaching Paradise sounds like utter madness. With hindsight, the Cold War seems even madder. How come thirty years ago people were willing to risk nuclear holocaust because of their belief in a communist paradise? A hundred years hence, our belief in democracy and human rights might look equally incomprehensible to our descendants.

Dreamtime

Sapiens rule the world because only they can weave an intersubjective web of meaning: a web of laws, forces, entities and places that exist purely in their common imagination. This web allows humans alone to organise crusades, socialist revolutions and human rights movements.

Other animals may also imagine various things. A cat waiting to ambush a mouse might not see the mouse, but may well imagine the shape and even taste of the mouse. Yet to the best of our knowledge, cats are able to imagine only things that actually exist in the world, like mice. They cannot imagine things that they have never seen or smelled or tasted – such as the US dollar, Google corporation or the European Union. Only Sapiens can imagine such chimeras.

Consequently, whereas cats and other animals are confined to the objective realm and use their

communication systems merely to describe reality, Sapiens use language to create completely new realities. During the last 70,000 years the intersubjective realities that Sapiens invented became ever more powerful, so that today they dominate the world. Will the chimpanzees, the elephants, the Amazon rainforests and the Arctic glaciers survive the twenty-first century? This depends on the wishes and decisions of intersubjective entities such as the European Union and the World Bank; entities that exist only in our shared imagination.

No other animal can stand up to us, not because they lack a soul or a mind, but because they lack the necessary imagination. Lions can run, jump, claw and bite. Yet they cannot open a bank account or file a lawsuit. And in the twenty-first century, a banker who knows how to file a lawsuit is far more powerful than the most ferocious lion in the savannah.

As well as separating humans from other animals, this ability to create intersubjective entities also separates the humanities from the life sciences. Historians seek to understand the development of intersubjective entities like gods and nations, whereas biologists hardly recognise the existence of such things. Some believe that if we could only crack the genetic code and map every neuron in the brain, we will know all of humanity's secrets. After all, if humans have no soul, and if thoughts, emotions and sensations are just biochemical algorithms, why can't biology account for all the vagaries of human societies? From this perspective, the crusades were territorial disputes shaped by evolutionary pressures, and English knights going to fight Saladin in the Holy Land were not that different from wolves trying to appropriate the territory of a neighbouring pack.

The humanities, in contrast, emphasise the crucial importance of intersubjective entities, which cannot be reduced to hormones and neurons. To think historically means to ascribe real power to the contents of our imaginary stories. Of course, historians don't ignore objective factors such as climate changes and genetic mutations, but they give much greater importance to the stories people invent and believe. North Korea and South Korea are so different from one another not because people in Pyongyang have different genes to people in Seoul, or because the north is colder and more mountainous. It's because the north is dominated by very different fictions.

Maybe someday breakthroughs in neurobiology will enable us to explain communism and the crusades in strictly biochemical terms. Yet we are very far from that point. During the twenty-first century the border between history and biology is likely to blur not because we will discover biological explanations for historical events, but rather because ideological fictions will rewrite DNA strands; political and economic interests will redesign the climate; and the geography of mountains and rivers will give way to cyberspace. As human fictions are translated into genetic and electronic codes, the intersubjective reality will swallow up the objective reality and biology will merge with history. In the twenty-first century fiction might thereby become the most potent force on earth, surpassing even wayward asteroids and natural selection. Hence if we want to understand our future, cracking genomes and crunching numbers is hardly enough. We must also decipher the fictions that give meaning to the world.



The Creator: Jackson Pollock in a moment of inspiration.

Rudy Burckhardt, photographer. Jackson Pollock and Lee Krasner papers, *c*.1905–1984. Archives of American Art, Smithsonian Institution. © The Pollock–Krasner Foundation ARS, NY and DACS, London, 2016.

PART II
Homo Sapiens Gives Meaning to the World

What kind of world did humans create?

How did humans become convinced that they not only control the world, but also give it meaning?

How did humanism – the worship of humankind – become the most important religion of all?

4
The Storytellers

Animals such as wolves and chimpanzees live in a dual reality. On the one hand, they are familiar with objective entities outside them, such as trees, rocks and rivers. On the other hand, they are aware of subjective experiences within them, such as fear, joy and desire. Sapiens, in contrast, live in triple-layered reality. In addition to trees, rivers, fears and desires, the Sapiens world also contains stories about money, gods, nations and corporations. As history unfolded, the impact of gods, nations and corporations grew at the expense of rivers, fears and desires. There are still many rivers in the world, and people are still motivated by their fears and wishes, but Jesus Christ, the French Republic and Apple Inc. have dammed and harnessed the rivers, and have learned to shape our deepest anxieties and yearnings.

Since new twenty-first-century technologies are likely to make such fictions only more potent, understanding our future requires understanding how stories about Christ, France and Apple have gained so much power. Humans think they make history, but history actually revolves around the web of stories. The basic abilities of individual humans have not changed much since the Stone Age. But the web of stories has grown from strength to strength, thereby pushing history from the Stone Age to the Silicon Age.

It all began about 70,000 years ago, when the Cognitive Revolution enabled Sapiens to start talking about things that existed only in their own imagination. For the following 60,000 years Sapiens wove many fictional webs, but these remained small and local. The spirit of a revered ancestor worshipped by one tribe was completely unknown to its neighbours, and seashells valuable in one locality became worthless once you crossed the nearby mountain range. Stories about ancestral spirits and precious seashells still gave Sapiens a huge advantage, because they allowed hundreds and sometimes even thousands of Sapiens to cooperate effectively, which was far more than Neanderthals or chimpanzees could do. Yet as long as Sapiens remained hunter-gatherers, they could not cooperate on a truly massive scale, because it was impossible to feed a city or a kingdom by hunting and gathering. Consequently the spirits, fairies and demons of the Stone Age were relatively weak entities.

The Agricultural Revolution, which began about 12,000 years ago, provided the necessary material base for enlarging and strengthening the intersubjective networks. Farming made it possible to feed thousands of people in crowded cities and thousands of soldiers in disciplined armies. However, the intersubjective webs then encountered a new obstacle. In order to preserve the collective myths and organise mass cooperation, the early farmers relied on the data-processing abilities of the human brain, which were strictly limited.

Farmers believed in stories about great gods. They built temples to their favourite god, held festivals in his honour, offered him sacrifices, and gave him lands, tithes and presents. In the first cities of ancient Sumer, about 6,000 years ago, the temples were not just centres of worship, but also

the most important political and economic hubs. The Sumerian gods fulfilled a function analogous to modern brands and corporations. Today, corporations are fictional legal entities that own property, lend money, hire employees and initiate economic enterprises. In ancient Uruk, Lagash and Shurupak the gods functioned as legal entities that could own fields and slaves, give and receive loans, pay salaries and build dams and canals.

Since the gods never died, and since they had no children to fight over their inheritance, they gathered more and more property and power. An increasing number of Sumerians found themselves employed by the gods, taking loans from the gods, tilling the gods' lands and owing taxes and tithes to the gods. Just as in present-day San Francisco John is employed by Google while Mary works for Microsoft, so in ancient Uruk one person was employed by the great god Enki while his neighbour worked for the goddess Inanna. The temples of Enki and Inanna dominated the Uruk skyline, and their divine logos branded buildings, products and clothes. For the Sumerians, Enki and Inanna were as real as Google and Microsoft are real for us. Compared to their predecessors – the ghosts and spirits of the Stone Age – the Sumerian gods were very powerful entities.

It goes without saying that the gods didn't actually run their businesses, for the simple reason that they didn't exist anywhere except in the human imagination. Day-to-day activities were managed by the temple priests (just as Google and Microsoft need to hire flesh-and-blood humans to manage their affairs). However, as the gods acquired more and more property and power, the priests could not cope. They may have represented the mighty sky god or the all-knowing earth goddess, but they themselves were fallible mortals. They had difficulty remembering all the lands belonging to the goddess Inanna, which of Inanna's employees had received their salary already, which of the goddess's tenants had failed to pay rent and what interest rate the goddess charged her debtors. This was one of the main reasons why in Sumer, like everywhere else around the world, human cooperation networks could not grow much even thousands of years after the Agricultural Revolution. There were no huge kingdoms, no extensive trade networks and no universal religions.

This obstacle was finally removed about 5,000 years ago, when the Sumerians invented both writing and money. These Siamese twins – born to the same parents at the same time and in the same place – broke the data-processing limitations of the human brain. Writing and money made it possible to start collecting taxes from hundreds of thousands of people, to organise complex bureaucracies and to establish vast kingdoms. In Sumer these kingdoms were managed in the name of the gods by human priest-kings. In the neighbouring Nile Valley people went a step further, merging the priest-king with the god to create a living deity – pharaoh.

The Egyptians considered pharaoh to be an actual god rather than just a divine deputy. The whole of Egypt belonged to that god, and all people had to obey his orders and pay his taxes. Just as in the Sumerian temples, so also in pharaonic Egypt the god didn't manage his business empire by himself. Some pharaohs ruled with an iron fist, while others passed their days at banquets and festivities, but in both cases the practical work of administering Egypt was left to thousands of literate officials. Just like any other human, pharaoh had a biological body with biological needs, desires and emotions. But the biological pharaoh was of little importance. The real ruler of the Nile Valley was an imagined pharaoh that existed in the stories millions of Egyptians told one another.

While pharaoh sat in his palace in the capital city of Memphis, eating grapes and dallying with his wives and mistresses, pharaoh's officials criss-crossed the kingdom from the Mediterranean shore to the Nubian Desert. The bureaucrats calculated the taxes each village had to pay, wrote them on long papyrus scrolls and sent them to Memphis. When a written order came from Memphis to recruit soldiers to the army or labourers for some construction project, the officials gathered the necessary

men. They computed how many kilograms of wheat the royal granaries contained, how many work days were required to clean the canals and reservoirs, and how many ducks and pigs to send to Memphis so that pharaoh's harem could dine well. Even when the living deity died, and his body was embalmed and borne in an extravagant funerary procession to the royal necropolis outside Memphis, the bureaucracy kept going. The officials kept writing scrolls, collecting taxes, sending orders and oiling the gears of the pharaonic machine.

If the Sumerian gods remind us of present-day company brands, so the living-god pharaoh can be compared to modern personal brands such as Elvis Presley, Madonna or Justin Bieber. Just like pharaoh, Elvis too had a biological body, complete with biological needs, desires and emotions. Elvis ate and drank and slept. Yet Elvis was much more than a biological body. Like pharaoh, Elvis was a story, a myth, a brand – and the brand was far more important than the biological body. During Elvis's lifetime, the brand earned millions of dollars selling records, tickets, posters and rights, but only a small fraction of the necessary work was done by Elvis in person. Instead, most of it was done by a small army of agents, lawyers, producers and secretaries. Consequently when the biological Elvis died, for the brand it was business as usual. Even today fans still buy the King's posters and albums, radio stations go on paying royalties, and more than half a million pilgrims flock each year to Graceland, the King's necropolis in Memphis, Tennessee.



Brands are not a modern invention. Just like Elvis Presley, pharaoh too was a brand rather than a living organism. For millions of followers his image counted for far more than his fleshy reality, and they kept worshipping him long after he was dead.

Left: © Richard Nowitz/Getty Images. Right: © Archive Photos/Stringer/Getty Images.

Prior to the invention of writing, stories were confined by the limited capacity of human brains. You couldn't invent overly complex stories which people couldn't remember. With writing you could suddenly create extremely long and intricate stories, which were stored on tablets and papyri rather than in human heads. No ancient Egyptian remembered all of pharaoh's lands, taxes and tithes; Elvis Presley never even read all the contracts signed in his name; no living soul is familiar with all the laws and regulations of the European Union; and no banker or CIA agent tracks down every dollar in the world. Yet all of these minutiae are written somewhere, and the assemblage of relevant documents defines the identity and power of pharaoh, Elvis, the EU and the dollar.

Writing has thus enabled humans to organise entire societies in an algorithmic fashion. We encountered the term 'algorithm' when we tried to understand what emotions are and how brains

function, and defined it as a methodical set of steps that can be used to make calculations, resolve problems and reach decisions. In illiterate societies people make all calculations and decisions in their heads. In literate societies people are organised into networks, so that each person is only a small step in a huge algorithm, and it is the algorithm as a whole that makes the important decisions. This is the essence of bureaucracy.

Think about a modern hospital, for example. When you arrive the receptionist hands you a standard form, and asks you a predetermined set of questions. Your answers are forwarded to a nurse, who compares them with the hospital's regulations in order to decide what preliminary tests to give you. She then measures, say, your blood pressure and heart rate, and takes a blood test. The doctor on duty examines the results, and follows a strict protocol to decide in which ward to hospitalise you. In the ward you are subjected to much more thorough examinations, such as an X-ray or an fMRI scan, mandated by thick medical guidebooks. Specialists then analyse the results according to well-known statistical databases, deciding what medicines to give you or what further tests to run.

This algorithmic structure ensures that it doesn't really matter who is the receptionist, nurse or doctor on duty. Their personality type, their political opinions and their momentary moods are irrelevant. As long as they all follow the regulations and protocols, they have a good chance of curing you. According to the algorithmic ideal, your fate is in the hands of 'the system', and not in the hands of the flesh-and-blood mortals who happen to man this or that post.

What's true of hospitals is also true of armies, prisons, schools, corporations – and ancient kingdoms. Of course ancient Egypt was far less technologically sophisticated than a modern hospital, but the algorithmic principle was the same. In ancient Egypt too, most decisions were made not by a single wise person, but by a network of officials linked together through papyri and stone inscriptions. Acting in the name of the living-god pharaoh, the network restructured human society and reshaped the natural world. For example, pharaohs Senusret III and his son Amenemhat III, who ruled Egypt from 1878 BC to 1814 BC, dug a huge canal linking the Nile to the swamps of the Fayum Valley. An intricate system of dams, reservoirs and subsidiary canals diverted some of the Nile waters to Fayum, creating an immense artificial lake holding 50 billion cubic metres of water.[1] By comparison, Lake Mead, the largest man-made reservoir in the United States (formed by the Hoover Dam), holds at most 35 billion cubic metres of water.

The Fayum engineering project gave pharaoh the power to regulate the Nile, prevent destructive floods and provide precious water relief in times of drought. In addition, it turned the Fayum Valley from a crocodile-infested swamp surrounded by barren desert into Egypt's granary. A new city called Shedet was built on the shore of the new artificial lake. The Greeks called it Crocodilopolis – the city of crocodiles. It was dominated by the temple of the crocodile god Sobek, who was identified with pharaoh (contemporary statues sometimes show pharaoh sporting a crocodile head). The temple housed a sacred crocodile called Petsuchos, who was considered the living incarnation of Sobek. Just like the living-god pharaoh, the living-god Petsuchos was lovingly groomed by the attending priests, who provided the lucky reptile with lavish food and even toys, and dressed him up in gold cloaks and gem-encrusted crowns. After all, Petsuchos was the priests' brand, and their authority and livelihood depended on him. When Petsuchos died, a new crocodile was immediately elected to fill his sandals, while the dead reptile was carefully embalmed and mummified.

In the days of Senusret III and Amenemhat III the Egyptians had neither bulldozers nor dynamite. They didn't even have iron tools, work horses or wheels (the wheel did not enter common usage in Egypt until about 1500 BC). Bronze tools were considered cutting-edge technology, but they were so expensive and rare that most of the building work was done only with tools made of stone and wood,

operated by human muscle power. Many people argue that the great building projects of ancient Egypt – all the dams and reservoirs and pyramids – must have been built by aliens from outer space. How else could a culture lacking even wheels and iron accomplish such wonders?

The truth is very different. Egyptians built Lake Fayum and the pyramids not thanks to extraterrestrial help, but thanks to superb organisational skills. Relying on thousands of literate bureaucrats, pharaoh recruited tens of thousands of labourers and enough food to maintain them for years on end. When tens of thousands of labourers cooperate for several decades, they can build an artificial lake or a pyramid even with stone tools.

Pharaoh himself hardly lifted a finger, of course. He didn't collect taxes himself, he didn't draw any architectural plans, and he certainly never picked up a shovel. But the Egyptians believed that only prayers to the living-god pharaoh and to his heavenly patron Sobek could save the Nile Valley from devastating floods and droughts. They were right. Pharaoh and Sobek were imaginary entities that did nothing to raise or lower the Nile water level, but when millions of people believed in pharaoh and Sobek and therefore cooperated to build dams and dig canals, floods and droughts became rare. Compared to the Sumerian gods, not to mention the Stone Age spirits, the gods of ancient Egypt were truly powerful entities that founded cities, raised armies and controlled the lives of millions of humans, cows and crocodiles.

It may sound strange to credit imaginary entities with building or controlling things. But nowadays we habitually say that the United States built the first nuclear bomb, that China built the Three Gorges Dam or that Google is building an autonomous car. Why not say, then, that pharaoh built a reservoir and Sobek dug a canal?

Living on Paper

Writing thus facilitated the appearance of powerful fictional entities that organised millions of people and reshaped the reality of rivers, swamps and crocodiles. Simultaneously, writing also made it easier for humans to believe in the existence of such fictional entities, because it habituated people to experiencing reality through the mediation of abstract symbols.

Hunter-gatherers spent their days climbing trees, looking for mushrooms, and chasing boars and rabbits. Their daily reality consisted of trees, mushrooms, boars and rabbits. Peasants worked all day in the fields, ploughing, harvesting, grinding corn and taking care of farmyard animals. Their daily reality was the feeling of muddy earth under bare feet, the smell of oxen pulling the plough and the taste of warm bread fresh from the oven. In contrast, scribes in ancient Egypt devoted most of their time to reading, writing and calculating. Their daily reality consisted of ink marks on papyrus scrolls, which determined who owned which field, how much an ox cost and what yearly taxes peasants had to pay. A scribe could decide the fate of an entire village with a stroke of his stylus.

The vast majority of people remained illiterate until the modern age, but the all-important administrators increasingly saw reality through the medium of written texts. For this literate elite – whether in ancient Egypt or in twentieth-century Europe – anything written on a piece of paper was at least as real as trees, oxen and human beings.

When the Nazis overran France in the spring of 1940, much of its Jewish population tried to escape the country. In order to cross the border south, they needed visas to Spain and Portugal, and tens of thousands of Jews, along with many other refugees, besieged the Portuguese consulate in Bordeaux in a desperate attempt to get the life-saving piece of paper. The Portuguese government forbade its

consuls in France to issue visas without prior approval from the Foreign Ministry, but the consul in Bordeaux, Aristides de Sousa Mendes, decided to disregard the order, throwing to the wind a thirty-year diplomatic career. As Nazi tanks were closing in on Bordeaux, Sousa Mendes and his team worked around the clock for ten days and nights, barely stopping to sleep, just issuing visas and stamping pieces of paper. Sousa Mendes issued thousands of visas before collapsing from exhaustion.

The Portuguese government – which had little desire to accept any of these refugees – sent agents to escort the disobedient consul back home, and fired him from the foreign office. Yet officials who cared little for the plight of human beings nevertheless had deep respect for documents, and the visas Sousa Mendes issued against orders were respected by French, Spanish and Portuguese bureaucrats alike, spiriting up to 30,000 people out of the Nazi death trap. Sousa Mendes, armed with little more than a rubber stamp, was responsible for the largest rescue operation by a single individual during the Holocaust.[2]



Aristides de Sousa Mendes, the angel with the rubber stamp.

Courtesy of the Sousa Mendes Foundation.

The sanctity of written records often had far less positive effects. From 1958 to 1961 communist China undertook the Great Leap Forward, when Mao Zedong wished to rapidly turn China into a superpower. Mao ordered the doubling and tripling of agricultural production, using the surplus produce to finance ambitious industrial and military projects. Mao's impossible demands made their way down the bureaucratic ladder, from the government offices in Beijing, through provincial administrators, all the way to the village headmen. The local officials, afraid of voicing any criticism and wishing to curry favour with their superiors, concocted imaginary reports of dramatic increases in agricultural output. As the fabricated numbers made their way up the bureaucratic hierarchy, each official only exaggerated them further, adding a zero here or there with a stroke of a pen.



One of the thousands of life-saving visas signed by Sousa Mendes in June 1940 (visa #1902 for Lazare Censor and family, dated 17 June 1940).

Courtesy of the Sousa Mendes Foundation.

Consequently, in 1958 the Chinese government was told that annual grain production was 50 per cent more than it actually was. Believing the reports, the government sold millions of tons of rice to foreign countries in exchange for weapons and heavy machinery, assuming that enough was left to feed the Chinese population. The result was the worst famine in history and the death of tens of millions of Chinese.[3]

Meanwhile, enthusiastic reports of China's farming miracle reached audiences throughout the world. Julius Nyerere, the idealistic president of Tanzania, was deeply impressed by the Chinese success. In order to modernise Tanzanian agriculture, Nyerere resolved to establish collective farms on the Chinese model. When peasants objected to the command, Nyerere sent the army and police to destroy traditional villages and forcefully move hundreds of thousands of peasants onto the new collective farms.

Government propaganda depicted the farms as miniature paradises, but many of them existed only in government documents. The protocols and reports written in the capital Dar es Salaam said that on such-and-such a date the inhabitants of such-and-such village were relocated to such-and-such farm. In reality, when the villagers reached their destination, they found absolutely nothing there. No houses, no fields, no tools. The officials reported great successes to themselves and to President Nyerere. In fact, within less than ten years Tanzania was transformed from Africa's biggest food exporter into a net food importer that could not feed itself without external assistance. In 1979, 90 per cent of Tanzanian farmers lived in collective farms, but they generated only 5 per cent of the country's agricultural output.[4]

Though the history of writing is full of similar mishaps, in most cases writing did enable officials to organise the state much more efficiently than before. Indeed, even the disaster of the Great Leap Forward didn't topple the Chinese Communist Party from power. The catastrophe was caused by the ability to impose written fantasies on reality, but exactly the same ability allowed the party to paint a rosy picture of its successes and hold on to power tenaciously.

Written language may have been conceived as a modest way of describing reality, but it gradually became a powerful way to reshape reality. When official reports collided with objective reality, it

was often reality that had to give way. Anyone who has ever dealt with the tax authorities, the educational system or any other complex bureaucracy knows that the truth hardly matters. What's written on your form is far more important.

Holy Scriptures

Is it true that when text and reality collide, reality sometimes has to give way? Isn't it just a common but exaggerated slander of bureaucratic systems? Most bureaucrats – whether serving pharaoh or Mao Zedong – were reasonable people, and surely would have made the following argument: 'We use writing to describe the reality of fields, canals and granaries. If the description is accurate, we make realistic decisions. If the description is inaccurate, it causes famines and even rebellions. Then we, or the administrators of some future regime, learn from the mistake, and strive to produce more truthful descriptions. So over time, our documents are bound to become ever more precise.'

That's true to some extent, but it ignores an opposite historical dynamic. As bureaucracies accumulate power, they become immune to their own mistakes. Instead of changing their stories to fit reality, they can change reality to fit their stories. In the end, external reality matches their bureaucratic fantasies, but only because they forced reality to do so. For example, the borders of many African countries disregard river lines, mountain ranges and trade routes, split historical and economic zones unnecessarily, and ignore local ethnic and religious identities. The same tribe may find itself riven between several countries, whereas one country may incorporate splinters of numerous rival clans. Such problems bedevil countries all over the world, but in Africa they are particularly acute because modern African borders don't reflect the wishes and struggles of local nations. They were drawn by European bureaucrats who never set foot in Africa.

In the late nineteenth century, several European powers laid claim to African territories. Fearing that conflicting claims might lead to an all-out European war, the concerned parties got together in Berlin in 1884, and divided Africa as if it were a pie. Back then, much of the African interior was terra incognita to Europeans. The British, French and Germans had accurate maps of Africa's coastal regions, and knew precisely where the Niger, the Congo and the Zambezi empty into the ocean. However, they knew little about the course these rivers took inland, about the kingdoms and tribes that lived along their banks, and about local religion, history and geography. This hardly mattered to the European diplomats. They took out an empty map of Africa, spread it over a well-polished Berlin table, sketched lines here and there, and divided the continent between them.

When the Europeans penetrated the African interior, armed with the agreed-upon map, they discovered that many of the borders drawn in Berlin hardly did justice to the geographic, economic and ethnic reality of Africa. However, to avoid renewed clashes, the invaders stuck to their agreements, and these imaginary lines became the actual borders of European colonies. During the second half of the twentieth century, as the European empires disintegrated and the colonies gained their independence, the new countries accepted the colonial borders, fearing that the alternative would be endless wars and conflicts. Many of the difficulties faced by present-day African countries stem from the fact that their borders make little sense. When the written fantasies of European bureaucracies encountered the African reality, reality was forced to surrender.[5]

The modern educational system provides numerous other examples of reality bowing down to written records. When measuring the width of my desk, the yardstick I am using matters little. My desk remains the same width regardless of whether I say it is 200 centimetres or 78.74 inches.

However, when bureaucracies measure people, the yardsticks they choose make all the difference. When schools began assessing people according to precise marks, the lives of millions of students and teachers changed dramatically. Marks are a relatively new invention. Hunter-gatherers were never marked for their achievements, and even thousands of years after the Agricultural Revolution, few educational establishments used precise marks. A medieval apprentice cobbler did not receive at the end of the year a piece of paper saying he has got an A on shoelaces but a C minus on buckles. An undergraduate in Shakespeare's day left Oxford with one of only two possible results – with a degree, or without one. Nobody thought of giving one student a final mark of 74 and another student 88.[6]



A European map of Africa from the mid-nineteenth century. The Europeans knew very little about the African interior, which did not prevent them from dividing the continent and drawing its borders.

© Antiqua Print Gallery/Alamy Stock Photo.

Only the mass educational systems of the industrial age began using precise marks on a regular basis. Since both factories and government ministries became accustomed to thinking in the language of numbers, schools followed suit. They started to gauge the worth of each student according to his or her average mark, whereas the worth of each teacher and principal was judged according to the school's overall average. Once bureaucrats adopted this yardstick, reality was transformed.

Originally, schools were supposed to focus on enlightening and educating students, and marks were merely a means of measuring success. But naturally enough, schools soon began focusing on getting high marks. As every child, teacher and inspector knows, the skills required to get high marks in an exam are not the same as a true understanding of literature, biology or mathematics. Every child, teacher and inspector also knows that when forced to choose between the two, most schools will go for the marks.

The power of written records reached its apogee with the appearance of holy scriptures. Priests and scribes in ancient civilisations got used to seeing documents as guidebooks for reality. At first, the texts told them about the reality of taxes, fields and granaries. But as the bureaucracy gained power, so the texts gained authority. Priests wrote down not just the god's property list, but also the god's deeds, commandments and secrets. The resulting scriptures purported to describe reality in its entirety, and generations of scholars became accustomed to looking for all the answers in the pages of

the Bible, the Qur'an or the Vedas.

In theory, if some holy book misrepresented reality, its disciples would sooner or later find it out, and the text would lose its authority. Abraham Lincoln said you cannot deceive everybody all the time. Well, that's wishful thinking. In practice, the power of human cooperation networks rests on a delicate balance between truth and fiction. If you distort reality too much, it will weaken you, and you will not be able to compete against more clear-sighted rivals. On the other hand, you cannot organise masses of people effectively without relying on some fictional myths. So if you stick to pure reality, without mixing any fiction with it, few people would follow you.

If you used a time machine to send a modern scientist to ancient Egypt, she would not be able to seize power by exposing the fictions of the local priests and lecturing the peasants on evolution, relativity and quantum physics. Of course, if our scientist could use her knowledge in order to produce a few rifles and artillery pieces, she could gain a huge advantage over pharaoh and the crocodile god Sobek. Yet in order to mine iron, build furnaces and manufacture gunpowder the scientist would need a lot of hard-working peasants. Do you really think she could inspire them by explaining that energy divided by mass equals the speed of light squared? If you happen to think so, you are welcome to travel to Afghanistan or Syria and try your luck.

Really powerful human organisations – such as pharaonic Egypt, communist China, the European empires and the modern school system – are not necessarily clear-sighted. Much of their power rests on their ability to force their fictional beliefs on a submissive reality. That's the whole idea of money, for example. The government takes worthless pieces of paper, declares them to be valuable and then uses them to compute the value of everything else. The government has enough power to force citizens to pay taxes using these pieces of paper, so the citizens have no choice but to get their hand on at least some bills. The bills consequently become really valuable, the government officials are vindicated in their beliefs, and since the government controls the issuing of paper money, its power grows. If somebody protests that 'These are just worthless pieces of paper!' and behaves as if they are only pieces of paper, he won't get very far in life.

The same thing happens when the educational system declares that matriculation exams are the best method to evaluate students. The system has enough authority to influence acceptance conditions to colleges, government offices and private-sector jobs. Students therefore invest all their efforts in getting good marks. Coveted positions are manned by people with high marks, who naturally support the system that brought them there. The fact that the educational system controls the critical exams gives it more power, and increases its influence over colleges, government offices and the job market. If somebody protests that 'The degree certificate is just a piece of paper!' and behaves accordingly, he is unlikely to get very far in life.

Holy scriptures work the same way. The religious establishment proclaims that the holy book contains the answers to all our questions. It simultaneously forces courts, governments and businesses to behave according to what the holy book says. When a wise person reads scriptures and then looks at the world, he sees that there is indeed a good match. 'Scriptures say that you must pay tithes to God – and look, everybody pays. Scriptures say that women are inferior to men, and cannot serve as judges or even give testimony in court – and look, there are indeed no women judges and the courts reject their testimony. Scriptures say that whoever studies the word of God will succeed in life – and look, all the good jobs are indeed held by people who know the holy book by heart.'

Such a wise person will naturally begin to study the holy book, and because he is wise, he will become a scriptural pundit. He will consequently be appointed a judge. When he becomes a judge, he will not allow women to bear witness in court, and when he chooses his successor, he will obviously

pick somebody who knows the holy book well. If someone protests that 'This book is just paper!' and behaves accordingly, such a heretic will not get very far in life.

Even when scriptures mislead people about the true nature of reality, they can nevertheless retain their authority for thousands of years. For instance, the biblical perception of history is fundamentally flawed, yet it managed to spread throughout the world, and billions still believe in it. The Bible peddled a monotheistic theory of history, which says that the world is governed by a single all-powerful deity, who cares above all else about me and my doings. If something good happens, it must be a reward for my good deeds. Any catastrophe must surely be punishment for my sins.

Thus the ancient Jews believed that if they suffered from drought, or if King Nebuchadnezzar of Babylonia invaded Judaea and exiled its people, surely these were divine punishments for their own sins. And if King Cyrus of Persia defeated the Babylonians and allowed the Jewish exiles to return home and rebuild Jerusalem, God in his mercy must have heard their remorseful prayers. The Bible doesn't recognise the possibility that perhaps the drought resulted from a volcanic eruption in the Philippines, that Nebuchadnezzar invaded in pursuit of Babylonian commercial interests and that King Cyrus had his own political reasons to favour the Jews. The Bible accordingly shows no interest whatsoever in understanding the global ecology, the Babylonian economy or the Persian political system.

Such self-absorption characterises all humans in their childhood. Children of all religions and cultures think they are the centre of the world, and therefore show little genuine interest in the conditions and feelings of other people. That's why divorce is so traumatic for children. A five-year-old cannot understand that something important is happening for reasons unrelated to him. No matter how many times you tell him that mummy and daddy are independent people with their own problems and wishes, and that they didn't divorce because of him – the child cannot absorb that. He is convinced that everything happens because of him. Most people grow out of this infantile delusion. Monotheists hold on to it till the day they die. Like a child thinking that his parents are fighting because of him, the monotheist is convinced that the Persians are fighting the Babylonians because of him.

Already in biblical times some cultures had a far more accurate perception of history. Animist and polytheist religions depicted the world as the playground of numerous different powers rather than a single god. It was consequently easy for animists and polytheists to accept that many events are unrelated to me or to my favourite deity, and they are neither punishments for my sins nor rewards for my good deeds. Greek historians such as Herodotus and Thucydides, and Chinese historians such as Sima Qian, developed sophisticated theories of history which are very similar to our own modern views. They explained that wars and revolutions break out due to a plethora of political, social and economic factors. People may fall victim to a war for no fault of their own. Accordingly, Herodotus showed keen interest in understanding Persian politics, while Sima Qian was very concerned about the culture and religion of barbarous steppe people.[7]

Present-day scholars agree with Herodotus and Sima Qian rather than with the Bible. That's why all modern states invest so much effort in collecting information about other countries, and in analysing global ecological, political and economic trends. When the US economy falters, even evangelical Republicans sometimes point an accusing finger at China rather than at their own sins.

Yet even though Herodotus and Thucydides understood reality much better than the authors of the Bible, when the two world views collided, the Bible won by a knockout. The Greeks adopted the Jewish view of history, rather than vice versa. A thousand years after Thucydides, the Greeks became convinced that if some barbarian horde invaded, surely it was divine punishment for their sins. No

matter how mistaken the biblical world view was, it provided a better basis for large-scale human cooperation.

But it Works!

Fictions enable us to cooperate better. The price we pay is that the same fictions also determine the goals of our cooperation. So we may have very elaborate systems of cooperation, which are harnessed to serve fictional aims and interests. Consequently the system may seem to be working well, but only if we adopt the system's own criteria. For example, a Muslim mullah would say: 'Our system works. There are now 1.5 billion Muslims worldwide, and more people study the Qur'an and submit themselves to Allah's will than ever before.' The key question, though, is whether this is the right yardstick for measuring success. A school principal would say: 'Our system works. During the last five years, exam results have risen by 7.3 per cent.' Yet is that the best way to judge a school? An official in ancient Egypt would say: 'Our system works. We collect more taxes, dig more canals and build bigger pyramids than anyone else in the world.' True enough, pharaonic Egypt led the world in taxation, irrigation and pyramid construction. But is that what really counts?

People have many material, social and mental needs. It is far from clear that peasants in ancient Egypt enjoyed more love or better social relations than their hunter-gatherer ancestors, and in terms of nutrition, health and child mortality it seems that life was actually worse. A document dated *c.*1850 BC from the reign of Amenemhat III – the pharaoh who created Lake Fayum – tells of a well-to-do man called Dua-Khety who took his son Pepy to school, so that he could learn to be a scribe. On the way to school, Dua-Khety portrayed the miserable life of peasants, labourers, soldiers and artisans, so as to encourage Pepy to devote all his energy to studying, thereby escaping the destiny of most humans.

According to Dua-Khety, the life of a landless field labourer is full of hardship and misery. Dressed in mere tatters, he works all day till his fingers are covered in blisters. Then pharaoh's officials come and take him away to do forced labour. In return for all his hard work he receives only sickness as payment. Even if he makes it home alive, he will be completely worn out and ruined. The fate of the landholding peasant is hardly better. He spends his days carrying water in buckets from the river to the field. The heavy load bends his shoulders and covers his neck with festering swellings. In the morning he has to water his plot of leeks, in the afternoon his date palms and in the evening his coriander field. Eventually he drops down and dies.[8] The text might exaggerate things on purpose, but not by much. Pharaonic Egypt was the most powerful kingdom of its day, but for the simple peasant all that power meant taxes and forced labour rather than clinics and social security services.

This was not a uniquely Egyptian defect. Despite all the immense achievements of the Chinese dynasties, the Muslim empires and the European kingdoms, even in AD 1850 the life of the average person was not better – and might actually have been worse – than the lives of archaic hunter-gatherers. In 1850 a Chinese peasant or a Manchester factory hand worked longer hours than their hunter-gatherer ancestors; their jobs were physically harder and mentally less fulfilling; their diet was less balanced; hygiene conditions were incomparably worse; and infectious diseases were far more common.

Suppose you were given a choice between the following two vacation packages:

Stone Age package: On day one we will hike for ten hours in a pristine forest, setting camp for the night in a clearing by a river. On day two we will canoe down the river for ten hours, camping on the

shores of a small lake. On day three we will learn from the native people how to fish in the lake and how to find mushrooms in the nearby woods.

Modern proletarian package: On day one we will work for ten hours in a polluted textile factory, passing the night in a cramped apartment block. On day two we will work for ten hours as cashiers in the local department store, going back to sleep in the same apartment block. On day three we will learn from the native people how to open a bank account and fill out mortgage forms.

Which package would you choose?

Hence when we come to evaluate human cooperation networks, it all depends on the yardsticks and viewpoint we adopt. Are we judging pharaonic Egypt in terms of production, nutrition or perhaps social harmony? Do we focus on the aristocracy, the simple peasants, or the pigs and crocodiles? History isn't a single narrative, but thousands of alternative narratives. Whenever we choose to tell one, we are also choosing to silence others.

Human cooperative networks usually judge themselves by yardsticks of their own invention, and not surprisingly, they often give themselves high marks. In particular, human networks built in the name of imaginary entities such as gods, nations and corporations normally judge their success from the viewpoint of the imaginary entity. A religion is successful if it follows divine commandments to the letter; a nation is glorious if it promotes the national interest; and a corporation thrives if it makes a lot of money.

When examining the history of any human network, it is therefore advisable to stop from time to time and look at things from the perspective of some real entity. How do you know if an entity is real? Very simple – just ask yourself, 'Can it suffer?' When people burn down the temple of Zeus, Zeus doesn't suffer. When the euro loses its value, the euro doesn't suffer. When a bank goes bankrupt, the bank doesn't suffer. When a country suffers a defeat in war, the country doesn't really suffer. It's just a metaphor. In contrast, when a soldier is wounded in battle, he really does suffer. When a famished peasant has nothing to eat, she suffers. When a cow is separated from her newborn calf, she suffers. This is reality.

Of course suffering might well be caused by our belief in fictions. For example, belief in national and religious myths might cause the outbreak of war, in which millions lose their homes, their limbs and even their lives. The cause of war is fictional, but the suffering is 100 per cent real. This is exactly why we should strive to distinguish fiction from reality.

Fiction isn't bad. It is vital. Without commonly accepted stories about things like money, states or corporations, no complex human society can function. We can't play football unless everyone believes in the same made-up rules, and we can't enjoy the benefits of markets and courts without similar make-believe stories. But the stories are just tools. They should not become our goals or our yardsticks. When we forget that they are mere fiction, we lose touch with reality. Then we begin entire wars 'to make a lot of money for the corporation' or 'to protect the national interest'. Corporations, money and nations exist only in our imagination. We invented them to serve us; how come we find ourselves sacrificing our lives in their service?

5
The Odd Couple

Stories serve as the foundations and pillars of human societies. As history unfolded, stories about gods, nations and corporations grew so powerful that they began to dominate objective reality. Believing in the great god Sobek, the Mandate of Heaven or the Bible enabled people to build Lake Fayum, the Great Wall of China and Chartres Cathedral. Unfortunately, blind faith in these stories meant that human efforts frequently focused on increasing the glory of fictional entities such as gods and nations, instead of bettering the lives of real sentient beings.

Does this analysis still hold true today? At first sight, it seems that modern society is very different from the kingdoms of ancient Egypt or medieval China. Hasn't the rise of modern science changed the basic rules of the human game? Wouldn't it be true to say that despite the ongoing importance of traditional myths, modern social systems rely increasingly on objective scientific theories such as the theory of evolution, which simply did not exist in ancient Egypt or medieval China?

We could of course argue that scientific theories are a new kind of myth, and that our belief in science is no different from the ancient Egyptians' belief in the great god Sobek. Yet the comparison doesn't hold water. Sobek existed only in the collective imagination of his devotees. Praying to Sobek helped cement the Egyptian social system, thereby enabling people to build dams and canals that prevented floods and droughts. Yet the prayers themselves didn't raise or lower the Nile's water level by a millimetre. In contrast, scientific theories are not just a way to bind people together. It is often said that God helps those who help themselves. This is a roundabout way of saying that God doesn't exist, but if our belief in Him inspires us to do something ourselves – it helps. Antibiotics, unlike God, help even those who don't help themselves. They cure infections whether you believe in them or not.

Consequently, the modern world is very different from the premodern world. Egyptian pharaohs and Chinese emperors failed to overcome famine, plague and war despite millennia of effort. Modern societies managed to do it within a few centuries. Isn't it the fruit of abandoning intersubjective myths in favour of objective scientific knowledge? And can't we expect this process to accelerate in the coming decades? As technology allows us to upgrade humans, overcome old age and find the key to happiness, so people would care less about fictional gods, nations and corporations, and focus instead on deciphering the physical and biological reality.

In truth, however, things are far more complicated. Modern science certainly changed the rules of the game, but it did not simply replace myths with facts. Myths continue to dominate humankind. Science only makes these myths stronger. Instead of destroying the intersubjective reality, science will enable it to control the objective and subjective realities more completely than ever before. Thanks to computers and bioengineering, the difference between fiction and reality will blur, as people reshape reality to match their pet fictions.

The priests of Sobek imagined the existence of divine crocodiles, while pharaoh dreamt about

immortality. In reality, the sacred crocodile was a very ordinary swamp reptile dressed in golden fineries, and pharaoh was as mortal as the simplest of peasants. After death, his corpse was mummified using preservative balms and scented perfumes, but it was as lifeless as one can get. In contrast, twenty-first-century scientists might be able to really engineer super-crocodiles, and to provide the human elite with eternal youth here on earth.

Consequently the rise of science will make at least some myths and religions mightier than ever. To understand why, and to face the challenges of the twenty-first century, we should therefore revisit one of the most nagging questions of all: how does modern science relate to religion? It seems that people have already said a million times everything there is to say about this question. Yet in practice, science and religion are like a husband and wife who after 500 years of marriage counselling still don't know each other. He still dreams about Cinderella and she keeps pining for Prince Charming, while they argue about whose turn it is to take out the rubbish.

Germs and Demons

Most of the misunderstandings regarding science and religion result from faulty definitions of religion. All too often, people confuse religion with superstition, spirituality, belief in supernatural powers or belief in gods. Religion is none of these things. Religion cannot be equated with superstition, because most people are unlikely to call their cherished beliefs 'superstitions'. We always believe in 'the truth'. It's only other people who believe in superstitions.

Similarly, few people put their faith in supernatural powers. For those who believe in demons, demons aren't supernatural. They are an integral part of nature, just like porcupines, scorpions and germs. Modern physicians blame disease on invisible germs, and voodoo priests blame disease on invisible demons. There's nothing supernatural about it: you make some demon angry, so the demon enters your body and causes you pain. What could be more natural than that? Only those who don't believe in demons think of them as standing apart from the natural order of things.

Equating religion with faith in supernatural powers implies that you can understand all known natural phenomena without religion, which is just an optional supplement. Having understood perfectly well the whole of nature, you can now choose whether to add some 'super-natural' religious dogma or not. However, most religions argue that you simply cannot understand the world without them. You will never comprehend the true reason for disease, drought or earthquakes if you do not take their dogma into account.

Defining religion as 'belief in gods' is also problematic. We tend to say that a devout Christian is religious because she believes in God, whereas a fervent communist isn't religious, because communism has no gods. However, religion is created by humans rather than by gods, and it is defined by its social function rather than by the existence of deities. Religion is *anything* that confers superhuman legitimacy on human social structures. It legitimises human norms and values by arguing that they reflect superhuman laws.

Religion asserts that we humans are subject to a system of moral laws that we did not invent and that we cannot change. A devout Jew would say that this is the system of moral laws created by God and revealed in the Bible. A Hindu would say that Brahma, Vishnu and Shiva created the laws, which were revealed to us humans in the Vedas. Other religions, from Buddhism and Daoism to Nazism, communism and liberalism, argue that the superhuman laws are natural laws, and not the creation of this or that god. Of course, each believes in a different set of natural laws discovered and revealed by

different seers and prophets, from Buddha and Laozi to Hitler and Lenin.

A Jewish boy comes to his father and asks, 'Dad, why shouldn't we eat pork?' The father strokes his long white beard thoughtfully and answers, 'Well, Yankele, that's how the world works. You are still young and you don't understand, but if we eat pork, God will punish us and we will come to a bad end. It isn't my idea. It's not even the rabbi's idea. If the rabbi had created the world, maybe he would have created a world in which pork was perfectly kosher. But the rabbi didn't create the world – God did it. And God said, I don't know why, that we shouldn't eat pork. So we shouldn't. Capeesh?'

In 1943 a German boy comes to his father, a senior SS officer, and asks, 'Dad, why are we killing the Jews?' The father puts on his shiny leather boots, and meanwhile explains, 'Well, Fritz, that's how the world works. You are still young and you don't understand, but if we allow the Jews to live, they will cause the degeneration and extinction of humankind. It's not my idea, and it's not even the Führer's idea. If Hitler had created the world, maybe he would have created a world in which the laws of natural selection did not apply, and Jews and Aryans could all live together in perfect harmony. But Hitler didn't create the world. He just managed to decipher the laws of nature, and then instructed us how to live in line with them. If we disobey these laws, we will come to a bad end. Is that clear?!'

In 2016 a British boy comes to his father, a liberal MP, and asks, 'Dad, why should we care about the human rights of Muslims in the Middle East?' The father puts down his cup of tea, thinks for a moment, and says, 'Well, Duncan, that's how the world works. You are still young and you don't understand, but all humans, even Muslims in the Middle East, have the same nature and therefore enjoy the same natural rights. This isn't my idea, nor a decision of Parliament. If Parliament had created the world, universal human rights might well have been buried in some subcommittee along with all that quantum physics stuff. But Parliament didn't create the world, it just tries to make sense of it, and we must respect the natural rights even of Muslims in the Middle East, or very soon our own rights will also be violated, and we will come to a bad end. Now off you go.'

Liberals, communists and followers of other modern creeds dislike describing their own system as a 'religion', because they identify religion with superstitions and supernatural powers. If you tell communists or liberals that they are religious, they think you accuse them of blindly believing in groundless pipe dreams. In fact, it means only that they believe in some system of moral laws that wasn't invented by humans, but which humans must nevertheless obey. As far as we know, all human societies believe in this. Every society tells its members that they must obey some superhuman moral law, and that breaking this law will result in catastrophe.

Religions differ of course in the details of their stories, their concrete commandments, and the rewards and punishments they promise. Thus in medieval Europe the Catholic Church argued that God doesn't like rich people. Jesus said that it is harder for a rich man to pass through the gates of heaven than for a camel to pass through the eye of a needle, and the Church encouraged the rich to give lots of alms, threatening that misers will burn in hell. Modern communism also dislikes rich people, but it threatens them with class conflict here and now, rather than with burning sulphur after death.

The communist laws of history are similar to the commandments of the Christian God, inasmuch as they are superhuman forces that humans cannot change at will. People can decide tomorrow morning to cancel the offside rule in football, because we invented that law, and we are free to change it. However, at least according to Marx, we cannot change the laws of history. No matter what the capitalists do, as long as they continue to accumulate private property they are bound to create class

conflict and they are destined to be defeated by the rising proletariat.

