

The Prophet of Posthumanism

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Sapiens: A Brief History of Mankind by Yuval Noah Harari
(Harvill Secker, 443 pages, 2011)

Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari
(Harvill Secker, 440 pages, 2015)

I

The past is prologue – the future is frightening. Thus says Yuval Harari in his two-volume report on the past and future of our species. His ambition is revealed in the titles he has given the volumes – perhaps he thinks he has done for human history what Stephen Hawking did a generation ago for cosmology and the big bang universe.

Well, has he? In short, not quite, but his shortfall is instructive. Professor Harari, who studied in Oxford and now lectures in Jerusalem, where he developed and taught the content of these books in Hebrew, has done the first half of the job well and the second half interestingly.

Sapiens told the tale of the human rise to planetary dominance, and did so with great panache and a lot of breezy generalizing that doubtless left many historians unconvinced. Its great merit was that it discerned some big trends in the history of the last seventy thousand years or so that could easily have gone missing in a more cautiously crafted monograph. The result was a brief but readable account of the biggest human story of all that prized wit over exactitude.

Homo Deus tells a tale of the present and future of humanity that can only work as a speculative hostage to fortune. Its analysis of the present seems selective and superficial, and the tools it deploys – in particular the concept of an algorithm – leave scope for skeptics to mount serious assaults on its main claims, but this may be par for the course when it comes to future history. The reader is at least offered the outlines of an argument worth challenging.

For Harari, the present and future of our species is characterized above all by the rise and fall of humanism. The fall is imminent and it may well be dramatic, but the nature of the regime that will follow is still unclear. Very roughly, in this picture, humanism rose in the Christian era, reached a zenith in the Enlightenment, and began to fall with Marxism. Soon the twilight will descend, as robots and cyborgs do battle with the last feral humans and thus usher in an age of new hybrids, in which biotechnology, robotics, and nanotechnology converge to repopulate the Earth with superhuman creatures beyond our present imagining. Already intelligence is decoupling from consciousness, and when artificial intelligence exceeds human bounds all bets on the future will be off for human punters. Readers of the 2005 book *The Singularity Is Near* by Ray Kurzweil, now director of engineering at Google, will recall some of these ideas.

The unifying thread in this portrait of the rise and fall of a species is the concept of an algorithm. An algorithm is just a methodical recipe for doing something definite. Computer programs are paradigm examples of algorithms, but the concept also covers the mathematical proofs the ancient Greeks compiled in arithmetic and geometry, the accounts in classical physics of the

behavior of planets or gases, business processes for making goods or delivering services, the genetic recipes for making organisms coded in DNA molecules, and indeed all the standard procedures and processes that shape our daily lives.

Behind the concept of the algorithm, at least in its modern manifestations, is the concept of data. Algorithms process data, and everything in our universe can in principle be described in terms of data tumbling, churning, recombining and generally having a wild time in the cosmic dance of vast numbers of bits. The entire rise and fall of the human species, Harari helpfully adds, can ultimately be seen as just a ripple in the cosmic dataflow.

Harari hammers this point rather heavily. We, body and soul, are just algorithms, he says, and infers from this that even the more serendipitous achievements of human endeavor, such as Beethoven's symphonies, Tolstoy's novels, Einstein's theories, Boeing's aircraft, and Apple's products, are all products of algorithmic processing too, and hence little more than background noise for the superhuman intelligences that will soon inherit the Earth. This confuses the logic of verification with the logic of discovery: given a proof, we can use an algorithm to check it; but to find a proof among countless possibilities we tend to need dumb luck, or at least a kind of sentience that has no obvious algorithmic correlate.

A scientist with faith in metaphysical determinism would argue that even for our luckiest strikes the universal acid of data-driven algorithms allows post facto reduction of all that was once holy. But for us, here and now, such faith in our future success is as empty as faith in a paradise stocked with comely virgins. For all practical purposes, here we hit a philosophical barrier.

II

Algorithms and data are the basis for reducing nature to a process amenable to modeling and control more thoroughly than ever before. Our previous best effort as a species was the strategy of reducing nature to the mechanical interactions of tiny particles, which Richard Feynman said was the best single idea to teach any survivors of an extinction-level event in order to help them reconstruct civilization. Particles are located in space and persistent in time, and they interact according to the laws of mechanics, formerly understood as classical deterministic laws but now construed as quantum laws in which exact determinism is lost in an apparently random collapse of superposed states.

In modern physics, statistical approximations to a deterministic story emerge when large numbers of particles interact. This creates an appearance of predictability that suffices for much of what we do in the course of our daily lives. But physics sets hard limits, both via quantum jumps and with the phenomenon of deterministic chaos, to any human attempt to control nature or predict the future. And it sets a hard limit to the power in principle of data-driven algorithms – ultimately a thermodynamic one based on the number of bits we can handle and the heat generated when we process them.

The data we harvest in nature and feed to our computing engines comes in the form of vast numbers of classical bits. The algorithms we run over that data crunch the bits to make more bits, and so on. But the future is unknown – when we try to map out the future we can at best sketch a range of possible scenarios and perhaps assign probabilities to them. A quantum view reveals a virtual realm of interfering possibilities that we can define with qubits, which superpose 0 and 1 in fragile bubbles that pop into 0 or 1 when we interact with them. That is, we first have to pop the qubits to make new bits to feed our algorithms. So our new paradigm for controlling nature is as doomed to uncertainty and eventual failure as any previous magic recipe for getting ahead of ourselves with bold predictions.

Physicists are intrigued by the project of reducing the manifold phenomena of nature to bits, but no theorist has yet accomplished the feat of actually doing so. The computing genius and entrepreneur Stephen Wolfram made one of the boldest stabs in this direction, and reported it in his big book *A New Kind of Science*, in which he envisaged reducing all and sundry to cellular automata evolving according to quite simple rules in a discrete matrix. Naturally this so far fails the test both of addressing quantum issues squarely and of explaining away the apparent centrality of the concept of the continuum, for example in theories of spacetime and for the differential equations we use to express most physical laws, so there is a lot to do before we can judge it as more than intriguing.

The main outcome of this brief appeal to physics and mathematics is that the facts fail to support the more hubristic extrapolations of the prophets of the Singularity. Their claims that artificial neural networks are so much more efficient than the wet cerebral networks in our skulls that the server farms of Google and other such corporations will achieve godlike powers within our lifetimes, with exponentially rising powers exceeding all bounds we can imagine, in a meltdown of all our fond hopes for a human future, will likely fail. They forget that early hopes for previous new technologies, such as cars, aircraft, and spacecraft, soon hit unexpected limits, such as traffic jams, the sound barrier, and the limitations of chemical rockets, and hence became transmuted into different hopes for further technologies in turn, so that earlier extrapolations promising flying cars for all or vacations on Venus began to look dated and embarrassing. For all their likely future speed and power, the artificial neural networks we now envisage will still be constrained by hard quantum and thermal limits, so until we develop compact photonic brains for robot bodies our machines are unlikely to rival cheap and flexible human workers for a multitude of challenging tasks, and hence the world as we know it will probably evolve quite smoothly into a world of powerful but circumscribed central engines for coordinating the simple robots that do the grunt work in our techno-utopia.

Only in a world where all human activity had been reduced to the algorithmic manipulation of data could we truly say the magic of human consciousness had been exhausted, and that world is still far away. It is an article of faith among most scientists that the human body and brain admit such reduction in principle, but the lack of any such reduction in fact for consciousness itself is only the tip of a vast iceberg of uncertainty over the precise characterization of innumerable biological processes, from the epigenetic regulation of gene expression, through the exact workings of the immune system, to the emergence of organized cognition from a torrent of inputs to the brain, where our progress to date still leaves a host of hostages to fortune that no amount of computing power seems likely to liberate for years to come. A reasonable view is that consciousness is a placeholder for an infinite sea of further unknowns, just as the mathematical continuum is an abyss that no conceivable discrete approximation can ever match, simply because the set of real numbers vastly exceeds the set of rational numbers. Hence nature in all its manifestations, as Wolfram saw with his cellular automata when he concluded that a simple rock is computationally as complex as a human brain, is infinite at more levels than a data-driven approach aiming for algorithmic control will ever exhaust.