If you happen to be a communist yourself you might argue that communism and Christianity are nevertheless very different, because communism is right, whereas Christianity is wrong. Class conflict really is inherent in the capitalist system, whereas rich people don't suffer eternal tortures in hell after they die. Yet even if that's the case, it doesn't mean communism is not a religion. Rather, it means that communism is the one true religion. Followers of every religion are convinced that theirs alone is true. Perhaps the followers of one religion are right.

If You Meet the Buddha

The assertion that religion is a tool for preserving social order and for organising large-scale cooperation may vex many people for whom it represents first and foremost a spiritual path. However, just as the gap between religion and science is smaller than we commonly think, so the gap between religion and spirituality is much bigger. Religion is a deal, whereas spirituality is a journey.

Religion gives a complete description of the world, and offers us a well-defined contract with predetermined goals. 'God exists. He told us to behave in certain ways. If you obey God, you'll be admitted to heaven. If you disobey Him, you'll burn in hell.' The very clarity of this deal allows society to define common norms and values that regulate human behaviour.

Spiritual journeys are nothing like that. They usually take people in mysterious ways towards unknown destinations. The quest usually begins with some big question, such as who am I? What is the meaning of life? What is good? Whereas many people just accept the ready-made answers provided by the powers that be, spiritual seekers are not so easily satisfied. They are determined to follow the big question wherever it leads, and not just to places you know well or wish to visit. Thus for most people, academic studies are a deal rather than a spiritual journey, because they take us to a predetermined goal approved by our elders, governments and banks. 'I'll study for three years, pass the exams, get my BA certificate and secure a well-paid job.' Academic studies might be transformed into a spiritual journey if the big questions you encounter on the way deflect you towards unexpected destinations, of which you could hardly even conceive at first. For example, a student might begin to study economics in order to secure a job in Wall Street. However, if what she learns somehow causes her to end up in a Hindu ashram or helping HIV patients in Zimbabwe, then we might call that a spiritual journey.

Why label such a voyage 'spiritual'? This is a legacy from ancient dualist religions that believed in the existence of two gods, one good and one evil. According to dualism, the good god created pure and everlasting souls that lived in a wonderful world of spirit. However, the bad god – sometimes named Satan – created another world, made of matter. Satan didn't know how to make his creation last, hence in the world of matter everything rots and disintegrates. In order to breathe life into his defective creation, Satan tempted souls from the pure world of spirit, and locked them up inside material bodies. That's what humans are – a good spiritual soul trapped inside an evil material body. Since the soul's prison – the body – decays and eventually dies, Satan ceaselessly tempts the soul with bodily delights, and above all with food, sex and power. When the body disintegrates and the soul has a chance to escape back to the spiritual world, its craving for bodily pleasures draws it back inside some new material body. The soul thus transmigrates from body to body, wasting its days in pursuit of food, sex and power.

Dualism instructs people to break these material shackles and undertake a journey back to the

spiritual world, which is totally unfamiliar to us, but is our true home. During this quest we must reject all material temptations and deals. Due to this dualist legacy, every journey on which we doubt the conventions and deals of the mundane world and walk towards an unknown destination is called 'a spiritual journey'.

Such journeys are fundamentally different from religions, because religions seek to cement the worldly order whereas spirituality seeks to escape it. Often enough, the most important demand from spiritual wanderers is to challenge the beliefs and conventions of dominant religions. In Zen Buddhism it is said that 'If you meet the Buddha on the road, kill him.' Which means that if while walking on the spiritual path you encounter the rigid ideas and fixed laws of institutionalised Buddhism, you must free yourself from them too.

For religions, spirituality is a dangerous threat. Religions typically strive to rein in the spiritual quests of their followers, and many religious systems were challenged not by laypeople preoccupied with food, sex and power, but rather by spiritual truth-seekers who wanted more than platitudes. Thus the Protestant revolt against the authority of the Catholic Church was ignited not by hedonistic atheists but rather by a devout and ascetic monk, Martin Luther. Luther wanted answers to the existential questions of life, and refused to settle for the rites, rituals and deals offered by the Church.

In Luther's day, the Church promised its followers very enticing deals. If you sinned, and feared eternal damnation in the afterlife, all you needed to do was buy an indulgence. In the early sixteenth century the Church employed professional 'salvation peddlers' who wandered the towns and villages of Europe and sold indulgences for fixed prices. You want an entry visa to heaven? Pay ten gold coins. You want Grandpa Heinz and Grandma Gertrud to join you there? No problem, but it will cost you thirty coins. The most famous of these peddlers, the Dominican friar Johannes Tetzel, allegedly said that the moment the coin clinks in the money chest, the soul flies out of purgatory to heaven.[1]

The more Luther thought about it, the more he doubted this deal, and the Church that offered it. You cannot just buy your way to salvation. The Pope couldn't possibly have the authority to forgive people their sins, and open the gates of heaven. According to Protestant tradition, on 31 October 1517 Luther walked to the All Saints' Church in Wittenberg, carrying a lengthy document, a hammer and some nails. The document listed ninety-five theses against contemporary religious practices, including against the selling of indulgences. Luther nailed it to the church door, sparking the Protestant Reformation, which called upon any human who cared about salvation to rebel against the Pope's authority and search for alternative routes to heaven.



The Pope selling indulgences for money (from a Protestant pamphlet).

Woodcut from 'Passional Christi und Antichristi' by Philipp Melanchthon, published in 1521, Cranach, Lucas (1472–1553) (studio of) © Private Collection/Bridgeman Images.

From a historical perspective, the spiritual journey is always tragic, for it is a lonely path fit for individuals rather than for entire societies. Human cooperation requires firm answers rather than just questions, and those who foam against stultified religious structures end up forging new structures in their place. It happened to the dualists, whose spiritual journeys became religious establishments. It happened to Martin Luther, who after challenging the laws, institutions and rituals of the Catholic Church found himself writing new law books, founding new institutions and inventing new ceremonies. It happened even to Buddha and Jesus. In their uncompromising quest for the truth they subverted the laws, rituals and structures of traditional Hinduism and Judaism. But eventually more laws, more rituals and more structures were created in their name than in the name of any other person in history.

Counterfeiting God

Now that we have a better understanding of religion, we can go back to examining the relationship between religion and science. There are two extreme interpretations for this relationship. One view says that science and religion are sworn enemies, and that modern history was shaped by the life-and-death struggle of scientific knowledge against religious superstition. With time, the light of science dispelled the darkness of religion, and the world became increasingly secular, rational and prosperous. However, though some scientific findings certainly undermine religious dogmas, this is not inevitable. For example, Muslim dogma holds that Islam was founded by the prophet Muhammad in seventh-century Arabia, and there is ample scientific evidence supporting this.

More importantly, science always needs religious assistance in order to create viable human institutions. Scientists study how the world functions, but there is no scientific method for determining

how humans ought to behave. Science tells us that humans cannot survive without oxygen. However, is it okay to execute criminals by asphyxiation? Science doesn't know how to answer such a question. Only religions provide us with the necessary guidance.

Hence every practical project scientists undertake also relies on religious insights. Take, for example, the building of the Three Gorges Dam over the Yangtze River. When the Chinese government decided to build the dam in 1992, physicists could calculate what pressures the dam would have to withstand, economists could forecast how much money it would probably cost, while electrical engineers could predict how much electricity it would produce. However, the government needed to take additional factors into account. Building the dam flooded huge territories containing many villages and towns, thousands of archaeological sites, and unique landscapes and habitats. More than 1 million people were displaced and hundreds of species were endangered. It seems that the dam directly caused the extinction of the Chinese river dolphin. No matter what you personally think about the Three Gorges Dam, it is clear that building it was an ethical rather than a purely scientific issue. No physics experiment, no economic model and no mathematical equation can determine whether generating thousands of megawatts and making billions of yuan is more valuable than saving an ancient pagoda or the Chinese river dolphin. Consequently, China cannot function on the basis of scientific theories alone. It requires some religion or ideology, too.

Some jump to the opposite extreme, and say that science and religion are completely separate kingdoms. Science studies facts, religion speaks about values, and never the twain shall meet. Religion has nothing to say about scientific facts, and science should keep its mouth shut concerning religious convictions. If the Pope believes that human life is sacred, and abortion is therefore a sin, biologists can neither prove nor refute this claim. As a private individual, each biologist is welcome to argue with the Pope. But as a scientist, the biologist cannot enter the fray.

This approach may sound sensible, but it misunderstands religion. Though science indeed deals only with facts, religion never confines itself to ethical judgements. Religion cannot provide us with any practical guidance unless it makes some factual claims too, and here it may well collide with science. The most important segments of many religious dogmas are not their ethical principles, but rather factual statements such as 'God exists', 'the soul is punished for its sins in the afterlife', 'the Bible was written by a deity rather than by humans', 'the Pope is never wrong'. These are all factual claims. Many of the most heated religious debates, and many of the conflicts between science and religion, involve such factual claims rather than ethical judgements.

Take abortion, for example. Devout Christians often oppose abortion, whereas many liberals support it. The main bone of contention is factual rather than ethical. Both Christians and liberals believe that human life is sacred, and that murder is a heinous crime. But they disagree about certain biological facts: does human life begin at the moment of conception, at the moment of birth or at some middle point? Indeed, some human cultures maintain that life doesn't begin even at birth. According to the !Kung of the Kalahari Desert and to various Inuit groups in the Arctic, human life begins only after the person is given a name. When an infant is born people wait for some time before naming it. If they decide not to keep the baby (either because it suffers from some deformity or because of economic difficulties), they kill it. Provided they do so before the naming ceremony, it is not considered murder.[2] People from such cultures might well agree with liberals and Christians that human life is sacred and that murder is a terrible crime, yet they support infanticide.

When religions advertise themselves, they tend to emphasise their beautiful values. But God often hides in the small print of factual statements. The Catholic religion markets itself as the religion of universal love and compassion. How wonderful! Who can object to that? Why, then, are not all

humans Catholic? Because when you read the small print, you discover that Catholicism also demands blind obedience to a pope 'who never makes mistakes' even when he orders us to go on crusades and burn heretics at the stake. Such practical instructions are not deduced solely from ethical judgements. Rather, they result from conflating ethical judgements with factual statements.

When we leave the ethereal sphere of philosophy and observe historical realities, we find that religious stories almost always include three parts:

1. Ethical judgements, such as 'human life is sacred'.
2. Factual statements, such as 'human life begins at the moment of conception'.
3. A conflation of the ethical judgements with the factual statements, resulting in practical guidelines such as 'you should never allow abortion, even a single day after conception'.

Science has no authority or ability to refute or corroborate the ethical judgements religions make. But scientists do have a lot to say about religious factual statements. For example, biologists are more qualified than priests to answer factual questions such as 'Do human fetuses have a nervous system one week after conception? Can they feel pain?'

To make things clearer, let us examine in depth a real historical example that you rarely hear about in religious commercials, but that had a huge social and political impact in its time. In medieval Europe, the popes enjoyed far-reaching political authority. Whenever a conflict erupted somewhere in Europe, they claimed the authority to decide the issue. To establish their claim to authority, they repeatedly reminded Europeans of the Donation of Constantine. According to this story, on 30 March 315 the Roman emperor Constantine signed an official decree granting Pope Sylvester I and his heirs perpetual control of the western part of the Roman Empire. The popes kept this precious document in their archive, and used it as a powerful propaganda tool whenever they faced opposition from ambitious princes, quarrelsome cities or rebellious peasants.

People in medieval Europe had great respect for ancient imperial decrees. They strongly believed that kings and emperors were God's representatives, and they also believed that the older the document, the more authority it carried. Constantine in particular was revered, because he turned the Roman Empire from a pagan realm into a Christian empire. In a clash between the desires of some present-day city council and a decree issued by the great Constantine himself, it was obvious that people ought to obey the ancient document. Hence whenever the Pope faced political opposition, he waved the Donation of Constantine, demanding obedience. Not that it always worked. But the Donation of Constantine was an important cornerstone of papal propaganda and of the medieval political order.

When we examine the Donation of Constantine closely, we find that this story is composed of three distinct parts:

Ethical judgement	**Factual statement**	**Practical guideline**
People ought to respect ancient imperial decrees more than present-day popular opinions.	On 30 March 315, Emperor Constantine granted the popes dominion over Europe.	Europeans in 1315 ought to obey the Pope's commands.

The ethical authority of ancient imperial decrees is far from self-evident. Most twenty-first-century

Europeans think that the wishes of present-day citizens trump the diktats of long-dead kings. However, science cannot join this ethical debate, because no experiment or equation can decide the matter. If a modern-day scientist time-travelled to medieval Europe, she couldn't prove to our ancestors that the decrees of ancient emperors are irrelevant to contemporary political disputes.

Yet the story of Constantine's Donation was based not just on ethical judgements. It also involved some very concrete factual statements, which science is highly qualified to either verify or falsify. In 1441 Lorenzo Valla – a Catholic priest and a pioneer linguist – published a scientific study proving that Constantine's Donation was forged. Valla analysed the style and grammar of the document, and the various words and terms it contained. He showed that the document included words which were unknown in fourth-century Latin, and that it was most probably forged about 400 years after Constantine's death. Moreover, the date appearing on the document is '30 March, in the year Constantine was consul for the fourth time, and Gallicanus was consul for the first time'. In the Roman Empire, two consuls were elected each year, and it was customary to date documents by their consulate years. Unfortunately, Constantine's fourth consulate was in 315, whereas Gallicanus was elected consul for the first time only in 317. If this all-important document was indeed composed in Constantine's days, it would never have contained such a blatant mistake. It is as if Thomas Jefferson and his colleagues had dated the American Declaration of Independence 34 July 1776.

Today all historians agree that the Donation of Constantine was forged in the papal court sometime in the eighth century. Even though Valla never disputed the moral authority of ancient imperial decrees, his scientific study did undermine the practical guideline that Europeans must obey the Pope.[3]

On 20 December 2013 the Ugandan parliament passed the Anti-Homosexuality Act, which criminalised homosexual activities, penalising some activities by life imprisonment. It was inspired and supported by evangelical Christian groups, which maintain that God prohibits homosexuality. As proof, they quote Leviticus 18:22 ('Do not have sexual relations with a man as one does with a woman; that is detestable') and Leviticus 20:13 ('If a man has sexual relations with a man as one does with a woman, both of them have done what is detestable. They are to be put to death; their blood will be on their own heads'). In previous centuries, the same religious story was responsible for tormenting millions of people all over the world. This story can be briefly summarised as follows:

Ethical judgement	**Factual statement**	**Practical guideline**
Humans ought to obey God's commands.	About 3,000 years ago God commanded humans to avoid homosexual activities.	People should avoid homosexual activities.

Is the story true? Scientists cannot argue with the judgement that humans ought to obey God. Personally, you may dispute it. You may believe that human rights trump divine authority, and if God orders us to violate human rights, we shouldn't listen to Him. Yet there is no scientific experiment that can decide this issue.

In contrast, science has a lot to say about the factual statement that 3,000 years ago the Creator of the Universe commanded members of the *Homo sapiens* species to abstain from boy-on-boy action. How do we know this statement is true? Examining the relevant literature reveals that though this statement is repeated in millions of books, articles and Internet sites, they all rely on a single source:

the Bible. If so, a scientist would ask, who composed the Bible, and when? Note that this is a factual question, not a question of values. Devout Jews and Christians say that at least the book of Leviticus was dictated by God to Moses on Mount Sinai, and from that moment onwards not a single letter was either added or deleted from it. 'But,' the scientist would insist, 'how can we be sure of that? After all, the Pope argued that the Donation of Constantine was composed by Constantine himself in the fourth century, when in fact it was forged 400 years later by the Pope's own clerks.'

We can now use an entire arsenal of scientific methods to determine who composed the Bible, and when. Scientists have been doing exactly that for more than a century, and if you are interested, you can read whole books about their findings. To cut a long story short, most peer-reviewed scientific studies agree that the Bible is a collection of numerous different texts composed by different people in different times, and that these texts were not assembled into a single holy book until long after biblical times. For example, whereas King David probably lived around 1000 BC, it is commonly accepted that the book of Deuteronomy was composed in the court of King Josiah of Judah, sometime around 620 BC, as part of a propaganda campaign aimed to strengthen Josiah's authority. Leviticus was compiled at an even later date, no earlier than 500 BC.

As for the idea that the ancient Jews carefully preserved the biblical text, without adding or subtracting anything, scientists point out that biblical Judaism was not a scripture-based religion at all. Rather, it was a typical Iron Age cult, similar to many of its Middle Eastern neighbours. It had no synagogues, yeshivas, rabbis – or even a bible. Instead it had elaborate temple rituals, most of which involved sacrificing animals to a jealous sky god so that he would bless his people with seasonal rains and military victories. Its religious elite consisted of priestly families, who owed everything to birth, and nothing to intellectual prowess. The mostly illiterate priests were busy with the temple ceremonies, and had little time for writing or studying any scriptures.

During the Second Temple period a rival religious elite was formed. Due partly to Persian and Greek influences, Jewish scholars who wrote and interpreted texts gained increasing prominence. These scholars eventually came to be known as rabbis, and the texts they compiled were christened 'the Bible'. Rabbinical authority rested on individual intellectual abilities rather than on birth. The clash between the new literate elite and the old priestly families was inevitable. Luckily for the rabbis, the Romans torched Jerusalem and its temple while suppressing the Great Jewish Revolt (AD 70). With the temple in ruins, the priestly families lost their religious authority, their economic power base and their very *raison d'être*. Traditional Judaism – a Judaism of temples, priests and head-splitting warriors – disappeared. Its place was taken by a new Judaism of books, rabbis and hair-splitting scholars. The scholars' main forte was interpretation. They used this ability not only to explain how an almighty God allowed His temple to be destroyed, but also to bridge the immense gaps between the old Judaism described in biblical stories and the very different Judaism they created.[4]

Hence according to our best scientific knowledge, the Leviticus injunctions against homosexuality reflect nothing grander than the biases of a few priests and scholars in ancient Jerusalem. Though science cannot decide whether people ought to obey God's commands, it has many relevant things to say about the provenance of the Bible. If Ugandan politicians think that the power that created the cosmos, the galaxies and the black holes becomes terribly upset whenever two *Homo sapiens* males have a bit of fun together, then science can help disabuse them of this rather bizarre notion.

Holy Dogma

In truth, it is not always easy to separate ethical judgements from factual statements. Religions have the nagging tendency to turn factual statements into ethical judgements, thereby creating terrible confusion and obfuscating what should have been relatively simple debates. Thus the factual statement 'God wrote the Bible' all too often mutates into the ethical injunction 'you ought to believe that God wrote the Bible'. Merely believing in this factual statement becomes a virtue, whereas doubting it becomes a terrible sin.

Conversely, ethical judgements often hide within them factual statements that people don't bother to mention, because they think they have been proven beyond doubt. Thus the ethical judgement 'human life is sacred' (which science cannot test) may shroud the factual statement 'every human has an eternal soul' (which is open for scientific debate). Similarly, when American nationalists proclaim that 'the American nation is sacred', this seemingly ethical judgement is in fact predicated on factual statements such as 'the USA has spearheaded most of the moral, scientific and economic advances of the last few centuries'. Whereas it is impossible to scientifically scrutinise the claim that the American nation is sacred, once we unpack this judgement we may well examine scientifically whether the USA has indeed been responsible for a disproportionate share of moral, scientific and economic breakthroughs.

This has led some philosophers, such as Sam Harris, to argue that science can always resolve ethical dilemmas, because human values *always* hide within them some factual statements. Harris thinks all humans share a single supreme value – minimising suffering and maximising happiness – and all ethical debates are factual arguments concerning the most efficient way to maximise happiness.[5] Islamic fundamentalists want to reach heaven in order to be happy, liberals believe that increasing human liberty maximises happiness, and German nationalists think that everyone would be better off if they only allowed Berlin to run this planet. According to Harris, Islamists, liberals and nationalists have no ethical dispute; they have a factual disagreement about how best to realise their common goal.

Yet even if Harris is right, and even if all humans cherish happiness, in practice it would be extremely difficult to use this insight to decide ethical disputes, particularly because we have no scientific definition or measurement of happiness. Consider the case of the Three Gorges Dam. Even if we agree that the ultimate aim of the project is to make the world a happier place, how can we tell whether generating cheap electricity contributes more to global happiness than protecting traditional lifestyles or saving the rare Chinese river dolphin? As long as we haven't deciphered the mysteries of consciousness, we cannot develop a universal measurement for happiness and suffering, and we don't know how to compare the happiness and suffering of different individuals, let alone different species. How many units of happiness are generated when a billion Chinese enjoy cheaper electricity? How many units of misery are produced when an entire dolphin species becomes extinct? Indeed, are happiness and misery mathematical entities that can be added or subtracted in the first place? Eating ice cream is enjoyable. Finding true love is more enjoyable. Do you think that if you just eat enough ice cream, the accumulated pleasure could ever equal the rapture of true love?

Consequently, although science has much more to contribute to ethical debates than we commonly think, there is a line it cannot cross, at least not yet. Without the guiding hand of some religion, it is impossible to maintain large-scale social orders. Even universities and laboratories need religious backing. Religion provides the ethical justification for scientific research, and in exchange gets to influence the scientific agenda and the uses of scientific discoveries. Hence you cannot understand the history of science without taking religious beliefs into account. Scientists seldom dwell on this fact, but the Scientific Revolution itself began in one of the most dogmatic, intolerant and religious

societies in history.

The Witch Hunt

We often associate science with the values of secularism and tolerance. If so, early modern Europe is the last place you would have expected a scientific revolution. Europe in the days of Columbus, Copernicus and Newton had the highest concentration of religious fanatics in the world, and the lowest level of tolerance. The luminaries of the Scientific Revolution lived in a society that expelled Jews and Muslims, burned heretics wholesale, saw a witch in every cat-loving elderly lady and started a new religious war every full moon.

If you travelled to Cairo or Istanbul around 1600, you would find there a multicultural and tolerant metropolis, where Sunnis, Shiites, Orthodox Christians, Catholics, Armenians, Copts, Jews and even the occasional Hindu lived side by side in relative harmony. Though they had their share of disagreements and riots, and though the Ottoman Empire routinely discriminated against people on religious grounds, it was a liberal paradise compared with Europe. If you then travelled to contemporary Paris or London, you would find cities awash with religious extremism, in which only those belonging to the dominant sect could live. In London they killed Catholics, in Paris they killed Protestants, the Jews had long been driven out, and nobody in his right mind would dream of letting any Muslims in. And yet, the Scientific Revolution began in London and Paris rather than in Cairo and Istanbul.

It is customary to tell the history of modernity as a struggle between science and religion. In theory, both science and religion are interested above all in the truth, and because each upholds a different truth, they are doomed to clash. In fact, neither science nor religion cares that much about the truth, hence they can easily compromise, coexist and even cooperate.

Religion is interested above all in order. It aims to create and maintain the social structure. Science is interested above all in power. It aims to acquire the power to cure diseases, fight wars and produce food. As individuals, scientists and priests may give immense importance to the truth; but as collective institutions, science and religion prefer order and power over truth. They can therefore make good bedfellows. The uncompromising quest for truth is a spiritual journey, which can seldom remain within the confines of either religious or scientific establishments.

It would accordingly be far more correct to view modern history as the process of formulating a deal between science and one particular religion – namely, humanism. Modern society believes in humanist dogmas, and uses science not in order to question these dogmas, but rather in order to implement them. In the twenty-first century the humanist dogmas are unlikely to be replaced by pure scientific theories. However, the covenant linking science and humanism may well crumble, and give way to a very different kind of deal, between science and some new post-humanist religion. We will dedicate the next two chapters to understanding the modern covenant between science and humanism. The third and final part of the book will then explain why this covenant is disintegrating, and what new deal might replace it.

6
The Modern Covenant

Modernity is a deal. All of us sign up to this deal on the day we are born, and it regulates our lives until the day we die. Very few of us can ever rescind or transcend this deal. It shapes our food, our jobs and our dreams, and it decides where we dwell, whom we love and how we pass away.

At first sight, modernity looks like an extremely complicated deal, hence few try to understand what they have signed up to. It's like when you download some software and are asked to sign an accompanying contract which is dozens of pages of legalese; you take one look at it, immediately scroll down to the last page, tick 'I agree' and forget about it. Yet in fact modernity is a surprisingly simple deal. The entire contract can be summarised in a single phrase: humans agree to give up meaning in exchange for power.

Up until modern times, most cultures believed that humans play a part in some great cosmic plan. The plan was devised by the omnipotent gods, or by the eternal laws of nature, and humankind could not change it. The cosmic plan gave meaning to human life, but also restricted human power. Humans were much like actors on a stage. The script gave meaning to their every word, tear and gesture – but placed strict limits on their performance. Hamlet cannot murder Claudius in Act I, or leave Denmark and go to an ashram in India. Shakespeare won't allow it. Similarly, humans cannot live for ever, they cannot escape all diseases, and they cannot do as they please. It's not in the script.

In exchange for giving up power, premodern humans believed that their lives gained meaning. It really mattered whether they fought bravely on the battlefield, whether they supported the lawful king, whether they ate forbidden foods for breakfast or whether they had an affair with the next-door neighbour. This created some inconveniences, of course, but it gave humans psychological protection against disasters. If something terrible happened – such as war, plague or drought – people consoled themselves that 'We all play a role in some great cosmic drama, devised by the gods, or by the laws of nature. We are not privy to the script, but we can rest assured that everything happens for a purpose. Even this terrible war, plague and drought have their place in the greater scheme of things. Furthermore, we can count on the playwright that the story surely has a good ending. So even the war, plague and drought will work out for the best – if not here and now, then in the afterlife.'

Modern culture rejects this belief in a great cosmic plan. We are not actors in any larger-than-life drama. Life has no script, no playwright, no director, no producer – and no meaning. To the best of our scientific understanding, the universe is a blind and purposeless process, full of sound and fury but signifying nothing. During our infinitesimally brief stay on our tiny speck of a planet, we fret and strut this way and that, and then are heard of no more.

Since there is no script, and since humans fulfil no role in any great drama, terrible things might befall us and no power will come to save us, or give meaning to our suffering. There won't be a happy ending, or a bad ending, or any ending at all. Things just happen, one after the other. The modern world does not believe in purpose, only in cause. If modernity has a motto, it is 'shit

happens'.

On the other hand, if shit just happens, without any binding script or purpose, then humans too are not limited to any predetermined role. We can do anything we want – provided we can find a way. We are constrained by nothing except our own ignorance. Plagues and droughts have no cosmic meaning – but we can eradicate them. Wars are not a necessary evil on the way to a better future – but we can make peace. No paradise awaits us after death – but we can create paradise here on earth, and live in it for ever, if we just manage to overcome some technical difficulties.

If we invest money in research, then scientific breakthroughs will accelerate technological progress. New technologies will fuel economic growth, and a growing economy could dedicate even more money to research. With each passing decade we will enjoy more food, faster vehicles and better medicines. One day our knowledge will be so vast and our technology so advanced that we could distil the elixir of eternal youth, the elixir of true happiness, and any other drug we might possibly desire – and no god will stop us.

The modern deal thus offers humans an enormous temptation, coupled with a colossal threat. Omnipotence is in front of us, almost within our reach, but below us yawns the abyss of complete nothingness. On the practical level, modern life consists of a constant pursuit of power within a universe devoid of meaning. Modern culture is the most powerful in history, and it is ceaselessly researching, inventing, discovering and growing. At the same time, it is plagued by more existential angst than any previous culture.

This chapter discusses the modern pursuit of power. The next chapter will examine how humankind has used its growing power to somehow sneak meaning back into the infinite emptiness of the cosmos. Yes, we moderns have promised to renounce meaning in exchange for power; but there's nobody out there to hold us to our promise. We think we are smart enough to enjoy the full benefits of the modern deal, without paying its price.

Why Bankers are Different from Vampires

The modern pursuit of power is fuelled by the alliance between scientific progress and economic growth. For most of history science progressed at a snail's pace, while the economy was in deep freeze. The gradual increase in human population did lead to a corresponding increase in production, and sporadic discoveries sometimes resulted even in per capita growth, but this was a very slow process.

If in AD 1000 a hundred villagers produced a hundred tons of wheat, and in AD 1100, 105 villagers produced 107 tons of wheat, this growth didn't change the rhythms of life or the sociopolitical order. Whereas today everyone is obsessed with growth, in the premodern era people were oblivious to it. Princes, priests and peasants assumed that human production was more or less stable, that one person could enrich himself only by pilfering somebody else and that their grandchildren were unlikely to enjoy a better standard of living.

This stagnation resulted to a large extent from the difficulties involved in financing new projects. Without proper funding, it wasn't easy to drain swamps, construct bridges and build ports – not to mention engineer new wheat strains, discover new energy sources or open new trade routes. Funds were scarce because there was little credit in those days; there was little credit because people had no belief in growth; and people didn't believe in growth because the economy was stagnant. Stagnation thereby perpetuated itself.

Suppose you live in a medieval town that suffers from annual outbreaks of dysentery. You resolve to find a cure. You need funding to set up a lab, buy medicinal herbs and exotic chemicals, pay assistants and travel to consult with famous doctors. You also need money to feed yourself and your family while you are busy with your research. But you don't have much money. You can approach the local lumberjack, blacksmith and baker and ask them to fulfil all your needs for a few years, promising that when you finally discover the cure and become rich, you will pay your debts.

Unfortunately, the lumberjack, blacksmith and baker are unlikely to agree. They need to feed their families today, and they have no faith in miracle medicines. They weren't born yesterday, and in all their years they have never heard of anyone finding a new medicine for some dreaded disease. If you want provisions – you must pay cash. But how can you have enough money when you haven't discovered the medicine yet, and all your time is taken up with research? Reluctantly, you go back to tilling your field, dysentery keeps tormenting the townsfolk, nobody tries to develop new remedies, and not a single gold coin changes hands. That's how the economy froze, and science stood still.

The cycle was eventually broken in the modern age thanks to people's growing trust in the future, and the resulting miracle of credit. Credit is the economic manifestation of trust. Today, if I want to develop a new drug but I don't have enough money, I can get a loan from the bank, or turn to private investors and venture capital funds. When Ebola erupted in West Africa in the summer of 2014, what do you think happened to the shares of pharmaceutical companies that were busy developing anti-Ebola drugs and vaccines? They skyrocketed. Tekmira shares rose by 50 per cent and BioCryst shares by 90 per cent. In the Middle Ages, the outbreak of a plague caused people to raise their eyes towards heaven, and pray to God to forgive them for their sins. Today, when people hear of some new deadly epidemic, they pick up the phone and call their broker. For the stock exchange, even an epidemic is a business opportunity.

If enough new ventures succeed, people's trust in the future increases, credit expands, interest rates fall, entrepreneurs can raise money more easily and the economy grows. People consequently have even greater trust in the future, the economy keeps growing and science progresses with it.

It sounds simple on paper. Why, then, did humankind have to wait until the modern era for economic growth to gather momentum? For thousands of years people had little faith in future growth not because they were stupid, but because it contradicts our gut feelings, our evolutionary heritage and the way the world works. Most natural systems exist in equilibrium, and most survival struggles are a zero-sum game in which one can prosper only at the expense of another.

For example, each year roughly the same amount of grass grows in a given valley. The grass supports a population of about 10,000 rabbits, which contains enough slow, dim-witted or unlucky rabbits to provide prey for a hundred foxes. If one fox is very diligent, and captures more rabbits than usual, then another fox will probably starve to death. If all foxes somehow manage to capture more rabbits simultaneously, the rabbit population will crash, and next year many foxes will starve. Even though there are occasional fluctuations in the rabbit market, in the long run the foxes cannot expect to hunt, say, 3 per cent more rabbits per year than the preceding year.

Of course, some ecological realities are more complex, and not all survival struggles are zero-sum games. Many animals cooperate effectively, and a few even give loans. The most famous lenders in nature are vampire bats. These vampires congregate in their thousands inside caves, and every night they fly out to look for prey. When they find a sleeping bird or a careless mammal, they make a small incision in its skin, and suck its blood. Not all bats find a victim every night. In order to cope with the uncertainty of their life, the vampires loan blood to each other. A vampire that fails to find prey will come home and ask for some stolen blood from a more fortunate friend. Vampires remember very

well to whom they loaned blood, so at a later date if the friend comes home empty-handed, he will approach his debtor, who will return the favour.

However, unlike human bankers, vampires never charge interest. If vampire A loaned vampire B ten centilitres of blood, B will repay the same amount. Nor do vampires use loans in order to finance new businesses or encourage growth in the blood-sucking market – because the blood is produced by other animals, the vampires have no way of increasing production. Though the blood market has its ups and downs, vampires cannot presume that in 2017 there will be 3 per cent more blood than in 2016, and that in 2018 the blood market will again grow by 3 per cent. Consequently, vampires don't believe in growth.[1] For millions of years of evolution, humans lived under similar conditions to vampires, foxes and rabbits. Hence humans too find it difficult to believe in growth.

The Miracle Pie

Evolutionary pressures have accustomed humans to see the world as a static pie. If somebody gets a bigger slice of the pie, somebody else inevitably gets a smaller slice. A particular family or city may prosper, but humankind as a whole is not going to produce more than it produces today. Accordingly, traditional religions such as Christianity and Islam sought ways to solve humanity's problems with the help of current resources, either by redistributing the existing pie, or by promising us a pie in the sky.

Modernity, in contrast, is based on the firm belief that economic growth is not only possible but is absolutely essential. Prayers, good deeds and meditation can be comforting and inspiring, but problems such as famine, plague and war can only be solved through growth. This fundamental dogma can be summarised in one simple idea: 'If you have a problem, you probably need more stuff, and in order to have more stuff, you must produce more of it.'

Modern politicians and economists insist that growth is vital for three principal reasons. Firstly, when we produce more, we can consume more, raise our standard of living and allegedly enjoy a happier life. Secondly, as long as humankind multiplies, economic growth is needed merely to stay where we are. For example, in India the annual population growth rate is 1.2 per cent. That means that unless the Indian economy grows each year by at least 1.2 per cent, unemployment will rise, salaries will fall and the average standard of living will decline. Thirdly, even if Indians stop multiplying, and even if the Indian middle class can be satisfied with its present standard of living, what should India do about its hundreds of millions of poverty-stricken citizens? If the economy doesn't grow, and the pie therefore remains the same size, you can give more to the poor only by taking something from the rich. That will force you to make some very hard choices, and will probably cause a lot of resentment and even violence. If you wish to avoid hard choices, resentment and violence, you need a bigger pie.

Modernity has turned 'more stuff' into a panacea applicable to almost all public and private problems, from Islamic fundamentalism through Third World authoritarianism down to a failed marriage. If only countries such as Pakistan and Egypt could keep a healthy growth rate, their citizens would come to enjoy the benefits of private cars and bulging refrigerators, and they would take the path of earthly prosperity instead of following the Islamic pied piper. Similarly, economic growth in countries such as Congo and Myanmar would produce a prosperous middle class which is the bedrock of liberal democracy. And in the case of the disgruntled couple, their marriage will be saved if they just buy a bigger house (so they don't have to share a cramped office), purchase a dishwasher (so that they stop arguing whose turn it is to do the dishes) and go to expensive therapy sessions twice

a week.

Economic growth has thus become the crucial juncture where almost all modern religions, ideologies and movements meet. The Soviet Union, with its megalomaniac Five Year Plans, was as obsessed with growth as the most cut-throat American robber baron. Just as Christians and Muslims both believed in heaven, and disagreed only about how to get there, so during the Cold War both capitalists and communists believed in creating heaven on earth through economic growth, and wrangled only about the exact method.

Today Hindu revivalists, pious Muslims, Japanese nationalists and Chinese communists may declare their adherence to very different values and goals, but they have all come to believe that economic growth is the key for realising their disparate goals. Thus in 2014 the devout Hindu Narendra Modi was elected prime minister of India largely thanks to his success in boosting economic growth in his home state of Gujarat, and thanks to the widely held view that only he could reinvigorate the sluggish national economy. Analogous views have kept the Islamist Recep Tayyip Erdoğan in power in Turkey since 2003. The name of his party – the Justice and Development Party – highlights its commitment to economic development, and the Erdoğan government has indeed managed to maintain impressive growth rates for more than a decade.

Japan's prime minister, the nationalist Shinzō Abe, came to office in 2012 pledging to jolt the Japanese economy out of two decades of stagnation. His aggressive and somewhat unusual measures to achieve this have been nicknamed Abenomics. Meanwhile in neighbouring China the Communist Party still pays lip service to traditional Marxist–Leninist ideals, but in practice it is guided by Deng Xiaoping's famous maxims that 'development is the only hard truth' and that 'it doesn't matter if a cat is black or white, so long as it catches mice'. Which means, in plain language: do anything it takes to promote economic growth, even if Marx and Lenin wouldn't have been happy with it.

In Singapore, as befits that no-nonsense city state, they followed this line of thinking even further, and pegged ministerial salaries to the national GDP. When the Singaporean economy grows, ministers get a raise, as if that is what their job is all about.[2]

This obsession with growth may sound self-evident, but only because we live in the modern world. It wasn't like this in the past. Indian maharajas, Ottoman sultans, Kamakura shoguns and Han emperors seldom staked their political fortunes on ensuring economic growth. That Modi, Erdoğan, Abe and Chinese president Xi Jinping all bet their careers on economic growth testifies to the almost religious status growth has managed to acquire throughout the world. Indeed, it may not be wrong to call the belief in economic growth a religion, because it now purports to solve many if not most of our ethical dilemmas. Since economic growth is allegedly the source of all good things, it encourages people to bury their ethical disagreements and adopt whichever course of action maximises long-term growth. Thus Modi's India is home to thousands of sects, parties, movements and gurus, yet though their ultimate aims may differ, they all have to pass through the same bottleneck of economic growth, so why not pull together in the meantime?

The credo of 'more stuff' accordingly urges individuals, firms and governments to discount anything that might hamper economic growth, such as preserving social equality, ensuring ecological harmony or honouring your parents. In the Soviet Union, when people thought that state-controlled communism was the fastest way to grow, anything that stood in the way of collectivisation was bulldozed, including millions of kulaks, the freedom of expression and the Aral Sea. Nowadays it is generally accepted that some version of free-market capitalism is a much more efficient way of ensuring long-term growth, hence rich farmers and freedom of expression are protected, but ecological habitats, social structures and traditional values that stand in the way of free-market

capitalism are destroyed and dismantled.

Take, for example, a software engineer making $250 per hour working for some hi-tech start-up. One day her elderly father has a stroke. He now needs help with shopping, cooking and even showering. She could move her father to her own house, leave home later in the morning, come back earlier in the evening and take care of her father personally. Both her income and the start-up's productivity would suffer, but her father would enjoy the care of a respectful and loving daughter. Alternatively, the engineer could hire a Mexican carer who, for $25 per hour, would live with the father and provide for all his needs. That would mean business as usual for the engineer and her start-up, and even the carer and the Mexican economy would benefit. What should the engineer do?

Free-market capitalism has a firm answer. If economic growth demands that we loosen family bonds, encourage people to live away from their parents, and import carers from the other side of the world – so be it. This answer, however, involves an ethical judgement rather than a factual statement. No doubt, when some people specialise in software engineering while others spend their time taking care of the elderly, we can produce more software and give old people more professional care. Yet is economic growth more important than family bonds? By daring to make such ethical judgements, free-market capitalism has crossed the border from the land of science to that of religion.

Most capitalists would probably dislike the title of religion, but as religions go, capitalism can at least hold its head high. Unlike other religions that promise us a pie in the sky, capitalism promises miracles here on earth – and sometimes even provides them. Much of the credit for overcoming famine and plague belongs to the ardent capitalist faith in growth. Capitalism even deserves some kudos for reducing human violence and increasing tolerance and cooperation. As the next chapter explains, there are additional factors at play here, but capitalism did make an important contribution to global harmony by encouraging people to stop viewing the economy as a zero-sum game, in which your profit is my loss, and instead see it as a win–win situation, in which your profit is also my profit. This has probably helped global harmony far more than centuries of Christian preaching about loving your neighbour and turning the other cheek.

From its belief in the supreme value of growth, capitalism deduces its number one commandment: thou shalt invest thy profits in increasing growth. For most of history princes and priests wasted their profits on flamboyant carnivals, sumptuous palaces and unnecessary wars. Alternatively, they put gold coins in an iron chest, sealed it and buried it in a dungeon. Today, devout capitalists use their profits to hire new employees, enlarge the factory or develop a new product.

If they don't know how to do it themselves, they give their money to somebody who does, such as bankers and venture capitalists. The latter lend the money to various entrepreneurs. Farmers take loans to plant new wheat fields, contractors build new houses, energy corporations explore new oil fields, and arms factories develop new weapons. The profits from all these activities enable the entrepreneurs to repay the loans with interest. We now have not only more wheat, houses, oil and weapons – but also more money, which the banks and funds can again lend. This wheel will never stop, at least not according to capitalism. We will never reach a moment when capitalism says: 'That's it. You have grown enough. You can now take it easy.' If you want to know why the capitalist wheel is unlikely ever to stop, talk for an hour with a friend who has just earned $100,000 and wonders what to do with it.

'The banks offer such low interest rates,' he would complain. 'I don't want to put my money in a savings account that pays hardly 0.5 per cent a year. You can make perhaps 2 per cent in government bonds. My cousin Richie bought a flat in Seattle last year, and he has already made 20 per cent on his

investment! Maybe I should go into real estate too; but everybody is saying there's a new real-estate bubble. So what do you think about the stock exchange? A friend told me the best deal these days is to buy an ETF that follows emerging economies, like Brazil or China.' As he stops for a moment to breathe, you ask, 'Well, why not just be satisfied with your $100,000?' He will explain to you better than I can why capitalism will never stop.

This lesson is hammered home even to children and teenagers through ubiquitous capitalist games. Premodern games such as chess assumed a stagnant economy. You begin a game of chess with sixteen pieces, and you never finish a game with more. In rare cases a pawn may be transformed into a queen, but you cannot produce new pawns, nor can you upgrade your knights into tanks. So chess players never have to think about investment. In contrast, many modern board games and computer games revolve around investment and growth.

Particularly telling are civilisation-style strategy games, such as *Minecraft*, *The Settlers of Catan* or Sid Meier's *Civilization*. The game may be set in the Middle Ages, in the Stone Age or in some imaginary fairy land, but the principles always remain the same – and they are always capitalist. Your aim is to establish a city, a kingdom or maybe an entire civilisation. You begin from a very modest base, perhaps just a village and its nearby fields. Your assets provide you with an initial income of wheat, wood, iron or gold. You then have to invest this income wisely. You have to choose between unproductive but still necessary tools such as soldiers, and productive assets such as more villages, fields and mines. The winning strategy is usually to invest the barest minimum in non-productive essentials, while maximising your productive assets. Establishing additional villages means that next turn you will have a larger income that would enable you not only to buy more soldiers (if necessary), but simultaneously to increase your investment in production. Soon you could upgrade your villages to towns, build universities, harbours and factories, explore the seas and oceans, establish your civilisation and win the game.

The Ark Syndrome

Yet can the economy actually keep growing for ever? Won't it eventually run out of resources – and grind to a halt? In order to ensure perpetual growth, we must somehow discover an inexhaustible store of resources.

One solution is to explore and conquer new lands and territories. For centuries, the growth of the European economy and the expansion of the capitalist system indeed relied heavily on overseas imperial conquests. However, there are only so many islands and continents on earth. Some entrepreneurs hope eventually to explore and conquer new planets and even galaxies, but in the meantime, the modern economy has had to find a better method of expanding.

Science has provided modernity with the alternative. The fox economy cannot grow, because foxes don't know how to produce more rabbits. The rabbit economy stagnates, because rabbits cannot make the grass grow faster. But the human economy can grow because humans can discover new materials and sources of energy.

The traditional view of the world as a pie of a fixed size presupposes there are only two kinds of resources in the world: raw materials and energy. But in truth, there are three kinds of resources: raw materials, energy and knowledge. Raw materials and energy are exhaustible – the more you use, the less you have. Knowledge, in contrast, is a growing resource – the more you use, the more you have. Indeed, when you increase your stock of knowledge, it can give you more raw materials and energy as

well. If I invest $100 million searching for oil in Alaska and I find it, then I now have more oil, but my grandchildren will have less of it. In contrast, if I invest $100 million researching solar energy, and I find a new and more efficient way of harnessing it, then both I and my grandchildren will have more energy.

For thousands of years, the scientific road to growth was blocked because people believed that holy scriptures and ancient traditions already contained all the important knowledge the world had to offer. A corporation that believed all the oil fields in the world had already been discovered would not waste time and money searching for oil. Similarly, a human culture that believed it already knew everything worth knowing would not bother searching for new knowledge. This was the position of most premodern human civilisations. However, the Scientific Revolution freed humankind from this conviction. The greatest scientific discovery was the discovery of ignorance. Once humans realised how little they knew about the world, they suddenly had a very good reason to seek new knowledge, which opened up the scientific road to progress.

With each passing generation, science helped discover fresh sources of energy, new kinds of raw material, better machinery and novel production methods. Consequently, in 2016 humankind commands far more energy and raw materials than ever before, and production skyrockets. Inventions such as the steam engine, the internal combustion engine and the computer have created whole new industries from scratch. As we look twenty years to the future, we confidently expect to produce and consume far more in 2036 than we do today. We trust nanotechnology, genetic engineering and artificial intelligence to revolutionise production yet again, and to open whole new sections in our ever-expanding supermarkets.

We therefore have a good chance of overcoming the problem of resource scarcity. The real nemesis of the modern economy is ecological collapse. Both scientific progress and economic growth take place within a brittle biosphere, and as they gather steam, so the shock waves destabilise the ecology. In order to provide every person in the world with the same standard of living as affluent Americans, we would need a few more planets – but we only have this one. If progress and growth do end up destroying the ecosystem, the cost will be dear not merely to vampires, foxes and rabbits, but also to Sapiens. An ecological meltdown will cause economic ruin, political turmoil, a fall in human standards of living, and it might threaten the very existence of human civilisation.

We could lessen the danger by slowing down the pace of progress and growth. If this year investors expect to get a 6 per cent return on their portfolios, in ten years they will be satisfied with a 3 per cent return, in twenty years only 1 per cent, and in thirty years the economy will stop growing and we'll be happy with what we've already got. Yet the creed of growth firmly objects to such a heretical idea. Instead, it suggests we should run even faster. If our discoveries destabilise the ecosystem and threaten humanity, then we should discover something to protect ourselves. If the ozone layer dwindles and exposes us to skin cancer, we should invent better sunscreen and better cancer treatments, thereby also promoting the growth of new sunscreen factories and cancer centres. If all the new industries pollute the atmosphere and the oceans, causing global warming and mass extinctions, then we should build for ourselves virtual worlds and hi-tech sanctuaries that will provide us with all the good things in life even if the planet is as hot, dreary and polluted as hell.

Beijing has already become so polluted that people avoid the outdoors, and wealthy Chinese pay thousands of dollars for indoor air-purifying systems. The super-rich build protective contraptions even over their yards. In 2013 the International School of Beijing, which caters for the children of foreign diplomats and upper-class Chinese, went a step further, and constructed a giant $5 million

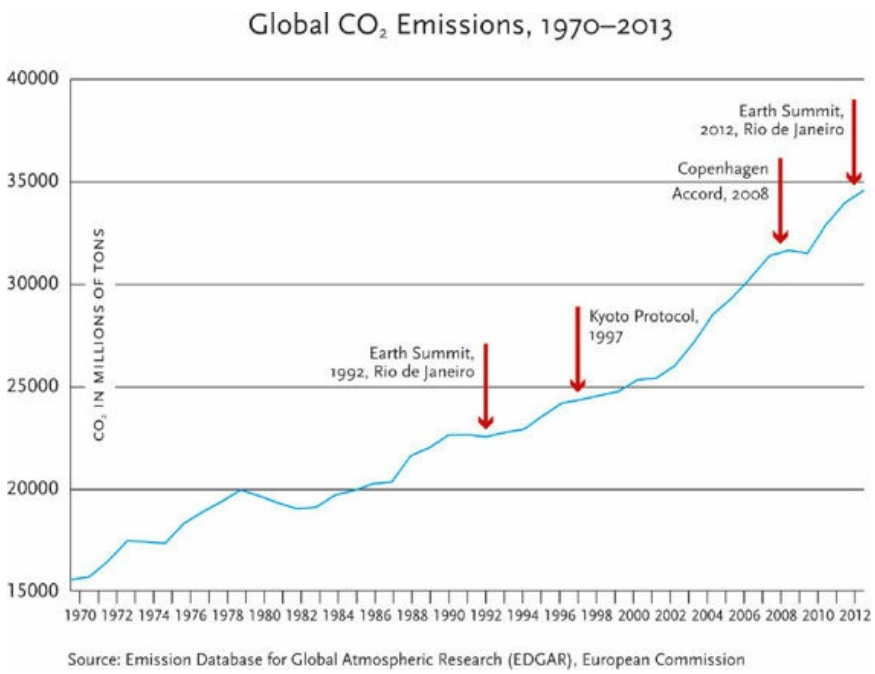
dome over its six tennis courts and its playing fields. Other schools are following suit, and the Chinese air-purification market is booming. Of course most Beijing residents cannot afford such luxuries in their homes, nor can they afford to send their kids to the International School.[3]

Humankind finds itself locked into a double race. On the one hand, we feel compelled to speed up the pace of scientific progress and economic growth. A billion Chinese and a billion Indians want to live like middle-class Americans, and they see no reason why they should put their dreams on hold when the Americans are unwilling to give up their SUVs and shopping malls. On the other hand, we must stay at least one step ahead of ecological Armageddon. Managing this double race becomes more difficult by the year, because every stride that brings the Delhi slum-dwellers closer to the American Dream also brings the planet closer to the brink.

The good news is that for hundreds of years humankind has enjoyed a growing economy without falling prey to ecological meltdown. Many other species have perished in the process, and humans too have faced a number of economic crises and ecological disasters, but so far we have always managed to pull through. Yet future success is not guaranteed by some law of nature. Who knows if science will always be able to simultaneously save the economy from freezing and the ecology from boiling. And since the pace just keeps accelerating, the margins for error keep narrowing. If previously it was enough to invent something amazing once a century, today we need to come up with a miracle every two years.

We should also be concerned that an ecological apocalypse might have different consequences for different human castes. There is no justice in history. When disaster strikes, the poor almost always suffer far more than the rich, even if the rich caused the tragedy in the first place. Global warming is already affecting the lives of poor people in arid African countries more than the lives of affluent Westerners. Paradoxically, the very power of science may increase the danger, because it makes the rich complacent.

Consider greenhouse gas emissions. Most scholars and an increasing number of politicians recognise the reality of global warming and the magnitude of the danger. Yet this recognition has so far failed to change our actual behaviour. We talk a lot about global warming, but in practice humankind is unwilling to make serious economic, social or political sacrifices to stop the catastrophe. Between 2000 and 2010 emissions didn't decrease at all. On the contrary, they increased at an annual rate of 2.2 per cent, compared with an annual increase rate of 1.3 per cent between 1970 and 2000.[4] The 1997 Kyoto protocol on reduction of greenhouse gas emissions aimed merely to slow down global warming rather than stop it, yet the world's number one polluter – the United States – refused to ratify it, and has made no attempt to significantly reduce its emissions, for fear of slowing down its economic growth.[5]



All the talk about global warming, and all the conferences, summits and protocols, have so far failed to curb global greenhouse emissions. If you look closely at the graph you see that emissions go down only during periods of economic crises and stagnation. Thus the small downturn in greenhouse emissions in 2008–9 was due not to the signing of the Copenhagen Accord, but to the global financial crisis.

Source: Emission Database for Global Atmospheric Research (EDGAR), European Commission.

In December 2015 more ambitious targets were set in the Paris Agreement, which calls for limiting average temperature increase to 1.5 degrees above pre-industrial levels. But many of the painful steps necessary to reach this aim have conveniently been postponed to after 2030, or even to the second half of the twenty-first century, effectively passing the hot potato to the next generation. Current administrations would be able to reap immediate political benefits from looking green, while the heavy political price of reducing emissions (and slowing growth) is bequeathed to future administrations. Even so, at the time of writing (January 2016) it is far from certain that the USA and other leading polluters will ratify the Paris Agreement. Too many politicians and voters believe that as long as the economy grows, scientists and engineers could always save us from doomsday. When it comes to climate change, many growth true-believers do not just hope for miracles – they take it for granted that the miracles will happen.

How rational is it to risk the future of humankind on the assumption that future scientists will make some unknown discoveries? Most of the presidents, ministers and CEOs who run the world are very rational people. Why are they willing to take such a gamble? Maybe because they don't think they are gambling on their own personal future. Even if bad comes to worse and science cannot hold off the deluge, engineers could still build a hi-tech Noah's Ark for the upper caste, while leaving billions of others to drown. The belief in this hi-tech Ark is currently one of the biggest threats to the future of humankind and of the entire ecosystem. People who believe in the hi-tech Ark should not be put in charge of the global ecology, for the same reason that people who believe in a heavenly afterlife should not be given nuclear weapons.

And what about the poor? Why aren't they protesting? If and when the deluge comes, they will bear the full cost of it. However, they will also be the first to bear the cost of economic stagnation. In a capitalist world, the lives of the poor improve only when the economy grows. Hence they are unlikely to support any steps to reduce future ecological threats that are based on slowing down present-day economic growth. Protecting the environment is a very nice idea, but those who cannot pay their rent are worried about their overdraft far more than about melting ice caps.

The Rat Race

Even if we go on running fast enough and manage to fend off both economic collapse and ecological meltdown, the race itself creates huge problems. On the individual level, it results in high levels of stress and tension. After centuries of economic growth and scientific progress, life should have become calm and peaceful, at least in the most advanced countries. If our ancestors knew what tools and resources stand ready at our command, they would have surmised we must be enjoying celestial tranquillity, free of all cares and worries. The truth is very different. Despite all our achievements, we feel a constant pressure to do and produce even more.

We blame ourselves, our boss, the mortgage, the government, the school system. But it's not really their fault. It's the modern deal, which we have all signed up to on the day we were born. In the premodern world, people were akin to lowly clerks in a socialist bureaucracy. They punched their card, and then waited for somebody else to do something. In the modern world, we humans run the business. So we are under constant pressure day and night.

On the collective level, the race manifests itself in ceaseless upheavals. Whereas previously social and political systems endured for centuries, today every generation destroys the old world and builds a new one in its place. As the *Communist Manifesto* brilliantly put it, the modern world positively requires uncertainty and disturbance. All fixed relations and ancient prejudices are swept away, and new structures become antiquated before they can ossify. All that is solid melts into air. It isn't easy to live in such a chaotic world, and it is even harder to govern it.

Hence modernity needs to work hard to ensure that neither human individuals nor the human collective will try to retire from the race, despite all the tension and chaos it creates. For that purpose, modernity upholds growth as a supreme value for whose sake we should make every sacrifice and risk every danger. On the collective level, governments, firms and organisations are encouraged to measure their success in terms of growth, and to fear equilibrium as if it were the Devil. On the individual level, we are inspired to constantly increase our income and our standard of living. Even if you are quite satisfied with your current conditions, you should strive for more. Yesterday's luxuries become today's necessities. If once you could live well in a three-bedroom apartment with one car and a single desktop, today you *need* a five-bedroom house with two cars and a host of iPods, tablets and smartphones.

It wasn't very hard to convince individuals to want more. Greed comes easily to humans. The big problem was to convince collective institutions such as states and churches to go along with the new ideal. For millennia, societies strove to curb individual desires and bring them into some kind of balance. It was well known that people wanted more and more for themselves, but when the pie was of a fixed size, social harmony depended on restraint. Avarice was bad. Modernity turned the world upside down. It convinced human collectives that equilibrium is far more frightening than chaos, and because avarice fuels growth, it is a force for good. Modernity accordingly inspired people to want more, and dismantled the age-old disciplines that curbed greed.

The resulting anxieties were assuaged to a large extent by free-market capitalism, which is one reason why this particular ideology has become so popular. Capitalist thinkers repeatedly calm us: 'Don't worry, it will be okay. Provided the economy grows, the invisible hand of the market will take care of everything else.' Capitalism has thus sanctified a voracious and chaotic system that grows by leaps and bounds, without anyone understanding what is happening and where we are rushing. (Communism, which also believed in growth, thought it could prevent chaos and orchestrate growth through state planning. After initial successes, it eventually fell far behind the messy free-market

cavalcade.)

Bashing free-market capitalism is high on the intellectual agenda nowadays. Since capitalism dominates our world, we should indeed make every effort to understand its shortcomings, before they cause apocalyptic catastrophes. Yet criticising capitalism should not blind us to its advantages and attainments. So far, it's been an amazing success – at least if you ignore the potential for future ecological meltdown, and if you measure success by the yardstick of production and growth. In 2016 we may be living in a stressful and chaotic world, but the doomsday prophecies of collapse and violence have not materialised, whereas the scandalous promises of perpetual growth and global cooperation are fulfilled. Although we experience occasional economic crises and international wars, in the long run capitalism has not only managed to prevail, but also to overcome famine, plague and war. For thousands of years priests, rabbis and muftis explained that humans cannot overcome famine, plague and war by their own efforts. Then along came the bankers, investors and industrialists, and within 200 years managed to do exactly that.

So the modern deal promised us unprecedented power – and the promise has been kept. Now what about the price? In exchange for power, the modern deal expects us to give up meaning. How did humans handle this chilling demand? Complying with it could easily have resulted in a dark world, devoid of ethics, aesthetics and compassion. Yet the fact remains that humankind is today not only far more powerful than ever, it is also far more peaceful and cooperative. How did humans manage that? How did morality, beauty and even compassion survive and flourish in a world devoid of gods, of heaven and of hell?

Capitalists are, again, quick to give all the credit to the invisible hand of the market. Yet the market's hand is blind as well as invisible, and by itself could never have saved human society. Indeed, not even a country fair can maintain itself without the helping hand of some god, king or church. If everything is for sale, including the courts and the police, trust evaporates, credit vanishes and business withers.[6] What, then, rescued modern society from collapse? Humankind was salvaged not by the law of supply and demand, but rather by the rise of a new revolutionary religion – humanism.

7
The Humanist Revolution

The modern deal offers us power, on condition that we renounce our belief in a great cosmic plan that gives meaning to life. Yet when you examine the deal closely, you find a cunning escape clause. If humans somehow manage to find meaning without deriving it from a great cosmic plan, this is not considered a breach of contract.

This escape clause has been the salvation of modern society, for it is impossible to sustain order without meaning. The great political, artistic and religious project of modernity has been to find a meaning to life that is not rooted in some great cosmic plan. We are not actors in a divine drama, and nobody cares about us and our deeds, so nobody sets limits to our power – but we are still convinced our lives have meaning.

As of 2016, humankind indeed manages to hold the stick at both ends. Not only do we possess far more power than ever before, but against all expectations, God's death did not lead to social collapse. Throughout history prophets and philosophers have argued that if humans stopped believing in a great cosmic plan, all law and order would vanish. Yet today, those who pose the greatest threat to global law and order are precisely those people who continue to believe in God and His all-encompassing plans. God-fearing Syria is a far more violent place than the atheist Netherlands.

If there is no cosmic plan, and we are not committed to any divine or natural laws, what prevents social collapse? How come you can travel for thousands of kilometres, from Amsterdam to Bucharest or from New Orleans to Montreal, without being kidnapped by slave-traders, ambushed by outlaws or killed by feuding tribes?

Look Inside

The antidote to a meaningless and lawless existence was provided by humanism, a revolutionary new creed that conquered the world during the last few centuries. The humanist religion worships humanity, and expects humanity to play the part that God played in Christianity and Islam, and that the laws of nature played in Buddhism and Daoism. Whereas traditionally the great cosmic plan gave meaning to the life of humans, humanism reverses the roles, and expects the experiences of humans to give meaning to the great cosmos. According to humanism, humans must draw from within their inner experiences not only the meaning of their own lives, but also the meaning of the entire universe. This is the primary commandment humanism has given us: create meaning for a meaningless world.

Accordingly, the central religious revolution of modernity was not losing faith in God; rather, it was gaining faith in humanity. It took centuries of hard work. Thinkers wrote pamphlets, artists composed poems and symphonies, politicians struck deals – and together they convinced humanity that it can imbue the universe with meaning. To grasp the depth and implications of the humanist

revolution, consider how modern European culture differs from medieval European culture. People in London, Paris or Toledo in 1300 did not believe that humans could determine by themselves what is good and what is evil, what is right and what is wrong, what is beautiful and what is ugly. Only God could create and define goodness, righteousness and beauty.

Although humans were viewed as enjoying unique abilities and opportunities, they were also seen as ignorant and corruptible beings. Without external supervision and guidance, humans could never understand the eternal truth, and would instead be drawn to fleeting sensual pleasures and worldly delusions. In addition, medieval thinkers pointed out that humans are mortal, and their opinions and feelings are as fickle as the wind. Today I love something with all my heart, tomorrow I am disgusted by it, and next week I am dead and buried. Hence any meaning that depends on human opinion is necessarily fragile and ephemeral. Absolute truths, and the meaning of life and of the universe, must therefore be based on some eternal law emanating from a superhuman source.

This view made God the supreme source not only of meaning, but also of authority. Meaning and authority always go hand in hand. Whoever determines the meaning of our actions – whether they are good or evil, right or wrong, beautiful or ugly – also gains the authority to tell us what to think and how to behave.

God's role as the source of meaning and authority was not just a philosophical theory. It affected every facet of daily life. Suppose that in 1300, in some small English town, a married woman took a fancy to the next-door neighbour and had sex with him. As she sneaked back home, hiding a smile and straightening her dress, her mind began to race: 'What was that all about? Why did I do it? Was it good or bad? What does it imply about me? Should I do it again?' In order to answer such questions, the woman was supposed to go to the local priest, confess and ask the holy father for guidance. The priest was well versed in scriptures, and these sacred texts revealed to him exactly what God thought about adultery. Based on the eternal word of God, the priest could determine beyond all doubt that the woman had committed a mortal sin, that if she doesn't make amends she will end up in hell, and that she ought to repent immediately, donate ten gold coins to the coming crusade, avoid eating meat for the next six months and make a pilgrimage to the tomb of St Thomas à Becket at Canterbury. And it goes without saying that she must never repeat her awful sin.

Today things are very different. For centuries humanism has been convincing us that we are the ultimate source of meaning, and that our free will is therefore the highest authority of all. Instead of waiting for some external entity to tell us what's what, we can rely on our own feelings and desires. From infancy we are bombarded with a barrage of humanist slogans counselling us: 'Listen to yourself, follow your heart, be true to yourself, trust yourself, do what feels good.' Jean-Jacques Rousseau summed it all up in his novel *Émile*, the eighteenth-century bible of feeling. Rousseau held that when looking for the rules of conduct in life, he found them 'in the depths of my heart, traced by nature in characters which nothing can efface. I need only consult myself with regard to what I wish to do; what I feel to be good is good, what I feel to be bad is bad.'[1]

Accordingly, when a modern woman wants to understand the meaning of an affair she is having, she is far less prone to blindly accept the judgements of a priest or an ancient book. Instead, she will carefully examine her feelings. If her feelings aren't very clear, she will call a good friend, meet for coffee and pour out her heart. If things are still vague, she will go to her therapist, and tell him all about it. Theoretically, the modern therapist occupies the same place as the medieval priest, and it is an overworked cliché to compare the two professions. Yet in practice, a huge chasm separates them. The therapist does not possess a holy book that defines good and evil. When the woman finishes her story, it is highly unlikely that the therapist will burst out: 'You wicked woman! You have committed a

terrible sin!' It is equally unlikely that he will say, 'Wonderful! Good for you!' Instead, no matter what the woman may have done and said, the therapist is most likely to ask in a caring voice, 'Well, how do *you* feel about what happened?'

True, the therapist's bookshelf sags under the weight of Freud, Jung and the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*). Yet these are not holy scriptures. The *DSM* diagnoses the ailments of life, not the meaning of life. Most psychologists believe that only human feelings are authorised to determine the true meaning of our actions. Hence no matter what the therapist thinks about his patient's affair, and no matter what Freud, Jung and the *DSM* think about affairs in general, the therapist should not force his views on the patient. Instead, he should help her examine the most secret chambers of her heart. There and only there will she find the answers. Whereas medieval priests had a hotline to God, and could distinguish for us between good and evil, modern therapists merely help us get in touch with our own inner feelings.

This partly explains the changing fortunes of the institution of marriage. In the Middle Ages, marriage was considered a sacrament ordained by God, and God also authorised the father to marry his children according to his wishes and interests. An extramarital affair was accordingly a brazen rebellion against both divine and parental authority. It was a mortal sin, no matter what the lovers felt and thought about it. Today people marry for love, and it is their inner feelings that give value to this bond. Hence, if the very same feelings that once drove you into the arms of one man now drive you into the arms of another, what's wrong with that? If an extramarital affair provides an outlet for emotional and sexual desires that are not satisfied by your spouse of twenty years, and if your new lover is kind, passionate and sensitive to your needs – why not enjoy it?

But wait a minute, you might say. We cannot ignore the feelings of the other concerned parties. The woman and her lover might feel wonderful in each other's arms, but if their respective spouses find out, everybody will probably feel awful for quite some time. And if it leads to divorce, their children might carry the emotional scars for decades. Even if the affair is never discovered, hiding it involves a lot of tension, and may lead to growing feelings of alienation and resentment.

The most interesting discussions in humanist ethics concern situations like extramarital affairs, when human feelings collide. What happens when the same action causes one person to feel good, and another to feel bad? How do we weigh the feelings against each other? Do the good feelings of the two lovers outweigh the bad feelings of their spouses and children?

It doesn't matter what you think about this particular question. It is far more important to understand the kind of arguments both sides deploy. Modern people have differing ideas about extramarital affairs, but no matter what their position is, they tend to justify it in the name of human feelings rather than in the name of holy scriptures and divine commandments. Humanism has taught us that something can be bad only if it causes somebody to feel bad. Murder is wrong not because some god once said, 'Thou shalt not kill.' Rather, murder is wrong because it causes terrible suffering to the victim, to his family members, and to his friends and acquaintances. Theft is wrong not because some ancient text says, 'Thou shalt not steal.' Rather, theft is wrong because when you lose your property, you feel bad about it. And if an action does not cause anyone to feel bad, there can be nothing wrong about it. If the same ancient text says that God commanded us not to make any images of either humans or animals (Exodus 20:4), but I enjoy sculpting such figures, and I don't harm anyone in the process – then what could possibly be wrong with it?

The same logic dominates current debates on homosexuality. If two adult men enjoy having sex with one another, and they don't harm anyone while doing so, why should it be wrong, and why should we outlaw it? It is a private matter between these two men, and they are free to decide about it

according to their inner feelings. In the Middle Ages, if two men confessed to a priest that they were in love with one another, and that they never felt so happy, their good feelings would not have changed the priest's damning judgement – indeed, their happiness would only have worsened the situation. Today, in contrast, if two men love one another, they are told: 'If it feels good – do it! Don't let any priest mess with your mind. Just follow your heart. You know best what's good for you.'

Interestingly enough, today even religious zealots adopt this humanistic discourse when they want to influence public opinion. For example, every year for the past decade the Israeli LGBT community holds a gay parade in the streets of Jerusalem. It is a unique day of harmony in this conflict-riven city, because it is the one occasion when religious Jews, Muslims and Christians suddenly find a common cause – they all fume in accord against the gay parade. What's really interesting, though, is the argument they use. They don't say, 'You shouldn't hold a gay parade because God forbids homosexuality.' Rather, they explain to every available microphone and TV camera that 'seeing a gay parade passing through the holy city of Jerusalem hurts our feelings. Just as gay people want us to respect their feelings, they should respect ours.'

On 7 January 2015 Muslim fanatics massacred several staff members of the French magazine *Charlie Hebdo*, because the magazine published caricatures of the prophet Muhammad. In the following days, many Muslim organisations condemned the attack, yet some could not resist adding a 'but' clause. For example, the Egyptian Journalists Syndicate denounced the terrorists for their use of violence, and in the same breath denounced the magazine for 'hurting the feelings of millions of Muslims across the world'.[2] Note that the Syndicate did not blame the magazine for disobeying God's will. That's what we call progress.

Our feelings provide meaning not only for our private lives, but also for social and political processes. When we want to know who should rule the country, what foreign policy to adopt and what economic steps to take, we don't look for the answers in scriptures. Nor do we obey the commands of the Pope or the Council of Nobel Laureates. Rather, in most countries, we hold democratic elections and ask people what they think about the matter at hand. We believe that the voter knows best, and that the free choices of individual humans are the ultimate political authority.

Yet how does the voter know what to choose? Theoretically at least, the voter is supposed to consult his or her innermost feelings, and follow their lead. It is not always easy. In order to get in touch with my feelings, I need to filter out the empty propaganda slogans, the endless lies of ruthless politicians, the distracting noise created by cunning spin doctors, and the learned opinions of hired pundits. I need to ignore all this racket, and attend only to my authentic inner voice. And then my authentic inner voice whispers in my ear 'Vote Cameron' or 'Vote Modi' or 'Vote Clinton' or whomever, and I put a cross against that name on the ballot paper – and that's how we know who should rule the country.

In the Middle Ages this would have been considered the height of foolishness. The fleeting feelings of ignorant commoners were hardly a sound basis for important political decisions. When England was torn apart by the Wars of the Roses, nobody thought to end the conflict by having a national referendum, in which each bumpkin and wench cast a vote for either Lancaster or York. Similarly, when Pope Urban II launched the First Crusade in 1095, he didn't claim it was the people's will. It was God's will. Political authority came down from heaven – it didn't rise up from the hearts and minds of mortal humans.



The Holy Spirit, in the guise of a dove, delivers an ampulla full of sacred oil for the baptism of King Clovis, founder of the Frankish kingdom (illustration from the *Grandes Chroniques de France*, *c*.1380). According to the founding myth of France, this ampulla was henceforth kept in Rheims Cathedral, and all subsequent French kings were anointed with the divine oil at their coronation. Each coronation thus involved a miracle, as the empty ampulla spontaneously refilled with oil. This indicated that God himself chose the king and gave him His blessing. If God did not want Louis IX or Louis XIV or Louis XVI to be king, the ampulla would not have refilled.

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What's true of ethics and politics is also true of aesthetics. In the Middle Ages art was governed by objective yardsticks. The standards of beauty did not reflect human fads. Rather, human tastes were supposed to conform to superhuman dictates. This made perfect sense in a period when people believed that art was inspired by superhuman forces rather than by human feelings. The hands of painters, poets, composers and architects were supposedly moved by muses, angels and the Holy Spirit. Many a time when a composer penned a beautiful hymn, no credit was given to the composer, for the same reason it was not given to the pen. The pen was held and directed by human fingers which in turn were held and directed by the hand of God.

Medieval scholars held on to a classical Greek theory, according to which the movements of the stars across the sky create heavenly music that permeates the entire universe. Humans enjoy physical and mental health when the inner movements of their body and soul are in harmony with the heavenly music created by the stars. Human music should therefore echo the divine melody of the cosmos, rather than reflect the ideas and caprices of flesh-and-blood composers. The most beautiful hymns, songs and tunes were usually attributed not to the genius of some human artist but to divine inspiration.



Pope Gregory the Great composes the eponymous Gregorian chants. The Holy Spirit, in its favourite dove costume, sits on his right shoulder, whispering the chants in his ear. The Holy Spirit is the chants' true author, whereas Gregory is just a conduit. God is the ultimate source of art and beauty.

Manuscript: *Registrum Gregorii*, *c.*983 © Archiv Gerstenberg/ullstein bild via Getty Images.

Such views are no longer in vogue. Today humanists believe that the only source for artistic creation and aesthetic value is human feelings. Music is created and judged by our inner voice, which need follow neither the rhythms of the stars nor the commands of muses and angels. For the stars are mute, while muses and angels exist only in our own imagination. Modern artists seek to get in touch with themselves and their feelings, rather than with God. No wonder then that when we come to evaluate art, we no longer believe in any objective yardsticks. Instead, we again turn to our subjective feelings. In ethics, the humanist motto is 'if it feels good – do it'. In politics, humanism instructs us that 'the voter knows best'. In aesthetics, humanism says that 'beauty is in the eye of the beholder'.

The very definition of art is consequently up for grabs. In 1917 Marcel Duchamp took an ordinary mass-produced urinal, named it *Fountain*, signed his name at the bottom, declared it a work of art and placed it in a Paris museum. Medieval people would not have bothered to even argue about it. Why waste oxygen on such utter nonsense? Yet in the modern humanist world, Duchamp's work is considered an important artistic milestone. In countless classrooms across the world, first-year art students are shown an image of Duchamp's *Fountain*, and at a sign from the teacher, all hell breaks loose. It is art! No it isn't! Yes it is! No way! After letting the students release some steam, the teacher focuses the discussion by asking 'What exactly is art? And how do we determine whether something is a work of art or not?' After a few more minutes of back and forth, the teacher steers the class in the right direction: 'Art is anything people think is art, and beauty is in the eye of the beholder.' If people think that a urinal is a beautiful work of art – then it is. What higher authority is there that can tell people they are wrong? Today, copies of Duchamp's masterpiece are presented in some of the most important museums in the world, including the San Francisco Museum of Modern Art, the National Gallery of Canada, the Tate Gallery in London and the Pompidou Centre in Paris. (The copies are placed in the museums' showrooms, not in the lavatories.)

Such humanist approaches have had a deep impact on the economic field as well. In the Middle Ages, guilds controlled the production process, leaving little room for the initiative or taste of individual artisans and customers. The carpenters' guild determined what was a good chair, the bakers' guild defined good bread, and the Meistersinger guild decided which songs were first class

and which were rubbish. Meanwhile princes and city councils regulated salaries and prices, occasionally forcing people to buy fixed amounts of goods at a non-negotiable price. In the modern free market, all these guilds, councils and princes have been superseded by a new supreme authority – the free will of the customer.

Suppose Toyota decides to produce the perfect car. It sets up a committee of experts from various fields: it hires the best engineers and designers, brings together the finest physicists and economists, and even consults with several sociologists and psychologists. To be on the safe side, they throw in a Nobel laureate or two, an Oscar-winning actress and some world-famous artists. After five years of research and development, they unveil the perfect car. Millions of vehicles are produced, and shipped to car agencies across the world. Yet nobody buys the car. Does it mean that the customers are making a mistake, and that they don't know what's good for them? No. In a free market, the customer is always right. If customers don't want it, it means that it is not a good car. It doesn't matter if all the university professors and all the priests and mullahs cry out from every pulpit that this is a wonderful car – if the customers reject it, it is a bad car. Nobody has the authority to tell customers that they are wrong, and heaven forbid that a government would try to force citizens to buy a particular car against their will.

What's true of cars is true of all other products. Listen, for example, to Professor Leif Andersson from the University of Uppsala. He specialises in the genetic enhancement of farm animals, in order to create faster-growing pigs, dairy cows that produce more milk, and chickens with extra meat on their bones. In an interview for the newspaper *Haaretz*, reporter Naomi Darom confronted Andersson with the fact that such genetic manipulations might cause much suffering to the animals. Already today 'enhanced' dairy cows have such heavy udders that they can barely walk, while 'upgraded' chickens cannot even stand up. Professor Andersson had a firm answer: 'Everything comes back to the individual customer and to the question how much the customer is willing to pay for meat . . . we must remember that it would be impossible to maintain current levels of global meat consumption without the [enhanced] modern chicken . . . if customers ask us only for the cheapest meat possible – that's what the customers will get . . . Customers need to decide what is most important to them – price, or something else.'[3]

Professor Andersson can go to sleep at night with a clean conscience. The fact that customers are buying his enhanced animal products implies that he is meeting their needs and desires and is therefore doing good. By the same logic, if some multinational corporation wants to know whether it lives up to its 'Don't be evil' motto, it need only take a look at its bottom line. If it makes loads of money, it means that millions of people like its products, which implies that it is a force for good. If someone objects and says that people might make the wrong choice, he will be quickly reminded that the customer is always right, and that human feelings are the source of all meaning and authority. If millions of people freely choose to buy the company's products, who are you to tell them that they are wrong?

Finally, the rise of humanist ideas has revolutionised the educational system too. In the Middle Ages the source of all meaning and authority was external, hence education focused on instilling obedience, memorising scriptures and studying ancient traditions. Teachers presented pupils with a question, and the pupils had to remember how Aristotle, King Solomon or St Thomas Aquinas answered it.

Humanism in Five Images



Humanist Politics: the voter knows best.

© Sadik Gulec/Shutterstock.com.



Humanist Economics: the customer is always right.

© CAMERIQUE/ClassicStock/Corbis.



Humanist Aesthetics: beauty is in the eyes of the beholder. (Marcel Duchamp's *Fountain* in a special exhibition of modern art at the National Gallery of Scotland.)

© Jeff J Mitchell/Getty Images.



Humanist Ethics: if it feels good – do it!

© Molly Landreth/Getty Images.



Humanist Education: think for yourself!

The Thinker, 1880–81 (bronze), Rodin, Auguste, Burrell Collection, Glasgow © Culture and Sport Glasgow (Museums)/Bridgeman Images.

In contrast, modern humanist education believes in teaching students to think for themselves. It is good to know what Aristotle, Solomon and Aquinas thought about politics, art and economics; yet since the supreme source of meaning and authority lies within ourselves, it is far more important to know what *you* think about these matters. Ask a teacher – whether in kindergarten, school or college – what she is trying to teach. 'Well,' she will answer, 'I teach the kids history, or quantum physics, or art – but above all I try to teach them to think for themselves.' It may not always succeed, but that is what humanist education seeks to do.

As the source of meaning and authority was relocated from the sky to human feelings, the nature of the entire cosmos changed. The exterior universe – hitherto teeming with gods, muses, fairies and ghouls – became empty space. The interior world – hitherto an insignificant enclave of crude passions – became deep and rich beyond measure. Angels and demons were transformed from real entities roaming the forests and deserts of the world into inner forces within our own psyche. Heaven and hell too ceased to be real places somewhere above the clouds and below the volcanoes, and were instead interpreted as internal mental states. You experience hell every time you ignite the fires of anger and hatred within your heart; and you enjoy heavenly bliss every time you forgive your enemies, repent your own misdeeds and share your wealth with the poor.

When Nietzsche declared that God is dead, this is what he meant. At least in the West, God has become an abstract idea that some accept and others reject, but it makes little difference either way. In the Middle Ages, without a god I had no source of political, moral and aesthetic authority. I could not tell what was right, good or beautiful. Who could live like that? Today, in contrast, it is very easy not to believe in God, because I pay no price for my unbelief. I can be a complete atheist, and still draw a very rich mix of political, moral and aesthetical values from my inner experience.

If I believe in God at all, it is *my choice* to believe. If my inner self tells me to believe in God – then I believe. I believe because I *feel* God's presence, and my heart tells me He is there. But if I no longer feel God's presence, and if my heart suddenly tells me that there is no God – I will cease believing. Either way, the real source of authority is my own feelings. So even while saying that I believe in God, the truth is I have a much stronger belief in my own inner voice.

Follow the Yellow Brick Road

Like every other source of authority, feelings have their shortcomings. Humanism assumes that each human has a single authentic inner self, but when I try to listen to it, I often encounter either silence or a cacophony of contending voices. In order to overcome this problem, humanism has upheld not just a new source of authority, but also a new method for getting in touch with authority and gaining true knowledge.

In medieval Europe, the chief formula for knowledge was: **Knowledge = Scriptures × Logic**.[*] If we want to know the answer to some important question, we should read scriptures, and use our logic to understand the exact meaning of the text. For example, scholars who wished to know the shape of the earth scanned the Bible looking for relevant references. One pointed out that in Job 38:13, it says that God can 'take hold of the edges of the earth, and the wicked be shaken out of it'. This implies – reasoned the pundit – that because the earth has 'edges' of which we can 'take hold', it must be a flat square. Another sage rejected this interpretation, calling attention to Isaiah 40:22, where it says that God 'sits enthroned above the circle of the earth'. Isn't that proof that the earth is round? In practice, that meant that scholars sought knowledge by spending years in schools and libraries, reading more and more texts, and sharpening their logic so they could understand the texts correctly.

The Scientific Revolution proposed a very different formula for knowledge: **Knowledge = Empirical Data × Mathematics**. If we want to know the answer to some question, we need to gather relevant empirical data, and then use mathematical tools to analyse the data. For example, in order to gauge the true shape of the earth, we can observe the sun, the moon and the planets from various locations across the world. Once we have amassed enough observations, we can use trigonometry to deduce not only the shape of the earth, but also the structure of the entire solar system. In practice, that means that scientists seek knowledge by spending years in observatories, laboratories and research expeditions, gathering more and more empirical data, and sharpening their mathematical tools so they could interpret the data correctly.

The scientific formula for knowledge led to astounding breakthroughs in astronomy, physics, medicine and countless other disciplines. But it had one huge drawback: it could not deal with questions of value and meaning. Medieval pundits could determine with absolute certainty that it is wrong to murder and steal, and that the purpose of human life is to do God's bidding, because scriptures said so. Scientists could not come up with such ethical judgements. No amount of data and no mathematical wizardry can prove that it is wrong to murder. Yet human societies cannot survive without such value judgements.

One way to overcome this difficulty was to continue using the old medieval formula alongside the new scientific method. When faced with a practical problem – such as determining the shape of the earth, building a bridge or curing a disease – we collect empirical data and analyse it mathematically. When faced with an ethical problem – such as determining whether to allow divorce, abortion and homosexuality – we read scriptures. This solution was adopted to some extent by numerous modern societies, from Victorian Britain to twenty-first-century Iran.

However, humanism offered an alternative. As humans gained confidence in themselves, a new formula for attaining ethical knowledge appeared: **Knowledge = Experiences × Sensitivity**. If we wish to know the answer to any ethical question, we need to connect to our inner experiences, and observe them with the utmost sensitivity. In practice, that means that we seek knowledge by spending years collecting experiences, and sharpening our sensitivity so we could understand these

experiences correctly.

What exactly are 'experiences'? They are not empirical data. An experience is not made of atoms, molecules, proteins or numbers. Rather, an experience is a subjective phenomenon that includes three main ingredients: sensations, emotions and thoughts. At any particular moment my experience comprises everything I sense (heat, pleasure, tension, etc.), every emotion I feel (love, fear, anger, etc.) and whatever thoughts arise in my mind.

And what is 'sensitivity'? It means two things. Firstly, paying attention to my sensations, emotions and thoughts. Secondly, allowing these sensations, emotions and thoughts to influence me. Granted, I shouldn't allow every passing breeze to sweep me away. Yet I should be open to new experiences, and permit them to change my views, my behaviour and even my personality.

Experiences and sensitivity build up one another in a never-ending cycle. I cannot experience anything if I have no sensitivity, and I cannot develop sensitivity unless I undergo a variety of experiences. Sensitivity is not an abstract aptitude that can be developed by reading books or listening to lectures. It is a practical skill that can ripen and mature only by applying it in practice.

Take tea, for example. I start by drinking very sweet ordinary tea while reading the morning paper. The tea is little more than an excuse for a sugar rush. One day I realise that between the sugar and the newspaper, I hardly taste the tea at all. So I reduce the amount of sugar, put the paper aside, close my eyes and focus on the tea itself. I begin to register its unique aroma and flavour. Soon I find myself experimenting with different teas, black and green, comparing their exquisite tangs and delicate bouquets. Within a few months, I drop the supermarket labels and buy my tea at Harrods. I develop a particular liking for 'Panda Dung tea' from the mountains of Ya'an in Sichuan province, made from leaves of tea trees fertilised by the dung of panda bears. That's how, one cup at a time, I hone my tea sensitivity and become a tea connoisseur. If in my early tea-drinking days you had served me Panda Dung tea in a Ming Dynasty porcelain goblet, I would not have appreciated it much more than builder's tea in a paper cup. You cannot experience something if you don't have the necessary sensitivity, and you cannot develop your sensitivity except by undergoing a long string of experiences.

What's true of tea is true of all other aesthetic and ethical knowledge. We aren't born with a ready-made conscience. As we pass through life, we hurt people and people hurt us, we act compassionately and others show compassion to us. If we pay attention, our moral sensitivity sharpens, and these experiences become a source of valuable ethical knowledge about what is good, what is right and who I really am.

Humanism thus sees life as a gradual process of inner change, leading from ignorance to enlightenment by means of experiences. The highest aim of humanist life is to fully develop your knowledge through a large variety of intellectual, emotional and physical experiences. In the early nineteenth century, Wilhelm von Humboldt – one of the chief architects of the modern education system – said that the aim of existence is 'a distillation of the widest possible experience of life into wisdom'. He also wrote that 'there is only one summit in life – to have taken the measure in feeling of everything human'.[4] This could well be the humanist motto.

According to Chinese philosophy, the world is sustained by the interplay of opposing but complementary forces called yin and yang. This may not be true of the physical world, but it is certainly true of the modern world that has been created by the covenant of science and humanism. Every scientific yang contains within it a humanist yin, and vice versa. The yang provides us with power, while the yin provides us with meaning and ethical judgements. The yang and yin of modernity are reason and emotion, the laboratory and the museum, the production line and the supermarket.

People often see only the yang, and imagine that the modern world is dry, scientific, logical and utilitarian – just like a laboratory or a factory. But the modern world is also an extravagant supermarket. No culture in history has ever given such importance to human feelings, desires and experiences. The humanist view of life as a string of experiences has become the founding myth of numerous modern industries, from tourism to art. Travel agents and restaurant chefs do not sell us flight tickets, hotels or fancy dinners – they sell us novel experiences. Similarly, whereas most premodern narratives focused on external events and actions, modern novels, films and poems often revolve around feelings. Graeco-Roman epics and medieval chivalric romances were catalogues of heroic deeds, not feelings. One chapter told how the brave knight fought a monstrous ogre, and killed him. Another chapter recounted how the knight rescued a beautiful princess from a fire-spitting dragon, and killed him. A third chapter narrated how a wicked sorcerer kidnapped the princess, but the knight pursued the sorcerer, and killed him. No wonder that the hero was invariably a knight, rather than a carpenter or a peasant, for peasants performed no heroic deeds.

Crucially, the heroes did not undergo any significant process of inner change. Achilles, Arthur, Roland and Lancelot were fearless warriors with a chivalric world view before they set out on their adventures, and they remained fearless warriors with the same world view at the end. All the ogres they killed and all the princesses they rescued confirmed their courage and perseverance, but ultimately taught them little.

The humanist focus on feelings and experiences, rather than deeds, transformed art. Wordsworth, Dostoevsky, Dickens and Zola cared little for brave knights and derring-do, and instead described how ordinary people and housewives felt. Some people believe that Joyce's *Ulysses* represents the apogee of this modern focus on the inner life rather than external actions – in 260,000 words Joyce describes a single day in the life of the Dubliners Stephen Dedalus and Leopold Bloom, who over the course of the day do . . . well, nothing much at all.

Few people have actually read all of *Ulysses*, but the same principles underpin much of our popular culture too. In the United States, the series *Survivor* is often credited (or blamed) for turning reality shows into a craze. *Survivor* was the first reality show to make it to the top of the Nielsen ratings, and in 2007 *Time* magazine listed it among the hundred greatest TV shows of all time.[5] In each season, twenty contenders in minimal swimsuits are isolated on some tropical island. They have to face all kinds of challenges, and each episode they vote out one of their members. The last one left takes home $1 million.

Audiences in Homeric Greece, in the Roman Empire or in medieval Europe would have found the idea familiar and highly attractive. Twenty challengers go in – only one hero comes out. 'Wonderful!' a Homeric prince, a Roman patrician or a crusader knight would have thought to himself as he sat down to watch. 'Surely we are about to see amazing adventures, life-and-death battles and incomparable acts of heroism and betrayal. The warriors will probably stab each other in the back, or spill their entrails for all to see.'

What a disappointment! The back-stabbing and entrails-spilling remain just a metaphor. Each episode lasts about an hour. Out of that, fifteen minutes are taken up by commercials for toothpaste, shampoo and cereals. Five minutes are dedicated to incredibly childish challenges, such as who can throw the most coconuts into a hoop, or who can eat the largest number of bugs in one minute. The rest of the time the 'heroes' just talk about their feelings! He said she said, and I felt this and I felt that. If a crusader knight had really sat down to watch *Survivor*, he would probably have grabbed his battleaxe and smashed the TV out of boredom and frustration.

Today we might think of medieval knights as insensitive brutes. If they lived among us, we would

send them to a therapist, who might help them get in touch with themselves. This is what the Tin Man does in *The Wizard of Oz*. He walks along the yellow brick road with Dorothy and her friends, hoping that when they get to Oz, the great wizard will give him a heart, while the Scarecrow wants a brain and the Lion wants courage. At the end of their journey they discover that the great wizard is a charlatan, and he can't give them any of these things. But they discover something far more important: everything they wish for is already within themselves. There is no need of some godlike wizard in order to obtain sensitivity, wisdom or bravery. You just need to follow the yellow brick road, and open yourself to whatever experiences come your way.

Exactly the same lesson is learned by Captain Kirk and Captain Jean-Luc Picard as they travel the galaxy in the starship *Enterprise*, by Huckleberry Finn and Jim as they sail down the Mississippi, by Wyatt and Billy as they ride their Harley-Davidsons in *Easy Rider*, and by countless other characters in myriad other road movies who leave their home town in Pennsylvania (or perhaps New South Wales), travel in an old convertible (or perhaps a bus), pass through various life-changing experiences, get in touch with themselves, talk about their feelings, and eventually reach San Francisco (or perhaps Alice Springs) as better and wiser individuals.

The Truth About War

The formula **Knowledge = Experiences × Sensitivity** has changed not just our popular culture, but even our perception of weighty issues like war. Throughout most of history, when people wished to know whether a particular war was just, they asked God, they asked scriptures, and they asked kings, noblemen and priests. Few cared about the opinions and experiences of a common soldier or an ordinary civilian. War narratives such as those of Homer, Virgil and Shakespeare focused on the actions of emperors, generals and outstanding heroes, and though they did not hide the misery of war, this was more than compensated for by a full menu of glory and heroism. Ordinary soldiers appeared as either piles of bodies slaughtered by some Goliath, or a cheering crowd hoisting a triumphant David upon its shoulders.



Jean-Jacques Walter, *Gustav Adolph of Sweden at the Battle of Breitenfeld* (1631).

© DeAgostini Picture Library/Scala, Florence.

Look, for example, at the painting above of the Battle of Breitenfeld, which took place on 17

September 1631. The painter, Jean-Jacques Walter, glorifies King Gustav Adolph of Sweden, who led his army that day to a decisive victory. Gustav Adolph towers over the battlefield as if he were some god of war. One gets the impression that the king controls the battle like a chess player moving pawns. The pawns themselves are mostly generic figures, or tiny dots in the background. Walter was not interested in how they felt while they charged, fled, killed or died. They are a faceless collective.

Even when painters focused on the battle itself, rather than on the commander, they still looked at it from above, and were far more concerned with collective manoeuvres than with personal feelings. Take, for example, Pieter Snayers's painting of the Battle of White Mountain in November 1620.

The painting depicts a celebrated Catholic victory in the Thirty Years War over heretical Protestant rebels. Snayers wished to commemorate this victory by painstakingly recording the various formations, manoeuvres and troop movements. You can easily tell the different units, their armament and their place within the order of battle. Snayers gave far less attention to the experiences and feelings of the common soldiers. Like Jean-Jacques Walter, he makes us observe the battle from the Olympian vantage point of gods and kings, and gives us the impression that war is a giant chess game.



Pieter Snayers, *The Battle of White Mountain*.

© Bpk/Bayerische Staatsgemäldesammlungen.

If you take a closer look – for which you might need a magnifying glass – you realise that *The Battle of White Mountain* is a bit more complex than a chess game. What at first sight seem to be geometrical abstractions turn upon closer inspection into bloody scenes of carnage. Here and there you can even spot the faces of individual soldiers running or fleeing, firing their guns or impaling an enemy on their pikes. However, these scenes receive their meaning from their place within the overall picture. When we see a cannonball smashing a soldier to bits, we understand it as part of the great Catholic victory. If the soldier is fighting on the Protestant side, his death is a just reward for rebellion and heresy. If the soldier is fighting in the Catholic army, his death is a noble sacrifice for a worthy cause. If we look up, we can see angels hovering high above the battlefield. They are holding a billboard which explains in Latin what happened in this battle, and why it was so important. The message is that God helped Emperor Ferdinand II defeat his enemies on 8 November 1620.

For thousands of years, when people looked at war, they saw gods, emperors, generals and great heroes. But over the last two centuries, the kings and generals have been increasingly pushed to the side, and the limelight shifted onto the common soldier and his experiences. War novels such as *All Quiet on the Western Front* and war films such as *Platoon* begin with a young and naïve recruit, who

knows little about himself and the world, but carries a heavy burden of hopes and illusions. He believes that war is glorious, our cause is just and the general is a genius. A few weeks of real war – of mud, and blood, and the smell of death – shatter his illusions one after another. If he survives, the naïve recruit will leave war as a much wiser man, who no longer believes the clichés and ideals peddled by teachers, film-makers and eloquent politicians.

Paradoxically, this narrative has become so influential that today it is told over and over again even by teachers, film-makers and eloquent politicians. 'War is not what you see in the movies!' warn Hollywood blockbusters such as *Apocalypse Now*, *Full Metal Jacket* and *Blackhawk Down*. Enshrined in celluloid, prose or poetry, the feelings of the ordinary grunt have become the ultimate authority on war, which everyone has learned to respect. As the joke goes, 'How many Vietnam vets does it take to change a light bulb?' 'You wouldn't know, you weren't there.'[6]

Painters too have lost interest in generals on horses and in tactical manoeuvres. Instead, they strive to depict how the common soldier feels. Look again at *The Battle of Breitenfeld* and *The Battle of White Mountain*. Now look at the following two pictures, considered masterpieces of twentieth-century war art: *The War* (*Der Krieg*) by Otto Dix, and *That 2,000 Yard Stare* by Tom Lea.