III

Any attempt to predict our future in terms of data-driven algorithms hits limits. The bolder the prediction, the more pertinent the limits, and Harari has pushed boldness to new extremes with the idea that our striving for immortality, bliss, and divinity will drive us to create techno-religions promising these things beyond the Singularity. The way we now treat other animals, he says, is a possible prototype for the sort of kindness we can expect from the new overlords, suggesting that

our best strategy for survival may be to seek a new and humbler accommodation with the natural world we once sought to dominate.

Here the main weight of Harari's case shifts from the realm of logic and physics, where it's fair to say his grasp of the deeper issues is sketchy, to that of history, where he moves more confidently. Assuming superhuman artificial intelligence in some form will come, which seems a safe bet, how far can historical analogies help us predict the kinds of outcome we might expect? Big changes in history have often overshadowed all that went before, and the Singularity bids fair to do so again, but much will continue unchanged and soon enough some analogies will show up.

We can start by zooming in on the role of our animal status. Human attitudes to other animals have changed in our lifetime. The great monotheistic religions encouraged people to see their animals as subordinate to human will and as lacking those attributes, such as consciousness and possession of a soul, that made mankind special in the eyes of God, with the result that people slaughtered and mistreated both wild and domesticated animals with an untroubled conscience. Now scientists have discovered that the similarities between human and nonhuman mammals are so great that practically everything we once thought distinguished us from them has been shown not to do so. Only higher intelligence and a greater capacity for social networking remain as the special distinctions of *Homo sapiens*. So Harari rightly concludes that the rise of intelligent machines and global machine networks throws a big shadow over any future we can reasonably envisage for our life on Earth.

But our special distinctions led to another feature of human life that made the historic difference, as Harari spelled out in *Sapiens*. We live in an inner world of conscious experiences and feelings, and we live in an outer world of physical objects in a natural environment, but we also both build and inhabit an intersubjective world of traditions and institutions such as religion, marriage, money, languages, nations, and knowledge of all kinds. This World Three, as Karl Popper called it, can be cast as a second-person world between the first-person world of inner mental states and the third-person world of science and physical things. Harari sees World Three as the key human achievement in explaining our success in rising so far – and even sees it as about to gobble up the other two worlds in a huge cloud of data.

Whether the data cloud will liberate itself from its human owners in the near future is a question that needs careful parsing. As Harari and Kurzweil stress, we shall merge with our technology to form various kinds of hybrid – people with artificial extensions to their limbs and organs, with brain chips and embedded sensors, plus nanobots in the bloodstream and so on, as well as with designer genes. These new people will be equipped through a commercial industry that sells its services to the highest bidder regardless of medical or other ethics, or even laws, and that will empower its customers – if they are rich enough – to live superhuman lives for longer than anyone has ever lived before. This industry will eventually transmute these well financed pioneers so far from their human roots that natural humans will be handicapped creatures by comparison. People as we now experience them will inevitably lose out in the evolutionary race to populate the future, but the superhuman cyborgs will live on. So says Harari.

Another story is that focusing on superman misses the forest for the trees. Human beings are animals, sure, but in the great race of life their World Three creations have made them special. The greatest of these creations is civilization itself. Its latest manifestation, as a globalized and ideologically humanist juggernaut that is relentlessly crushing all the remnants of its former embodiments, is now in the process of upgrading the platform for its central command from human hosts to a globally networked machine infrastructure. Soon the server farms of Google and other big corporations will do most of the hard work of running the systems that keep

civilization running smoothly on planet Earth. Harari tells a nice story of our increasing dependence on GPS navigation systems in cars to show how we humans will become ever more passive fellow travelers within the wired and networked world order as this upgrade process accelerates. The intersubjective world of organized data flows will have grown up, in a textbook example of the Hegelian master-slave dialectic, from serving its human masters to enslaving them. Enslavement is a big step on the slippery slope to extermination, but of course helping us, guiding us, and leading us is far from enslavement in the old human sense.

Harari tells a gripping tale, but he misses an opportunity to explore a fascinating story of human transcendence of its own animal limits through religion. Our creation of global civilization as the footprints of the march of World Three social fictions on Earth was powered in another dialectical inversion by our sense of being creatures of a higher power. This higher power was the God of the monotheists – and was, as Harari never tires of pointing out, itself a fictional denizen of World Three. Enslaved by our own creation, in the service of our transcendent God, we stamped His footprints upon the planet in a mighty thrashing of human endeavor unparalleled in the previous history of life on Earth.

In a modern psychology constrained by credibility in view of evolution and by the discoveries of neuroscience, the patriarchal God of the monotheists inspired by the Bible is an idealized father figure that transcends human limitations. Reflection on this deity has evidently led our ancestors within the monotheist tradition to extend their networks of cooperation ever wider, the better to reflect the territorial ambition of their ideal patriarch. In the process, those ancestors widened and generalized their own sense of self practically to infinity. Neuroscientists have explored the plasticity of our sense of self with simple experiments that demonstrate our propensity to transform and shift our self image in surprising ways, for example to include rubber hands or to reach out into other bodies, which we conceive as the locus of directly felt sense impressions. We theorize about the location and extension of our self depending on felt and sensed neural input. Organized religion has encouraged the dilation and delocalization of our sense of self in sacred contexts, which also encouraged us to attach supreme value to such transformations of the self. The result is that we, alone among the animals on Earth, can talk freely about our spanning the globe, traveling into space, and achieving effects in the far future, in ways that can only be realized in or by bodies other than those we were born into. This is a remarkable consequence of the neural plasticity that such cultural traditions as those of monotheism have celebrated and encouraged. We can think and act together as a species in ways no other animal can dream of, since those animals lack our deep immersion in World Three ideation.

This ability has direct consequences for our likely future, where a rapture into the data cloud is not a credible or interesting option. Crunching data is like digesting food – it is a precondition for visionary action but it cannot by itself constitute such action. By laying out a banquet table of relevant facts together with a menu of preliminary ways to understand those facts, Harari has helped prepare us to address our long-term future more realistically and effectively, but he has not led us to the promised land. That contribution requires a more deeply rooted appreciation of the logic of discovery and motivation than his gloss on our striving for immortality, bliss, and divinity in terms of algorithmic automatism can provide.

Our striving for immortality, bliss, and divinity reflects our tradition of sacred rites that celebrate them. The idea is that we, as dependent beings, may in some magical future enjoy them too, if only by dissolving ourselves utterly within the godhead and leaving our mortal bodies behind. We want those things in large part because our sacred traditions have drummed desire for them into us, when we could otherwise have rested content with ignorant animal pleasures.

The point here is that people who band together in the service of a higher goal can achieve more than those who aim only to stay alive, have fun, and enjoy power and respect. The difference lies in how the sense of self is invested – whether it remains rooted in an animal body and accepts those bodily limitations as features to be tweaked and upgraded, the better to enjoy precisely the same old self in its fortress in the same old skull, or whether it learns the lessons of its sacred rites more fully and takes the side of God, as it were, in addressing the world.

This latter choice, I would submit, is where our species future lies at this historical juncture. We are accustomed to the idea that history as we once knew it ended in about 1990, when Soviet communism came crashing down and the world was made safe for liberal democracy. Harari is rightly skeptical of this take on history, and points to the inexorable rise of new technology, not only Kurzweil's triad of genetic engineering, robotics, and nanotechnology but also the coming internet of things, as the first wave of a new world order. But he does not spell this out.

We have three threads here that can be woven together – the perception of humans as animals, the plasticity of the self as encouraged by monotheism, and a range of new ideas leveraging the internet. I see a step change here that puts Harari's casual ramblings about the emergence of new techno-religions into better focus.