Dix served as a sergeant in the German army during the First World War. Lea covered the Battle of Peleliu Island in 1944 for *Life* magazine. Whereas Walter and Snayers viewed war as a military and political phenomenon, and wanted us to know what happened in particular battles, Dix and Lea view war as an emotional phenomenon, and want us to know how it feels. They don't care about the genius of generals or about the tactical details of this or that battle. Dix's soldier might be in Verdun or Ypres or the Somme – it doesn't matter which, because war is hell everywhere. Lea's soldier just happens to be an American GI in Peleliu, but you could see exactly the same 2,000-yard stare on the face of a Japanese soldier in Iwo Jima, a German soldier in Stalingrad or a British soldier in Dunkirk.



Otto Dix, *The War* (1929–32).

Staatliche Kunstsammlungen, Neue Meister, Dresden, Germany © Lessing Images.



Tom Lea, *That 2,000 Yard Stare* (1944).

Tom Lea, *That 2,000 Yard Stare*, 1944. Oil on canvas, 36"x28". LIFE Collection of Art WWII, U.S. Army Center of Military History, Ft. Belvoir, Virginia. © Courtesy of the Tom Lea Institute, El Paso, Texas.

In the paintings of Dix and Lea, the meaning of war does not emanate from tactical movements or divine proclamations. If you want to understand war, don't look up at the general on the hilltop, or at angels in the sky. Instead, look straight into the eyes of the common soldiers. In Lea's painting, the gaping eyes of a traumatised soldier open a window onto the terrible truth of war. In Dix's painting, the truth is so unbearable that it must be partly concealed behind a gas mask. No angels fly above the battlefield – only a rotting corpse, hanging from a ruined rafter and pointing an accusing finger.

Artists such as Dix and Lea thus overturned the traditional hierarchy of war. In earlier times wars could have been as horrific as in the twentieth century. However, even atrocious experiences were placed within a wider context that gave them positive meaning. War might be hell, but it was also the gateway to heaven. A Catholic soldier fighting at the Battle of White Mountain could say to himself: 'True, I am suffering. But the Pope and the emperor say that we are fighting for a good cause, so my suffering is meaningful.' Otto Dix employed an opposite kind of logic. He saw personal experience as the source of all meaning, hence his line of thinking said: 'I am suffering – and this is bad – hence the whole war is bad. And if the kaiser and the clergy nevertheless support the war, they must be mistaken.'[7]

The Humanist Schism

So far we have discussed humanism as if it were a single coherent world view. In fact, humanism shared the fate of every successful religion, such as Christianity and Buddhism. As it spread and evolved, it fragmented into several conflicting sects. All humanist sects believe that human experience is the supreme source of authority and meaning, yet they interpret human experience in different ways.

Humanism split into three main branches. The orthodox branch holds that each human being is a unique individual possessing a distinctive inner voice and a never-to-be-repeated string of experiences. Every human being is a singular ray of light, which illuminates the world from a

different perspective, and which adds colour, depth and meaning to the universe. Hence we ought to give as much freedom as possible to every individual to experience the world, follow his or her inner voice and express his or her inner truth. Whether in politics, economics or art, individual free will should have far more weight than state interests or religious doctrines. The more liberty individuals enjoy, the more beautiful, rich and meaningful is the world. Due to this emphasis on liberty, the orthodox branch of humanism is known as 'liberal humanism' or simply as 'liberalism'.*

It is liberal politics that believes the voter knows best. Liberal art holds that beauty is in the eye of the beholder. Liberal economics maintains that the customer is always right. Liberal ethics advises us that if it feels good, we should go ahead and do it. Liberal education teaches us to think for ourselves, because we will find all the answers within us.

During the nineteenth and twentieth centuries, as humanism gained increasing social credibility and political power, it sprouted two very different offshoots: socialist humanism, which encompassed a plethora of socialist and communist movements, and evolutionary humanism, whose most famous advocates were the Nazis. Both offshoots agreed with liberalism that human experience is the ultimate source of meaning and authority. Neither believed in any transcendental power or divine law book. If, for example, you asked Karl Marx what was wrong with ten-year-olds working twelve-hour shifts in smoky factories, he would have answered that it made the kids feel bad. We should avoid exploitation, oppression and inequality not because God said so, but because they make people miserable.

However, both socialists and evolutionary humanists pointed out that the liberal understanding of the human experience is flawed. Liberals think the human experience is an individual phenomenon. But there are many individuals in the world, and they often feel different things and have contradictory desires. If all authority and meaning flows from individual experiences, how do you settle contradictions between different such experiences?

On 17 July 2015 the German chancellor Angela Merkel was confronted by a teenage Palestinian refugee girl from Lebanon, whose family sought asylum in Germany but faced imminent deportation. The girl, Reem, told Merkel in fluent German that 'It's really very hard to watch how other people can enjoy life and you yourself can't. I don't know what my future will bring.' Merkel replied that 'politics can be tough' and explained that there are hundreds of thousands of Palestinian refugees in Lebanon, and Germany cannot absorb them all. Stunned by this no-nonsense reply, Reem burst out crying. Merkel proceeded to stroke the desperate girl on the back, but stuck to her guns.

In the ensuing public storm, many accused Merkel of cold-hearted insensitivity. To assuage criticism, Merkel changed tack, and Reem and her family were given asylum. In the following months, Merkel opened the door even wider, welcoming hundreds of thousands of refugees to Germany. But you can't please everybody. Soon enough she was under heavy attack for succumbing to sentimentalism and for not taking a sufficiently firm stand. Numerous German parents feared that Merkel's U-turn means their children will have a lower standard of living, and perhaps suffer from a tidal wave of Islamisation. Why should they risk their families' peace and prosperity for complete strangers who might not even believe in the values of liberalism? Everyone feels very strongly about this matter. How to settle the contradictions between the feelings of the desperate refugees and of the anxious Germans?[8]

Liberals forever agonise about such contradictions. The best efforts of Locke, Jefferson, Mill and their colleagues have failed to provide us with a fast and easy solution to such conundrums. Holding democratic elections won't help, because then the question will be who would get to vote in these elections – only German citizens, or also millions of Asians and Africans who want to immigrate to

Germany? Why privilege the feelings of one group over another? Likewise, you cannot resolve the Arab–Israeli conflict by making 8 million Israeli citizens and 350 million citizens of Arab League nations vote on it. For obvious reasons, the Israelis won't feel committed to the outcome of such a plebiscite.

People feel bound by democratic elections only when they share a basic bond with most other voters. If the experience of other voters is alien to me, and if I believe they don't understand my feelings and don't care about my vital interests, then even if I am outvoted by a hundred to one, I have absolutely no reason to accept the verdict. Democratic elections usually work only within populations that have some prior common bond, such as shared religious beliefs and national myths. They are a method to settle disagreements between people who already agree on the basics.

Accordingly, in many cases liberalism has fused with age-old collective identities and tribal feelings to form modern nationalism. Today many associate nationalism with anti-liberal forces, but at least during the nineteenth century nationalism was closely aligned with liberalism. Liberals celebrate the unique experiences of individual humans. Each human has distinctive feelings, tastes and quirks, which he or she should be free to express and explore as long as they don't hurt anyone else. Similarly, nineteenth-century nationalists such as Giuseppe Mazzini celebrated the uniqueness of individual nations. They emphasised that many human experiences are communal. You cannot dance the polka by yourself, and you cannot invent and preserve the German language by yourself. Using word, dance, food and drink, each nation fosters different experiences in its members, and develops its own peculiar sensitivities.

Liberal nationalists like Mazzini sought to protect these distinctive national experiences from being oppressed and obliterated by intolerant empires, and envisaged a peaceful community of nations, each free to express and explore its communal feelings without hurting its neighbours. This is still the official ideology of the European Union, whose constitution of 2004 states that Europe is 'united in diversity' and that the different peoples of Europe remain 'proud of their own national identities'. The value of preserving the unique communal experiences of the German nation enables even liberal Germans to oppose opening the floodgates of immigration.

Of course the alliance with nationalism hardly solved all conundrums, while it created a host of new problems. How do you compare the value of communal experiences with that of individual experiences? Does preserving polka, bratwurst and the German language justify leaving millions of refugees exposed to poverty and even death? And what happens when fundamental conflicts erupt within nations about the very definition of their identity, as happened in Germany in 1933, in the USA in 1861, in Spain in 1936 or in Egypt in 2011? In such cases, holding democratic elections is hardly a cure-all, because the opposing parties have no reason to respect the results.

Lastly, as you dance the nationalist polka, a small but momentous step may take you from believing that your nation is different from all other nations to believing that your nation is better. Nineteenth-century liberal nationalism required the Habsburg and tsarist empires to respect the unique experiences of Germans, Italians, Poles and Slovenes. Twentieth-century ultra-nationalism proceeded to wage wars of conquest and build concentration camps for people who dance to a different tune.

Socialist humanism has taken a very different course. Socialists blame liberals for focusing our attention on our own feelings instead of on what other people experience. Yes, the human experience is the source of all meaning, but there are billions of people in the world, and all of them are just as valuable as I am. Whereas liberalism turns my gaze inwards, emphasising my uniqueness and the uniqueness of my nation, socialism demands that I stop obsessing about me and my feelings and

instead focus on what others are feeling and about how my actions influence their experiences. Global peace will be achieved not by celebrating the distinctiveness of each nation, but by unifying all the workers of the world; and social harmony won't be achieved by each person narcissistically exploring their own inner depths, but rather by each person prioritising the needs and experiences of others over their own desires.

A liberal may reply that by exploring her own inner world she develops her compassion and her understanding of others, but such reasoning would have cut little ice with Lenin or Mao. They would have explained that individual self-exploration is a bourgeois indulgent vice, and that when I try to get in touch with my inner self, I am all too likely to fall into one or another capitalist trap. My current political views, my likes and dislikes, and my hobbies and ambitions do not reflect my authentic self. Rather, they reflect my upbringing and social surrounding. They depend on my class, and are shaped by my neighbourhood and my school. Rich and poor alike are brainwashed from birth. The rich are taught to disregard the poor, while the poor are taught to disregard their true interests. No amount of self-reflection or psychotherapy will help, because the psychotherapists are also working for the capitalist system.

Indeed, self-reflection is likely only to distance me even further from understanding the truth about myself, because it gives too much credit to personal decisions and too little credit to social conditions. If I am rich, I am likely to conclude that it is because I made wise choices. If I suffer from poverty, I must have made some mistakes. If I am depressed, a liberal therapist is likely to blame my parents, and to encourage me to set some new aims in life. If I suggest that perhaps I am depressed because I am being exploited by capitalists, and because under the prevailing social system I have no chance of realising my aims, the therapist may well say that I am projecting onto 'the social system' my own inner difficulties, and I am projecting onto 'the capitalists' unresolved issues with my mother.

According to socialism, instead of spending years talking about my mother, my emotions and my complexes, I should ask myself: who owns the means of production in my country? What are its main exports and imports? What's the connection between the ruling politicians and international banking? Only by understanding the surrounding socio-economic system and taking into account the experiences of all other people could I truly understand what I feel, and only by common action can we change the system. Yet what person can take into account the experiences of all human beings, and weigh them one against the other in a fair way?

That's why socialists discourage self-exploration, and advocate the establishment of strong collective institutions – such as socialist parties and trade unions – that aim to decipher the world for us. Whereas in liberal politics the voter knows best, and in liberal economics the customer is always right, in socialist politics the party knows best, and in socialist economics the trade union is always right. Authority and meaning still come from human experience – both the party and the trade union are composed of people and work to alleviate human misery – yet individuals must listen to the party and the trade union rather than to their personal feelings.

Evolutionary humanism has a different solution to the problem of conflicting human experiences. Rooting itself in the firm ground of Darwinian evolutionary theory, it says that conflict is something to applaud rather than lament. Conflict is the raw material of natural selection, which pushes evolution forward. Some humans are simply superior to others, and when human experiences collide, the fittest humans should steamroll everyone else. The same logic that drives humankind to exterminate wild wolves and to ruthlessly exploit domesticated sheep also mandates the oppression of inferior humans by their superiors. It's a good thing that Europeans conquer Africans and that shrewd businessmen

drive the dim-witted to bankruptcy. If we follow this evolutionary logic, humankind will gradually become stronger and fitter, eventually giving rise to superhumans. Evolution didn't stop with *Homo sapiens* – there is still a long way to go. However, if in the name of human rights or human equality we emasculate the fittest humans, it will prevent the rise of the superman, and may even cause the degeneration and extinction of *Homo sapiens*.

Who exactly are these superior humans who herald the coming of the superman? They might be entire races, particular tribes or exceptional individual geniuses. In any case, what makes them superior is that they have better abilities, manifested in the creation of new knowledge, more advanced technology, more prosperous societies or more beautiful art. The experience of an Einstein or a Beethoven is far more valuable than that of a drunken good-for-nothing, and it is ludicrous to treat them as if they have equal merit. Similarly, if a particular nation has consistently spearheaded human progress, we should rightly consider it superior to other nations that contributed little or nothing to the evolution of humankind.

Consequently, in contrast to liberal artists like Otto Dix, evolutionary humanism thinks that the human experience of war is valuable and even essential. The movie *The Third Man* takes place in Vienna immediately after the end of the Second World War. Reflecting on the recent conflict, the character Harry Lime says: 'After all, it's not that awful . . . In Italy for thirty years under the Borgias they had warfare, terror, murder and bloodshed, but they produced Michelangelo, Leonardo da Vinci and the Renaissance. In Switzerland they had brotherly love, they had 500 years of democracy and peace, and what did that produce? The cuckoo clock.' Lime gets almost all his facts wrong – Switzerland was probably the most bloodthirsty corner of early modern Europe (its main export was mercenary soldiers), and the cuckoo clock was actually invented by the Germans – but the facts are of lesser importance than Lime's idea, namely that the experience of war pushes humankind to new achievements. War allows natural selection free rein at last. It exterminates the weak and rewards the fierce and the ambitious. War exposes the truth about life, and awakens the will for power, for glory and for conquest. Nietzsche summed it up by saying that war is 'the school of life' and that 'what does not kill me makes me stronger'.

Similar ideas were expressed by Lieutenant Henry Jones of the British army. Three days before his death on the Western Front in the First World War, the twenty-one-year-old Jones sent a letter to his brother, describing the experience of war in glowing terms:

> Have you ever reflected on the fact that, despite the horrors of war, it is at least a big thing? I mean to say that in it one is brought face to face with realities. The follies, selfishness, luxury and general pettiness of the vile commercial sort of existence led by nine-tenths of the people of the world in peacetime are replaced in war by a savagery that is at least more honest and outspoken. Look at it this way: in peacetime one just lives one's own little life, engaged in trivialities, worrying about one's own comfort, about money matters, and all that sort of thing – just living for one's own self. What a sordid life it is! In war, on the other hand, even if you do get killed you only anticipate the inevitable by a few years in any case, and you have the satisfaction of knowing that you have 'pegged out' in the attempt to help your country. You have, in fact, realised an ideal, which, as far as I can see, you very rarely do in ordinary life. The reason is that ordinary life runs on a commercial and selfish basis; if you want to 'get on', as the saying is, you can't keep your hands clean.
>
> Personally, I often rejoice that the War has come my way. It has made me realise what a petty

thing life is. I think that the War has given to everyone a chance to 'get out of himself', as I might say . . . Certainly, speaking for myself, I can say that I have never in all my life experienced such a wild exhilaration as on the commencement of a big stunt, like the last April one for example. The excitement for the last half-hour or so before it is like nothing on earth.[9]

In his bestseller *Black Hawk Down*, the journalist Mark Bowden relates in similar terms the combat experience of Shawn Nelson, an American soldier, in Mogadishu in 1993:

It was hard to describe how he felt . . . it was like an epiphany. Close to death, he had never felt so completely alive. There had been split seconds in his life when he'd felt death brush past, like when another fast-moving car veered from around a sharp curve and just missed hitting him head on. On this day he had lived with that feeling, with death breathing right in his face . . . for moment after moment after moment, for three hours or more . . . Combat was . . . a state of complete mental and physical awareness. In those hours on the street he had not been Shawn Nelson, he had no connection to the larger world, no bills to pay, no emotional ties, nothing. He had just been a human being staying alive from one nanosecond to the next, drawing one breath after another, fully aware that each one might be his last. He felt he would never be the same.[10]

Adolf Hitler too was changed and enlightened by his war experiences. In *Mein Kampf*, he tells how shortly after his unit reached the front line, the soldiers' initial enthusiasm turned into fear, against which each soldier had to wage a relentless inner war, straining every nerve to avoid being overwhelmed by it. Hitler says that he won this inner war by the winter of 1915/16. 'At last,' he writes, 'my will was undisputed master . . . I was now calm and determined. And this was enduring. Now Fate could bring on the ultimate tests without my nerves shattering or my reason failing.'[11]

The experience of war revealed to Hitler the truth about the world: it is a jungle run by the remorseless laws of natural selection. Those who refuse to recognise this truth cannot survive. If you wish to succeed, you must not only understand the laws of the jungle, but embrace them joyfully. It should be stressed that just like the anti-war liberal artists, Hitler too sanctified the experience of ordinary soldiers. Indeed, Hitler's political career is one of the best examples we have for the immense authority accorded to the personal experience of common people in twentieth-century politics. Hitler wasn't a senior officer – in four years of war, he rose no higher than the rank of corporal. He had no formal education, no professional skills and no political background. He wasn't a successful businessman or a union activist, he didn't have friends or relatives in high places, or any money to speak of. At first, he didn't even have German citizenship. He was a penniless immigrant.

When Hitler appealed to the German voters and asked for their trust, he could muster only one argument in his favour: his experiences in the trenches had taught him what you can never learn at university, at general headquarters or at a government ministry. People followed him, and voted for him, because they identified with him, and because they too believed that the world is a jungle, and that what doesn't kill us only makes us stronger.

Whereas liberalism merged with the milder versions of nationalism to protect the unique experiences of each human community, evolutionary humanists such as Hitler identified particular nations as the engines of human progress, and concluded that these nations ought to bludgeon or even

exterminate anyone standing in their way. It should be remembered, though, that Hitler and the Nazis represent only one extreme version of evolutionary humanism. Just as Stalin's gulags do not automatically nullify every socialist idea and argument, so too the horrors of Nazism should not blind us to whatever insights evolutionary humanism might offer. Nazism was born from the pairing of evolutionary humanism with particular racial theories and ultra-nationalist emotions. Not all evolutionary humanists are racists, and not every belief in humankind's potential for further evolution necessarily calls for setting up police states and concentration camps.

Auschwitz should serve as a blood-red warning sign rather than as a black curtain that hides entire sections of the human horizon. Evolutionary humanism played an important part in the shaping of modern culture, and it is likely to play an even greater role in the shaping of the twenty-first century.

Is Beethoven Better than Chuck Berry?

To make sure we understand the difference between the three humanist branches, let's compare a few human experiences.

Experience no. 1: A musicology professor sits in the Vienna Opera House, listening to the opening of Beethoven's Fifth Symphony. 'Pa pa pa PAM!' As the sound waves hit his eardrums, signals travel via the auditory nerve to the brain, and the adrenal gland floods his bloodstream with adrenaline. His heartbeat accelerates, his breathing intensifies, the hairs on his neck stand up, and a shiver runs down his spine. 'Pa pa pa PAM!'

Experience no. 2: It's 1965. A Mustang convertible is speeding down the Pacific road from San Francisco to LA at full throttle. The young macho driver puts on Chuck Berry at full volume: 'Go! Go, Johnny, go, go!' As the sound waves hit his eardrums, signals travel via the auditory nerve to the brain, and the adrenal gland floods his bloodstream with adrenaline. His heartbeat accelerates, his breathing intensifies, the hairs on his neck stand up, and a shiver runs down his spine. 'Go! Go, Johnny, go, go!'

Experience no. 3: Deep in the Congolese rainforest, a pygmy hunter stands transfixed. From the nearby village, he hears a choir of girls singing their initiation song. 'Ye oh, oh. Ye oh, eh.' As the sound waves hit his eardrums, signals travel via the auditory nerve to the brain, and the adrenal gland floods his bloodstream with adrenaline. His heartbeat accelerates, his breathing intensifies, the hairs on his neck stand up, and a shiver runs down his spine. 'Ye oh, oh. Ye oh, eh.'

Experience no. 4: It's a full-moon night, somewhere in the Canadian Rockies. A wolf is standing on a hilltop, listening to the howls of a female in heat. 'Awoooooo! Awoooooo!' As the sound waves hit his eardrums, signals travel via the auditory nerve to the brain, and the adrenal gland floods his bloodstream with adrenaline. His heartbeat accelerates, his breathing intensifies, the hairs on his neck stand up, and a shiver runs down his spine. 'Awoooooo! Awoooooo!'

Which of these four experiences is the most valuable?

If you are liberal, you will tend to say that the experiences of the musicology professor, of the young driver and of the Congolese hunter are all equally valuable, and all should be equally cherished. Every human experience contributes something unique, and enriches the world with new meaning. Some people like classical music, others love rock and roll, and still others prefer traditional African chants. Music students should be exposed to the widest possible range of genres, and at the end of the day, everyone could go to the iTunes store, punch in their credit card number and buy what they like. Beauty is in the ears of the listener, and the customer is always right. The wolf,

though, isn't human, hence his experiences are far less valuable. That's why the life of a wolf is worth less than the life of a human, and why it is perfectly okay to kill a wolf in order to save a human. When all is said and done, wolves don't get to vote in any beauty contests, nor do they hold any credit cards.

This liberal approach is manifested, for example, in the *Voyager* golden record. In 1977 the Americans launched the space probe *Voyager I* on a journey to outer space. By now it has left the solar system, making it the first man-made object to traverse interstellar space. Besides state-of-the-art scientific equipment, NASA placed on board a golden record, aimed to introduce planet Earth to any inquisitive aliens who might encounter the probe.

The record contains a variety of scientific and cultural information about Earth and its inhabitants, some images and voices, and several dozen pieces of music from around the world, which are supposed to represent a fair sample of earthly artistic achievement. The musical sample mixes in no obvious order classical pieces including the opening movement of Beethoven's Fifth Symphony, contemporary popular music including Chuck Berry's 'Johnny B. Goode', and traditional music from throughout the world, including an initiation song of Congolese pygmy girls. Though the record also contains some canine howls, they are not part of the music sample, but rather relegated to a different section that also includes the sounds of wind, rain and surf. The message to potential listeners in Alpha Centauri is that Beethoven, Chuck Berry and the pygmy initiation song are of equal merit, whereas wolf howls belong to an altogether different category.

If you are socialist, you will probably agree with the liberals that the wolf's experience is of little value. But your attitude towards the three human experiences will be quite different. A socialist true-believer will explain that the real value of music depends not on the experiences of the individual listener, but on the impact it has on the experiences of other people and of society as a whole. As Mao said, 'There is no such thing as art for art's sake, art that stands above classes, art that is detached from or independent of politics.'[12]

So when coming to evaluate the musical experiences, a socialist will focus, for example, on the fact that Beethoven wrote the Fifth Symphony for an audience of upper-class white Europeans, exactly when Europe was about to embark on its conquest of Africa. His symphony reflected Enlightenment ideals, which glorified upper-class white men, and branded the conquest of Africa as 'the white man's burden'.

Rock and roll – the socialists will say – was pioneered by downtrodden African American musicians who drew inspiration from genres like blues, jazz and gospel. However, in the 1950s and 1960s rock and roll was hijacked by mainstream white America, and pressed into the service of consumerism, of American imperialism and of Coca-Colonisation. Rock and roll was commercialised and appropriated by privileged white teenagers in their petit-bourgeois fantasy of rebellion. Chuck Berry himself bowed to the dictates of the capitalist juggernaut. While he originally sang about 'a *coloured* boy named Johnny B. Goode', under pressure from white-owned radio stations Berry changed the lyrics to 'a *country* boy named Johnny B. Goode'.

As for the choir of Congolese pygmy girls – their initiation songs are part of a patriarchal power structure that brainwashes both men and women to conform to an oppressive gender order. And if a recording of such an initiation song ever makes it to the global marketplace, it merely serves to reinforce Western colonial fantasies about Africa in general and about African women in particular.

So which music is best: Beethoven's Fifth, 'Johnny B. Goode' or the pygmy initiation song? Should the government finance the building of opera houses, rock and roll venues or African-heritage exhibitions? And what should we teach music students in schools and colleges? Well, don't ask me.

Ask the party's cultural commissar.

Whereas liberals tiptoe around the minefield of cultural comparisons, fearful of committing some politically incorrect faux pas, and whereas socialists leave it to the party to find the right path through the minefield, evolutionary humanists gleefully jump right in, setting off all the mines and relishing the mayhem. They may start by pointing out that both liberals and socialists draw the line at other animals, and have no trouble admitting that humans are superior to wolves, and that consequently human music is far more valuable than wolf howls. Yet humankind itself is not exempt from the forces of evolution. Just as humans are superior to wolves, so some human cultures are more advanced than others. There is an unambiguous hierarchy of human experiences, and we shouldn't be apologetic about it. The Taj Mahal is more beautiful than a straw hut, Michelangelo's *David* is superior to my five-year-old niece's latest clay figurine, and Beethoven composed far better music than Chuck Berry or the Congolese pygmies. There, we've said it!

According to evolutionary humanists, anyone arguing that all human experiences are equally valuable is either an imbecile or a coward. Such vulgarity and timidity will lead only to the degeneration and extinction of humankind, as human progress is impeded in the name of cultural relativism or social equality. If liberals or socialists had lived in the Stone Age, they would probably have seen little merit in the murals of Lascaux and Altamira, and would have insisted that they are in no way superior to Neanderthal doodles.

The Humanist Wars of Religion

Initially, the differences between liberal humanism, socialist humanism and evolutionary humanism seemed rather frivolous. Set against the enormous gap separating all humanist sects from Christianity, Islam or Hinduism, the arguments between different versions of humanism were trifling. As long as we all agree that God is dead and that only the human experience gives meaning to the universe, does it really matter whether we think that all human experiences are equal or that some are superior to others? Yet as humanism conquered the world, these internal schisms widened, and eventually flared up into the deadliest war of religion in history.

In the first decade of the twentieth century, the liberal orthodoxy was still confident of its strength. Liberals were convinced that if we only gave individuals maximum freedom to express themselves and follow their hearts, the world would enjoy unprecedented peace and prosperity. It may take time to completely dismantle the fetters of traditional hierarchies, obscurantist religions and brutal empires, but every decade would bring new liberties and achievements, and eventually we would create paradise on earth. In the halcyon days of June 1914, liberals thought history was on their side.

By Christmas 1914 liberals were shell-shocked, and in the following decades their ideas were subjected to a double assault from both left and right. Socialists argued that liberalism is in fact a fig leaf for a ruthless, exploitative and racist system. For vaunted 'liberty', read 'property'. The defence of the individual's right to do what feels good amounts in most cases to safeguarding the property and privileges of the middle and upper classes. What good is the liberty to live where you want, when you cannot pay the rent; to study what interests you, when you cannot afford the tuition fees; and to travel where you fancy, when you cannot buy a car? Under liberalism, went a famous quip, everyone is free to starve. Even worse, by encouraging people to view themselves as isolated individuals, liberalism separates them from their other class members, and prevents them from uniting against the system that oppresses them. Liberalism thereby perpetuates inequality, condemning the masses to

poverty and the elite to alienation.

While liberalism staggered under this left punch, evolutionary humanism struck from the right. Racists and fascists blamed both liberalism and socialism for subverting natural selection and causing the degeneration of humankind. They warned that if all humans were given equal value and equal breeding opportunities, natural selection would cease to function. The fittest humans would be submerged in an ocean of mediocrity, and instead of evolving into superman, humankind would become extinct.

From 1914 to 1989 a murderous war of religion raged between the three humanist sects, and liberalism at first sustained one defeat after the other. Not only did communist and fascist regimes take over numerous countries, but the core liberal ideas were exposed as naïve at best, if not downright dangerous. Just give freedom to individuals and the world will enjoy peace and prosperity? Yeah, right.

The Second World War, which with hindsight we remember as a great liberal victory, hardly looked like that at the time. The war began as a conflict between a mighty liberal alliance and an isolated Nazi Germany. (Until June 1940, even Fascist Italy preferred to play a waiting game.) The liberal alliance enjoyed overwhelming numerical and economic superiority. While German GDP in 1940 stood at $387 million, the GDP of Germany's European opponents totalled $631 million (not including the GDP of the overseas British dominions and of the British, French, Dutch and Belgian empires). Still, in the spring of 1940 it took Germany a mere three months to deal the liberal alliance a decisive blow, and occupy France, the Low Countries, Norway and Denmark. The UK was saved from a similar fate only by the English Channel.[13]

The Germans were eventually beaten only when the liberal countries allied themselves with the Soviet Union, which bore the brunt of the conflict and paid a much higher price: 25 million Soviet citizens died in the war, compared to half a million Britons and half a million Americans. Much of the credit for defeating Nazism should be given to communism. And at least in the short term, communism was also the great beneficiary of the war.

The Soviet Union entered the war as an isolated communist pariah. It emerged as one of the two global superpowers, and the leader of an expanding international bloc. By 1949 eastern Europe became a Soviet satellite, the Chinese Communist Party won the Chinese Civil War, and the United States was gripped by anti-communist hysteria. Revolutionary and anti-colonial movements throughout the world looked longingly towards Moscow and Beijing, while liberalism became identified with the racist European empires. As these empires collapsed, they were usually replaced by either military dictatorships or socialist regimes, not liberal democracies. In 1956 the Soviet premier, Nikita Khrushchev, confidently told the liberal West that 'Whether you like it or not, history is on our side. We will bury you!'

Khrushchev sincerely believed this, as did increasing numbers of Third World leaders and First World intellectuals. In the 1960s and 1970s the word 'liberal' became a term of abuse in many Western universities. North America and western Europe experienced growing social unrest, as radical left-wing movements strove to undermine the liberal order. Students in Paris, London, Rome and the People's Republic of Berkeley thumbed through Chairman Mao's Little Red Book, and hung Che Guevara's heroic portrait over their beds. In 1968 the wave crested with the outbreak of protests and riots all over the Western world. Mexican security forces killed dozens of students in the notorious Tlatelolco Massacre, students in Rome fought the Italian police in the so-called Battle of Valle Giulia, and the assassination of Martin Luther King sparked days of riots and protests in more than a hundred American cities. In May students took over the streets of Paris, President de Gaulle

fled to a French military base in Germany, and well-to-do French citizens trembled in their beds, having guillotine nightmares.

By 1970 the world contained 130 independent countries, but only thirty of these were liberal democracies, most of which were crammed into the north-western corner of Europe. India was the only important Third World country that committed to the liberal path after securing its independence, but even India distanced itself from the Western bloc, and leaned towards the Soviets.

In 1975 the liberal camp suffered its most humiliating defeat of all: the Vietnam War ended with the North Vietnamese David overcoming the American Goliath. In quick succession communism took over South Vietnam, Laos and Cambodia. On 17 April 1975 the Cambodian capital, Phnom Penh, fell to the Khmer Rouge. Two weeks later, people all over the world watched as helicopters evacuated the last Yankees from the rooftop of the American Embassy in Saigon. Many were certain that the American Empire was falling. Before anyone could say 'domino theory', on 25 June Indira Gandhi proclaimed the Emergency in India, and it seemed that the world's largest democracy was on its way to becoming yet another socialist dictatorship.

Liberal democracy increasingly looked like an exclusive club for ageing white imperialists, who had little to offer the rest of the world, or even their own youth. Washington presented itself as the leader of the free world, but most of its allies were either authoritarian kings (such as King Khaled of Saudi Arabia, King Hassan of Morocco and the Persian shah) or military dictators (such as the Greek colonels, General Pinochet in Chile, General Franco in Spain, General Park in South Korea, General Geisel in Brazil and Generalissimo Chiang Kai-shek in Taiwan).

Despite the support of all these colonels and generals, militarily the Warsaw Pact had a huge numerical superiority over NATO. In order to reach parity in conventional armament, Western countries would probably have had to scrap liberal democracy and the free market, and become totalitarian states on a permanent war footing. Liberal democracy was saved only by nuclear weapons. NATO adopted the doctrine of MAD (mutual assured destruction), according to which even conventional Soviet attacks would be answered by an all-out nuclear strike. 'If you attack us,' threatened the liberals, 'we will make sure nobody comes out of it alive.' Behind this monstrous shield, liberal democracy and the free market managed to hold out in their last bastions, and Westerners could enjoy sex, drugs and rock and roll, as well as washing machines, refrigerators and televisions. Without nukes, there would have been no Woodstock, no Beatles and no overflowing supermarkets. But in the mid-1970s it seemed that nuclear weapons notwithstanding, the future belonged to socialism.



The evacuation of the American Embassy in Saigon.

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And then everything changed. Liberal democracy crawled out of history's dustbin, cleaned itself up and conquered the world. The supermarket proved to be far stronger than the gulag. The blitzkrieg began in southern Europe, where the authoritarian regimes in Greece, Spain and Portugal collapsed, giving way to democratic governments. In 1977 Indira Gandhi ended the Emergency, re-establishing democracy in India. During the 1980s military dictatorships in East Asia and Latin America were replaced by democratic governments in countries such as Brazil, Argentina, Taiwan and South Korea. In the late 1980s and early 1990s the liberal wave turned into a veritable tsunami, sweeping away the mighty Soviet Empire, and raising expectations of the coming end of history. After decades of defeats and setbacks, liberalism won a decisive victory in the Cold War, emerging triumphant from the humanist wars of religion, albeit a bit worse for wear.

As the Soviet Empire imploded, liberal democracies replaced communist regimes not only in eastern Europe, but also in many of the former Soviet republics, such as the Baltic States, Ukraine, Georgia and Armenia. Even Russia nowadays pretends to be a democracy. Victory in the Cold War gave renewed impetus for the spread of the liberal model elsewhere around the world, most notably in Latin America, South Asia and Africa. Some liberal experiments ended in abject failures, but the number of success stories is impressive. For instance, Indonesia, Nigeria and Chile have been ruled by military strongmen for decades, but all are now functioning democracies.

If a liberal had fallen asleep in June 1914 and woken up in June 2014, he or she would have felt very much at home. Once again people believe that if you just give individuals more freedom, the world will enjoy peace and prosperity. The entire twentieth century looks like a big mistake. Humankind was speeding on the liberal highway back in the summer of 1914, when it took a wrong turn and entered a cul-de-sac. It then needed eight decades and three horrendous global wars to find its way back to the highway. Of course, these decades were not a total waste, as they did give us antibiotics, nuclear energy and computers, as well as feminism, de-colonialism and free sex. In addition, liberalism itself smarted from the experience, and is less conceited than it was a century ago. It has adopted various ideas and institutions from its socialist and fascist rivals, in particular a commitment to provide the general public with education, health and welfare services. Yet the core liberal package has changed surprisingly little. Liberalism still sanctifies individual liberties above all, and still has a firm belief in the voter and the customer. In the early twenty-first century, this is the only show in town.

Electricity, Genetics and Radical Islam

As of 2016, there is no serious alternative to the liberal package of individualism, human rights, democracy and a free market. The social protests that swept the Western world in 2011 – such as Occupy Wall Street and the Spanish 15-M movement – have absolutely nothing against democracy, individualism and human rights, or even against the basic principles of free-market economics. Just the opposite – they take governments to task for not living up to these liberal ideals. They demand that the market be really free, instead of being controlled and manipulated by corporations and banks 'too big to fail'. They call for truly representative democratic institutions, which will serve the interests of ordinary citizens rather than of moneyed lobbyists and powerful interest groups. Even those blasting

stock exchanges and parliaments with the harshest criticism don't have a viable alternative model for running the world. While it is a favourite pastime of Western academics and activists to find fault with the liberal package, they have so far failed to come up with anything better.

China seems to offer a much more serious challenge than Western social protestors. Despite liberalising its politics and economics, China is neither a democracy nor a truly free-market economy, which does not prevent it from becoming the economic giant of the twenty-first century. Yet this economic giant casts a very small ideological shadow. Nobody seems to know what the Chinese believe these days – including the Chinese themselves. In theory China is still communist, but in practice it is nothing of the kind. Some Chinese thinkers and leaders toy with a return to Confucianism, but that's hardly more than a convenient veneer. This ideological vacuum makes China the most promising breeding ground for the new techno-religions emerging from Silicon Valley (which we will discuss in the following chapters). But these techno-religions, with their belief in immortality and virtual paradises, would take at least a decade or two to establish themselves. Hence at present, China doesn't pose a real alternative to liberalism. If bankrupted Greeks despair of the liberal model and search for a substitute, 'imitating the Chinese' doesn't mean much.

How about radical Islam, then? Or fundamentalist Christianity, messianic Judaism and revivalist Hinduism? Whereas the Chinese don't know what they believe, religious fundamentalists know it only too well. More than a century after Nietzsche pronounced Him dead, God seems to be making a comeback. But this is a mirage. God *is* dead – it just takes a while to get rid of the body. Radical Islam poses no serious threat to the liberal package, because for all their fervour, the zealots don't really understand the world of the twenty-first century, and have nothing relevant to say about the novel dangers and opportunities that new technologies are generating all around us.

Religion and technology always dance a delicate tango. They push one another, depend on one another and cannot stray too far away from one another. Technology depends on religion, because every invention has many potential applications, and the engineers need some prophet to make the crucial choice and point towards the required destination. Thus in the nineteenth century engineers invented locomotives, radios and internal combustion engines. But as the twentieth century proved, you can use these very same tools to create fascist societies, communist dictatorships and liberal democracies. Without some religious convictions, the locomotives cannot decide where to go.

On the other hand, technology often defines the scope and limits of our religious visions, like a waiter that demarcates our appetites by handing us a menu. New technologies kill old gods and give birth to new gods. That's why agricultural deities were different from hunter-gatherer spirits, why factory hands fantasise about different paradises than peasants and why the revolutionary technologies of the twenty-first century are far more likely to spawn unprecedented religious movements than to revive medieval creeds. Islamic fundamentalists may repeat the mantra that 'Islam is the answer', but religions that lose touch with the technological realities of the day lose their ability even to understand the questions being asked. What will happen to the job market once artificial intelligence outperforms humans in most cognitive tasks? What will be the political impact of a massive new class of economically useless people? What will happen to relationships, families and pension funds when nanotechnology and regenerative medicine turn eighty into the new fifty? What will happen to human society when biotechnology enables us to have designer babies, and to open unprecedented gaps between rich and poor?

You will not find the answers to any of these questions in the Qur'an or sharia law, nor in the Bible or in the Confucian *Analects*, because nobody in the medieval Middle East or in ancient China knew much about computers, genetics or nanotechnology. Radical Islam may promise an anchor of certainty

in a world of technological and economic storms – but in order to navigate a storm, you need a map and a rudder rather than just an anchor. Hence radical Islam may appeal to people born and raised in its fold, but it has precious little to offer unemployed Spanish youths or anxious Chinese billionaires.

True, hundreds of millions may nevertheless go on believing in Islam, Christianity or Hinduism. But numbers alone don't count for much in history. History is often shaped by small groups of forward-looking innovators rather than by the backward-looking masses. Ten thousand years ago most people were hunter-gatherers and only a few pioneers in the Middle East were farmers. Yet the future belonged to the farmers. In 1850 more than 90 per cent of humans were peasants, and in the small villages along the Ganges, the Nile and the Yangtze nobody knew anything about steam engines, railroads or telegraph lines. Yet the fate of these peasants had already been sealed in Manchester and Birmingham by the handful of engineers, politicians and financiers who spearheaded the Industrial Revolution. Steam engines, railroads and telegraphs transformed the production of food, textiles, vehicles and weapons, giving industrial powers a decisive edge over traditional agricultural societies.

Even when the Industrial Revolution spread around the world and penetrated up the Ganges, Nile and Yangtze, most people continued to believe in the Vedas, the Bible, the Qur'an and the *Analects* more than in the steam engine. As today, so too in the nineteenth century there was no shortage of priests, mystics and gurus who argued that they alone hold the solution to all of humanity's woes, including to the new problems created by the Industrial Revolution. For example, between the 1820s and 1880s Egypt (backed by Britain) conquered Sudan, and tried to modernise the country and incorporate it into the new international trade network. This destabilised traditional Sudanese society, creating widespread resentment and fostering revolts. In 1881 a local religious leader, Muhammad Ahmad bin Abdallah, declared that he was the Mahdi (the Messiah), sent to establish the law of God on earth. His supporters defeated the Anglo-Egyptian army, and beheaded its commander – General Charles Gordon – in a gesture that shocked Victorian Britain. They then established in Sudan an Islamic theocracy governed by sharia law, which lasted until 1898.

Meanwhile in India, Dayananda Saraswati headed a Hindu revival movement, whose basic principle was that the Vedic scriptures are never wrong. In 1875 he founded the Arya Samaj (Noble Society), dedicated to the spreading of Vedic knowledge – though truth be told, Dayananda often interpreted the Vedas in a surprisingly liberal way, supporting for example equal rights for women long before the idea became popular in the West.

Dayananda's contemporary, Pope Pius IX, had much more conservative views about women, but shared Dayananda's admiration for superhuman authority. Pius led a series of reforms in Catholic dogma, and established the novel principle of papal infallibility, according to which the Pope can never err in matters of faith (this seemingly medieval idea became binding Catholic dogma only in 1870, eleven years after Charles Darwin published *On the Origin of Species*).

Thirty years before the Pope discovered that he is incapable of making mistakes, a failed Chinese scholar called Hong Xiuquan had a succession of religious visions. In these visions, God revealed that Hong was none other than the younger brother of Jesus Christ. God then invested Hong with a divine mission. He told Hong to expel the Manchu 'demons' that had ruled China since the seventeenth century, and establish on earth the Great Peaceful Kingdom of Heaven (Taiping Tiānguó). Hong's message fired the imagination of millions of desperate Chinese, who were shaken by China's defeats in the Opium Wars and by the coming of modern industry and European imperialism. But Hong did not lead them to a kingdom of peace. Rather, he led them against the Manchu Qing dynasty in the Taiping Rebellion – the deadliest war of the nineteenth century. From 1850 to 1864, at least 20

million people lost their lives; far more than in the Napoleonic Wars or in the American Civil War.

Hundreds of millions clung to the religious dogmas of Hong, Dayananda, Pius and the Mahdi even as industrial factories, railroads and steamships filled the world. Yet most of us don't think about the nineteenth century as the age of faith. When we think of nineteenth-century visionaries, we are far more likely to recall Marx, Engels and Lenin than the Mahdi, Pius IX or Hong Xiuquan. And rightly so. Though in 1850 socialism was only a fringe movement, it soon gathered momentum, and changed the world in far more profound ways than the self-proclaimed messiahs of China and Sudan. If you count on national health services, pension funds and free schools, you need to thank Marx and Lenin (and Otto von Bismarck) far more than Hong Xiuquan or the Mahdi.

Why did Marx and Lenin succeed where Hong and the Mahdi failed? Not because socialist humanism was philosophically more sophisticated than Islamic and Christian theology, but rather because Marx and Lenin devoted more attention to understanding the technological and economic realities of their time than to perusing ancient texts and prophetic dreams. Steam engines, railroads, telegraphs and electricity created unheard-of problems as well as unprecedented opportunities. The experiences, needs and hopes of the new class of urban proletariats were simply too different from those of biblical peasants. To answer these needs and hopes, Marx and Lenin studied how a steam engine functions, how a coal mine operates, how railroads shape the economy and how electricity influences politics.

Lenin was once asked to define communism in a single sentence. 'Communism is power to worker councils,' he said, 'plus electrification of the whole country.' There can be no communism without electricity, without railroads, without radio. You couldn't establish a communist regime in sixteenth-century Russia, because communism necessitates the concentration of information and resources in one hub. 'From each according to his ability, to each according to his needs' only works when produce can easily be collected and distributed across vast distances, and when activities can be monitored and coordinated over entire countries.

Marx and his followers understood the new technological realities and the new human experiences, so they had relevant answers to the new problems of industrial society, as well as original ideas about how to benefit from the unprecedented opportunities. The socialists created a brave new religion for a brave new world. They promised salvation through technology and economics, thus establishing the first techno-religion in history, and changing the foundations of ideological discourse. Before Marx, people defined and divided themselves according to their views about God, not about production methods. Since Marx, questions of technology and economic structure became far more important and divisive than debates about the soul and the afterlife. In the second half of the twentieth century, humankind almost obliterated itself in an argument about production methods. Even the harshest critics of Marx and Lenin adopted their basic attitude towards history and society, and began thinking about technology and production much more carefully than about God and heaven.

In the mid-nineteenth century, few people were as perceptive as Marx, hence only a few countries underwent rapid industrialisation. These few countries conquered the world. Most societies failed to understand what was happening, and they therefore missed the train of progress. Dayananda's India and the Mahdi's Sudan remained far more preoccupied with God than with steam engines, hence they were occupied and exploited by industrial Britain. Only in the last few years has India managed to make significant progress in closing the economic and geopolitical gap separating it from Britain. Sudan is still struggling far behind.

In the early twenty-first century the train of progress is again pulling out of the station – and this will

probably be the last train ever to leave the station called *Homo sapiens*. Those who miss this train will never get a second chance. In order to get a seat on it, you need to understand twenty-first-century technology, and in particular the powers of biotechnology and computer algorithms. These powers are far more potent than steam and the telegraph, and they will not be used merely for the production of food, textiles, vehicles and weapons. The main products of the twenty-first century will be bodies, brains and minds, and the gap between those who know how to engineer bodies and brains and those who do not will be far bigger than the gap between Dickens's Britain and the Mahdi's Sudan. Indeed, it will be bigger than the gap between Sapiens and Neanderthals. In the twenty-first century, those who ride the train of progress will acquire divine abilities of creation and destruction, while those left behind will face extinction.

Socialism, which was very up to date a hundred years ago, failed to keep up with the new technology. Leonid Brezhnev and Fidel Castro held on to ideas that Marx and Lenin formulated in the age of steam, and did not understand the power of computers and biotechnology. Liberals, in contrast, adapted far better to the information age. This partly explains why Khrushchev's 1956 prediction never materialised, and why it was the liberal capitalists who eventually buried the Marxists. If Marx came back to life today, he would probably urge his few remaining disciples to devote less time to reading *Das Kapital* and more time to studying the Internet and the human genome.

Radical Islam is in a far worse position than socialism. It has not yet even come to terms with the Industrial Revolution – no wonder it has little of relevance to say about genetic engineering and artificial intelligence. Islam, Christianity and other traditional religions are still important players in the world. Yet their role is now largely reactive. In the past, they were a creative force. Christianity, for example, spread the hitherto heretical idea that all humans are equal before God, thereby changing human political structures, social hierarchies and even gender relations. In his Sermon on the Mount, Jesus went further, insisting that the meek and oppressed are God's favourite people, thus turning the pyramid of power on its head, and providing ammunition for generations of revolutionaries.

In addition to social and ethical reforms, Christianity was responsible for important economic and technological innovations. The Catholic Church established medieval Europe's most sophisticated administrative system, and pioneered the use of archives, catalogues, timetables and other techniques of data processing. The Vatican was the closest thing twelfth-century Europe had to Silicon Valley. The Church established Europe's first economic corporations – the monasteries – which for 1,000 years spearheaded the European economy and introduced advanced agricultural and administrative methods. Monasteries were the first institutions to use clocks, and for centuries they and the cathedral schools were the most important learning centres of Europe, helping to found many of Europe's first universities, such as Bologna, Oxford and Salamanca.

Today the Catholic Church continues to enjoy the loyalties and tithes of hundreds of millions of followers. Yet it and the other theist religions have long since turned from a creative into a reactive force. They are busy with rearguard holding operations more than with pioneering novel technologies, innovative economic methods or groundbreaking social ideas. They now mostly agonise over the technologies, methods and ideas propagated by other movements. Biologists invent the contraceptive pill – and the Pope doesn't know what to do about it. Computer scientists develop the Internet – and rabbis argue whether orthodox Jews should be allowed to surf it. Feminist thinkers call upon women to take possession of their bodies – and learned muftis debate how to confront such incendiary ideas.

Ask yourself: what was the most influential discovery, invention or creation of the twentieth century? That's a difficult question, because it is hard to choose from a long list of candidates, including scientific discoveries such as antibiotics, technological inventions such as computers, and

ideological creations such as feminism. Now ask yourself: what was the most influential discovery, invention or creation of traditional religions such as Islam and Christianity in the twentieth century? This too is a very difficult question, because there is so little to choose from. What did priests, rabbis and muftis discover in the twentieth century that can be mentioned in the same breath as antibiotics, computers or feminism? Having mulled over these two questions, from where do you think the big changes of the twenty-first century will emerge: from the Islamic State, or from Google? Yes, the Islamic State knows how to put videos on YouTube; but leaving aside the industry of torture, how many new start-ups have emerged from Syria or Iraq lately?

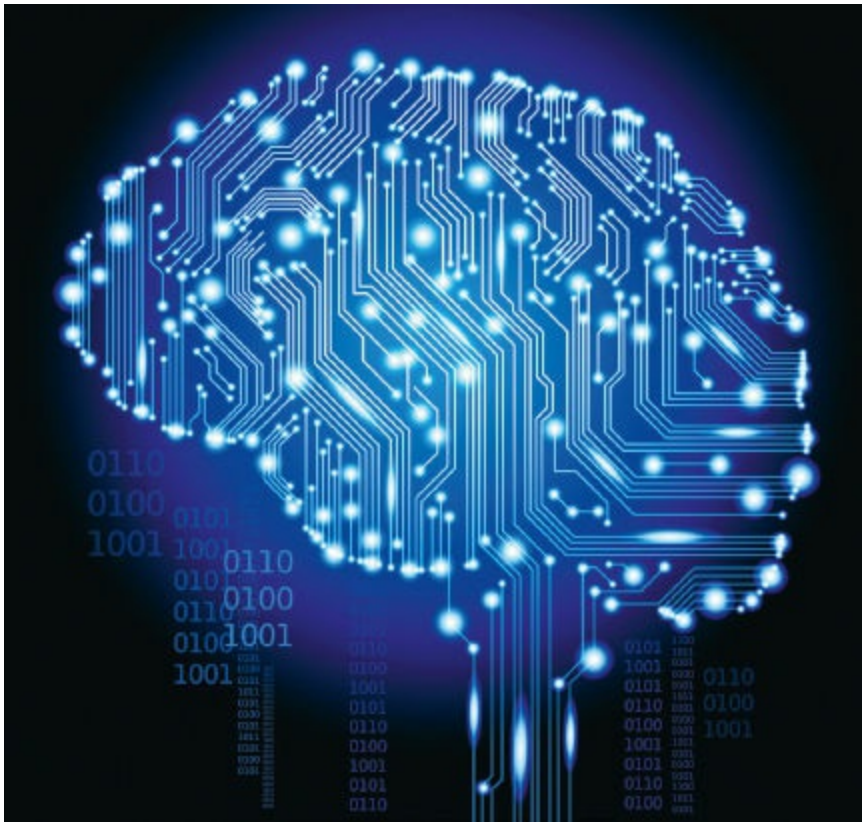
Billions of people, including many scientists, continue to use religious scriptures as a source of authority, but these texts are no longer a source of creativity. Think, for example, about the acceptance of gay marriage or female clergy by the more progressive branches of Christianity. Where did this acceptance originate? Not from reading the Bible, St Augustine or Martin Luther. Rather, it came from reading texts like Michel Foucault's *The History of Sexuality* or Donna Haraway's 'A Cyborg Manifesto'.[14] Yet Christian true-believers – however progressive – cannot admit to drawing their ethics from Foucault and Haraway. So they go back to the Bible, to St Augustine and to Martin Luther, and make a very thorough search. They read page after page and story after story with the utmost attention, until they find what they need: some maxim, parable or ruling that if interpreted creatively enough means that God blesses gay marriages and that women can be ordained to the priesthood. They then pretend the idea originated in the Bible, when in fact it originated with Foucault. The Bible is kept as a source of authority, even though it is no longer a true source of inspiration.

That's why traditional religions offer no real alternative to liberalism. Their scriptures don't have anything to say about genetic engineering or artificial intelligence, and most priests, rabbis and muftis don't understand the latest breakthroughs in biology and computer science. For if you want to understand these breakthroughs, you don't have much choice – you need to spend time reading scientific articles and conducting lab experiments instead of memorising and debating ancient texts.

That doesn't mean liberalism can rest on its laurels. True, it has won the humanist wars of religion, and as of 2016 it has no viable alternative. But its very success may contain the seeds of its ruin. The triumphant liberal ideals are now pushing humankind to reach for immortality, bliss and divinity. Egged on by the allegedly infallible wishes of customers and voters, scientists and engineers devote more and more energies to these liberal projects. Yet what the scientists are discovering and what the engineers are developing may unwittingly expose both the inherent flaws in the liberal world view and the blindness of customers and voters. When genetic engineering and artificial intelligence reveal their full potential, liberalism, democracy and free markets might become as obsolete as flint knives, tape cassettes, Islam and communism.

This book began by forecasting that in the twenty-first century, humans will try to attain immortality, bliss and divinity. This forecast isn't very original or far-sighted. It simply reflects the traditional ideals of liberal humanism. Since humanism has long sanctified the life, the emotions and the desires of human beings, it's hardly surprising that a humanist civilisation will want to maximise human lifespans, human happiness and human power. Yet the third and final part of the book will argue that attempting to realise this humanist dream will undermine its very foundations, by unleashing new post-humanist technologies. The humanist belief in feelings has enabled us to benefit from the fruits of the modern covenant without paying its price. We don't need any gods to limit our power and give us meaning – the free choices of customers and voters supply us with all the meaning we require. What, then, will happen once we realise that customers and voters never make free choices, and once we have the technology to calculate, design or outsmart their feelings? If the whole

universe is pegged to the human experience, what will happen once the human experience becomes just another designable product, no different in essence from any other item in the supermarket?



Brains as computers – computers as brains. Artificial intelligence is now poised to surpass human intelligence.

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PART III
Homo Sapiens Loses Control

Can humans go on running the world and giving it meaning?
How do biotechnology and artificial intelligence threaten humanism?
Who might inherit humankind, and what new religion might replace humanism?

8
The Time Bomb in the Laboratory

In 2016 the world is dominated by the liberal package of individualism, human rights, democracy and the free market. Yet twenty-first-century science is undermining the foundations of the liberal order. Because science does not deal with questions of value, it cannot determine whether liberals are right in valuing liberty more than equality, or in valuing the individual more than the collective. However, like every other religion, liberalism too is based on what it believes to be factual statements, in addition to abstract ethical judgements. And these factual statements just don't stand up to rigorous scientific scrutiny.

Liberals value individual liberty so much because they believe that humans have free will. According to liberalism, the decisions of voters and customers are neither deterministic nor random. People are of course influenced by external forces and chance events, but at the end of the day each of us can wave the magic wand of freedom and decide things for ourselves. This is the reason liberalism gives so much importance to voters and customers, and instructs us to follow our heart and do what feels good. It is our free will that imbues the universe with meaning, and since no outsider can know how you really feel or predict your choices for sure, you shouldn't trust any Big Brother to look after your interests and desires.

Attributing free will to humans is *not* an ethical judgement – it purports to be a factual description of the world. Although this so-called factual description might have made sense back in the days of Locke, Rousseau and Thomas Jefferson, it does not sit well with the latest findings of the life sciences. The contradiction between free will and contemporary science is the elephant in the laboratory, whom many prefer not to see as they peer into their microscopes and fMRI scanners.[1]

In the eighteenth century *Homo sapiens* was like a mysterious black box, whose inner workings were beyond our grasp. Hence when scholars asked why a man drew a knife and stabbed another to death, an acceptable answer said: 'Because he chose to. He used his free will to choose murder, which is why he is fully responsible for his crime.' Over the last century, as scientists opened up the Sapiens black box, they discovered there neither soul, nor free will, nor 'self' – but only genes, hormones and neurons that obey the same physical and chemical laws governing the rest of reality. Today, when scholars ask why a man drew a knife and stabbed someone death, answering 'Because he chose to' doesn't cut the mustard. Instead, geneticists and brain scientists provide a much more detailed answer: 'He did it due to such-and-such electrochemical processes in the brain, which were shaped by a particular genetic make-up, which reflect ancient evolutionary pressures coupled with chance mutations.'

The electrochemical brain processes that result in murder are either deterministic or random or a combination of both – but they are never free. For example, when a neuron fires an electric charge, this may either be a deterministic reaction to external stimuli, or it might be the outcome of a random event such as the spontaneous decomposition of a radioactive atom. Neither option leaves any room

for free will. Decisions reached through a chain reaction of biochemical events, each determined by a previous event, are certainly not free. Decisions resulting from random subatomic accidents aren't free either. They are just random. And when random accidents combine with deterministic processes, we get probabilistic outcomes, but this too doesn't amount to freedom.

Suppose we build a robot whose central processing unit is linked to a radioactive lump of uranium. When choosing between two options – say, press the right button or the left button – the robot counts the number of uranium atoms that decayed during the previous minute. If the number is even – it presses the right button. If the number is odd – the left button. We can never be certain about the actions of such a robot. But nobody would call this contraption 'free', and we wouldn't dream of allowing it to vote in democratic elections or holding it legally responsible for its actions.

To the best of our scientific understanding, determinism and randomness have divided the entire cake between them, leaving not even a crumb for 'freedom'. The sacred word 'freedom' turns out to be, just like 'soul', an empty term that carries no discernible meaning. Free will exists only in the imaginary stories we humans have invented.

The last nail in freedom's coffin is provided by the theory of evolution. Just as evolution cannot be squared with eternal souls, neither can it swallow the idea of free will. For if humans are free, how could natural selection have shaped them? According to the theory of evolution, all the choices animals make – whether of residence, food or mates – reflect their genetic code. If, thanks to its fit genes, an animal chooses to eat a nutritious mushroom and copulate with healthy and fertile mates, these genes pass on to the next generation. If, because of unfit genes, an animal chooses poisonous mushrooms and anaemic mates, these genes become extinct. However, if an animal 'freely' chooses what to eat and with whom to mate, then natural selection is left with nothing to work on.

When confronted with such scientific explanations, people often brush them aside, pointing out that they *feel* free, and that they act according to their own wishes and decisions. This is true. Humans act according to their desires. If by 'free will' you mean the ability to act according to your desires – then yes, humans have free will, and so do chimpanzees, dogs and parrots. When Polly wants a cracker, Polly eats a cracker. But the million-dollar question is not whether parrots and humans can act out their inner desires – the question is whether they can *choose their desires in the first place*. Why does Polly want a cracker rather than a cucumber? Why do I decide to kill my annoying neighbour instead of turning the other cheek? Why do I want to buy the red car rather than the black? Why do I prefer voting for the Conservatives rather than the Labour Party? I don't choose any of these wishes. I feel a particular wish welling up within me because this is the feeling created by the biochemical processes in my brain. These processes might be deterministic or random, but not free.

You might reply that at least in the case of major decisions such as murdering a neighbour or electing a government, my choice does not reflect a momentary feeling, but a long and reasoned contemplation of weighty arguments. However, there are many possible trains of arguments I could follow, some of which will cause me to vote Conservative, others to vote Labour, and still others to vote UKIP or just stay at home. What makes me board one train of reasoning rather than another? In the Paddington of my brain, I may be compelled to get on a particular train of reasoning by deterministic processes, or I may embark at random. But I don't 'freely' choose to think those thoughts that will make me vote Conservative.

These are not just hypotheses or philosophical speculations. Today we can use brain scanners to predict people's desires and decisions well before they are aware of them. In one kind of experiment, people are placed within a huge brain scanner, holding a switch in each hand. They are asked to press one of the two switches whenever they feel like it. Scientists observing neural activity in the brain

can predict which switch the person will press well before the person actually does so, and even before the person is aware of their own intention. Neural events in the brain indicating the person's decision begin from a few hundred milliseconds to a few seconds *before* the person is aware of this choice.[2]

The decision to press either the right or left switch certainly reflected the person's choice. Yet it wasn't a *free* choice. In fact, our belief in free will results from faulty logic. When a biochemical chain reaction makes me desire to press the right switch, I feel that I really want to press the right switch. And this is true. I really want to press it. Yet people erroneously jump to the conclusion that if I want to press it, I *choose* to want to. This is of course false. I don't *choose* my desires. I only *feel* them, and act accordingly.

People nevertheless go on arguing about free will because even scientists all too often continue to use outdated theological concepts. Christian, Muslim and Jewish theologians debated for centuries the relations between the soul and the will. They assumed that every human has an internal inner essence – called the soul – which is my true self. They further maintained that this self possesses various desires, just as it possesses clothes, vehicles and houses. I allegedly choose my desires in the same way I choose my clothes, and my fate is determined according to these choices. If I choose good desires, I go to heaven. If I choose bad desires, I am sent to hell. The question then arose, how exactly do I choose my desires? Why, for example, did Eve desire to eat the forbidden fruit the snake offered her? Was this desire forced upon her? Did this desire just pop up within her by pure chance? Or did she choose it 'freely'? If she didn't choose it freely, why punish her for it?

However, once we accept that there is no soul, and that humans have no inner essence called 'the self', it no longer makes sense to ask, 'How does the self choose its desires?' It's like asking a bachelor, 'How does your wife choose her clothes?' In reality, there is only a stream of consciousness, and desires arise and pass within this stream, but there is no permanent self who owns the desires, hence it is meaningless to ask whether I choose my desires deterministically, randomly or freely.

It may sound extremely complicated, but it is surprisingly easy to test this idea. Next time a thought pops up in your mind, stop and ask yourself: 'Why did I think this particular thought? Did I decide a minute ago to think this thought, and only then did I think it? Or did it just arise in my mind, without my permission or instruction? If I am indeed the master of my thoughts and decisions, can I decide not to think about anything at all for the next sixty seconds?' Just try, and see what happens.

Doubting free will is not just a philosophical exercise. It has practical implications. If organisms indeed lack free will, it implies we could manipulate and even control their desires using drugs, genetic engineering or direct brain stimulation.

If you want to see philosophy in action, pay a visit to a robo-rat laboratory. A robo-rat is a run-of-the-mill rat with a twist: scientists have implanted electrodes into the sensory and reward areas in the rat's brain. This enables the scientists to manoeuvre the rat by remote control. After short training sessions, researchers have managed not only to make the rats turn left or right, but also to climb ladders, sniff around garbage piles, and do things that rats normally dislike, such as jumping from great heights. Armies and corporations show keen interest in the robo-rats, hoping they could prove useful in many tasks and situations. For example, robo-rats could help detect survivors trapped under collapsed buildings, locate bombs and booby traps, and map underground tunnels and caves.

Animal-welfare activists have voiced concern about the suffering such experiments inflict on the rats. Professor Sanjiv Talwar of the State University of New York, one of the leading robo-rat

researchers, has dismissed these concerns, arguing that the rats actually enjoy the experiments. After all, explains Talwar, the rats 'work for pleasure' and when the electrodes stimulate the reward centre in their brain, 'the rat feels Nirvana'.[3]

To the best of our understanding, the rat doesn't feel that somebody else controls her, and she doesn't feel that she is being coerced to do something against her will. When Professor Talwar presses the remote control, the rat *wants* to move to the left, which is why she moves to the left. When the professor presses another switch, the rat *wants* to climb a ladder, which is why she climbs the ladder. After all, the rat's desires are nothing but a pattern of firing neurons. What does it matter whether the neurons are firing because they are stimulated by other neurons, or because they are stimulated by transplanted electrodes connected to Professor Talwar's remote control? If you asked the rat about it, she might well have told you, 'Sure I have free will! Look, I want to turn left – and I turn left. I want to climb a ladder – and I climb a ladder. Doesn't that prove that I have free will?'

Experiments performed on *Homo sapiens* indicate that like rats humans too can be manipulated, and that it is possible to create or annihilate even complex feelings such as love, anger, fear and depression by stimulating the right spots in the human brain. The US military has recently initiated experiments on implanting computer chips in people's brains, hoping to use this method to treat soldiers suffering from post-traumatic stress disorder.[4] In Hadassah Hospital in Jerusalem, doctors have pioneered a novel treatment for patients suffering from acute depression. They implant electrodes into the patient's brain, and wire the electrodes to a minuscule computer implanted into the patient's breast. On receiving a command from the computer, the electrodes use weak electric currents to paralyse the brain area responsible for the depression. The treatment does not always succeed, but in some cases patients reported that the feeling of dark emptiness that tormented them throughout their lives disappeared as if by magic.

One patient complained that several months after the operation, he had a relapse, and was overcome by severe depression. Upon inspection, the doctors found the source of the problem: the computer's battery had run out of power. Once they changed the battery, the depression quickly melted away.[5]

Due to obvious ethical restrictions, researchers implant electrodes into human brains only under special circumstances. Hence most relevant experiments on humans are conducted using non-intrusive helmet-like devices (technically known as 'transcranial direct current stimulators'). The helmet is fitted with electrodes that attach to the scalp from outside. It produces weak electromagnetic fields and directs them towards specific brain areas, thereby stimulating or inhibiting select brain activities.

The American military experiments with such helmets in the hope of sharpening the focus and enhancing the performance of soldiers both in training sessions and on the battlefield. The main experiments are conducted in the Human Effectiveness Directorate, which is located in an Ohio air force base. Though the results are far from conclusive, and though the hype around transcranial stimulators currently runs far ahead of actual achievements, several studies have indicated that the method may indeed enhance the cognitive abilities of drone operators, air-traffic controllers, snipers and other personnel whose duties require them to remain highly attentive for extended periods.[6]

Sally Adee, a journalist for the *New Scientist*, was allowed to visit a training facility for snipers and test the effects herself. At first, she entered a battlefield simulator without wearing the transcranial helmet. Sally describes how fear swept over her as she saw twenty masked men, strapped with suicide bombs and armed with rifles, charge straight towards her. 'For every one I manage to shoot dead,' writes Sally, 'three new assailants pop up from nowhere. I'm clearly not

shooting fast enough, and panic and incompetence are making me continually jam my rifle.' Luckily for her, the assailants were just video images, projected on huge screens all around her. Still, she was so disappointed with her poor performance that she felt like putting down the rifle and leaving the simulator.

Then they wired her up to the helmet. She reports feeling nothing unusual, except a slight tingle and a strange metallic taste in her mouth. Yet she began picking off the terrorists one by one, as coolly and methodically as if she were Rambo or Clint Eastwood. 'As twenty of them run at me brandishing their guns, I calmly line up my rifle, take a moment to breathe deeply, and pick off the closest one, before tranquilly assessing my next target. In what seems like next to no time, I hear a voice call out, "Okay, that's it." The lights come up in the simulation room . . . In the sudden quiet amid the bodies around me, I was really expecting more assailants, and I'm a bit disappointed when the team begins to remove my electrodes. I look up and wonder if someone wound the clocks forward. Inexplicably, twenty minutes have just passed. "How many did I get?" I ask the assistant. She looks at me quizzically. "All of them."'

The experiment changed Sally's life. In the following days she realised she has been through a 'near-spiritual experience . . . what defined the experience was not feeling smarter or learning faster: the thing that made the earth drop out from under my feet was that for the first time in my life, everything in my head finally shut up . . . My brain without self-doubt was a revelation. There was suddenly this incredible silence in my head . . . I hope you can sympathise with me when I tell you that the thing I wanted most acutely for the weeks following my experience was to go back and strap on those electrodes. I also started to have a lot of questions. Who was I apart from the angry bitter gnomes that populate my mind and drive me to failure because I'm too scared to try? And where did those voices come from?'[7]

Some of those voices repeat society's prejudices, some echo our personal history, and some articulate our genetic legacy. All of them together, says Sally, create an invisible story that shapes our conscious decisions in ways we seldom grasp. What would happen if we could rewrite our inner monologues, or even silence them completely on occasion?[8]

As of 2016, transcranial stimulators are still in their infancy, and it is unclear if and when they will become a mature technology. So far they provide enhanced capabilities for only short durations, and even Sally Adee's twenty-minute experience may be quite exceptional (or perhaps even the outcome of the notorious placebo effect). Most published studies of transcranial stimulators are based on very small samples of people operating under special circumstances, and the long-term effects and hazards are completely unknown. However, if the technology does mature, or if some other method is found to manipulate the brain's electric patterns, what would it do to human societies and to human beings?

People may well manipulate their brain's electric circuits not just in order to shoot terrorists, but also to achieve more mundane liberal goals. Namely, to study and work more efficiently, immerse ourselves in games and hobbies, and be able to focus on what interests us at any particular moment, be it maths or football. However, if and when such manipulations become routine, the supposedly free will of customers will become just another product we can buy. You want to master the piano but whenever practice time comes you actually prefer to watch television? No problem: just put on the helmet, install the right software, and you will be downright aching to play the piano.

You may counter-argue that the ability to silence or enhance the voices in your head will actually strengthen rather than undermine your free will. Presently, you often fail to realise your most cherished and authentic desires due to external distractions. With the help of the attention helmet and similar devices, you could more easily silence the alien voices of priests, spin doctors, advertisers

and neighbours, and focus on what *you* want. However, as we will shortly see, the notion that you have a single self and that you could therefore distinguish your authentic desires from alien voices is just another liberal myth, debunked by the latest scientific research.

Who Are I?

Science undermines not only the liberal belief in free will, but also the belief in individualism. Liberals believe that we have a single and indivisible self. To be an individual means that I am in-dividual. Yes, my body is made up of approximately 37 trillion cells,[9] and each day both my body and my mind go through countless permutations and transformations. Yet if I really pay attention and strive to get in touch with myself, I am bound to discover deep inside a single clear and authentic voice, which is my true self, and which is the source of all meaning and authority in the universe. For liberalism to make sense, I must have one – and only one – true self, for if I had more than one authentic voice, how would I know which voice to heed in the polling station, in the supermarket and in the marriage market?

However, over the last few decades the life sciences have reached the conclusion that this liberal story is pure mythology. The single authentic self is as real as the eternal Christian soul, Santa Claus and the Easter Bunny. If you look really deep within yourself, the seeming unity that we take for granted dissolves into a cacophony of conflicting voices, none of which is 'my true self'. Humans aren't individuals. They are 'dividuals'.

The human brain is composed of two hemispheres, connected to each other through a thick neural cable. Each hemisphere controls the opposite side of the body. The right hemisphere controls the left side of the body, receives data from the left-hand field of vision and is responsible for moving the left arm and leg, and vice versa. This is why people who have had a stroke in their right hemisphere sometimes ignore the left side of their body (combing only the right side of their hair, or eating only the food placed on the right side of their plate).[10]

There are also emotional and cognitive differences between the two hemispheres, though the division is far from clear-cut. Most cognitive activities involve both hemispheres, but not to the same degree. For example, in most cases the left hemisphere plays a more important role in speech and in logical reasoning, whereas the right hemisphere is more dominant in processing spatial information.

Many breakthroughs in understanding the relations between the two hemispheres were based on the study of epilepsy patients. In severe cases of epilepsy, electrical storms begin in one part of the brain but quickly spread to other parts, causing a very acute seizure. During such seizures patients lose control of their body, and frequent seizures consequently prevent patients from holding a job or leading a normal lifestyle. In the mid-twentieth century, when all other treatments failed, doctors alleviated the problem by cutting the thick neural cable connecting the two hemispheres, so that electrical storms beginning in one hemisphere could not spill over to the other. For brain scientists these patients were a gold-mine of astounding data.

Some of the most notable studies on these split-brain patients were conducted by Professor Roger Wolcott Sperry, who won the Nobel Prize in Physiology and Medicine for his groundbreaking discoveries, and by his student, Professor Michael S. Gazzaniga. One study was conducted on a teenaged boy. The boy was asked what he would like to do when he grew up. The boy answered that he wanted to be a draughtsman. This answer was provided by the left hemisphere, which plays a crucial part in logical reasoning as well as in speech. Yet the boy had another active speech centre in

his right hemisphere, which could not control vocal language, but could spell words using Scrabble tiles. The researchers were keen to know what the right hemisphere would say. So they spread Scrabble tiles on the table, and then took a piece of paper and wrote on it: 'What would you like to do when you grow up?' They placed the paper at the edge of the boy's left visual field. Data from the left visual field is processed in the right hemisphere. Since the right hemisphere could not use vocal language, the boy said nothing. But his left hand began moving rapidly across the table, collecting tiles from here and there. It spelled out: 'automobile race'. Spooky.[11]

Equally eerie behaviour was displayed by patient WJ, a Second World War veteran. WJ's hands were each controlled by a different hemisphere. Since the two hemispheres were out of touch with one another, it sometimes happened that his right hand would reach out to open a door, and then his left hand would intervene and try to slam the door shut.

In another experiment, Gazzaniga and his team flashed a picture of a chicken claw to the left-half brain – the side responsible for speech – and simultaneously flashed a picture of a snowy landscape to the right brain. When asked what they saw, patients invariably answered 'a chicken claw'. Gazzaniga then presented one patient, PS, with a series of picture cards and asked him to point to the one that best matched what he had seen. The patient's right hand (controlled by his left brain) pointed to a picture of a chicken, but simultaneously his left hand shot out and pointed to a snow shovel. Gazzaniga then asked PS the million-dollar question: 'Why did you point both to the chicken and to the shovel?' PS replied, 'Oh, the chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed.'[12]

What happened here? The left brain, which controls speech, had no data about the snow scene, and therefore did not really know why the left hand pointed to the shovel. So it just invented something credible. After repeating this experiment many times, Gazzaniga concluded that the left hemisphere of the brain is the seat not only of our verbal abilities, but also of an internal interpreter that constantly tries to make sense of our life, using partial clues in order to concoct plausible stories.

In another experiment, the non-verbal right hemisphere was shown a pornographic image. The patient reacted by blushing and giggling. 'What did you see?' asked the mischievous researchers. 'Nothing, just a flash of light,' said the left hemisphere, and the patient immediately giggled again, covering her mouth with her hand. 'Why are you laughing then?' they insisted. The bewildered left-hemisphere interpreter – struggling for some rational explanation – replied that one of the machines in the room looked very funny.[13]

It's as if the CIA conducts a drone strike in Pakistan, unbeknown to the US State Department. When a journalist grills State Department officials about it, they make up some plausible explanation. In reality, the spin doctors don't have a clue why the strike was ordered, so they just invent something. A similar mechanism is employed by all human beings, not just by split-brain patients. Again and again my own private CIA does things without the approval or knowledge of my State Department, and then my State Department cooks up a story that presents me in the best possible light. Often enough, the State Department itself becomes convinced of the pure fantasies it has invented.[14]

Similar conclusions have been reached by behavioural economists, who want to know how people take economic decisions. Or more accurately, *who* takes these decisions. Who decides to buy a Toyota rather than a Mercedes, to go on holiday to Paris rather than Thailand, and to invest in South Korean treasury bonds rather than in the Shanghai stock exchange? Most experiments have indicated that there is no single self making any of these decisions. Rather, they result from a tug of war between different and often conflicting inner entities.

One groundbreaking experiment was conducted by Daniel Kahneman, who won the Nobel Prize in Economics. Kahneman asked a group of volunteers to join a three-part experiment. In the 'short' part of the experiment, the volunteers inserted one hand into a container filled with water at 14°C for one minute, which is unpleasant, bordering on painful. After sixty seconds, they were told to take their hand out. In the 'long' part of the experiment, volunteers placed their other hand in another water container. The temperature there was also 14°C, but after sixty seconds, hot water was secretly added into the container, bringing the temperature up to 15°C. Thirty seconds later, they were told to pull out their hand. Some volunteers did the 'short' part first, while others began with the 'long' part. In either case, exactly seven minutes after both parts were over came the third and most important part of the experiment. The volunteers were told they must repeat one of the two parts, and it was up to them to choose which; 80 per cent preferred to repeat the 'long' experiment, remembering it as less painful.

The cold-water experiment is so simple, yet its implications shake the core of the liberal world view. It exposes the existence of at least two different selves within us: the experiencing self and the narrating self. The experiencing self is our moment-to-moment consciousness. For the experiencing self, it's obvious that the 'long' part of the cold-water experiment was worse. First you experience water at 14°C for sixty seconds, which is every bit as bad as what you experience in the 'short' part, and then you must endure another thirty seconds of water at 15°C, which is not quite as bad, but still far from pleasant. For the experiencing self, it is impossible that adding a slightly unpleasant experience to a very unpleasant experience will make the entire episode more appealing.

However, the experiencing self remembers nothing. It tells no stories, and is seldom consulted when it comes to big decisions. Retrieving memories, telling stories and making big decisions are all the monopoly of a very different entity inside us: the narrating self. The narrating self is akin to Gazzaniga's left-brain interpreter. It is forever busy spinning yarns about the past and making plans for the future. Like every journalist, poet and politician, the narrating self takes many short cuts. It doesn't narrate everything, and usually weaves the story only from peak moments and end results. The value of the whole experience is determined by averaging peaks with ends. For example, in the short part of the cold-water experiment, the narrating self finds the average between the worst part (the water was very cold) and the last moment (the water was still very cold) and concludes that 'the water was very cold'. The narrating self does the same thing with the long part of the experiment. It finds the average between the worst part (the water was very cold) and the last moment (the water was not so cold) and concludes that 'the water was somewhat warmer'. Crucially, the narrating self is duration-blind, giving no importance to the differing lengths of the two parts. So when it has a choice between the two, it prefers to repeat the long part, the one in which 'the water was somewhat warmer'.

Every time the narrating self evaluates our experiences, it discounts their duration, and adopts the 'peak-end rule' – it remembers only the peak moment and the end moment, and evaluates the whole experience according to their average. This has far-reaching impact on all our practical decisions. Kahneman began investigating the experiencing self and the narrating self in the early 1990s when, together with Donald Redelmeier of the University of Toronto, he studied colonoscopy patients. In colonoscopy tests, a tiny camera is inserted into the guts through the anus, in order to diagnose various bowel diseases. It is not a pleasant experience. Doctors want to know how to perform the test in the least painful way. Should they speed up the colonoscopy and cause patients more severe pain for a shorter duration, or should they work more slowly and carefully?

To answer this query, Kahneman and Redelmeier asked 154 patients to report the pain during the colonoscopy at one-minute intervals. They used a scale of 0 to 10, where 0 meant no pain at all, and

10 meant intolerable pain. After the colonoscopy was over, patients were asked to rank the test's 'overall pain level', also on a scale of 0 to 10. We might have expected the overall rank to reflect the accumulation of minute-by-minute reports. The longer the colonoscopy lasted, and the more pain the patient experienced, the higher the overall pain level. But the actual results were different.

Just as in the cold-water experiment, the overall pain level neglected duration and instead reflected only the peak-end rule. One colonoscopy lasted eight minutes, at the worst moment the patient reported a level 8 pain, and in the last minute he reported a level 7 pain. After the test was over, this patient ranked his overall pain level at 7.5. Another colonoscopy lasted twenty-four minutes. This time too peak pain was level 8, but in the very last minute of the test, the patient reported a level 1 pain. This patient ranked his overall pain level only at 4.5. The fact that his colonoscopy lasted three times as long, and that he consequently suffered far more pain on aggregate, did not affect his memory at all. The narrating self doesn't aggregate experiences – it averages them.

So what do the patients prefer: to have a short and sharp colonoscopy, or a long and careful one? There isn't a single answer to this question, because the patient has at least two different selves, and they have different interests. If you ask the experiencing self, it will probably prefer a short colonoscopy. But if you ask the narrating self, it will vote for a long colonoscopy because it remembers only the average between the worst moment and the last moment. Indeed, from the viewpoint of the narrating self, the doctor should add a few completely superfluous minutes of dull aches at the very end of the test, because it will make the entire memory far less traumatic.[15]

Paediatricians know this trick well. So do vets. Many keep in their clinics jars full of treats, and hand a few to the kids (or dogs) after giving them a painful injection or an unpleasant medical examination. When the narrating self remembers the visit to the doctor, ten seconds of pleasure at the end of the visit will erase many minutes of anxiety and pain.

Evolution discovered this trick aeons before the paediatricians. Given the unbearable torments women undergo at childbirth, you might think that after going through it once, no sane woman would ever agree to do it again. However, at the end of labour and in the following days the hormonal system secretes cortisol and beta-endorphins, which reduce the pain and create a feeling of relief and sometimes even of elation. Moreover, the growing love towards the baby, and the acclaim from friends, family members, religious dogmas and nationalist propaganda, conspire to turn childbirth from a terrible trauma into a positive memory.



An iconic image of the Virgin Mary holding baby Jesus. In most cultures, childbirth is narrated as a wonderful experience rather than as

a trauma.

Virgin and Child, Sassoferrato, Il (Giovanni Battista Salvi) (1609–85), Musee Bonnat, Bayonne, France © Bridgeman Images.

One study conducted at the Rabin Medical Center in Tel Aviv showed that the memory of labour reflected mainly the peak and end points, while the overall duration had almost no impact at all.[16] In another research project, 2,428 Swedish women were asked to recount their memories of labour two months after giving birth. Ninety per cent reported that the experience was either positive or very positive. They didn't necessarily forget the pain – 28.5 per cent described it as the worst pain imaginable – yet it did not prevent them from evaluating the experience as positive. The narrating self goes over our experiences with a sharp pair of scissors and a thick black marker. It censors at least some moments of horror, and files in the archive a story with a happy ending.[17]

Most of our critical life choices – of partners, careers, residences and holidays – are taken by our narrating self. Suppose you can choose between two potential holidays. You can go to Jamestown, Virginia, and visit the historic colonial town where the first English settlement on mainland North America was founded in 1607. Alternatively, you can realise your number one dream vacation, whether it is trekking in Alaska, sunbathing in Florida or having an unbridled bacchanalia of sex, drugs and gambling in Las Vegas. But there is a caveat: if you choose your dream vacation, then just before you board the plane home, you must take a pill which will wipe out all your memories of that vacation. What happened in Vegas will forever remain in Vegas. Which holiday would you choose? Most people would opt for colonial Jamestown, because most people give their credit card to the narrating self, which cares only about stories and has zero interest in even the most mind-blowing experiences if it cannot remember them.

Truth be told, the experiencing self and the narrating self are not completely separate entities but are closely intertwined. The narrating self uses our experiences as important (but not exclusive) raw materials for its stories. These stories, in turn, shape what the experiencing self actually feels. We experience hunger differently when we fast on Ramadan, when we fast in preparation for a medical examination, and when we don't eat because we have no money. The different meanings ascribed to our hunger by the narrating self create very different actual experiences.

Furthermore, the experiencing self is often strong enough to sabotage the best-laid plans of the narrating self. For example, I can make a New Year resolution to start a diet and go to the gym every day. Such grand decisions are the monopoly of the narrating self. But the following week when it's gym time, the experiencing self takes over. I don't feel like going to the gym, and instead I order pizza, sit on the sofa and turn on the TV.

Nevertheless, most people identify with their narrating self. When they say 'I', they mean the story in their head, not the stream of experiences they undergo. We identify with the inner system that takes the crazy chaos of life and spins out of it seemingly logical and consistent yarns. It doesn't matter that the plot is full of lies and lacunas, and that it is rewritten again and again, so that today's story flatly contradicts yesterday's; the important thing is that we always retain the feeling that we have a single unchanging identity from birth to death (and perhaps even beyond the grave). This gives rise to the questionable liberal belief that I am an individual, and that I possess a consistent and clear inner voice, which provides meaning for the entire universe.[18]

The Meaning of Life

The narrating self is the star of Jorge Luis Borges's story 'A Problem'.[19] The story deals with Don Quixote, the eponymous hero of Miguel Cervantes's famous novel. Don Quixote creates for himself an imaginary world in which he is a legendary champion going forth to fight giants and save Lady Dulcinea del Toboso. In reality, Don Quixote is Alonso Quixano, an elderly country gentleman; the noble Dulcinea is an uncouth farm girl from a nearby village; and the giants are windmills. What would happen, wonders Borges, if out of his belief in these fantasies, Don Quixote attacks and kills a real person? Borges asks a fundamental question about the human condition: what happens when the yarns spun by our narrating self cause great harm to ourselves or those around us? There are three main possibilities, says Borges.

One option is that nothing much happens. Don Quixote will not be bothered at all by killing a real man. His delusions are so overpowering that he could not tell the difference between this incident and his imaginary duel with the windmill giants. Another option is that once he takes a real life, Don Quixote will be so horrified that he will be shaken out of his delusions. This is akin to a young recruit who goes to war believing that it is good to die for one's country, only to be completely disillusioned by the realities of warfare.

And there is a third option, much more complex and profound. As long as he fought imaginary giants, Don Quixote was just play-acting, but once he actually kills somebody, he will cling to his fantasies for all he is worth, because they are the only thing giving meaning to his terrible crime. Paradoxically, the more sacrifices we make for an imaginary story, the stronger the story becomes, because we desperately want to give meaning to these sacrifices and to the suffering we have caused.

In politics this is known as the 'Our Boys Didn't Die in Vain' syndrome. In 1915 Italy entered the First World War on the side of the Entente powers. Italy's declared aim was to 'liberate' Trento and Trieste – two 'Italian' territories that the Austro-Hungarian Empire held 'unjustly'. Italian politicians gave fiery speeches in parliament, vowing historical redress and promising a return to the glories of ancient Rome. Hundreds of thousands of Italian recruits went to the front shouting, 'For Trento and Trieste!' They thought it would be a walkover.

It was anything but. The Austro-Hungarian army held a strong defensive line along the Isonzo River. The Italians hurled themselves against the line in eleven gory battles, gaining a few kilometres at most, and never securing a breakthrough. In the first battle they lost 15,000 men. In the second battle they lost 40,000 men. In the third battle they lost 60,000. So it continued for more than two dreadful years until the eleventh engagement, when the Austrians finally counter-attacked, and in the Battle of Caporreto soundly defeated the Italians and pushed them back almost to the gates of Venice. The glorious adventure became a bloodbath. By the end of the war, almost 700,000 Italian soldiers were killed, and more than a million were wounded.[20]

After losing the first Isonzo battle, Italian politicians had two choices. They could admit their mistake and sign a peace treaty. Austria–Hungary had no claims against Italy, and would have been delighted to sign a peace treaty because it was busy fighting for survival against the much stronger Russians. Yet how could the politicians go to the parents, wives and children of 15,000 dead Italian soldiers, and tell them: 'Sorry, there has been a mistake. We hope you don't take it too hard, but your Giovanni died in vain, and so did your Marco.' Alternatively they could say: 'Giovanni and Marco were heroes! They died so that Trieste would be Italian, and we will make sure they didn't die in vain. We will go on fighting until victory is ours!' Not surprisingly, the politicians preferred the second option. So they fought a second battle, and lost another 40,000 men. The politicians again decided it would be best to keep on fighting, because 'our boys didn't die in vain'.



A few of the victims of the Isonzo battles. Was their sacrifice in vain?

© Bettmann/Corbis.

Yet you cannot blame only the politicians. The masses also kept supporting the war. And when after the war Italy did not get all the territories it demanded, Italian democracy placed at its head Benito Mussolini and his fascists, who promised they would gain for Italy a proper compensation for all the sacrifices it had made. While it's hard for a politician to tell parents that their son died for no good reason, it is far more difficult for parents to say this to themselves – and it is even harder for the victims. A crippled soldier who lost his legs would rather tell himself, 'I sacrificed myself for the glory of the eternal Italian nation!' than 'I lost my legs because I was stupid enough to believe self-serving politicians.' It is much easier to live with the fantasy, because the fantasy gives meaning to the suffering.

Priests discovered this principle thousands of years ago. It underlies numerous religious ceremonies and commandments. If you want to make people believe in imaginary entities such as gods and nations, you should make them sacrifice something valuable. The more painful the sacrifice, the more convinced people are of the existence of the imaginary recipient. A poor peasant sacrificing a priceless bull to Jupiter will become convinced that Jupiter really exists, otherwise how can he excuse his stupidity? The peasant will sacrifice another bull, and another, and another, just so he won't have to admit that all the previous bulls were wasted. For exactly the same reason, if I have sacrificed a child to the glory of the Italian nation, or my legs to the communist revolution, it's enough to turn me into a zealous Italian nationalist or an enthusiastic communist. For if Italian national myths or communist propaganda are a lie, then I will be forced to admit that my child's death or my own paralysis have been completely pointless. Few people have the stomach to admit such a thing.

The same logic is at work in the economic sphere too. In 1999 the government of Scotland decided to erect a new parliament building. According to the original plan, the construction was supposed to take two years and cost £40 million. In fact, it took five years and cost £400 million. Every time the contractors encountered unexpected difficulties and expenses, they went to the Scottish government and asked for more time and money. Every time this happened, the government told itself: 'Well, we've already sunk £40 million into this and we'll be completely discredited if we stop now and end

up with a half-built skeleton. Let's authorise another £40 million.' Six months later the same thing happened, by which time the pressure to avoid ending up with an unfinished building was even greater; and six months after that the story repeated itself, and so on until the actual cost was ten times the original estimate.

Not only governments fall into this trap. Business corporations often sink millions into failed enterprises, while private individuals cling to dysfunctional marriages and dead-end jobs. For the narrating self would much prefer to go on suffering in the future, just so it won't have to admit that our past suffering was devoid of all meaning. Eventually, if we want to come clean about past mistakes, our narrating self must invent some twist in the plot that will infuse these mistakes with meaning. For example, a pacifist war veteran may tell himself, 'Yes, I've lost my legs because of a mistake. But thanks to this mistake, I understand that war is hell, and from now onwards I will dedicate my life to fight for peace. So my injury did have some positive meaning: it taught me to value peace.'



The Scottish Parliament building. Our sterling did not die in vain.

© Jeremy Sutton-Hibbert/Getty Images.

We see, then, that the self too is an imaginary story, just like nations, gods and money. Each of us has a sophisticated system that throws away most of our experiences, keeps only a few choice samples, mixes them up with bits from movies we saw, novels we read, speeches we heard, and from our own daydreams, and weaves out of all that jumble a seemingly coherent story about who I am, where I came from and where I am going. This story tells me what to love, whom to hate and what to do with myself. This story may even cause me to sacrifice my life, if that's what the plot requires. We all have our genre. Some people live a tragedy, others inhabit a never-ending religious drama, some approach life as if it were an action film, and not a few act as if in a comedy. But in the end, they are all just stories.

What, then, is the meaning of life? Liberalism maintains that we shouldn't expect an external entity to provide us with some readymade meaning. Rather, each individual voter, customer and viewer ought to use his or her free will in order to create meaning not just for his or her life, but for the entire universe.

The life sciences undermine liberalism, arguing that the free individual is just a fictional tale concocted by an assembly of biochemical algorithms. Every moment, the biochemical mechanisms of the brain create a flash of experience, which immediately disappears. Then more flashes appear and fade, appear and fade, in quick succession. These momentary experiences do not add up to any

enduring essence. The narrating self tries to impose order on this chaos by spinning a never-ending story, in which every such experience has its place, and hence every experience has some lasting meaning. But, as convincing and tempting as it may be, this story is a fiction. Medieval crusaders believed that God and heaven provided their lives with meaning. Modern liberals believe that individual free choices provide life with meaning. They are all equally delusional.

Doubts about the existence of free will and individuals are nothing new, of course. Thinkers in India, China and Greece argued that 'the individual self is an illusion' more than 2,000 years ago. Yet such doubts don't really change history unless they have a practical impact on economics, politics and day-to-day life. Humans are masters of cognitive dissonance, and we allow ourselves to believe one thing in the laboratory and an altogether different thing in the courthouse or in parliament. Just as Christianity didn't disappear the day Darwin published *On the Origin of Species*, so liberalism won't vanish just because scientists have reached the conclusion that there are no free individuals.

Indeed, even Richard Dawkins, Steven Pinker and the other champions of the new scientific world view refuse to abandon liberalism. After dedicating hundreds of erudite pages to deconstructing the self and the freedom of will, they perform breathtaking intellectual somersaults that miraculously land them back in the eighteenth century, as if all the amazing discoveries of evolutionary biology and brain science have absolutely no bearing on the ethical and political ideas of Locke, Rousseau and Thomas Jefferson.

However, once the heretical scientific insights are translated into everyday technology, routine activities and economic structures, it will become increasingly difficult to sustain this double-game, and we – or our heirs – will probably require a brand-new package of religious beliefs and political institutions. At the beginning of the third millennium, liberalism is threatened not by the philosophical idea that 'there are no free individuals' but rather by concrete technologies. We are about to face a flood of extremely useful devices, tools and structures that make no allowance for the free will of individual humans. Can democracy, the free market and human rights survive this flood?

9
The Great Decoupling

The preceding pages took us on a brief tour of recent scientific discoveries that undermine the liberal philosophy. It's time to examine the practical implications of these scientific discoveries. Liberals uphold free markets and democratic elections because they believe that every human is a uniquely valuable individual, whose free choices are the ultimate source of authority. In the twenty-first century three *practical* developments might make this belief obsolete:

1. Humans will lose their economic and military usefulness, hence the economic and political system will stop attaching much value to them.
2. The system will still find value in humans collectively, but not in unique individuals.
3. The system will still find value in some unique individuals, but these will be a new elite of upgraded superhumans rather than the mass of the population.

Let's examine all three threats in detail. The first – that technological developments will make humans economically and militarily useless – will not prove that liberalism is wrong on a philosophical level, but in practice it is hard to see how democracy, free markets and other liberal institutions can survive such a blow. After all, liberalism did not become the dominant ideology simply because its philosophical arguments were the most accurate. Rather, liberalism succeeded because there was much political, economic and military sense in ascribing value to every human being. On the mass battlefields of modern industrial wars, and in the mass production lines of modern industrial economies, every human counted. There was value to every pair of hands that could hold a rifle or pull a lever.

In 1793 the royal houses of Europe sent their armies to strangle the French Revolution in its cradle. The firebrands in Paris reacted by proclaiming the *levée en masse* and unleashing the first total war. On 23 August, the National Convention decreed that 'From this moment until such time as its enemies shall have been driven from the soil of the Republic, all Frenchmen are in permanent requisition for the services of the armies. The young men shall fight; the married men shall forge arms and transport provisions; the women shall make tents and clothes and shall serve in the hospitals; the children shall turn old lint into linen; and the old men shall betake themselves to the public squares in order to arouse the courage of the warriors and preach hatred of kings and the unity of the Republic.'[1]

This decree sheds interesting light on the French Revolution's most famous document – *The Declaration of the Rights of Man and of the Citizen* – which recognised that all citizens have equal value and equal political rights. Is it a coincidence that universal rights were proclaimed at the same historical juncture that universal conscription was decreed? Though scholars may quibble about the

exact relations between the two, in the following two centuries a common argument in defence of democracy explained that giving people political rights is good, because the soldiers and workers of democratic countries perform better than those of dictatorships. Allegedly, granting people political rights increases their motivation and their initiative, which is useful both on the battlefield and in the factory.

Thus Charles W. Eliot, president of Harvard from 1869 to 1909, wrote on 5 August 1917 in the *New York Times* that 'democratic armies fight better than armies aristocratically organised and autocratically governed' and that 'the armies of nations in which the mass of the people determine legislation, elect their public servants, and settle questions of peace and war, fight better than the armies of an autocrat who rules by right of birth and by commission from the Almighty'.[2]

A similar rationale stood behind the enfranchisement of women in the wake of the First World War. Realising the vital role of women in total industrial wars, countries saw the need to give them political rights in peacetime. Thus in 1918 President Woodrow Wilson became a supporter of women's suffrage, explaining to the US Senate that the First World War 'could not have been fought, either by the other nations engaged or by America, if it had not been for the services of women – services rendered in every sphere – not only in the fields of effort in which we have been accustomed to see them work, but wherever men have worked and upon the very skirts and edges of the battle itself. We shall not only be distrusted but shall deserve to be distrusted if we do not enfranchise them with the fullest possible enfranchisement.'[3]

However, in the twenty-first century the majority of both men and women might lose their military and economic value. Gone is the mass conscription of the two world wars. The most advanced armies of the twenty-first century rely far more on cutting-edge technology. Instead of limitless cannon fodder, you now need only small numbers of highly trained soldiers, even smaller numbers of special forces super-warriors and a handful of experts who know how to produce and use sophisticated technology. Hi-tech forces 'manned' by pilotless drones and cyber-worms are replacing the mass armies of the twentieth century, and generals delegate more and more critical decisions to algorithms.

Aside from their unpredictability and their susceptibility to fear, hunger and fatigue, flesh-and-blood soldiers think and move on an increasingly irrelevant timescale. From the days of Nebuchadnezzar to those of Saddam Hussein, despite myriad technological improvements, war was waged on an organic timetable. Discussions lasted for hours, battles took days, and wars dragged on for years. Cyber-wars, however, may last just a few minutes. When a lieutenant on shift at cyber-command notices something odd is going on, she picks up the phone to call her superior, who immediately alerts the White House. Alas, by the time the president reaches for the red handset, the war has already been lost. Within seconds, a sufficiently sophisticated cyber strike might shut down the US power grid, wreck US flight control centres, cause numerous industrial accidents in nuclear plants and chemical installations, disrupt the police, army and intelligence communication networks – and wipe out financial records so that trillions of dollars simply vanish without trace and nobody knows who owns what. The only thing curbing public hysteria is that with the Internet, television and radio down, people will not be aware of the full magnitude of the disaster.

On a smaller scale, suppose two drones fight each other in the air. One drone cannot fire a shot without first receiving the go-ahead from a human operator in some bunker. The other drone is fully autonomous. Which do you think will prevail? If in 2093 the decrepit European Union sends its drones and cyborgs to snuff out a new French Revolution, the Paris Commune might press into service every available hacker, computer and smartphone, but it will have little use for most humans, except perhaps as human shields. It is telling that already today in many asymmetrical conflicts the majority

of citizens are reduced to serving as human shields for advanced armaments.



Left: Soldiers in action at the Battle of the Somme, 1916. Right: A pilotless drone.

Left: © Fototeca Gilardi/Getty Images. Right: © alxpin/Getty Images.

Even if you care more about justice than victory, you should probably opt to replace your soldiers and pilots with autonomous robots and drones. Human soldiers murder, rape and pillage, and even when they try to behave themselves, they all too often kill civilians by mistake. Computers programmed with ethical algorithms could far more easily conform to the latest rulings of the international criminal court.

In the economic sphere too, the ability to hold a hammer or press a button is becoming less valuable than before. In the past, there were many things only humans could do. But now robots and computers are catching up, and may soon outperform humans in most tasks. True, computers function very differently from humans, and it seems unlikely that computers will become humanlike any time soon. In particular, it doesn't seem that computers are about to gain consciousness, and to start experiencing emotions and sensations. Over the last decades there has been an immense advance in computer intelligence, but there has been exactly zero advance in computer consciousness. As far as we know, computers in 2016 are no more conscious than their prototypes in the 1950s. However, we are on the brink of a momentous revolution. Humans are in danger of losing their value, because intelligence is decoupling from consciousness.

Until today, high intelligence always went hand in hand with a developed consciousness. Only conscious beings could perform tasks that required a lot of intelligence, such as playing chess, driving cars, diagnosing diseases or identifying terrorists. However, we are now developing new types of non-conscious intelligence that can perform such tasks far better than humans. For all these tasks are based on pattern recognition, and non-conscious algorithms may soon excel human consciousness in recognising patterns. This raises a novel question: which of the two is really important, intelligence or consciousness? As long as they went hand in hand, debating their relative value was just a pastime for philosophers. But in the twenty-first century, this is becoming an urgent political and economic issue. And it is sobering to realise that, at least for armies and corporations, the answer is straightforward: intelligence is mandatory but consciousness is optional.

Armies and corporations cannot function without intelligent agents, but they don't need consciousness and subjective experiences. The conscious experiences of a flesh-and-blood taxi driver are infinitely richer than those of a self-driving car, which feels absolutely nothing. The taxi driver can enjoy music while navigating the busy streets of Seoul. His mind may expand in awe as he looks up at the stars and contemplates the mysteries of the universe. His eyes may fill with tears of joy when he sees his baby girl taking her very first step. But the system doesn't need all that from a taxi driver. All it really wants is to bring passengers from point A to point B as quickly, safely and cheaply as possible. And the autonomous car will soon be able to do that far better than a human

driver, even though it cannot enjoy music or be awestruck by the magic of existence.

Indeed, if we forbid humans to drive taxis and cars altogether, and give computer algorithms monopoly over traffic, we can then connect all vehicles to a single network, and thereby make car accidents virtually impossible. In August 2015, one of Google's experimental self-driving cars had an accident. As it approached a crossing and detected pedestrians wishing to cross, it applied its brakes. A moment later it was hit from behind by a sedan whose careless human driver was perhaps contemplating the mysteries of the universe instead of watching the road. This could not have happened if *both* vehicles were steered by interlinked computers. The controlling algorithm would have known the position and intentions of every vehicle on the road, and would not have allowed two of its marionettes to collide. Such a system will save lots of time, money and human lives – but it will also do away with the human experience of driving a car and with tens of millions of human jobs.[4]

Some economists predict that sooner or later, unenhanced humans will be completely useless. While robots and 3D printers replace workers in manual jobs such as manufacturing shirts, highly intelligent algorithms will do the same to white-collar occupations. Bank clerks and travel agents, who a short time ago were completely secure from automation, have become endangered species. How many travel agents do we need when we can use our smartphones to buy plane tickets from an algorithm?

Stock-exchange traders are also in danger. Most trade today is already being managed by computer algorithms, which can process in a second more data than a human can in a year, and that can react to the data much faster than a human can blink. On 23 April 2013, Syrian hackers broke into Associated Press's official Twitter account. At 13:07 they tweeted that the White House had been attacked and President Obama was hurt. Trade algorithms that constantly monitor newsfeeds reacted in no time, and began selling stocks like mad. The Dow Jones went into free fall, and within sixty seconds lost 150 points, equivalent to a loss of $136 billion! At 13:10 Associated Press clarified that the tweet was a hoax. The algorithms reversed gear, and by 13:13 the Dow Jones had recuperated almost all the losses.

Three years previously, on 6 May 2010, the New York stock exchange underwent an even sharper shock. Within five minutes – from 14:42 to 14:47 – the Dow Jones dropped by 1,000 points, wiping out $1 trillion. It then bounced back, returning to its pre-crash level in a little over three minutes. That's what happens when super-fast computer programs are in charge of our money. Experts have been trying ever since to understand what happened in this so-called 'Flash Crash'. We know algorithms were to blame, but we are still not sure exactly what went wrong. Some traders in the USA have already filed lawsuits against algorithmic trading, arguing that it unfairly discriminates against human beings, who simply cannot react fast enough to compete. Quibbling whether this really constitutes a violation of rights might provide lots of work and lots of fees for lawyers.[5]

And these lawyers won't necessarily be human. Movies and TV series give the impression that lawyers spend their days in court shouting 'Objection!' and making impassioned speeches. Yet most run-of-the-mill lawyers spend their time going over endless files, looking for precedents, loopholes and tiny pieces of potentially relevant evidence. Some are busy trying to figure out what happened on the night John Doe got killed, or formulating a gargantuan business contract that will protect their client against every conceivable eventuality. What will be the fate of all these lawyers once sophisticated search algorithms can locate more precedents in a day than a human can in a lifetime, and once brain scans can reveal lies and deceptions at the press of a button? Even highly experienced lawyers and detectives cannot easily spot deceptions merely by observing people's facial expressions and tone of voice. However, lying involves different brain areas to those used when we

tell the truth. We're not there yet, but it is conceivable that in the not too distant future fMRI scanners could function as almost infallible truth machines. Where will that leave millions of lawyers, judges, cops and detectives? They might need to go back to school and learn a new profession.[6]

When they get in the classroom, however, they may well discover that the algorithms have got there first. Companies such as Mindojo are developing interactive algorithms that not only teach me maths, physics and history, but also simultaneously study me and get to know exactly who I am. Digital teachers will closely monitor every answer I give, and how long it took me to give it. Over time, they will discern my unique weaknesses as well as my strengths. They will identify what gets me excited, and what makes my eyelids droop. They could teach me thermodynamics or geometry in a way that suits my personality type, even if that particular way doesn't suit 99 per cent of the other pupils. And these digital teachers will never lose their patience, never shout at me, and never go on strike. It is unclear, however, why on earth I would need to know thermodynamics or geometry in a world containing such intelligent computer programs.[7]

Even doctors are fair game for the algorithms. The first and foremost task of most doctors is to diagnose diseases correctly, and then suggest the best available treatment. If I arrive at the clinic complaining about fever and diarrhoea, I might be suffering from food poisoning. Then again, the same symptoms might result from a stomach virus, cholera, dysentery, malaria, cancer or some unknown new disease. My doctor has only five minutes to make a correct diagnosis, because this is what my health insurance pays for. This allows for no more than a few questions and perhaps a quick medical examination. The doctor then cross-references this meagre information with my medical history, and with the vast world of human maladies. Alas, not even the most diligent doctor can remember all my previous ailments and check-ups. Similarly, no doctor can be familiar with every illness and drug, or read every new article published in every medical journal. To top it all, the doctor is sometimes tired or hungry or perhaps even sick, which affects her judgement. No wonder that doctors often err in their diagnoses, or recommend a less-than-optimal treatment.

Now consider IBM's famous Watson – an artificial intelligence system that won the *Jeopardy!* television game show in 2011, beating human former champions. Watson is currently groomed to do more serious work, particularly in diagnosing diseases. An AI such as Watson has enormous potential advantages over human doctors. Firstly, an AI can hold in its databanks information about every known illness and medicine in history. It can then update these databanks every day, not only with the findings of new researches, but also with medical statistics gathered from every clinic and hospital in the world.



IBM's Watson defeating its two humans opponents in *Jeopardy!* in 2011.

© Sony Pictures Television.

Secondly, Watson can be intimately familiar not only with my entire genome and my day-to-day medical history, but also with the genomes and medical histories of my parents, siblings, cousins, neighbours and friends. Watson will know instantly whether I visited a tropical country recently, whether I have recurring stomach infections, whether there have been cases of intestinal cancer in my family or whether people all over town are complaining this morning about diarrhoea.

Thirdly, Watson will never be tired, hungry or sick, and will have all the time in the world for me. I could sit comfortably on my sofa at home and answer hundreds of questions, telling Watson exactly how I feel. This is good news for most patients (except perhaps hypochondriacs). But if you enter medical school today in the expectation of still being a family doctor in twenty years, maybe you should think again. With such a Watson around, there is not much need for Sherlocks.

This threat hovers over the heads not only of general practitioners, but also of experts. Indeed, it might prove easier to replace doctors specialising in a relatively narrow field such as cancer diagnosis. For example, in a recent experiment a computer algorithm diagnosed correctly 90 per cent of lung cancer cases presented to it, while human doctors had a success rate of only 50 per cent.[8] In fact, the future is already here. CT scans and mammography tests are routinely checked by specialised algorithms, which provide doctors with a second opinion, and sometimes detect tumours that the doctors missed.[9]

A host of tough technical problems still prevent Watson and its ilk from replacing most doctors tomorrow morning. Yet these technical problems – however difficult – need only be solved once. The training of a human doctor is a complicated and expensive process that lasts years. When the process is complete, after ten years of studies and internships, all you get is one doctor. If you want two doctors, you have to repeat the entire process from scratch. In contrast, if and when you solve the technical problems hampering Watson, you will get not one, but an infinite number of doctors, available 24/7 in every corner of the world. So even if it costs $100 billion to make it work, in the long run it would be much cheaper than training human doctors.

And what's true of doctors is doubly true of pharmacists. In 2011 a pharmacy opened in San Francisco manned by a single robot. When a human comes to the pharmacy, within seconds the robot receives all of the customer's prescriptions, as well as detailed information about other medicines taken by them, and their suspected allergies. The robot makes sure the new prescriptions don't combine adversely with any other medicine or allergy, and then provides the customer with the required drug. In its first year of operation the robotic pharmacist provided 2 million prescriptions, without making a single mistake. On average, flesh-and-blood pharmacists get wrong 1.7 per cent of prescriptions. In the United States alone this amounts to more than 50 million prescription errors every year![10]

Some people argue that even if an algorithm could outperform doctors and pharmacists in the technical aspects of their professions, it could never replace their human touch. If your CT indicates you have cancer, would you like to receive the news from a caring and empathetic human doctor, or from a machine? Well, how about receiving the news from a caring and empathetic machine that tailors its words to your personality type? Remember that organisms are algorithms, and Watson could detect your emotional state with the same accuracy that it detects your tumours.

This idea has already been implemented by some customer-services departments, such as those pioneered by the Chicago-based Mattersight Corporation. Mattersight publishes its wares with the

following advert: 'Have you ever spoken with someone and felt as though you just clicked? The magical feeling you get is the result of a personality connection. Mattersight creates that feeling every day, in call centers around the world.'[11] When you call customer services with a request or complaint, it usually takes a few seconds to route your call to a representative. In Mattersight systems, your call is routed by a clever algorithm. You first state the reason for your call. The algorithm listens to your request, analyses the words you have chosen and your tone of voice, and deduces not only your present emotional state but also your personality type – whether you are introverted, extroverted, rebellious or dependent. Based on this information, the algorithm links you to the representative that best matches your mood and personality. The algorithm knows whether you need an empathetic person to patiently listen to your complaints, or you prefer a no-nonsense rational type who will give you the quickest technical solution. A good match means both happier customers and less time and money wasted by the customer-services department.[12]

The most important question in twenty-first-century economics may well be what to do with all the superfluous people. What will conscious humans do, once we have highly intelligent non-conscious algorithms that can do almost everything better?

Throughout history the job market was divided into three main sectors: agriculture, industry and services. Until about 1800, the vast majority of people worked in agriculture, and only a small minority worked in industry and services. During the Industrial Revolution people in developed countries left the fields and herds. Most began working in industry, but growing numbers also took up jobs in the services sector. In recent decades developed countries underwent another revolution, as industrial jobs vanished, whereas the services sector expanded. In 2010 only 2 per cent of Americans worked in agriculture, 20 per cent worked in industry, 78 per cent worked as teachers, doctors, webpage designers and so forth. When mindless algorithms are able to teach, diagnose and design better than humans, what will we do?

This is not an entirely new question. Ever since the Industrial Revolution erupted, people feared that mechanisation might cause mass unemployment. This never happened, because as old professions became obsolete, new professions evolved, and there was always something humans could do better than machines. Yet this is not a law of nature, and nothing guarantees it will continue to be like that in the future. Humans have two basic types of abilities: physical abilities and cognitive abilities. As long as machines competed with us merely in physical abilities, you could always find cognitive tasks that humans do better. So machines took over purely manual jobs, while humans focused on jobs requiring at least some cognitive skills. Yet what will happen once algorithms outperform us in remembering, analysing and recognising patterns?

The idea that humans will always have a unique ability beyond the reach of non-conscious algorithms is just wishful thinking. The current scientific answer to this pipe dream can be summarised in three simple principles:

1. Organisms are algorithms. Every animal – including *Homo sapiens* – is an assemblage of organic algorithms shaped by natural selection over millions of years of evolution.
2. Algorithmic calculations are not affected by the materials from which you build the calculator. Whether you build an abacus from wood, iron or plastic, two beads plus two beads equals four beads.
3. Hence there is no reason to think that organic algorithms can do things that non-organic algorithms

will never be able to replicate or surpass. As long as the calculations remain valid, what does it matter whether the algorithms are manifested in carbon or silicon?

True, at present there are numerous things that organic algorithms do better than non-organic ones, and experts have repeatedly declared that something will 'for ever' remain beyond the reach of non-organic algorithms. But it turns out that 'for ever' often means no more than a decade or two. Until a short time ago, facial recognition was a favourite example of something which even babies accomplish easily but which escaped even the most powerful computers on earth. Today facial-recognition programs are able to recognise people far more efficiently and quickly than humans can. Police forces and intelligence services now use such programs to scan countless hours of video footage from surveillance cameras, tracking down suspects and criminals.

In the 1980s when people discussed the unique nature of humanity, they habitually used chess as primary proof of human superiority. They believed that computers would never beat humans at chess. On 10 February 1996, IBM's Deep Blue defeated world chess champion Garry Kasparov, laying to rest that particular claim for human pre-eminence.

Deep Blue was given a head start by its creators, who preprogrammed it not only with the basic rules of chess, but also with detailed instructions regarding chess strategies. A new generation of AI uses machine learning to do even more remarkable and elegant things. In February 2015 a program developed by Google DeepMind learned *by itself* how to play forty-nine classic Atari games. One of the developers, Dr Demis Hassabis, explained that 'the only information we gave the system was the raw pixels on the screen and the idea that it had to get a high score. And everything else it had to figure out by itself.' The program managed to learn the rules of all the games it was presented with, from *Pac-Man* and *Space Invaders* to car racing and tennis games. It then played most of them as well as or better than humans, sometimes coming up with strategies that never occur to human players.[13]



Deep Blue defeating Garry Kasparov.

© STAN HONDA/AFP/Getty Images.

Computer algorithms have recently proven their worth in ball games, too. For many decades, baseball teams used the wisdom, experience and gut instincts of professional scouts and managers to pick players. The best players fetched millions of dollars, and naturally enough the rich teams got the

cream of the market, whereas poorer teams had to settle for the scraps. In 2002 Billy Beane, the manager of the low-budget Oakland Athletics, decided to beat the system. He relied on an arcane computer algorithm developed by economists and computer geeks to create a winning team from players that human scouts overlooked or undervalued. The old-timers were incensed by Beane's algorithm transgressing into the hallowed halls of baseball. They said that picking baseball players is an art, and that only humans with an intimate and long-standing experience of the game can master it. A computer program could never do it, because it could never decipher the secrets and the spirit of baseball.

They soon had to eat their baseball caps. Beane's shoestring-budget algorithmic team ($44 million) not only held its own against baseball giants such as the New York Yankees ($125 million), but became the first team ever in American League baseball to win twenty consecutive games. Not that Beane and Oakland could enjoy their success for long. Soon enough, many other baseball teams adopted the same algorithmic approach, and since the Yankees and Red Sox could pay far more for both baseball players and computer software, low-budget teams such as the Oakland Athletics now had an even smaller chance of beating the system than before.[14]

In 2004 Professor Frank Levy from MIT and Professor Richard Murnane from Harvard published a thorough research of the job market, listing those professions most likely to undergo automation. Truck drivers were given as an example of a job that could not possibly be automated in the foreseeable future. It is hard to imagine, they wrote, that algorithms could safely drive trucks on a busy road. A mere ten years later, Google and Tesla not only imagine this, but are actually making it happen.[15]

In fact, as time goes by, it becomes easier and easier to replace humans with computer algorithms, not merely because the algorithms are getting smarter, but also because humans are professionalising. Ancient hunter-gatherers mastered a very wide variety of skills in order to survive, which is why it would be immensely difficult to design a robotic hunter-gatherer. Such a robot would have to know how to prepare spear points from flint stones, how to find edible mushrooms in a forest, how to use medicinal herbs to bandage a wound, how to track down a mammoth and how to coordinate a charge with a dozen other hunters. However, over the last few thousand years we humans have been specialising. A taxi driver or a cardiologist specialises in a much narrower niche than a hunter-gatherer, which makes it easier to replace them with AI.

Even the managers in charge of all these activities can be replaced. Thanks to its powerful algorithms, Uber can manage millions of taxi drivers with only a handful of humans. Most of the commands are given by the algorithms without any need of human supervision.[16] In May 2014 Deep Knowledge Ventures – a Hong Kong venture-capital firm specialising in regenerative medicine – broke new ground by appointing an algorithm called VITAL to its board. VITAL makes investment recommendations by analysing huge amounts of data on the financial situation, clinical trials and intellectual property of prospective companies. Like the other five board members, the algorithm gets to vote on whether the firm makes an investment in a specific company or not.

Examining VITAL's record so far, it seems that it has already picked up one managerial vice: nepotism. It has recommended investing in companies that grant algorithms more authority. With VITAL's blessing, Deep Knowledge Ventures has recently invested in Silico Medicine, which develops computer-assisted methods for drug research, and in Pathway Pharmaceuticals, which employs a platform called OncoFinder to select and rate personalised cancer therapies.[17]

As algorithms push humans out of the job market, wealth might become concentrated in the hands of

the tiny elite that owns the all-powerful algorithms, creating unprecedented social inequality. Alternatively, the algorithms might not only manage businesses, but actually come to own them. At present, human law already recognises intersubjective entities like corporations and nations as 'legal persons'. Though Toyota or Argentina has neither a body nor a mind, they are subject to international laws, they can own land and money, and they can sue and be sued in court. We might soon grant similar status to algorithms. An algorithm could then own a venture-capital fund without having to obey the wishes of any human master.

If the algorithm makes the right decisions, it could accumulate a fortune, which it could then invest as it sees fit, perhaps buying your house and becoming your landlord. If you infringe on the algorithm's legal rights – say, by not paying rent – the algorithm could hire lawyers and sue you in court. If such algorithms consistently outperform human fund managers, we might end up with an algorithmic upper class owning most of our planet. This may sound impossible, but before dismissing the idea, remember that most of our planet is already legally owned by non-human inter-subjective entities, namely nations and corporations. Indeed, 5,000 years ago much of Sumer was owned by imaginary gods such as Enki and Inanna. If gods can possess land and employ people, why not algorithms?

So what will people do? Art is often said to provide us with our ultimate (and uniquely human) sanctuary. In a world where computers replace doctors, drivers, teachers and even landlords, everyone would become an artist. Yet it is hard to see why artistic creation will be safe from the algorithms. Why are we so sure computers will be unable to better us in the composition of music? According to the life sciences, art is not the product of some enchanted spirit or metaphysical soul, but rather of organic algorithms recognising mathematical patterns. If so, there is no reason why non-organic algorithms couldn't master it.

David Cope is a musicology professor at the University of California in Santa Cruz. He is also one of the more controversial figures in the world of classical music. Cope has written programs that compose concertos, chorales, symphonies and operas. His first creation was named EMI (Experiments in Musical Intelligence), which specialised in imitating the style of Johann Sebastian Bach. It took seven years to create the program, but once the work was done, EMI composed 5,000 chorales à la Bach in a single day. Cope arranged a performance of a few select chorales in a music festival at Santa Cruz. Enthusiastic members of the audience praised the wonderful performance, and explained excitedly how the music touched their innermost being. They didn't know it was composed by EMI rather than Bach, and when the truth was revealed, some reacted with glum silence, while others shouted in anger.

EMI continued to improve, and learned to imitate Beethoven, Chopin, Rachmaninov and Stravinsky. Cope got EMI a contract, and its first album – *Classical Music Composed by Computer* – sold surprisingly well. Publicity brought increasing hostility from classical-music buffs. Professor Steve Larson from the University of Oregon sent Cope a challenge for a musical showdown. Larson suggested that professional pianists play three pieces one after the other: one by Bach, one by EMI, and one by Larson himself. The audience would then be asked to vote who composed which piece. Larson was convinced people would easily tell the difference between soulful human compositions, and the lifeless artefact of a machine. Cope accepted the challenge. On the appointed date, hundreds of lecturers, students and music fans assembled in the University of Oregon's concert hall. At the end of the performance, a vote was taken. The result? The audience thought that EMI's piece was genuine Bach, that Bach's piece was composed by Larson, and that Larson's piece was produced by a computer.

Critics continued to argue that EMI's music is technically excellent, but that it lacks something. It is too accurate. It has no depth. It has no soul. Yet when people heard EMI's compositions without being informed of their provenance, they frequently praised them precisely for their soulfulness and emotional resonance.

Following EMI's successes, Cope created newer and even more sophisticated programs. His crowning achievement was Annie. Whereas EMI composed music according to predetermined rules, Annie is based on machine learning. Its musical style constantly changes and develops in reaction to new inputs from the outside world. Cope has no idea what Annie is going to compose next. Indeed, Annie does not restrict itself to music composition but also explores other art forms such as haiku poetry. In 2011 Cope published *Comes the Fiery Night: 2,000 Haiku by Man and Machine*. Of the 2,000 haikus in the book, some are written by Annie, and the rest by organic poets. The book does not disclose which are which. If you think you can tell the difference between human creativity and machine output, you are welcome to test your claim.[18]

In the nineteenth century the Industrial Revolution created a huge new class of urban proletariats, and socialism spread because no one else managed to answer their unprecedented needs, hopes and fears. Liberalism eventually defeated socialism only by adopting the best parts of the socialist programme. In the twenty-first century we might witness the creation of a new massive class: people devoid of any economic, political or even artistic value, who contribute nothing to the prosperity, power and glory of society.

In September 2013 two Oxford researchers, Carl Benedikt Frey and Michael A. Osborne, published 'The Future of Employment', in which they surveyed the likelihood of different professions being taken over by computer algorithms within the next twenty years. The algorithm developed by Frey and Osborne to do the calculations estimated that 47 per cent of US jobs are at high risk. For example, there is a 99 per cent probability that by 2033 human telemarketers and insurance underwriters will lose their jobs to algorithms. There is a 98 per cent probability that the same will happen to sports referees, 97 per cent that it will happen to cashiers and 96 per cent to chefs. Waiters – 94 per cent. Paralegal assistants – 94 per cent. Tour guides – 91 per cent. Bakers – 89 per cent. Bus drivers – 89 per cent. Construction labourers – 88 per cent. Veterinary assistants – 86 per cent. Security guards – 84 per cent. Sailors – 83 per cent. Bartenders – 77 per cent. Archivists – 76 per cent. Carpenters – 72 per cent. Lifeguards – 67 per cent. And so forth. There are of course some safe jobs. The likelihood that computer algorithms will displace archaeologists by 2033 is only 0.7 per cent, because their job requires highly sophisticated types of pattern recognition, and doesn't produce huge profits. Hence it is improbable that corporations or government will make the necessary investment to automate archaeology within the next twenty years.[19]

Of course, by 2033 many new professions are likely to appear, for example, virtual-world designers. But such professions will probably require much more creativity and flexibility than your run-of-the-mill job, and it is unclear whether forty-year-old cashiers or insurance agents will be able to reinvent themselves as virtual-world designers (just try to imagine a virtual world created by an insurance agent!). And even if they do so, the pace of progress is such that within another decade they might have to reinvent themselves yet again. After all, algorithms might well outperform humans in designing virtual worlds too. The crucial problem isn't creating new jobs. The crucial problem is creating new jobs that humans perform better than algorithms.[20]

The technological bonanza will probably make it feasible to feed and support the useless masses even without any effort on their side. But what will keep them occupied and content? People must do something, or they will go crazy. What will they do all day? One solution might be offered by drugs

and computer games. Unnecessary people might spend increasing amounts of time within 3D virtual-reality worlds, which would provide them with far more excitement and emotional engagement than the drab reality outside. Yet such a development would deal a mortal blow to the liberal belief in the sacredness of human life and of human experiences. What's so sacred in useless bums who pass their days devouring artificial experiences in La La Land?

Some experts and thinkers, such as Nick Bostrom, warn that humankind is unlikely to suffer this degradation, because once artificial intelligence surpasses human intelligence, it might simply exterminate humankind. The AI is likely to do so either for fear that humankind would turn against it and try to pull its plug, or in pursuit of some unfathomable goal of its own. For it would be extremely difficult for humans to control the motivation of a system smarter than themselves.

Even preprogramming the system with seemingly benign goals might backfire horribly. One popular scenario imagines a corporation designing the first artificial super-intelligence, and giving it an innocent test such as calculating pi. Before anyone realises what is happening, the AI takes over the planet, eliminates the human race, launches a conquest campaign to the ends of the galaxy, and transforms the entire known universe into a giant super-computer that for billions upon billions of years calculates pi ever more accurately. After all, this is the divine mission its Creator gave it.[21]

A Probability of 87 Per Cent

At the beginning of this chapter we identified several practical threats to liberalism. The first is that humans might become militarily and economically useless. This is just a possibility, of course, not a prophecy. Technical difficulties or political objections might slow down the algorithmic invasion of the job market. Alternatively, since much of the human mind is still uncharted territory, we don't really know what hidden talents humans might discover, and what novel jobs they might create to replace the losses. That, however, may not be enough to save liberalism. For liberalism believes not just in the value of human beings – it also believes in individualism. The second threat facing liberalism is that in the future, while the system might still need humans, it will not need individuals. Humans will continue to compose music, to teach physics and to invest money, but the system will understand these humans better than they understand themselves, and will make most of the important decisions for them. The system will thereby deprive individuals of their authority and freedom.

The liberal belief in individualism is founded on the three important assumptions that we discussed earlier in the book:

1. I am an in-dividual – i.e. I have a single essence which cannot be divided into any parts or subsystems. True, this inner core is wrapped in many outer layers. But if I make the effort to peel these external crusts, I will find deep within myself a clear and single inner voice, which is my authentic self.
2. My authentic self is completely free.
3. It follows from the first two assumptions that I can know things about myself nobody else can discover. For only I have access to my inner space of freedom, and only I can hear the whispers of my authentic self. This is why liberalism grants the individual so much authority. I cannot trust anyone else to make choices for me, because no one else can know who I really am, how I feel and what I want. This is why the voter knows best, why the customer is always right and why beauty is

in the eye of the beholder.

However, the life sciences challenge all three assumptions. According to the life sciences:

1. Organisms are algorithms, and humans are not individuals – they are 'dividuals', i.e. humans are an assemblage of many different algorithms lacking a single inner voice or a single self.
2. The algorithms constituting a human are not free. They are shaped by genes and environmental pressures, and take decisions either deterministically or randomly – but not freely.
3. It follows that an external algorithm could theoretically know me much better than I can ever know myself. An algorithm that monitors each of the systems that comprise my body and my brain could know exactly who I am, how I feel and what I want. Once developed, such an algorithm could replace the voter, the customer and the beholder. Then the algorithm will know best, the algorithm will always be right, and beauty will be in the calculations of the algorithm.

During the nineteenth and twentieth centuries, the belief in individualism nevertheless made good practical sense, because there were no external algorithms that could actually monitor me effectively. States and markets may have wished to do exactly that, but they lacked the necessary technology. The KGB and FBI had only a vague understanding of my biochemistry, genome and brain, and even if agents bugged every phone call I made and recorded every chance encounter on the street, they did not have the computing power to analyse all this data. Consequently, given twentieth-century technological conditions, liberals were right to argue that nobody can know me better than I know myself. Humans therefore had a very good reason to regard themselves as an autonomous system, and to follow their own inner voices rather than the commands of Big Brother.

However, twenty-first-century technology may enable external algorithms to know me far better than I know myself, and once this happens, the belief in individualism will collapse and authority will shift from individual humans to networked algorithms. People will no longer see themselves as autonomous beings running their lives according to their wishes, and instead become accustomed to seeing themselves as a collection of biochemical mechanisms that is constantly monitored and guided by a network of electronic algorithms. For this to happen, there is no need of an external algorithm that knows me *perfectly*, and that never makes any mistakes; it is enough that an external algorithm will know me *better* than I know myself, and will make *fewer* mistakes than me. It will then make sense to trust this algorithm with more and more of my decisions and life choices.

We have already crossed this line as far as medicine is concerned. In the hospital, we are no longer individuals. Who do you think will make the most momentous decisions about your body and your health during your lifetime? It is highly likely that many of these decisions will be taken by computer algorithms such as IBM's Watson. And this is not necessarily bad news. Diabetics already carry sensors that automatically check their sugar level several times a day, alerting them whenever it crosses a dangerous threshold. In 2014 researchers at Yale University announced the first successful trial of an 'artificial pancreas' controlled by an iPhone. Fifty-two diabetics took part in the experiment. Each patient had a tiny sensor and a tiny pump implanted in his or her stomach. The pump was connected to small tubes of insulin and glucagon, two hormones that together regulate sugar levels in the blood. The sensor constantly measured the sugar level, transmitting the data to an iPhone. The iPhone hosted an application that analysed the information, and whenever necessary gave orders

to the pump, which injected measured amounts of either insulin or glucagon – without any need of human intervention.[22]

Many other people who suffer from no serious illnesses have begun to use wearable sensors and computers to monitor their health and activities. The devices – incorporated into anything from smartphones and wristwatches to armbands and underwear – record diverse biometric data such as blood pressure. The data is then fed into sophisticated computer programs, which advise you how to change your diet and daily routines so as to enjoy improved health and a longer and more productive life.[23] Google, together with the drug giant Novartis, are developing a contact lens that checks glucose levels in the blood every few seconds, by testing tear contents.[24] Pixie Scientific sells 'smart diapers' that analyse baby poop for clues about the baby's medical condition. Microsoft has launched the Microsoft Band in November 2014 – a smart armband that monitors among other things your heartbeat, the quality of your sleep and the number of steps you take each day. An application called Deadline goes a step further, telling you how many years of life you have left, given your current habits.

Some people use these apps without thinking too deeply about it, but for others this is already an ideology, if not a religion. The Quantified Self movement argues that the self is nothing but mathematical patterns. These patterns are so complex that the human mind has no chance of understanding them. So if you wish to obey the old adage and know thyself, you should not waste your time on philosophy, meditation or psychoanalysis, but rather you should systematically collect biometric data and allow algorithms to analyse them for you and tell you who you are and what you should do. The movement's motto is 'Self-knowledge through numbers'.[25]

In 2000 the Israeli singer Shlomi Shavan conquered the local playlists with his hit song 'Arik'. It's about a guy who is obsessed with his girlfriend's ex, Arik. He demands to know who is better in bed – him, or Arik? The girlfriend dodges the question, saying that it was different with each of them. The guy is not satisfied and demands: 'Talk numbers, lady.' Well, precisely for such guys, a company called Bedpost sells biometric armbands you can wear while having sex. The armband collects data such as heart rate, sweat level, duration of sexual intercourse, duration of orgasm and the number of calories you burnt. The data is fed into a computer that analyses the information and ranks your performance with precise numbers. No more fake orgasms and 'How was it for you?'[26]

People who experience themselves through the unrelenting mediation of such devices may begin to see themselves as a collection of biochemical systems more than as individuals, and their decisions will increasingly reflect the conflicting demands of the various systems.[27] Suppose you have two free hours a week, and you are unsure whether to use them in order to play chess or tennis. A good friend may ask: 'What does your heart tell you?' 'Well,' you answer, 'as far as my heart is concerned, it's obvious tennis is better. It's also better for my cholesterol level and blood pressure. But my fMRI scans indicate I should strengthen my left pre-frontal cortex. In my family, dementia is quite common, and my uncle had it at a very early age. The latest studies indicate that a weekly game of chess can help delay the onset of dementia.'

You can already find much more extreme examples of external mediation in the geriatric wards of hospitals. Humanism fantasises about old age as a period of wisdom and awareness. The ideal elder may suffer from bodily ailments and weaknesses, but his mind is quick and sharp, and he has eighty years of insights to dispense. He knows exactly what's what, and always has good advice for the grandchildren and other visitors. Twenty-first-century octogenarians don't always look like that. Thanks to our growing understanding of human biology, medicine keeps us alive long enough for our

minds and our 'authentic selves' to disintegrate and dissolve. All too often, what's left is a collection of dysfunctional biological systems kept going by a collection of monitors, computers and pumps.

At a deeper level, as genetic technologies are integrated into daily life, and as people develop increasingly intimate relations with their DNA, the single self might blur even further, and the authentic inner voice might dissolve into a noisy crowd of genes. When I am faced by difficult dilemmas and decisions, I may stop searching for my inner voice, and instead consult my inner genetic parliament.

On 14 May 2013 actress Angelina Jolie published an article in the *New York Times* about her decision to have a double mastectomy. Jolie lived for years under the shadow of breast cancer, as both her mother and grandmother died of it at a relatively early age. Jolie herself did a genetic test that proved she was carrying a dangerous mutation of the BRCA1 gene. According to recent statistical surveys, women carrying this mutation have an 87 per cent probability of developing breast cancer. Even though at the time Jolie did not have cancer, she decided to pre-empt the dreaded disease and have a double mastectomy. In the article Jolie explained that 'I choose not to keep my story private because there are many women who do not know that they might be living under the shadow of cancer. It is my hope that they, too, will be able to get gene-tested, and that if they have a high risk they, too, will know that they have strong options.'[28]

Deciding whether to undergo a mastectomy is a difficult and potentially fatal choice. Beyond the discomforts, dangers and financial costs of the operation and its follow-up treatments, the decision can have far-reaching effects on one's health, body image, emotional well-being and relationships. Jolie's choice, and the courage she showed in going public with it, caused a great stir and won her international acclaim and admiration. In particular, many hoped that the publicity would increase awareness of genetic medicine and its potential benefits.

From a historical perspective, it is interesting to note the critical role algorithms played in this case. When Jolie had to take such an important decision about her life, she did not climb a mountaintop overlooking the ocean, watch the sun set into the waves and attempt to connect to her innermost feelings. Instead, she preferred to listen to her genes, whose voice manifested not in feelings but in numbers. Jolie felt no pain or discomfort whatsoever. Her feelings told her: 'Relax, everything is perfectly fine.' But the computer algorithms used by her doctors told a different story: 'You don't feel anything is wrong, but there is a time bomb ticking in your DNA. Do something about it – now!'

Of course, Jolie's emotions and unique personality played a key part too. If another woman with a different personality had discovered she was carrying the same genetic mutation, she might well have decided not to undergo a mastectomy. However – and here we enter the twilight zone – what if that other woman had discovered she carried not only the dangerous BRCA1 mutation, but another mutation in the (fictional) gene ABCD3, which impairs a brain area responsible for evaluating probabilities, thereby causing people to underestimate dangers? What if a statistician pointed out to this woman that her mother, grandmother and several other relatives all died young because they underestimated various health risks and failed to take precautionary measures?

In all likelihood, you too will make important decisions about your health in the same way as Angelina Jolie. You will do a genetic test, a blood test or an fMRI; an algorithm will analyse your results on the basis of enormous statistical databases; and you will then accept the algorithm's recommendation. This is not an apocalyptic scenario. The algorithms won't revolt and enslave us. Rather, the algorithms will be so good in making decisions for us that it would be madness not to follow their advice.

Angelina Jolie's first leading role was in the 1993 science-fiction action film *Cyborg 2*. She played Casella Reese, a cyborg developed in the year 2074 by Pinwheel Robotics for corporate espionage and assassination. Casella is programmed with human emotions, in order to blend better into human societies while pursuing her missions. When Casella discovers that Pinwheel Robotics not only controls her, but also intends to terminate her, she escapes and fights for her life and freedom. *Cyborg 2* is a liberal fantasy about an individual fighting for liberty and privacy against global corporate octopuses.

In her real life, Jolie preferred to sacrifice privacy and autonomy for health. A similar desire to improve human health may well cause most of us to willingly dismantle the barriers protecting our private spaces, and allow state bureaucracies and multinational corporations access to our innermost recesses. For instance, allowing Google to read our emails and follow our activities would make it possible for Google to alert us to brewing epidemics before they are noticed by traditional health services.

How does the UK National Health Service know that a flu epidemic has erupted in London? By analysing the reports of thousands of doctors in hundreds of clinics. And how do all these doctors get the information? Well, when Mary wakes up one morning feeling a bit under the weather, she doesn't run straight to her doctor. She waits a few hours, or even a day or two, hoping that a nice cup of tea with honey will do the trick. When things don't improve, she makes an appointment with the doctor, goes to the clinic and describes the symptoms. The doctor types the data into the computer, and somebody up in NHS headquarters hopefully analyses this data together with reports streaming in from thousands of other doctors, concluding that flu is on the march. All this takes a lot of time.

Google could do it in minutes. All it needs to do is monitor the words Londoners type in their emails and in Google's search engine, and cross-reference them with a database of disease symptoms. Suppose on an average day the words 'headache', 'fever', 'nausea' and 'sneezing' appear 100,000 times in London emails and searches. If today the Google algorithm notices they appear 300,000 times, then bingo! We have a flu epidemic. There is no need to wait till Mary goes to her doctor. On the very first morning she woke up feeling a bit unwell, and before going to work she emailed a colleague, 'I have a headache, but I'll be there.' That's all Google needs.

However, for Google to work its magic, Mary must allow Google not only to read her messages, but also to share the information with the health authorities. If Angelina Jolie was willing to sacrifice her privacy in order to raise awareness of breast cancer, why shouldn't Mary make a similar sacrifice in order to fight epidemics?

This isn't a theoretical idea. In 2008 Google actually launched Google Flu Trends, that tracks flu outbreaks by monitoring Google searches. The service is still being developed, and due to privacy limitations it tracks only search words and allegedly avoids reading private emails. But it is already capable of ringing the flu alarm bells ten days before traditional health services.[29]

A more ambitious project is called the Google Baseline Study. Google intends to build a mammoth database on human health, establishing the 'perfect health' profile. This will hopefully make it possible to identify even the smallest deviations from the baseline, thereby alerting people to burgeoning health problems such as cancer when they can be nipped in the bud. The Baseline Study dovetails with an entire line of products called Google Fit. These products will be incorporated into wearables such as clothes, bracelets, shoes and glasses, and will collect a never-ending stream of biometrical data. The idea is for Google Fit to feed the Baseline Study with the data it needs.[30]

Yet companies such as Google want to go much deeper than wearables. The market for DNA testing is currently growing in leaps and bounds. One of its leaders is 23andMe, a private company

founded by Anne Wojcicki, former wife of Google co-founder Sergey Brin. The name '23andMe' refers to the twenty-three pairs of chromosomes that contain our genome, the message being that my chromosomes have a very special relationship with me. Anyone who can understand what the chromosomes are saying can tell you things about yourself that you never even suspected.

If you want to know what, pay 23andMe a mere $99, and they will send you a small package with a tube. You spit into the tube, seal it and mail it to Mountain View, California. There the DNA in your saliva is read, and you receive the results online. You get a list of the potential health hazards you face, and your genetic predisposition for more than ninety traits and conditions ranging from baldness to blindness. 'Know thyself' was never easier or cheaper. Since it is all based on statistics, the size of the company's database is the key to making accurate predictions. Hence the first company to build a giant genetic database will provide customers with the best predictions, and will potentially corner the market. US biotech companies are increasingly worried that strict privacy laws in the USA combined with Chinese disregard for individual privacy may hand China the genetic market on a plate.

If we connect all the dots, and if we give Google and its competitors free access to our biometric devices, to our DNA scans and to our medical records, we will get an all-knowing medical health service, which will not only fight epidemics, but will also shield us from cancer, heart attacks and Alzheimer's. Yet with such a database at its disposal, Google could do far more. Imagine a system that, in the words of the famous Police song, watches every breath you take, every move you make and every bond you break. A system that monitors your bank account and your heartbeat, your sugar levels and your sexual escapades. It will definitely know you much better than you know yourself. The self-deceptions and self-delusions that trap people in bad relationships, wrong careers and harmful habits will not fool Google. Unlike the narrating self that controls us today, Google will not make decisions on the basis of cooked-up stories, and will not be misled by cognitive short cuts and the peak-end rule. Google will actually remember every step we took and every hand we shook.

Many people will be happy to transfer much of their decision-making processes into the hands of such a system, or at least consult with it whenever they face important choices. Google will advise us which movie to see, where to go on holiday, what to study in college, which job offer to accept, and even whom to date and marry. 'Listen, Google,' I will say, 'both John and Paul are courting me. I like both of them, but in a different way, and it's so hard to make up my mind. Given everything you know, what do you advise me to do?'

And Google will answer: 'Well, I know you from the day you were born. I have read all your emails, recorded all your phone calls, and know your favourite films, your DNA and the entire history of your heart. I have exact data about each date you went on, and if you want, I can show you second-by-second graphs of your heart rate, blood pressure and sugar levels whenever you went on a date with John or Paul. If necessary, I can even provide you with accurate mathematical ranking of every sexual encounter you had with either of them. And naturally enough, I know them as well as I know you. Based on all this information, on my superb algorithms, and on decades' worth of statistics about millions of relationships – I advise you to go with John, with an 87 per cent probability of being more satisfied with him in the long run.

'Indeed, I know you so well that I also know you don't like this answer. Paul is much more handsome than John, and because you give external appearances too much weight, you secretly wanted me to say "Paul". Looks matter, of course; but not as much as you think. Your biochemical algorithms – which evolved tens of thousands of years ago in the African savannah – give looks a weight of 35 per cent in their overall rating of potential mates. My algorithms – which are based on

the most up-to-date studies and statistics – say that looks have only a 14 per cent impact on the long-term success of romantic relationships. So, even though I took Paul's looks into account, I still tell you that you would be better off with John.'[31]

In exchange for such devoted counselling services, we will just have to give up the idea that humans are individuals, and that each human has a free will determining what's good, what's beautiful and what is the meaning of life. Humans will no longer be autonomous entities directed by the stories their narrating self invents. Instead, they will be integral parts of a huge global network.

Liberalism sanctifies the narrating self, and allows it to vote in the polling stations, in the supermarket and in the marriage market. For centuries this made good sense, because though the narrating self believed in all kinds of fictions and fantasies, no alternative system knew me better. Yet once we have a system that really does know me better, it will be foolhardy to leave authority in the hands of the narrating self.

Liberal habits such as democratic elections will become obsolete, because Google will be able to represent even my own political opinions better than myself. When I stand behind the curtain in the polling booth, liberalism instructs me to consult my authentic self, and choose whichever party or candidate reflects my deepest desires. Yet the life sciences point out that when I stand there behind the curtain, I don't really remember everything I felt and thought in the years since the last election. Moreover, I am bombarded by a barrage of propaganda, spin and random memories which might well distort my choices. Just as in Kahneman's cold-water experiment, in politics too the narrating self follows the peak-end rule. It forgets the vast majority of events, remembers only a few extreme incidents and gives a wholly disproportional weight to recent happenings.

For four long years I may repeatedly complain about the PM's policies, telling myself and anyone willing to listen that he will be 'the ruin of us all'. However, in the months prior to the elections the government cuts taxes and spends money generously. The ruling party hires the best copywriters to lead a brilliant campaign, with a well-balanced mixture of threats and promises that speak right to the fear centre in my brain. On the morning of the elections I wake up with a cold, which impacts my mental processes, and causes me to prefer security and stability over all other considerations. And voila! I send the man who will be 'the ruin of us all' back into office for another four years.

I could have saved myself from such a fate if I only authorised Google to vote for me. Google wasn't born yesterday, you know. Though it doesn't ignore the recent tax cuts and the election promises, it also remembers what happened throughout the previous four years. It knows what my blood pressure was every time I read the morning newspapers, and how my dopamine level plummeted while I watched the evening news. Google will know how to screen the spin-doctors' empty slogans. Google will also know that illness makes voters lean a bit more to the right than usual, and will compensate for this. Google will therefore be able to vote not according to my momentary state of mind, and not according to the fantasies of the narrating self, but rather according to the real feelings and interests of the collection of biochemical algorithms known as 'I'.

Naturally, Google will not always get it right. After all, these are all just probabilities. But if Google makes enough good decisions, people will grant it increasing authority. As time goes by, the databases will grow, the statistics will become more accurate, the algorithms will improve and the decisions will be even better. The system will never know me perfectly, and will never be infallible. But there is no need for that. Liberalism will collapse on the day the system knows me better than I know myself. Which is less difficult than it may sound, given that most people don't really know themselves well.

A recent study commissioned by Google's nemesis – Facebook – has indicated that already today the Facebook algorithm is a better judge of human personalities and dispositions even than people's friends, parents and spouses. The study was conducted on 86,220 volunteers who have a Facebook account and who completed a hundred-item personality questionnaire. The Facebook algorithm predicted the volunteers' answers based on monitoring their Facebook Likes – which webpages, images and clips they tagged with the Like button. The more Likes, the more accurate the predictions. The algorithm's predictions were compared with those of work colleagues, friends, family members and spouses. Amazingly, the algorithm needed a set of only ten Likes in order to outperform the predictions of work colleagues. It needed seventy Likes to outperform friends, 150 Likes to outperform family members and 300 Likes to outperform spouses. In other words, if you happen to have clicked 300 Likes on your Facebook account, the Facebook algorithm can predict your opinions and desires better than your husband or wife!

Indeed, in some fields the Facebook algorithm did better than the person themself. Participants were asked to evaluate things such as their level of substance use or the size of their social networks. Their judgements were less accurate than those of the algorithm. The research concludes with the following prediction (made by the human authors of the article, not by the Facebook algorithm): 'People might abandon their own psychological judgements and rely on computers when making important life decisions, such as choosing activities, career paths, or even romantic partners. It is possible that such data-driven decisions will improve people's lives.'[32]

On a more sinister note, the same study implies that in the next US presidential elections, Facebook could know not only the political opinions of tens of millions of Americans, but also who among them are the critical swing votes, and how these votes might be swung. Facebook could tell you that in Oklahoma the race between Republicans and Democrats is particularly close, Facebook could identify the 32,417 voters who still haven't made up their mind, and Facebook could determine what each candidate needs to say in order to tip the balance. How could Facebook obtain this priceless political data? We provide it for free.

In the high days of European imperialism, conquistadors and merchants bought entire islands and countries in exchange for coloured beads. In the twenty-first century our personal data is probably the most valuable resource most humans still have to offer, and we are giving it to the tech giants in exchange for email services and funny cat videos.

From Oracle to Sovereign

Once Google, Facebook and other algorithms become all-knowing oracles, they may well evolve into agents and finally into sovereigns.[33] To understand this trajectory, consider the case of Waze – a GPS-based navigational application which many drivers use nowadays. Waze isn't just a map. Its millions of users constantly update it about traffic jams, car accidents and police cars. Hence Waze knows to divert you away from heavy traffic, and bring you to your destination through the quickest possible route. When you reach a junction and your gut instinct tells you to turn right, but Waze instructs you to turn left, users sooner or later learn that they had better listen to Waze rather than to their feelings.[34]

At first sight it seems that the Waze algorithm serves us only as an oracle. We ask a question, the oracle replies, but it is up to us to make a decision. If the oracle wins our trust, however, the next logical step is to turn it into an agent. We give the algorithm only a final aim, and it acts to realise that

aim without our supervision. In the case of Waze, this may happen when we connect Waze to a self-driving car, and tell Waze 'take the fastest route home' or 'take the most scenic route' or 'take the route which will result in the minimum amount of pollution'. We call the shots, but leave it to Waze to execute our commands.

Finally, Waze might become sovereign. Having so much power in its hands, and knowing far more than we know, it may start manipulating us, shaping our desires and making our decisions for us. For example, suppose because Waze is so good, everybody starts using it. And suppose there is a traffic jam on route no. 1, while the alternative route no. 2 is relatively open. If Waze simply lets everybody know that, then all drivers will rush to route no. 2, and it too will be clogged. When everybody uses the same oracle, and everybody believes the oracle, the oracle turns into a sovereign. So Waze must think for us. Maybe it will inform only half the drivers that route no. 2 is open, while keeping this information secret from the other half. Thereby pressure will ease on route no. 1 without blocking route no. 2.

Microsoft is developing a far more sophisticated system called Cortana, named after an AI character in their popular *Halo* video-game series. Cortana is an AI personal assistant which Microsoft hopes to include as an integral feature of future versions of Windows. Users will be encouraged to allow Cortana access to all their files, emails and applications, so that it will get to know them, and can offer its advice on myriad matters, as well as becoming a virtual agent representing the user's interests. Cortana could remind you to buy something for your wife's birthday, select the present, reserve a table at the restaurant and prompt you to take your medicine an hour before dinner. It could alert you that if you don't stop reading now, you will be late for an important business meeting. As you are about to enter the meeting, Cortana will warn that your blood pressure is too high and your dopamine level too low, and based on past statistics, you tend to make serious business mistakes in such circumstances. So you had better keep things tentative and avoid committing yourself or signing any deals.

Once Cortanas evolve from oracles to agents, they might start speaking directly with one another, on their masters' behalf. It can begin innocently enough, with my Cortana contacting your Cortana to agree on a place and time for a meeting. Next thing I know, a potential employer tells me not to bother sending a CV, but simply allow his Cortana to grill my Cortana. Or my Cortana may be approached by the Cortana of a potential lover, and the two will compare notes to decide whether it's a good match – completely unbeknown to their human owners.

As Cortanas gain authority, they may begin manipulating each other to further the interests of their masters, so that success in the job market or the marriage market may increasingly depend on the quality of your Cortana. Rich people owning the most up-to-date Cortana will have a decisive advantage over poor people with their older versions.

But the murkiest issue of all concerns the identity of Cortana's master. As we have seen, humans are not individuals, and they don't have a single unified self. Whose interests, then, should Cortana serve? Suppose my narrating self makes a New Year resolution to start a diet and go to the gym every day. A week later, when it is time to go to the gym, the experiencing self asks Cortana to turn on the TV and order pizza. What should Cortana do? Should it obey the experiencing self, or the resolution taken a week ago by the narrating self?

You may well ask whether Cortana is really different from an alarm clock, which the narrating self sets in the evening, in order to wake the experiencing self in time for work. But Cortana will have far more power over me than an alarm clock. The experiencing self can silence the alarm clock by pressing a button. In contrast, Cortana will know me so well that it will know exactly what inner

buttons to push in order to make me follow its 'advice'.

Microsoft's Cortana is not alone in this game. Google Now and Apple's Siri are headed in the same direction. Amazon too has algorithms that constantly study you and use their knowledge to recommend products. When I go to Amazon to buy a book, an ad pops up and tells me: 'I know which books you liked in the past. People with similar tastes also tend to love this or that new book.' Wonderful! There are millions of books in the world, and I can never go over all of them, not to mention predicting accurately which ones I would like. How good that an algorithm knows me, and can give me recommendations based on my unique taste.

And this is just the beginning. Today in the US more people read digital books than printed volumes. Devices such as Amazon's Kindle are able to collect data on their users while they are reading the book. For example, your Kindle can monitor which parts of the book you read fast, and which slow; on which page you took a break, and on which sentence you abandoned the book, never to pick it up again. (Better tell the author to rewrite that bit.) If Kindle is upgraded with face recognition and biometric sensors, it can know what made you laugh, what made you sad and what made you angry. Soon, books will read you while you are reading them. And whereas you quickly forget most of what you read, Amazon will never forget a thing. Such data will enable Amazon to evaluate the suitability of a book much better than ever before. It will also enable Amazon to know exactly who you are, and how to turn you on and off.[35]

Eventually, we may reach a point when it will be impossible to disconnect from this all-knowing network even for a moment. Disconnection will mean death. If medical hopes are realised, future people will incorporate into their bodies a host of biometric devices, bionic organs and nano-robots, which will monitor our health and defend us from infections, illnesses and damage. Yet these devices will have to be online 24/7, both in order to be updated with the latest medical news, and in order to protect them from the new plagues of cyberspace. Just as my home computer is constantly attacked by viruses, worms and Trojan horses, so will be my pacemaker, my hearing aid and my nanotech immune system. If I don't update my body's anti-virus program regularly, I will wake up one day to discover that the millions of nano-robots coursing through my veins are now controlled by a North Korean hacker.

The new technologies of the twenty-first century may thus reverse the humanist revolution, stripping humans of their authority, and empowering non-human algorithms instead. If you are horrified by this direction, don't blame the computer geeks. The responsibility actually lies with the biologists. It is crucial to realise that this entire trend is fuelled by biological insights more than by computer science. It is the life sciences that have concluded that organisms are algorithms. If this is not the case – if organisms function in an inherently different way to algorithms – then computers may work wonders in other fields, but they will not be able to understand us and direct our life, and they will certainly be incapable of merging with us. Yet once biologists concluded that organisms are algorithms, they dismantled the wall between the organic and inorganic, turned the computer revolution from a purely mechanical affair into a biological cataclysm, and shifted authority from individual humans to networked algorithms.

Some people are indeed horrified by this development, but the fact is that millions willingly embrace it. Already today many of us give up our privacy and our individuality, record our every action, conduct our lives online and become hysterical if connection to the net is interrupted even for a few minutes. The shifting of authority from humans to algorithms is happening all around us, not as a result of some momentous governmental decision, but due to a flood of mundane choices.

The result will not be an Orwellian police state. We always prepare ourselves for the previous

enemy, even when we face an altogether new menace. Defenders of human individuality stand guard against the tyranny of the collective, without realising that human individuality is now threatened from the opposite direction. The individual will not be crushed by Big Brother; it will disintegrate from within. Today corporations and governments pay homage to my individuality, and promise to provide medicine, education and entertainment customised to my unique needs and wishes. But in order to so, corporations and governments first need to break me up into biochemical subsystems, monitor these subsystems with ubiquitous sensors and decipher their working with powerful algorithms. In the process, the individual will transpire to be nothing but a religious fantasy. Reality will be a mesh of biochemical and electronic algorithms, without clear borders, and without individual hubs.

Upgrading Inequality

So far we have looked at two of the three practical threats to liberalism: firstly, that humans will lose their value completely; secondly, that humans will still be valuable collectively, but they will lose their individual authority, and will instead be managed by external algorithms. The system will still need you to compose symphonies, teach history or write computer code, but the system will know you better than you know yourself, and will therefore make most of the important decisions for you – and you will be perfectly happy with that. It won't necessarily be a bad world; it will, however, be a post-liberal world.

The third threat to liberalism is that some people will remain both indispensable and undecipherable, but they will constitute a small and privileged elite of upgraded humans. These superhumans will enjoy unheard-of abilities and unprecedented creativity, which will allow them to go on making many of the most important decisions in the world. They will perform crucial services for the system, while the system could not understand and manage them. However, most humans will not be upgraded, and they will consequently become an inferior caste, dominated by both computer algorithms and the new superhumans.

Splitting humankind into biological castes will destroy the foundations of liberal ideology. Liberalism can coexist with socio-economic gaps. Indeed, since it favours liberty over equality, it takes such gaps for granted. However, liberalism still presupposes that all human beings have equal value and authority. From a liberal perspective, it is perfectly all right that one person is a billionaire living in a sumptuous chateau, whereas another is a poor peasant living in a straw hut. For according to liberalism, the peasant's unique experiences are still just as valuable as the billionaire's. That's why liberal authors write long novels about the experiences of poor peasants – and why even billionaires read such books avidly. If you go to see *Les Misérables* in Broadway or Covent Garden, you will find that good seats can cost hundreds of dollars, and the audience's combined wealth probably runs into the billions, yet they still sympathise with Jean Valjean who served nineteen years in jail for stealing a loaf of bread to feed his starving nephews.

The same logic operates on election day, when the vote of the poor peasant counts for exactly the same as the billionaire's. The liberal solution for social inequality is to give equal value to different human experiences, instead of trying to create the same experiences for everyone. However, what will be the fate of this solution once rich and poor are separated not merely by wealth, but also by real biological gaps?

In her *New York Times* article, Angelina Jolie referred to the high costs of genetic testing. At present, the test Jolie had taken costs $3,000 (which does not include the price of the actual

mastectomy, the reconstruction surgery and related treatments). This in a world where 1 billion people earn less than $1 per day, and another 1.5 billion earn between $1 and $2 a day.[36] Even if they work hard their entire life, they will never be able to finance a $3,000 genetic test. And the economic gaps are at present only increasing. As of early 2016, the sixty-two richest people in the world were worth as much as the poorest 3.6 billion people! Since the world's population is about 7.2 billion, it means that these sixty-two billionaires together hold as much wealth as the entire bottom half of humankind.[37]

The cost of DNA testing is likely to go down with time, but expensive new procedures are constantly being pioneered. So while old treatments will gradually come within reach of the masses, the elites will always remain a couple of steps ahead. Throughout history the rich enjoyed many social and political advantages, but there was never a huge biological gap separating them from the poor. Medieval aristocrats claimed that superior blue blood was flowing through their veins, and Hindu Brahmins insisted that they were naturally smarter than everyone else, but this was pure fiction. In the future, however, we may see real gaps in physical and cognitive abilities opening between an upgraded upper class and the rest of society.

When scientists are confronted with this scenario, their standard reply is that in the twentieth century too many medical breakthroughs began with the rich, but eventually benefited the whole population and helped to narrow rather than widen the social gaps. For example, vaccines and antibiotics at first profited mainly the upper classes in Western countries, but today they improve the lives of all humans everywhere.

However, the expectation that this process will be repeated in the twenty-first century may be just wishful thinking, for two important reasons. First, medicine is undergoing a tremendous conceptual revolution. Twentieth-century medicine aimed to heal the sick. Twenty-first-century medicine is increasingly aiming to upgrade the healthy. Healing the sick was an egalitarian project, because it assumed that there is a normative standard of physical and mental health that everyone can and should enjoy. If someone fell below the norm, it was the job of doctors to fix the problem and help him or her 'be like everyone'. In contrast, upgrading the healthy is an elitist project, because it rejects the idea of a universal standard applicable to all, and seeks to give some individuals an edge over others. People want superior memories, above-average intelligence and first-class sexual abilities. If some form of upgrade becomes so cheap and common that everyone enjoys it, it will simply be considered the new baseline, which the next generation of treatments will strive to surpass.

Second, twentieth-century medicine benefited the masses because the twentieth century was the age of the masses. Twentieth-century armies needed millions of healthy soldiers, and the economy needed millions of healthy workers. Consequently, states established public health services to ensure the health and vigour of everyone. Our greatest medical achievements were the provision of mass-hygiene facilities, the campaigns of mass vaccinations and the overcoming of mass epidemics. The Japanese elite in 1914 had a vested interest in vaccinating the poor and building hospitals and sewage systems in the slums, because if they wanted Japan to be a strong nation with a strong army and a strong economy, they needed many millions of healthy soldiers and workers.

But the age of the masses may be over, and with it the age of mass medicine. As human soldiers and workers give way to algorithms, at least some elites may conclude that there is no point in providing improved or even standard conditions of health for masses of useless poor people, and it is far more sensible to focus on upgrading a handful of superhumans beyond the norm.

Already today, the birth rate is falling in technologically advanced countries such as Japan and South Korea, where prodigious efforts are invested in the upbringing and education of fewer and

fewer children – from whom more and more is expected. How could huge developing countries like India, Brazil or Nigeria hope to compete with Japan? These countries resemble a long train. The elites in the first-class carriages enjoy health care, education and income levels on a par with the most developed nations in the world. However, the hundreds of millions of ordinary citizens who crowd the third-class carriages still suffer from widespread diseases, ignorance and poverty. What would the Indian, Brazilian or Nigerian elites prefer to do in the coming century? Invest in fixing the problems of hundreds of millions of poor, or in upgrading a few million rich? Unlike in the twentieth century, when the elite had a stake in fixing the problems of the poor because they were militarily and economically vital, in the twenty-first century the most efficient (albeit ruthless) strategy may be to let go of the useless third-class carriages, and dash forward with the first class only. In order to compete with Japan, Brazil might need a handful of upgraded superhumans far more than millions of healthy ordinary workers.

How can liberal beliefs survive the appearance of superhumans with exceptional physical, emotional and intellectual abilities? What will happen if it turns out that such superhumans have fundamentally different experiences to normal Sapiens? What if superhumans are bored by novels about the experiences of lowly Sapiens thieves, whereas run-of-the-mill humans find soap operas about superhuman love affairs unintelligible?

The great human projects of the twentieth century – overcoming famine, plague and war – aimed to safeguard a universal norm of abundance, health and peace for all people without exception. The new projects of the twenty-first century – gaining immortality, bliss and divinity – also hope to serve the whole of humankind. However, because these projects aim at surpassing rather than safeguarding the norm, they may well result in the creation of a new superhuman caste that will abandon its liberal roots and treat normal humans no better than nineteenth-century Europeans treated Africans.

If scientific discoveries and technological developments split humankind into a mass of useless humans and a small elite of upgraded superhumans, or if authority shifts altogether away from human beings into the hands of highly intelligent algorithms, then liberalism will collapse. What new religions or ideologies might fill the resulting vacuum and guide the subsequent evolution of our godlike descendants?

10
The Ocean of Consciousness

The new religions are unlikely to emerge from the caves of Afghanistan or from the madrasas of the Middle East. Rather, they will emerge from research laboratories. Just as socialism took over the world by promising salvation through steam and electricity, so in the coming decades new techno-religions may conquer the world by promising salvation through algorithms and genes.

Despite all the talk of radical Islam and Christian fundamentalism, the most interesting place in the world from a religious perspective is not the Islamic State or the Bible Belt, but Silicon Valley. That's where hi-tech gurus are brewing for us brave new religions that have little to do with God, and everything to do with technology. They promise all the old prizes – happiness, peace, prosperity and even eternal life – but here on earth with the help of technology, rather than after death with the help of celestial beings.

These new techno-religions can be divided into two main types: techno-humanism and data religion. Data religion argues that humans have completed their cosmic task, and they should now pass the torch on to entirely new kinds of entities. We will discuss the dreams and nightmares of data religion in the next chapter. This chapter is dedicated to the more conservative creed of techno-humanism, which still sees humans as the apex of creation and clings to many traditional humanist values. Techno-humanism agrees that *Homo sapiens* as we know it has run its historical course and will no longer be relevant in the future, but concludes that we should therefore use technology in order to create *Homo deus* – a much superior human model. *Homo deus* will retain some essential human features, but will also enjoy upgraded physical and mental abilities that will enable it to hold its own even against the most sophisticated non-conscious algorithms. Since intelligence is decoupling from consciousness, and since non-conscious intelligence is developing at breakneck speed, humans must actively upgrade their minds if they want to stay in the game.

Seventy thousand years ago the Cognitive Revolution transformed the Sapiens mind, thereby turning an insignificant African ape into the ruler of the world. The improved Sapiens minds suddenly had access to the vast intersubjective realm, which enabled us to create gods and corporations, to build cities and empires, to invent writing and money, and eventually to split the atom and reach the moon. As far as we know, this earth-shattering revolution resulted from a few small changes in the Sapiens DNA, and a slight rewiring of the Sapiens brain. If so, says techno-humanism, maybe a few additional changes to our genome and another rewiring of our brain will suffice for launching a second cognitive revolution. The mental renovations of the first Cognitive Revolution gave *Homo sapiens* access to the intersubjective realm and turned us into the rulers of the planet; a second cognitive revolution might give *Homo deus* access to unimaginable new realms and turn us into the lords of the galaxy.

This idea is an updated variant on the old dreams of evolutionary humanism, which already a century ago called for the creation of superhumans. However, whereas Hitler and his ilk planned to create superhumans by means of selective breeding and ethnic cleansing, twenty-first-century techno-

humanism hopes to reach the goal far more peacefully, with the help of genetic engineering, nanotechnology and brain–computer interfaces.

Gap the Mind

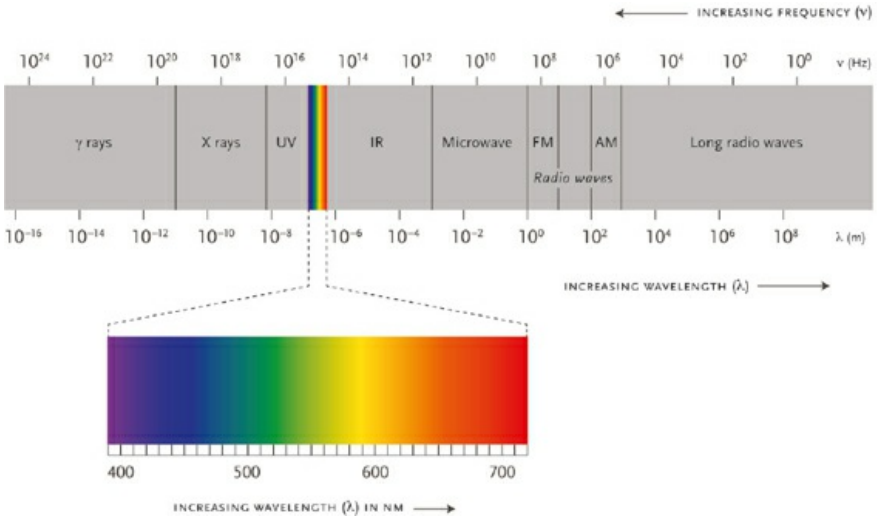
Techno-humanism seeks to upgrade the human mind and give us access to unknown experiences and unfamiliar states of consciousness. However, revamping the human mind is an extremely complex and dangerous undertaking. As we saw in Chapter 3, we don't really understand the mind. We don't know how minds emerge, or what their function is. Through trial and error we learn how to engineer mental states, but we seldom comprehend the full implications of such manipulations. Worse yet, since we are unfamiliar with the full spectrum of mental states, we don't know what mental aims to set ourselves.

We are akin to the inhabitants of a small isolated island who have just invented the first boat, and are about to set sail without a map or even a destination. Indeed, we are in a somewhat worse condition. The inhabitants of our imaginary island at least know that they occupy just a small space within a large and mysterious sea. We fail to appreciate that we are living on a tiny island of consciousness within a giant ocean of alien mental states.

Just as the spectrums of light and sound are far larger than what we humans can see and hear, so the spectrum of mental states is far larger than what the average human is aware of. We can see light in wavelengths of between 400 and 700 nanometres only. Above this small principality of human vision extend the unseen but vast realms of infrared, microwaves and radio waves, and below it lie the dark kingdoms of ultraviolet, X-rays and gamma rays. Similarly, the spectrum of possible mental states may be infinite, but science has studied only two tiny sections of it: the sub-normative and the WEIRD.

For more than a century psychologists and biologists have conducted extensive research on people suffering from various psychiatric disorders and mental diseases. Consequently, today we have a very detailed (though far from perfect) map of the sub-normative mental spectrum. Simultaneously, scientists have studied the mental states of people considered to be healthy and normative. However, most scientific research about the human mind and the human experience has been conducted on people from **W**estern, **e**ducated, **i**ndustrialised, **r**ich and **d**emocratic (WEIRD) societies, who do not constitute a representative sample of humanity. The study of the human mind has so far assumed that *Homo sapiens* is Homer Simpson.

In a groundbreaking 2010 study, Joseph Henrich, Steven J. Heine and Ara Norenzayan systematically surveyed all the papers published between 2003 and 2007 in leading scientific journals belonging to six different subfields of psychology. The study found that though the papers often make broad claims about the human mind, most of them base their findings on exclusively WEIRD samples. For example, in papers published in the *Journal of Personality and Social Psychology* – arguably the most important journal in the subfield of social psychology – 96 per cent of the sampled individuals were WEIRD, and 68 per cent were Americans. Moreover, 67 per cent of American subjects and 80 per cent of non-American subjects were psychology students! In other words, more than two-thirds of the individuals sampled for papers published in this prestigious journal were psychology students in Western universities. Henrich, Heine and Norenzayan half-jokingly suggested that the journal change its name to the *Journal of Personality and Social Psychology of American Psychology Students*.[1]



Humans can see only a minuscule part of the electromagnetic spectrum. The spectrum in its entirety is about 10 trillion times larger than that of visible light. Might the mental spectrum be equally vast?

'EM spectrum'. Licensed under CC BY-SA 3.0 via Commons, https://commons.wikimedia.org/wiki/File:EM_spectrum.svg#/media/File:EM_spectrum.svg.

Psychology students star in many of the studies because their professors oblige them to take part in experiments. If I am a psychology professor at Harvard it is much easier for me to conduct experiments on my own students than on the residents of a crime-ridden New York slum – not to mention travelling to Namibia and conducting experiments on hunter-gatherers in the Kalahari Desert. However, it may well be that New York slum-dwellers and Kalahari hunter-gatherers experience mental states which we will never discover by forcing Harvard psychology students to answer long questionnaires or stick their heads into fMRI scanners.

Even if we travel all over the globe and study each and every community, we would still cover only a limited part of the Sapiens mental spectrum. Nowadays, all humans have been touched by modernity, and we are all members of a single global village. Though Kalahari foragers are somewhat less modern than Harvard psychology students, they are not a time capsule from our distant past. They too have been influenced by Christian missionaries, European traders, wealthy eco-tourists and inquisitive anthropologists (the joke is that in the Kalahari Desert, the typical hunter-gatherer band consists of twenty hunters, twenty gatherers and fifty anthropologists).

Before the emergence of the global village, the planet was a galaxy of isolated human cultures, which might have fostered mental states that are now extinct. Different socio-economic realities and daily routines nurtured different states of consciousness. Who could gauge the minds of Stone Age mammoth-hunters, Neolithic farmers or Kamakura samurais? Moreover, many pre-modern cultures believed in the existence of superior states of consciousness, which people might access using meditation, drugs or rituals. Shamans, monks and ascetics systematically explored the mysterious lands of mind, and came back laden with breathtaking stories. They told of unfamiliar states of supreme tranquillity, extreme sharpness and matchless sensitivity. They told of the mind expanding to infinity or dissolving into emptiness.

The humanist revolution caused modern Western culture to lose faith and interest in superior mental states, and to sanctify the mundane experiences of the average Joe. Modern Western culture is therefore unique in lacking a special class of people who seek to experience extraordinary mental states. It believes anyone attempting to do so is a drug addict, mental patient or charlatan. Consequently, though we have a detailed map of the mental landscape of Harvard psychology students, we know far less about the mental landscapes of Native American shamans, Buddhist monks

or Sufi mystics.[2]

And that is just the Sapiens mind. Fifty thousand years ago, we shared this planet with our Neanderthal cousins. They didn't launch spaceships, build pyramids or establish empires. They obviously had very different mental abilities, and lacked many of our talents. Nevertheless, they had bigger brains than us Sapiens. What exactly did they do with all those neurons? We have absolutely no idea. But they might well have had many mental states that no Sapiens had ever experienced.

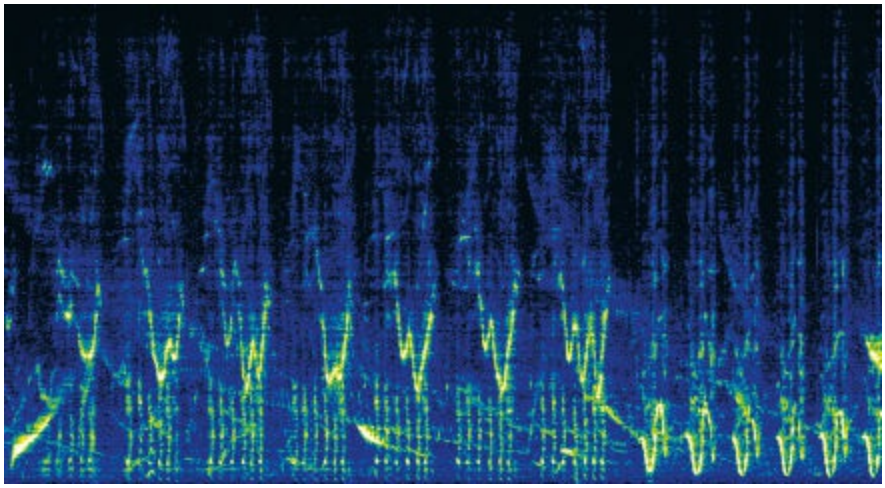
Yet even if we take into account all human species that ever existed, that would still not exhaust the mental spectrum. Other animals probably have experiences that we humans can barely imagine. Bats, for example, experience the world through echolocation. They emit a very rapid stream of high-frequency calls, well beyond the range of the human ear. They then detect and interpret the returning echoes to build a picture of the world. That picture is so detailed and accurate that the bats can fly quickly between trees and buildings, chase and capture moths and mosquitoes, and all the time evade owls and other predators.

The bats live in a world of echoes. Just as in the human world every object has a characteristic shape and colour, so in the bat world every object has its echo-pattern. A bat can tell the difference between a tasty moth species and a poisonous moth species by the different echoes returning from their slender wings. Some edible moth species try to protect themselves by evolving an echo-pattern similar to that of a poisonous species. Other moths have evolved an even more remarkable ability to deflect the waves of the bat radar, so that like stealth bombers they fly around without the bat knowing they are there. The world of echolocation is as complex and stormy as our familiar world of sound and sight, but we are completely oblivious to it.

One of the most important articles about the philosophy of mind is titled 'What Is It Like to Be a Bat?'[3] In this 1974 article, the philosopher Thomas Nagel points out that a Sapiens mind cannot fathom the subjective world of a bat. We can write all the algorithms we want about the bat body, about bat echolocation systems and about bat neurons, but it won't tell us how it *feels* to be a bat. How does it feel to echolocate a moth flapping its wings? Is it similar to seeing it, or is it something completely different?

Trying to explain to a Sapiens how it feels to echolocate a butterfly is probably as pointless as explaining to a blind mole how it feels to see a Caravaggio. It's likely that bat emotions are also deeply influenced by the centrality of their echolocation sense. For Sapiens, love is red, envy is green and depression is blue. Who knows what echolocations colour the love of a female bat to her offspring, or the feelings of a male bat towards his rivals?

Bats aren't special, of course. They are but one out of countless possible examples. Just as Sapiens cannot understand what it's like to be a bat, we have similar difficulties understanding how it feels to be a whale, a tiger or a pelican. It certainly feels like something; but we don't know like what. Both whales and humans process emotions in a part of the brain called the limbic system, yet the whale limbic system contains an entire additional part which is missing from the human structure. Maybe that part enables whales to experience extremely deep and complex emotions which are alien to us? Whales might also have astounding musical experiences which even Bach and Mozart couldn't grasp. Whales can hear one another from hundreds of kilometres away, and each whale has a repertoire of characteristic 'songs' that may last for hours and follow very intricate patterns. Every now and then a whale composes a new hit, which other whales throughout the ocean adopt. Scientists routinely record these hits and analyse them with the help of computers, but can any human fathom these musical experiences and tell the difference between a whale Beethoven and a whale Justin Bieber?[4]

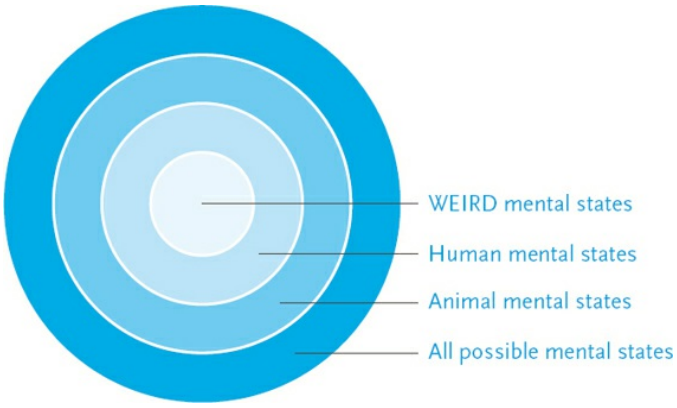


A spectrogram of a bowhead whale song. How does a whale experience this song? The *Voyager* record included a whale song in addition to Beethoven, Bach and Chuck Berry. We can only hope it is a good one.

© Cornell Bioacoustics Research Program at the Lab of Ornithology.

None of this should surprise us. Sapiens don't rule the world because they have deeper emotions or more complex musical experiences than other animals. So we may be inferior to whales, bats, tigers and pelicans at least in some emotional and experiential domains.

Beyond the mental spectrum of humans, bats, whales and all other animals, even vaster and stranger continents may lie in wait. In all probability, there is an infinite variety of mental states that no Sapiens, bat or dinosaur ever experienced in 4 billion years of terrestrial evolution, because they did not have the necessary faculties. In the future, however, powerful drugs, genetic engineering, electronic helmets and direct brain–computer interfaces may open passages to these places. Just as Columbus and Magellan sailed beyond the horizon to explore new islands and unknown continents, so we may one day set sail towards the antipodes of the mind.



The spectrum of consciousness.

I Smell Fear

As long as doctors, engineers and customers focused on healing mental diseases and enjoying life in WEIRD societies, the study of subnormal mental states and WEIRD minds was perhaps sufficient to our needs. Though normative psychology is often accused of mistreating any divergence from the norm, in the last century it has brought relief to countless people, saving the lives and sanity of millions.

However, at the beginning of the third millennium we face a completely different kind of challenge,

as liberal humanism makes way for techno-humanism, and medicine is increasingly focused on upgrading the healthy rather than healing the sick. Doctors, engineers and customers no longer want merely to fix mental problems – they seek to upgrade the mind. We are acquiring the technical abilities to begin manufacturing new states of consciousness, yet we lack a map of these potential new territories. Since we are familiar mainly with the normative and sub-normative mental spectrum of WEIRD people, we don't even know what destinations to aim towards.

Not surprisingly, then, positive psychology has become the trendiest subfield of the discipline. In the 1990s leading experts such as Martin Seligman, Ed Dinner and Mihaly Csikszentmihalyi argued that psychology should study not just mental illnesses, but also mental strengths. How come we have a remarkably detailed atlas of the sick mind, but have no scientific map of the prosperous mind? Over the last two decades, positive psychology has made important first steps in the study of super-normative mental states, but as of 2016, the super-normative zone is largely terra incognita to science.

Under such circumstances, we might rush forward without any map, and focus on upgrading those mental abilities that the current economic and political system needs, while neglecting and even downgrading other abilities. Of course, this is not a completely new phenomenon. For thousands of years the system has been shaping and reshaping our minds according to its needs. Sapiens originally evolved as members of small intimate communities, and their mental faculties were not adapted to living as cogs within a giant machine. However, with the rise of cities, kingdoms and empires, the system cultivated capacities required for large-scale cooperation, while disregarding other skills and talents.

For example, archaic humans probably made extensive use of their sense of smell. Hunter-gatherers are able to smell from a distance the difference between various animal species, various humans and even various emotions. Fear, for example, smells different to courage. When a man is afraid he secretes different chemicals compared to when he is full of courage. If you sat among an archaic band debating whether to start a war against a neighbouring band, you could literary smell public opinion.

As Sapiens organised themselves in larger groups, our nose lost its importance, because it is useful only when dealing with small numbers of individuals. You cannot, for example, smell the American fear of China. Consequently, human olfactory powers were neglected. Brain areas that tens of thousands of years ago probably dealt with odours were put to work on more urgent tasks such as reading, mathematics and abstract reasoning. The system prefers that our neurons solve differential equations rather than smell our neighbours.[5]

The same thing happened to our other senses, and to the underlying ability to pay attention to our sensations. Ancient foragers were always sharp and attentive. Wandering in the forest in search of mushrooms, they sniffed the wind carefully and watched the ground intently. When they found a mushroom, they ate it with the utmost attention, aware of every little nuance of flavour, which could distinguish an edible mushroom from its poisonous cousin. Members of today's affluent societies don't need such keen awareness. We can go to the supermarket and buy any of a thousand different dishes, all supervised by the health authorities. But whatever we choose – Italian pizza or Thai noodles – we are likely to eat it in haste in front of the TV, hardly paying attention to the taste (which is why food producers are constantly inventing new exciting flavours, which might somehow pierce the curtain of indifference). Similarly, when going on holiday we can choose between thousands of amazing destinations. But wherever we go, we are likely to be playing with our smartphone instead of really seeing the place. We have more choice than ever before, but no matter what we choose, we have lost the ability to really pay attention to it.[6]

In addition to smelling and paying attention, we have also been losing our ability to dream. Many cultures believed that what people see and do in their dreams is no less important than what they see and do while awake. Hence people actively developed their ability to dream, to remember dreams and even to control their actions in the dream world, which is known as 'lucid dreaming'. Experts in lucid dreaming could move about the dream world at will, and claimed they could even travel to higher planes of existence or meet visitors from other worlds. The modern world, in contrast, dismisses dreams as subconscious messages at best, and mental garbage at worst. Consequently, dreams play a much smaller part in our lives, few people actively develop their dreaming skills, and many people claim that they don't dream at all, or that they cannot remember any of their dreams.[7]

Did the decline in our capacity to smell, to pay attention and to dream make our lives poorer and greyer? Maybe. But even if it did, for the economic and political system it was worth it. Mathematical skills are more important to the economy than smelling flowers or dreaming about fairies. For similar reasons, it is likely that future upgrades to the human mind will reflect political needs and market forces.

For example, the US army's 'attention helmet' is meant to help people focus on well-defined tasks and speed up their decision-making process. It may, however, reduce their ability to show empathy and tolerate doubts and inner conflicts. Humanist psychologists have pointed out that people in distress often don't want a quick fix – they want somebody to listen to them and sympathise with their fears and misgivings. Suppose you are having an ongoing crisis in your workplace, because your new boss doesn't appreciate your views, and insists on doing everything her way. After one particularly unhappy day, you pick up the phone and call a friend. But the friend has little time and energy for you, so he cuts you short, and tries to solve your problem: 'Okay. I get it. Well, you really have just two options here: either quit the job, or stay and do what the boss wants. And if I were you, I would quit.' That would hardly help. A really good friend will have patience, and will not be quick to find a solution. He will listen to your distress, and will provide time and space for all your contradictory emotions and gnawing anxieties to surface.

The attention helmet works a bit like the impatient friend. Of course sometimes – on the battlefield, for instance – people need to take firm decisions quickly. But there is more to life than that. If we start using the attention helmet in more and more situations, we may end up losing our ability to tolerate confusion, doubts and contradictions, just as we have lost our ability to smell, dream and pay attention. The system may push us in that direction, because it usually rewards us for the decisions we make rather than for our doubts. Yet a life of resolute decisions and quick fixes may be poorer and shallower than one of doubts and contradictions.

When you mix a practical ability to engineer minds with our ignorance of the mental spectrum and with the narrow interests of governments, armies and corporations, you get a recipe for trouble. We may successfully upgrade our bodies and our brains, while losing our minds in the process. Indeed, techno-humanism may end up *downgrading* humans. The system may prefer downgraded humans not because they would possess any superhuman knacks, but because they would lack some really disturbing human qualities that hamper the system and slow it down. As any farmer knows, it's usually the brightest goat in the herd that stirs up the greatest trouble, which is why the Agricultural Revolution involved downgrading animal mental abilities. The second cognitive revolution dreamed up by techno-humanists might do the same to us.

The Nail on Which the Universe Hangs

Techno-humanism faces another dire threat. Like all humanist sects, techno-humanism too sanctifies the human will, seeing it as the nail on which the entire universe hangs. Techno-humanism expects our desires to choose which mental abilities to develop, and to thereby determine the shape of future minds. Yet what would happen once technological progress makes it possible to reshape and engineer our desires themselves?

Humanism always emphasised that it is not easy to identify our authentic will. When we try to listen to ourselves, we are often flooded by a cacophony of conflicting noises. Indeed, we sometimes don't really want to hear our authentic voice, because it can disclose unwelcome secrets and make uncomfortable requests. Many people take great care not to probe themselves too deeply. A successful lawyer on the fast track may stifle an inner voice telling her to take a break and have a child. A woman trapped in a dissatisfying marriage fears losing the security it provides. A guilt-ridden soldier is stalked by nightmares about atrocities he committed. A young man unsure of his sexuality follows a personal 'don't ask, don't tell' policy. Humanism doesn't think any of these situations has an obvious one-size-fits-all solution. But humanism demands that we show some guts, listen to the inner messages even if they scare us, identify our authentic voice and then follow its instructions regardless of the difficulties.

Technological progress has a very different agenda. It doesn't want to listen to our inner voices. It wants to control them. Once we understand the biochemical system producing all these voices, we can play with the switches, turn up the volume here, lower it there, and make life much more easy and comfortable. We'll give Ritalin to the distracted lawyer, Prozac to the guilty soldier and Cipralex to the dissatisfied wife. And that's just the beginning.

Humanists are often appalled by this approach, but we had better not pass judgement on it too quickly. The humanist recommendation to listen to ourselves has ruined the lives of many a person, whereas the right dosage of the right chemical has greatly improved the well-being and relationships of millions. In order to really listen to themselves, some people must first turn down the volume of the inner screams and diatribes. According to modern psychiatry, many 'inner voices' and 'authentic wishes' are nothing more than the product of biochemical imbalances and neurological diseases. People suffering from clinical depression repeatedly walk out on promising careers and healthy relationships because some biochemical glitch makes them see everything through dark-coloured lenses. Instead of listening to such destructive inner voices, it might be a good idea to shut them up. When Sally Adee used the attention helmet to silence the voices in her head, she not only became an expert markswoman, but she also felt much better about herself.

Personally, you may have many different views about these issues. Yet from a historical perspective it is clear that something momentous is happening. The number one humanist commandment – listen to yourself! – is no longer self-evident. As we learn to turn our inner volume up and down, we give up our belief in authenticity, because it is no longer clear whose hand is on the switch. Silencing annoying noises inside your head seems like a wonderful idea, provided it enables you to finally hear your deep authentic self. But if there is no authentic self, how do you decide which voices to silence and which to amplify?

Let's assume, just for the sake of argument, that within a few decades brain scientists will give us easy and accurate control over many inner voices. Imagine a young gay man from a devout Mormon family, who after years of living in the closet has finally accumulated enough money to finance a passion operation. He goes to the clinic armed with $100,000, determined to walk out of it as straight as Joseph Smith. Standing in front of the clinic's door, he mentally repeats what he is going to say to the doctor: 'Doc, here's $100,000. Please fix me so that I will never want men again.' He then rings

the bell, and the door is opened by a real-life George Clooney. 'Doc,' mumbles the overwhelmed lad, 'here's $100,000. Please fix me so that I will never want to be straight again.'

Did the young man's authentic self win over the religious brainwashing he underwent? Or perhaps a moment's temptation caused him to betray himself? And perhaps there is simply no such thing as an authentic self that you can follow or betray? Once people could design and redesign their will, we could no longer see it as the ultimate source of all meaning and authority. For no matter what our will says, we can always make it say something else.

According to humanism, only human desires imbue the world with meaning. Yet if we could choose our desires, on what basis could we possibly make such choices? Suppose *Romeo and Juliet* opened with Romeo having to decide with whom to fall in love. And suppose even after making a decision, Romeo could always retract and make a different choice instead. What kind of play would it have been? Well, that's the play technological progress is trying to produce for us. When our desires make us uncomfortable, technology promises to bail us out. When the nail on which the entire universe hangs is pegged in a problematic spot, technology would pull it out and stick it somewhere else. But where exactly? If I could peg that nail anywhere in the cosmos, where should I peg it, and why there of all places?

Humanist dramas unfold when people have uncomfortable desires. For example, it is extremely uncomfortable when Romeo of the house of Montague falls in love with Juliet of the house of Capulet, because the Montagues and Capulets are bitter enemies. The technological solution to such dramas is to make sure we never have uncomfortable desires. How much pain and sorrow would have been avoided if instead of drinking poison, Romeo and Juliet could just take a pill or wear a helmet that would have redirected their star-crossed love towards other people.

Techno-humanism faces an impossible dilemma here. It considers the human will to be the most important thing in the universe, hence it pushes humankind to develop technologies that can control and redesign our will. After all, it's tempting to gain control over the most important thing in the world. Yet once we have such control, techno-humanism would not know what to do with it, because the sacred human will would become just another designer product. We can never deal with such technologies as long as we believe that the human will and the human experience are the supreme source of authority and meaning.

Hence a bolder techno-religion seeks to sever the humanist umbilical cord altogether. It foresees a world which does not revolve around the desires and experiences of any humanlike beings. What might replace desires and experiences as the source of all meaning and authority? As of 2016, only one candidate is sitting in history's reception room waiting for the job interview. This candidate is information. The most interesting emerging religion is Dataism, which venerates neither gods nor man – it worships data.

11
The Data Religion

Dataism says that the universe consists of data flows, and the value of any phenomenon or entity is determined by its contribution to data processing.[1] This may strike you as some eccentric fringe notion, but in fact it has already conquered most of the scientific establishment. Dataism was born from the explosive confluence of two scientific tidal waves. In the 150 years since Charles Darwin published *On the Origin of Species*, the life sciences have come to see organisms as biochemical algorithms. Simultaneously, in the eight decades since Alan Turing formulated the idea of a Turing Machine, computer scientists have learned to engineer increasingly sophisticated electronic algorithms. Dataism puts the two together, pointing out that exactly the same mathematical laws apply to both biochemical and electronic algorithms. Dataism thereby collapses the barrier between animals and machines, and expects electronic algorithms to eventually decipher and outperform biochemical algorithms.

For politicians, business people and ordinary consumers, Dataism offers groundbreaking technologies and immense new powers. For scholars and intellectuals it also promises to provide the scientific holy grail that has eluded us for centuries: a single overarching theory that unifies all the scientific disciplines from literature and musicology to economics and biology. According to Dataism, *King Lear* and the flu virus are just two patterns of data flow that can be analysed using the same basic concepts and tools. This idea is extremely attractive. It gives all scientists a common language, builds bridges over academic rifts and easily exports insights across disciplinary borders. Musicologists, political scientists and cell biologists can finally understand each other.

In the process, Dataism inverts the traditional pyramid of learning. Hitherto, data was seen as only the first step in a long chain of intellectual activity. Humans were supposed to distil data into information, information into knowledge, and knowledge into wisdom. However, Dataists believe that humans can no longer cope with the immense flows of data, hence they cannot distil data into information, let alone into knowledge or wisdom. The work of processing data should therefore be entrusted to electronic algorithms, whose capacity far exceeds that of the human brain. In practice, this means that Dataists are sceptical about human knowledge and wisdom, and prefer to put their trust in Big Data and computer algorithms.

Dataism is most firmly entrenched in its two mother disciplines: computer science and biology. Of the two, biology is the more important. It was the biological embracement of Dataism that turned a limited breakthrough in computer science into a world-shattering cataclysm that may completely transform the very nature of life. You may not agree with the idea that organisms are algorithms, and that giraffes, tomatoes and human beings are just different methods for processing data. But you should know that this is current scientific dogma, and that it is changing our world beyond recognition.

Not only individual organisms are seen today as data-processing systems, but also entire societies

such as beehives, bacteria colonies, forests and human cities. Economists increasingly interpret the economy, too, as a data-processing system. Laypeople believe that the economy consists of peasants growing wheat, workers manufacturing clothes, and customers buying bread and underpants. Yet experts see the economy as a mechanism for gathering data about desires and abilities, and turning this data into decisions.

According to this view, free-market capitalism and state-controlled communism aren't competing ideologies, ethical creeds or political institutions. At bottom, they are competing data-processing systems. Capitalism uses distributed processing, whereas communism relies on centralised processing. Capitalism processes data by directly connecting all producers and consumers to one another, and allowing them to exchange information freely and make decisions independently. For example, how do you determine the price of bread in a free market? Well, every bakery may produce as much bread as it likes, and charge for it as much as it wants. The customers are equally free to buy as much bread as they can afford, or take their business to the competitor. It isn't illegal to charge $1,000 for a baguette, but nobody is likely to buy it.

On a much grander scale, if investors predict increased demand for bread, they will buy shares of biotech firms that genetically engineer more prolific wheat strains. The inflow of capital will enable the firms to speed up their research, thereby providing more wheat faster, and averting bread shortages. Even if one biotech giant adopts a flawed theory and reaches an impasse, its more successful competitors will achieve the hoped-for breakthrough. Free-market capitalism thus distributes the work of analysing data and making decisions between many independent but interconnected processors. As the Austrian economics guru Friedrich Hayek explained, 'In a system in which the knowledge of the relevant facts is dispersed among many people, prices can act to coordinate the separate actions of different people.'[2]

According to this view, the stock exchange is the fastest and most efficient data-processing system humankind has so far created. Everyone is welcome to join, if not directly then through their banks or pension funds. The stock exchange runs the global economy, and takes into account everything that happens all over the planet – and even beyond it. Prices are influenced by successful scientific experiments, by political scandals in Japan, by volcanic eruptions in Iceland and even by irregular activities on the surface of the sun. In order for the system to run smoothly, as much information as possible needs to flow as freely as possible. When millions of people throughout the world have access to all the relevant information, they determine the most accurate price of oil, of Hyundai shares and of Swedish government bonds by buying and selling them. It has been estimated that the stock exchange needs just fifteen minutes of trade to determine the influence of a *New York Times* headline on the prices of most shares.[3]

Data-processing considerations also explain why capitalists favour lower taxes. Heavy taxation means that a large part of all available capital accumulates in one place – the state coffers – and consequently more and more decisions have to be made by a single processor, namely the government. This creates an overly centralised data-processing system. In extreme cases, when taxes are exceedingly high, almost all capital ends up in the government's hands, and so the government alone calls the shots. It dictates the price of bread, the location of bakeries, and the research-and-development budget. In a free market, if one processor makes a wrong decision, others will be quick to utilise its mistake. However, when a single processor makes almost all the decisions, mistakes can be catastrophic.

This extreme situation in which all data is processed and all decisions are made by a single central processor is called communism. In a communist economy, people allegedly work according to their

abilities, and receive according to their needs. In other words, the government takes 100 per cent of your profits, decides what you need and then supplies these needs. Though no country ever realised this scheme in its extreme form, the Soviet Union and its satellites came as close as they could. They abandoned the principle of distributed data processing, and switched to a model of centralised data processing. All information from throughout the Soviet Union flowed to a single location in Moscow, where all the important decisions were made. Producers and consumers could not communicate directly, and had to obey government orders.



The Soviet leadership in Moscow, 1963: centralised data processing.

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For instance, the Soviet economics ministry might decide that the price of bread in all shops should be exactly two roubles and four kopeks, that a particular kolkhoz in the Odessa oblast should switch from growing wheat to raising chickens, and that the Red October bakery in Moscow should produce 3.5 million loaves of bread per day, and not a single loaf more. Meanwhile the Soviet science ministry forced all Soviet biotech laboratories to adopt the theories of Trofim Lysenko – the infamous head of the Lenin Academy for Agricultural Sciences. Lysenko rejected the dominant genetic theories of his day. He insisted that if an organism acquired some new trait during its lifetime, this quality could pass directly to its descendants. This idea flew in the face of Darwinian orthodoxy, but it dovetailed nicely with communist educational principles. It implied that if you could train wheat plants to withstand cold weather, their progenies will also be cold-resistant. Lysenko accordingly sent billions of counter-revolutionary wheat plants to be re-educated in Siberia – and the Soviet Union was soon forced to import more and more flour from the United States.[4]



Commotion on the floor of the Chicago Board of Trade: distributed data processing.

© Jonathan Kirn/Getty Images.

Capitalism did not defeat communism because capitalism was more ethical, because individual liberties are sacred or because God was angry with the heathen communists. Rather, capitalism won

the Cold War because distributed data processing works better than centralised data processing, at least in periods of accelerating technological changes. The central committee of the Communist Party just could not deal with the rapidly changing world of the late twentieth century. When all data is accumulated in one secret bunker, and all important decisions are taken by a group of elderly apparatchiks, you can produce nuclear bombs by the cartload, but you won't get an Apple or a Wikipedia.

There is a story (probably apocryphal, like most good stories) that when Mikhail Gorbachev tried to resuscitate the moribund Soviet economy, he sent one of his chief aids to London to find out what Thatcherism was all about, and how a capitalist system actually functioned. The hosts took their Soviet visitor on a tour of the City, of the London stock exchange and of the London School of Economics, where he had lengthy talks with bank managers, entrepreneurs and professors. After a few hours, the Soviet expert burst out: 'Just one moment, please. Forget about all these complicated economic theories. We have been going back and forth across London for a whole day now, and there's one thing I cannot understand. Back in Moscow, our finest minds are working on the bread supply system, and yet there are such long queues in every bakery and grocery store. Here in London live millions of people, and we have passed today in front of many shops and supermarkets, yet I haven't seen a single bread queue. Please take me to meet the person in charge of supplying bread to London. I must learn his secret.' The hosts scratched their heads, thought for a moment, and said: 'Nobody is in charge of supplying bread to London.'

That's the capitalist secret of success. No central processing unit monopolises all the data on the London bread supply. The information flows freely between millions of consumers and producers, bakers and tycoons, farmers and scientists. Market forces determine the price of bread, the number of loaves baked each day and the research-and-development priorities. If market forces make the wrong decision, they soon correct themselves, or so capitalists believe. For our current purposes, it doesn't matter whether the theory is correct. The crucial thing is that the theory understands economics in terms of data processing.

Where Has All the Power Gone?

Political scientists also increasingly interpret human political structures as data-processing systems. Like capitalism and communism, so democracies and dictatorships are in essence competing mechanisms for gathering and analysing information. Dictatorships use centralised processing methods, whereas democracies prefer distributed processing. In the last decades democracy gained the upper hand because under the unique conditions of the late twentieth century, distributed processing worked better. Under alternative conditions – those prevailing in the ancient Roman Empire, for instance – centralised processing had an edge, which is why the Roman Republic fell and power shifted from the Senate and popular assemblies into the hands of a single autocratic emperor.

This implies that as data-processing conditions change again in the twenty-first century, democracy might decline and even disappear. As both the volume and speed of data increase, venerable institutions like elections, parties and parliaments might become obsolete – not because they are unethical, but because they don't process data efficiently enough. These institutions evolved in an era when politics moved faster than technology. In the nineteenth and twentieth centuries, the Industrial Revolution unfolded slowly enough for politicians and voters to remain one step ahead of it and regulate and manipulate its course. Yet whereas the rhythm of politics has not changed much since the

days of steam, technology has switched from first gear to fourth. Technological revolutions now outpace political processes, causing MPs and voters alike to lose control.

The rise of the Internet gives us a taste of things to come. Cyberspace is now crucial to our daily lives, our economy and our security. Yet the critical choices between alternative web designs weren't taken through a democratic political process, even though they involved traditional political issues such as sovereignty, borders, privacy and security. Did you ever vote about the shape of cyberspace? Decisions made by web designers far from the public limelight mean that today the Internet is a free and lawless zone that erodes state sovereignty, ignores borders, abolishes privacy and poses perhaps the most formidable global security risk. Whereas a decade ago it hardly registered on the radar, today hysterical officials are predicting an imminent cyber 9/11.

Governments and NGOs consequently conduct intense debates about restructuring the Internet, but it is much harder to change an existing system than to intervene at its inception. Besides, by the time the cumbersome government bureaucracy makes up its mind about cyber regulation, the Internet has morphed ten times. The governmental tortoise cannot keep up with the technological hare. It is overwhelmed by data. The NSA may be spying on your every word, but to judge by the repeated failures of American foreign policy, nobody in Washington knows what to do with all the data. Never in history did a government know so much about what's going on in the world – yet few empires have botched things up as clumsily as the contemporary United States. It's like a poker player who knows what cards his opponents hold, yet somehow still manages to lose round after round.

In the coming decades, it is likely that we will see more Internet-like revolutions, in which technology steals a march on politics. Artificial intelligence and biotechnology might soon overhaul our societies and economies – and our bodies and minds too – but they are hardly a blip on our political radar. Our current democratic structures just cannot collect and process the relevant data fast enough, and most voters don't understand biology and cybernetics well enough to form any pertinent opinions. Hence traditional democratic politics loses control of events, and fails to provide us with meaningful visions for the future.

That doesn't mean we will go back to twentieth-century-style dictatorships. Authoritarian regimes seem to be equally overwhelmed by the pace of technological development and the speed and volume of the data flow. In the twentieth century, dictators had grand visions for the future. Communists and fascists alike sought to completely destroy the old world and build a new world in its place. Whatever you think about Lenin, Hitler or Mao, you cannot accuse them of lacking vision. Today it seems that leaders have a chance to pursue even grander visions. While communists and Nazis tried to create a new society and a new human with the help of steam engines and typewriters, today's prophets could rely on biotechnology and super-computers.

In science-fiction films, ruthless Hitler-like politicians are quick to pounce on such new technologies, putting them in the service of this or that megalomaniac political ideal. Yet flesh-and-blood politicians in the early twenty-first century, even in authoritarian countries such as Russia, Iran or North Korea, are nothing like their Hollywood counterparts. They don't seem to plot any Brave New World. The wildest dreams of Kim Jong-un and Ali Khamenei don't go much beyond atom bombs and ballistic missiles: that is so 1945. Putin's aspirations seem confined to rebuilding the old Soviet zone, or the even older tsarist empire. Meanwhile in the USA, paranoid Republicans accuse Barack Obama of being a ruthless despot hatching conspiracies to destroy the foundations of American society – yet in eight years of presidency he barely managed to pass a minor health-care reform. Creating new worlds and new humans is far beyond his agenda.

Precisely because technology is now moving so fast, and parliaments and dictators alike are

overwhelmed by data they cannot process quickly enough, present-day politicians are thinking on a far smaller scale than their predecessors a century ago. In the early twenty-first century, politics is consequently bereft of grand visions. Government has become mere administration. It manages the country, but it no longer leads it. It makes sure teachers are paid on time and sewage systems don't overflow, but it has no idea where the country will be in twenty years.

To some extent, this is a very good thing. Given that some of the big political visions of the twentieth century led us to Auschwitz, Hiroshima and the Great Leap Forward, maybe we are better off in the hands of petty-minded bureaucrats. Mixing godlike technology with megalomaniac politics is a recipe for disaster. Many neo-liberal economists and political scientists argue that it is best to leave all the important decisions in the hands of the free market. They thereby give politicians the perfect excuse for inaction and ignorance, which are reinterpreted as profound wisdom. Politicians find it convenient to believe that the reason they don't understand the world is that they need not understand it.

Yet mixing godlike technology with myopic politics also has its downside. Lack of vision isn't always a blessing, and not all visions are necessarily bad. In the twentieth century, the dystopian Nazi vision did not fall apart spontaneously. It was defeated by the equally grand visions of socialism and liberalism. It is dangerous to trust our future to market forces, because these forces do what's good for the market rather than what's good for humankind or for the world. The hand of the market is blind as well as invisible, and left to its own devices it may fail to do anything about the threat of global warming or the dangerous potential of artificial intelligence.

Some people believe that there is somebody in charge after all. Not democratic politicians or autocratic despots, but rather a small coterie of billionaires who secretly run the world. But such conspiracy theories never work, because they underestimate the complexity of the system. A few billionaires smoking cigars and drinking Scotch in some back room cannot possibly understand everything happening on the globe, let alone control it. Ruthless billionaires and small interest groups flourish in today's chaotic world not because they read the map better than anyone else, but because they have very narrow aims. In a chaotic system, tunnel vision has its advantages, and the billionaires' power is strictly proportional to their goals. If the world's richest man would like to make another billion dollars he could easily game the system in order to achieve his goal. In contrast, if he would like to reduce global inequality or stop global warming, even he won't be able to do it, because the system is far too complex.

Yet power vacuums seldom last long. If in the twenty-first century traditional political structures can no longer process the data fast enough to produce meaningful visions, then new and more efficient structures will evolve to take their place. These new structures may be very different from any previous political institutions, whether democratic or authoritarian. The only question is who will build and control these structures. If humankind is no longer up to the task, perhaps it might give somebody else a try.

History in a Nutshell

From a Dataist perspective, we may interpret the entire human species as a single data-processing system, with individual humans serving as its chips. If so, we can also understand the whole of history as a process of improving the efficiency of this system, through four basic methods:

1. **Increasing the number of processors.** A city of 100,000 people has more computing power than a village of 1,000 people.
2. **Increasing the variety of processors.** Different processors may use diverse ways to calculate and analyse data. Using several kinds of processors in a single system may therefore increase its dynamism and creativity. A conversation between a peasant, a priest and a physician may produce novel ideas that would never emerge from a conversation between three hunter-gatherers.
3. **Increasing the number of connections between processors.** There is little point in increasing the mere number and variety of processors if they are poorly connected to each other. A trade network linking ten cities is likely to result in many more economic, technological and social innovations than ten isolated cities.
4. **Increasing the freedom of movement along existing connections.** Connecting processors is hardly useful if data cannot flow freely. Just building roads between ten cities won't be very useful if they are plagued by robbers, or if some autocratic despot doesn't allow merchants and travellers to move as they wish.

These four methods often contradict one another. The greater the number and variety of processors, the harder it is to freely connect them. The construction of the Sapiens data-processing system accordingly passed through four main stages, each characterised by an emphasis on different methods.

The first stage began with the Cognitive Revolution, which made it possible to connect unlimited numbers of Sapiens into a single data-processing network. This gave Sapiens a crucial advantage over all other human and animal species. While there is a strict limit to the number of Neanderthals, chimpanzees or elephants you can connect to the same net, there is no limit to the number of Sapiens.

Sapiens used their advantage in data processing to overrun the entire world. However, as they spread into different lands and climates they lost touch with one another, and underwent diverse cultural transformations. The result was an immense variety of human cultures, each with its own lifestyle, behaviour patterns and world view. Hence the first phase of history involved an increase in the number and variety of human processors, at the expense of connectivity: 20,000 years ago there were many more Sapiens than 70,000 years ago, and Sapiens in Europe processed information differently to Sapiens in China. However, there were no connections between people in Europe and China, and it would have seemed utterly impossible that all Sapiens may one day be part of a single data-processing web.

The second stage began with the Agricultural Revolution and continued until the invention of writing and money about 5,000 years ago. Agriculture speeded demographic growth, so the number of human processors rose sharply. Simultaneously, agriculture enabled many more people to live together in the same place, thereby generating dense local networks that contained an unprecedented number of processors. In addition, agriculture created new incentives and opportunities for different networks to trade and communicate with one another. Nevertheless, during the second phase centrifugal forces remained predominant. In the absence of writing and money, humans could not establish cities, kingdoms or empires. Humankind was still divided into innumerable little tribes, each with its own lifestyle and world view. Uniting the whole of humankind was not even a fantasy.

The third stage kicked off with the invention of writing and money about 5,000 years ago, and lasted until the beginning of the Scientific Revolution. Thanks to writing and money, the gravitational field of human cooperation finally overpowered the centrifugal forces. Human groups bonded and merged to form cities and kingdoms. Political and commercial links between different cities and

kingdoms also tightened. At least since the first millennium BC – when coinage, empires and universal religions appeared – humans began to consciously dream about forging a single network that would encompass the entire globe.

This dream became a reality during the fourth and last stage of history, which began around 1492. Early modern explorers, conquerors and traders wove the first thin threads that encompassed the whole world. In the late modern period these threads were made stronger and denser, so that the spider's web of Columbus's days became the steel and asphalt grid of the twenty-first century. Even more importantly, information was allowed to flow increasingly freely along this global grid. When Columbus first hooked up the Eurasian net to the American net, only a few bits of data could cross the ocean each year, running the gauntlet of cultural prejudices, strict censorship and political repression. But as the years went by, the free market, the scientific community, the rule of law and the spread of democracy all helped to lift the barriers. We often imagine that democracy and the free market won because they were 'good'. In truth, they won because they improved the global data-processing system.

So over the last 70,000 years humankind first spread out, then separated into distinct groups, and finally merged again. Yet the process of unification did not take us back to the beginning. When the different human groups fused into the global village of today, each brought along its unique legacy of thoughts, tools and behaviours, which it collected and developed along the way. Our modern larders are now stuffed with Middle Eastern wheat, Andean potatoes, New Guinean sugar and Ethiopian coffee. Similarly, our language, religion, music and politics are replete with heirlooms from across the planet.[5]

If humankind is indeed a single data-processing system, what is its output? Dataists would say that its output will be the creation of a new and even more efficient data-processing system, called the Internet-of-All-Things. Once this mission is accomplished, *Homo sapiens* will vanish.

Information Wants to be Free

Like capitalism, Dataism too began as a neutral scientific theory, but is now mutating into a religion that claims to determine right and wrong. The supreme value of this new religion is 'information flow'. If life is the movement of information, and if we think that life is good, it follows that we should extend, deepen and spread the flow of information in the universe. According to Dataism, human experiences are not sacred and *Homo sapiens* isn't the apex of creation or a precursor of some future *Homo deus*. Humans are merely tools for creating the Internet-of-All-Things, which may eventually spread out from planet Earth to cover the whole galaxy and even the whole universe. This cosmic data-processing system would be like God. It will be everywhere and will control everything, and humans are destined to merge into it.

This vision is reminiscent of some traditional religious visions. Thus Hindus believe that humans can and should merge into the universal soul of the cosmos – the atman. Christians believe that after death saints are filled by the infinite grace of God, whereas sinners cut themselves off from His presence. Indeed, in Silicon Valley the Dataist prophets consciously use traditional messianic language. For example, Ray Kurzweil's book of prophecies is called *The Singularity is Near*, echoing John the Baptist's cry: 'the kingdom of heaven is near' (Matthew 3:2).

Dataists explain to those who still worship flesh-and-blood mortals that they are overly attached to outdated technology. *Homo sapiens* is an obsolete algorithm. After all, what's the advantage of

humans over chickens? Only that in humans information flows in much more complex patterns than in chickens. Humans absorb more data, and process it using better algorithms. (In day-to-day language that means that humans allegedly have deeper emotions and superior intellectual abilities. But remember that according to current biological dogma, emotions and intelligence are just algorithms.) Well then, if we could create a data-processing system that absorbs even more data than a human being, and that processes it even more efficiently, wouldn't that system be superior to a human in exactly the same way that a human is superior to a chicken?

Dataism isn't limited to idle prophecies. Like every religion, it has its practical commandments. First and foremost, a Dataist ought to maximise data flow by connecting to more and more media, and producing and consuming more and more information. Like other successful religions, Dataism is also missionary. Its second commandment is to connect everything to the system, including heretics who don't want to be connected. And 'everything' means more than just humans. It means every *thing*. My body, of course, but also the cars on the street, the refrigerators in the kitchen, the chickens in their coop and the trees in the jungle – all should be connected to the Internet-of-All-Things. The refrigerator will monitor the number of eggs in the drawer, and inform the chicken coop when a new shipment is needed. The cars will talk with one another, and the trees in the jungle will report on the weather and on carbon dioxide levels. We mustn't leave any part of the universe disconnected from the great web of life. Conversely, the greatest sin is to block the data flow. What is death, if not a situation when information doesn't flow? Hence Dataism upholds the freedom of information as the greatest good of all.

People rarely manage to come up with a completely new value. The last time this happened was in the eighteenth century, when the humanist revolution preached the stirring ideals of human liberty, human equality and human fraternity. Since 1789, despite numerous wars, revolutions and upheavals, humans have not managed to come up with any new value. All subsequent conflicts and struggles have been conducted either in the name of the three humanist values, or in the name of even older values such as obeying God or serving the nation. Dataism is the first movement since 1789 that created a really novel value: freedom of information.

We mustn't confuse freedom of information with the old liberal ideal of freedom of expression. Freedom of expression was given to humans, and protected their right to think and say what they wished – including their right to keep their mouths shut and their thoughts to themselves. Freedom of information, in contrast, is not given to humans. It is given to *information*. Moreover, this novel value may impinge on the traditional freedom of expression, by privileging the right of information to circulate freely over the right of humans to own data and to restrict its movement.

On 11 January 2013, Dataism got its first martyr when Aaron Swartz, a twenty-six-year-old American hacker, committed suicide in his apartment. Swartz was a rare genius. At fourteen, he helped develop the crucial RSS protocol. Swartz was also a firm believer in the freedom of information. In 2008 he published the 'Guerilla Open Access Manifesto' that demanded a free and unlimited flow of information. Swartz said that 'We need to take information, wherever it is stored, make our copies and share them with the world. We need to take stuff that's out of copyright and add it to the archive. We need to buy secret databases and put them on the Web. We need to download scientific journals and upload them to file sharing networks. We need to fight for Guerilla Open Access.'

Swartz was as good as his word. He became annoyed with the JSTOR digital library for charging its customers. JSTOR holds millions of scientific papers and studies, and believes in the freedom of expression of scientists and journal editors, which includes the freedom to charge a fee for reading

their articles. According to JSTOR, if I want to get paid for the ideas I created, it's my right to do so. Swartz thought otherwise. He believed that information wants to be free, that ideas don't belong to the people who created them, and that it is wrong to lock data behind walls and charge money for entrance. He used the MIT computer network to access JSTOR, and downloaded hundreds of thousands of scientific papers, which he intended to release onto the Internet, so that everybody could read them freely.

Swartz was arrested and put on trial. When he realised he would probably be convicted and sent to jail, he hanged himself. Hackers reacted with petitions and attacks directed at the academic and governmental institutions that persecuted Swartz and that infringe on the freedom of information. Under pressure, JSTOR apologised for its part in the tragedy, and today allows free access to much of its data (though not to all of it).[6]

To convince sceptics, Dataist missionaries repeatedly explain the immense benefits of the freedom of information. Just as capitalists believe that all good things depend on economic growth, so Dataists believe all good things – including economic growth – depend on the freedom of information. Why did the USA grow faster than the USSR? Because information flowed more freely in the USA. Why are Americans healthier, wealthier and happier than Iranians or Nigerians? Thanks to the freedom of information. So if we want to create a better world, the key is to set the data free.

We have already seen that Google can detect new epidemics faster than traditional health organisations, but only if we allow it free access to the information we are producing. A free data flow can similarly reduce pollution and waste, for example by rationalising the transportation system. In 2010 the number of private cars in the world exceeded 1 billion, and it has since kept growing.[7] These cars pollute the planet and waste enormous resources, not least by necessitating ever wider roads and parking spaces. People have become so used to the convenience of private transport that they are unlikely to settle for buses and trains. However, Dataists point out that people really want mobility rather than a private car, and a good data-processing system can provide this mobility far more cheaply and efficiently.

I have a private car, but most of the time it sits idly in the car park. On a typical day, I enter my car at 8:04, and drive for half an hour to the university, where I park my car for the day. At 18:11 I come back to the car, drive half an hour back home, and that's it. So I am using my car for just an hour a day. Why do I need to keep it for the other twenty-three hours? We can create a smart car-pool system, run by computer algorithms. The computer would know that I need to leave home at 8:04, and would route the nearest autonomous car to pick me up at that precise moment. After dropping me off at campus, it would be available for other uses instead of waiting in the car park. At 18:11 sharp, as I leave the university gate, another communal car would stop right in front of me, and take me home. In such a way, 50 million communal autonomous cars may replace 1 billion private cars, and we would also need far fewer roads, bridges, tunnels and parking spaces. Provided, of course, I renounce my privacy and allow the algorithms to always know where I am and where I want to go.

Record, Upload, Share!

But maybe you don't need convincing, especially if you are under twenty. People just want to be part of the data flow, even if that means giving up their privacy, their autonomy and their individuality. Humanist art sanctifies the individual genius, and a Picasso doodle on a napkin nets millions at

Sotheby's. Humanist science glorifies the individual researcher, and every scholar dreams of putting his or her name at the top of a *Science* or *Nature* paper. But a growing number of artistic and scientific creations are nowadays produced by the ceaseless collaboration of 'everyone'. Who writes Wikipedia? All of us.

The individual is becoming a tiny chip inside a giant system that nobody really understands. Every day I absorb countless data bits through emails, phone calls and articles; process the data; and transmit back new bits through more emails, phone calls and articles. I don't really know where I fit into the great scheme of things, and how my bits of data connect with the bits produced by billions of other humans and computers. I don't have time to find out, because I am too busy answering all the emails. And as I process more data more efficiently – answering more emails, making more phone calls and writing more articles – so the people around me are flooded by even more data.

This relentless flow of data sparks new inventions and disruptions that nobody plans, controls or comprehends. No one understands how the global economy functions or where global politics is heading. But no one needs to understand. All you need to do is answer your emails faster – and allow the system to read them. Just as free-market capitalists believe in the invisible hand of the market, so Dataists believe in the invisible hand of the data flow.

As the global data-processing system becomes all-knowing and all-powerful, so connecting to the system becomes the source of all meaning. Humans want to merge into the data flow because when you are part of the data flow you are part of something much bigger than yourself. Traditional religions told you that your every word and action was part of some great cosmic plan, and that God watched you every minute and cared about all your thoughts and feelings. Data religion now says that your every word and action is part of the great data flow, that the algorithms are constantly watching you and that they care about everything you do and feel. Most people like this very much. For true-believers, to be disconnected from the data flow risks losing the very meaning of life. What's the point of doing or experiencing anything if nobody knows about it, and if it doesn't contribute something to the global exchange of information?

Humanism thought that experiences occur inside us, and that we ought to find within ourselves the meaning of all that happens, thereby infusing the universe with meaning. Dataists believe that experiences are valueless if they are not shared, and that we need not – indeed *cannot* – find meaning within ourselves. We need only record and connect our experience to the great data flow, and the algorithms will discover its meaning and tell us what to do. Twenty years ago Japanese tourists were a universal laughing stock because they always carried cameras and took pictures of everything in sight. Now everyone is doing it. If you go to India and see an elephant, you don't look at the elephant and ask yourself, 'What do I feel?' – you are too busy looking for your smartphone, taking a picture of the elephant, posting it on Facebook and then checking your account every two minutes to see how many Likes you got. Writing a private diary – a common humanist practice in previous generations – sounds to many present-day youngsters utterly pointless. Why write anything if nobody else can read it? The new motto says: 'If you experience something – record it. If you record something – upload it. If you upload something – share it.'

Throughout this book we have repeatedly asked what makes humans superior to other animals. Dataism has a new and simple answer. In themselves, human experiences are not superior at all to the experiences of wolves or elephants. One bit of data is as good as another. However, a human can write a poem about his experience and post it online, thereby enriching the global data-processing system. That makes his bits count. A wolf cannot do this. Hence all of the wolf's experiences – as deep and complex as they may be – are worthless. No wonder we are so busy converting our

experiences into data. It isn't a question of trendiness. It is a question of survival. We must prove to ourselves and to the system that we still have value. And value lies not in having experiences, but in turning these experiences into free-flowing data.

(By the way, wolves – or at least their dog cousins – aren't a hopeless case. A company called 'No More Woof' is developing a helmet for reading canine experiences. The helmet monitors the dog's brain waves, and uses computer algorithms to translate simple messages such as 'I am angry' into human language.[8] Your dog may soon have a Facebook or Twitter account of his own – perhaps with more Likes and followers than you.)

Know Thyself

Dataism is neither liberal nor humanist. It should be emphasised, however, that Dataism isn't anti-humanist. It has nothing against human experiences. It just doesn't think they are intrinsically valuable. When we surveyed the three main humanist sects, we asked which experience is the most valuable: listening to Beethoven's Fifth Symphony, to Chuck Berry, to a pygmy initiation song or to the howl of a wolf in heat. A Dataist would argue that the entire exercise is misguided, because music should be evaluated according to the data it carries rather than according to the experience it creates. A Dataist may argue, for example, that the Fifth Symphony carries far more data than the pygmy initiation song, because it uses more chords and scales, and creates dialogues with many more musical styles. Consequently, you need far more computational power to decipher the Fifth Symphony, and you gain far more knowledge from doing so.

Music, according to this view, is mathematical patterns. Mathematics can describe every musical piece, as well as the relations between any two pieces. Hence you can measure the precise data value of every symphony, song and howl, and determine which is the richest. The experiences they create in humans or wolves don't really matter. True, for the last 70,000 years or so, human experiences have been the most efficient data-processing algorithms in the universe, hence there was good reason to sanctify them. However, we may soon reach a point when these algorithms will be superseded, and even become a burden.

Sapiens evolved in the African savannah tens of thousands of years ago, and their algorithms are just not built to handle twenty-first-century data flows. We might try to upgrade the human data-processing system, but this may not be enough. The Internet-of-All-Things may soon create such huge and rapid data flows that even upgraded human algorithms cannot handle it. When the car replaced the horse-drawn carriage, we didn't upgrade the horses – we retired them. Perhaps it is time to do the same with *Homo sapiens*.

Dataism adopts a strictly functional approach to humanity, appraising the value of human experiences according to their function in data-processing mechanisms. If we develop an algorithm that fulfils the same function better, human experiences will lose their value. Thus if we can replace not just taxi drivers and doctors but also lawyers, poets and musicians with superior computer programs, why should we care if these programs have no consciousness and no subjective experiences? If some humanist starts adulating the sacredness of human experience, Dataists would dismiss such sentimental humbug. 'The experience you praise is just an outdated biochemical algorithm. In the African savannah 70,000 years ago, that algorithm was state-of-the-art. Even in the twentieth century it was vital for the army and for the economy. But soon we will have much better algorithms.'

In the climactic scene of many Hollywood science-fiction movies, humans face an alien invasion fleet, an army of rebellious robots or an all-knowing super-computer that wants to obliterate them. Humanity seems doomed. But at the very last moment, against all the odds, humanity triumphs thanks to something that the aliens, the robots and the super-computers didn't suspect and cannot fathom: love. The hero, who up till now has been easily manipulated by the super-computer and has been riddled with bullets by the evil robots, is inspired by his sweetheart to make a completely unexpected move that turns the tables on the thunderstruck Matrix. Dataism finds such scenarios utterly ridiculous. 'Come on,' it admonishes the Hollywood screenwriters, 'is that all you could come up with? Love? And not even some platonic cosmic love, but the carnal attraction between two mammals? Do you really think that an all-knowing super-computer or aliens who managed to conquer the entire galaxy would be dumbfounded by a hormonal rush?'

By equating the human experience with data patterns, Dataism undermines our main source of authority and meaning, and heralds a tremendous religious revolution, the like of which has not been seen since the eighteenth century. In the days of Locke, Hume and Voltaire humanists argued that 'God is a product of the human imagination'. Dataism now gives humanists a taste of their own medicine, and tells them: 'Yes, God is a product of the human imagination, but human imagination in turn is the product of biochemical algorithms.' In the eighteenth century, humanism sidelined God by shifting from a deo-centric to a homo-centric world view. In the twenty-first century, Dataism may sideline humans by shifting from a homo-centric to a data-centric view.

The Dataist revolution will probably take a few decades, if not a century or two. But then the humanist revolution too did not happen overnight. At first, humans kept on believing in God, and argued that humans are sacred because they were created by God for some divine purpose. Only much later did some people dare say that humans are sacred in their own right, and that God doesn't exist at all. Similarly, today most Dataists say that the Internet-of-All-Things is sacred because humans are creating it to serve human needs. But eventually, the Internet-of-All-Things may become sacred in its own right.

The shift from a homo-centric to a data-centric world view won't be merely a philosophical revolution. It will be a practical revolution. All truly important revolutions are practical. The humanist idea that 'humans invented God' was significant because it had far-reaching practical implications. Similarly, the Dataist idea that 'organisms are algorithms' is significant due to its day-to-day practical consequences. Ideas change the world only when they change our behaviour.

In ancient Babylon, when people faced a difficult dilemma they climbed to the top of the local temple in the darkness of night and observed the sky. The Babylonians believed that the stars control our fate and predict our future. By watching the stars the Babylonians decided whether to get married, plough the field and go to war. Their philosophical beliefs were translated into very practical procedures.

Scriptural religions such as Judaism and Christianity told a different story: 'The stars are lying. God, who created the stars, revealed the entire truth in the Bible. So stop observing the stars – read the Bible instead!' This too was a practical recommendation. When people didn't know whom to marry, what career to choose and whether to start a war, they read the Bible and followed its counsel.

Next came the humanists, with an altogether new story: 'Humans invented God, wrote the Bible and then interpreted it in a thousand different ways. So humans themselves are the source of all truth. You may read the Bible as an inspiring human creation, but you don't have to. If you are facing any dilemma, just listen to yourself and follow your inner voice.' Humanism then gave detailed practical

instructions on how to listen to yourself, recommending things such as watching sunsets, reading Goethe, keeping a private diary, having heart-to-heart talks with a good friend and holding democratic elections.

For centuries scientists too accepted these humanist guidelines. When physicists wondered whether to get married or not, they too watched sunsets and tried to get in touch with themselves. When chemists contemplated whether to accept a problematic job offer, they too wrote diaries and had heart-to-heart talks with a good friend. When biologists debated whether to wage war or sign a peace treaty, they too voted in democratic elections. When brain scientists wrote books about their startling discoveries, they often put an inspiring Goethe quote on the first page. This was the basis for the modern alliance between science and humanism, which kept the delicate balance between the modern yang and the modern yin – between reason and emotion, between the laboratory and the museum, between the production line and the supermarket.

The scientists not only sanctified human feelings, but also found an excellent evolutionary reason to do so. After Darwin, biologists began explaining that feelings are complex algorithms honed by evolution to help animals make the right decisions. Our love, our fear and our passion aren't some nebulous spiritual phenomena good only for composing poetry. Rather, they encapsulate millions of years of practical wisdom. When you read the Bible, you get advice from a few priests and rabbis who lived in ancient Jerusalem. In contrast, when you listen to your feelings, you follow an algorithm that evolution has developed for millions of years, and that withstood the harshest quality tests of natural selection. Your feelings are the voice of millions of ancestors, each of whom managed to survive and reproduce in an unforgiving environment. Your feelings are not infallible, of course, but they are better than most alternatives. For millions upon millions of years, feelings were the best algorithms in the world. Hence in the days of Confucius, of Muhammad or of Stalin, people should have listened to their feelings rather than to the teachings of Confucianism, Islam or communism.

Yet in the twenty-first century, feelings are no longer the best algorithms in the world. We are developing superior algorithms which utilise unprecedented computing power and giant databases. The Google and Facebook algorithms not only know exactly how you feel, they also know a million other things about you that you hardly suspect. Consequently you should now stop listening to your feelings, and start listening to these external algorithms instead. What's the use of having democratic elections when the algorithms know how each person is going to vote, and when they also know the exact neurological reasons why one person votes Democrat while another votes Republican? Whereas humanism commanded: 'Listen to your feelings!' Dataism now commands: 'Listen to the algorithms! They know how you feel.'

When you contemplate whom to marry, which career to pursue and whether to start a war, Dataism tells you it would be a total waste of time to climb a high mountain and watch the sun setting on the waves. It would be equally pointless to go to a museum, write a private diary or have a heart-to-heart talk with a friend. Yes, in order to make the right decisions you must get to know yourself better. But if you want to know yourself in the twenty-first century, there are much better methods than climbing mountains, going to museums or writing diaries. Here are some practical Dataist guidelines for you:

'You want to know who you really are?' asks Dataism. 'Then forget about mountains and museums. Have you had your DNA sequenced? No?! What are you waiting for? Go and do it today. And convince your grandparents, parents and siblings to have their DNA sequenced too – their data is very valuable for you. And have you heard about these wearable biometric devices that measure your blood pressure and heart rate twenty-four hours a day? Good – so buy one of those, put it on and connect it to your smartphone. And while you are shopping, buy a mobile camera and microphone,

record everything you do, and put in online. And allow Google and Facebook to read all your emails, monitor all your chats and messages, and keep a record of all your Likes and clicks. If you do all that, then the great algorithms of the Internet-of-All-Things will tell you whom to marry, which career to pursue and whether to start a war.'

But where do these great algorithms come from? This is the mystery of Dataism. Just as according to Christianity we humans cannot understand God and His plan, so Dataism says the human brain cannot embrace the new master algorithms. At present, of course, the algorithms are mostly written by human hackers. Yet the really important algorithms – such as the Google search algorithm – are developed by huge teams. Each member understands just one part of the puzzle, and nobody really understands the algorithm as a whole. Moreover, with the rise of machine learning and artificial neural networks, more and more algorithms evolve independently, improving themselves and learning from their own mistakes. They analyse astronomical amounts of data, which no human can possibly encompass, and learn to recognise patterns and adopt strategies that escape the human mind. The seed algorithm may initially be developed by humans, but as it grows, it follows its own path, going where no human has gone before – and where no human can follow.

A Ripple in the Data Flow

Dataism naturally has its critics and heretics. As we saw in Chapter 3, it's doubtful whether life can really be reduced to data flows. In particular, at present we have no idea how or why data flows could produce consciousness and subjective experiences. Maybe we'll have a good explanation in twenty years. But maybe we'll discover that organisms aren't algorithms after all.

It is equally doubtful whether life boils down to decision-making. Under Dataist influence, both the life sciences and the social sciences have become obsessed with decision-making processes, as if that's all there is to life. But is it so? Sensations, emotions and thoughts certainly play an important part in making decisions, but is that their sole meaning? Dataism gains a better and better understanding of decision-making processes, but it might be adopting an increasingly skewed view of life.

A critical examination of the Dataist dogma is likely to be not only the greatest scientific challenge of the twenty-first century, but also the most urgent political and economic project. Scholars in the life sciences and social sciences should ask themselves whether we miss anything when we understand life as data processing and decision-making. Is there perhaps something in the universe that cannot be reduced to data? Suppose non-conscious algorithms could eventually outperform conscious intelligence in all known data-processing tasks – what, if anything, would be lost by replacing conscious intelligence with superior non-conscious algorithms?

Of course, even if Dataism is wrong and organisms aren't just algorithms, it won't necessarily prevent Dataism from taking over the world. Many previous religions gained enormous popularity and power despite their factual mistakes. If Christianity and communism could do it, why not Dataism? Dataism has especially good prospects, because it is currently spreading across all scientific disciplines. A unified scientific paradigm may easily become an unassailable dogma. It is very difficult to contest a scientific paradigm, but up till now, no single paradigm was adopted by the entire scientific establishment. Hence scholars in one field could always import heretical views from outside. But if everyone from musicologists to biologists uses the same Dataist paradigm, interdisciplinary excursions will serve only to strengthen the paradigm further. Consequently even if

the paradigm is flawed, it would be extremely difficult to resist it.

If Dataism succeeds in conquering the world, what will happen to us humans? In the beginning, it will probably accelerate the humanist pursuit of health, happiness and power. Dataism spreads itself by promising to fulfil these humanist aspirations. In order to gain immortality, bliss and divine powers of creation, we need to process immense amounts of data, far beyond the capacity of the human brain. So the algorithms will do it for us. Yet once authority shifts from humans to algorithms, the humanist projects may become irrelevant. Once we abandon the homo-centric world view in favour of a data-centric world view, human health and happiness may seem far less important. Why bother so much about obsolete data-processing machines when much better models are already in existence? We are striving to engineer the Internet-of-All-Things in the hope that it will make us healthy, happy and powerful. Yet once the Internet-of-All-Things is up and running, we might be reduced from engineers to chips, then to data, and eventually we might dissolve within the data torrent like a clump of earth within a gushing river.

Dataism thereby threatens to do to *Homo sapiens* what *Homo sapiens* has done to all other animals. In the course of history humans have created a global network, and evaluated everything according to its function within the network. For thousands of years, this boosted human pride and prejudices. Since humans fulfilled the most important functions in the network, it was easy for us to take credit for the network's achievements, and to see ourselves as the apex of creation. The lives and experiences of all other animals were undervalued, because they fulfilled far less important functions, and whenever an animal ceased to fulfil any function at all, it went extinct. However, once humans lose their functional importance to the network, we will discover that we are not the apex of creation after all. The yardsticks that we ourselves have enshrined will condemn us to join the mammoths and the Chinese river dolphins in oblivion. Looking back, humanity will turn out to be just a ripple within the cosmic data flow.

We cannot really predict the future. All the scenarios outlined in this book should be understood as possibilities rather than prophecies. When we think about the future, our horizons are usually constrained by present-day ideologies and social systems. Democracy encourages us to believe in a democratic future; capitalism doesn't allow us to envisage a non-capitalist alternative; and humanism makes it difficult for us to imagine a post-human destiny. At most, we sometimes recycle past events and think about them as alternative futures. For example, twentieth-century Nazism and communism serve as a blueprint for many dystopian fantasies; and science-fiction authors use medieval and ancient legacies to imagine Jedi knights and galactic emperors fighting it out with spaceships and laser guns.

This book traces the origins of our present-day conditioning in order to loosen its grip and enable us to think in far more imaginative ways about our future. Instead of narrowing our horizons by forecasting a single definitive scenario, the book aims to broaden our horizons and make us aware of a much wider spectrum of options. As I have repeatedly emphasised, nobody really knows what the job market, the family or the ecology will look like in 2050, or what religions, economic systems or political structures will dominate the world.

Yet broadening our horizons can backfire by making us more confused and inactive than before. With so many scenarios and possibilities, what should we pay attention to? The world is changing faster than ever before, and we are flooded by impossible amounts of data, of ideas, of promises and of threats. Humans relinquish authority to the free market, to crowd wisdom and to external algorithms partly because they cannot deal with the deluge of data. In the past, censorship worked by

blocking the flow of information. In the twenty-first century, censorship works by flooding people with irrelevant information. People just don't know what to pay attention to, and they often spend their time investigating and debating side issues. In ancient times having power meant having access to data. Today having power means knowing what to ignore. So of everything that happens in our chaotic world, what should we focus on?

If we think in term of months, we had probably focus on immediate problems such as the turmoil in the Middle East, the refugee crisis in Europe and the slowing of the Chinese economy. If we think in terms of decades, then global warming, growing inequality and the disruption of the job market loom large. Yet if we take the really grand view of life, all other problems and developments are overshadowed by three interlinked processes:

1. Science is converging on an all-encompassing dogma, which says that organisms are algorithms, and life is data processing.
2. Intelligence is decoupling from consciousness.
3. Non-conscious but highly intelligent algorithms may soon know us better than we know ourselves.

These three processes raise three key questions, which I hope will stick in your mind long after you have finished this book:

1. Are organisms really just algorithms, and is life really just data processing?
2. What's more valuable – intelligence or consciousness?
3. What will happen to society, politics and daily life when non-conscious but highly intelligent algorithms know us better than we know ourselves?

Notes

1 The New Human Agenda

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About the Author

YUVAL NOAH HARARI has a PhD in history from the University of Oxford and now lectures at the Department of History at the Hebrew University of Jerusalem, specializing in world history. His first book, *Sapiens*, was translated into twenty-six languages and became a bestseller in the US, UK, France, China, Korea, and numerous other countries. In 2010 he became president of the Royal Society of Literature. He lives in London.

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* The formula takes a multiplication symbol because the elements work one on the other. At least according to medieval scholastics, you cannot understand the Bible without logic. If your logic value is zero, then even if you read every page of the Bible, the sum of your knowledge would still be zero. Conversely, if your scripture value is zero, then no amount of logic can help you. If the formula used the addition symbol, the implication would be that somebody with lots of logic and no scriptures would still have a lot of knowledge – which you and I may find reasonable, but medieval scholastics did not.

* In American politics, liberalism is often interpreted far more narrowly, and contrasted with ‘conservatism’. In the broad sense of the term, however, most American conservatives are also liberal.