IV

Our civilization has learned to package humans comfortably and productively. Some people who had grown used to living within earlier orders are still fighting back – most notably in many of the traditionally Islamic regions of the world – but the progress of the civilization that swallowed both communism and capitalism is inexorable. Human animals can relax and enjoy long life, material comfort, and power aplenty in the world of work.

However, and this is the crux of the matter, I suspect an unprecedented fate awaits us. We are on the verge of creating a single planetary organism in which the society of humans on Earth will play a role analogous to that played for a human being by the bacterial population in his or her gut. As beings who are used to dilating and projecting our sense of self, we shall – in our best and most exalted moments – identify with this planetary organism and sense that it confers godlike powers and duties upon us.

The environmentalist fads that grip people today give us a foretaste of things to come. Here we see the growth and development of mindsets that exalt planetary thinking in various ways, and I believe that we shall see more of this sort of thinking, in both more exciting and more rigorous forms, until our taking a planetary perspective seems like the merest good sense to us. At that point, the machine infrastructure that surrounds us will serve as our system of sensory organs and our levers of power and control. Not all humans will manage to achieve this level of planetary awareness, but for those of us who succeed, a dominion awaits that will exceed most previous dreams of divinity, yet do so in a secular and pragmatic context.

By almost any definition of what constitutes an organism, the increasingly organized global civilization we are building on Rock 3 of system Sol more and more resembles one. The global brain embodied in the internet and its server farms, plus the human and machine nodes that feed it and feed off it, is growing daily and increasingly animating an anthropogenic footprint on Earth that used to resemble nothing more than a few smudges of dirt on our ball of rock, or perhaps a surface infestation, but is now beginning to look like a knot of crudely functional feedback loops on a global scale, fed by global news cycles and money flows and channeled through institutions like the United Nations. As we update our installed base and learn to recycle or detoxify our waste products, this global organism will wake up and become conscious.

Harari is frankly mystified by consciousness, as most people are, and the philosophers and neuroscientists are still struggling to develop a more coherent understanding of it. But one thing becomes clearer with every new discovery, namely that consciousness is not some miraculous extra for an organism, sparked in from on high as if by divine grace, but arises from the workings of precisely configured components and is exquisitely correlated with the individual and collective actions of those components. Researchers armed with the scientific method will rein in the magic and explain consciousness so far that it seems no more mysterious than the inner workings of a humble rock, to recall Wolfram's computational paradigm. When that time comes, we shall probably agree that the global infrastructure on Earth can sustain the same exquisite correlations and exemplify the same emergent phenomenon as a brain, and a new organism will be born, in the biggest step change for life on Earth since the Cambrian explosion half a billion years ago, when free-living cells in the primordial soup learned to live together in symbiosis to form eukaryotic organisms.

Consciousness may well be the automatic correlate of a functionally self-sustaining knot of feedback loops. The heights of human consciousness no doubt require a hundred billion neurons and a hundred trillion synapses, but even the modest few hundred of a flatworm may well suffice to sustain some feeble glimmer of the same sort of thing. This is no more than a plausible view at present, but it does imply that our global organism is already beginning to glow with consciousness. Its functional array of billions of human nodes, who sometimes work together, plus billions of machine nodes, which cooperate more consistently, already vibrates with the globally integrated states of excitation that some say define consciousness. If so, a sense of self, and an intuition of the infinite extensibility of that sense of self, is part of the package.

Organisms in biology are generally reckoned to have one essential characteristic that our global organism so far lacks, namely the power to reproduce. Here Harari's visions of things to come are disappointing, for he makes no real mention in his brief history of the prospects for life as we know it beyond the confines of this planet. He seems to think that humans in space are like fish out of water and to have therefore lost any enthusiasm for pushing further. Perhaps he thinks the superhuman beings he foresees on Earth will be augmented enough both bodily and intellectually to take up the challenge anew and relieve him of the need to think about all that rocket science. In any case, he says little about it.

The civilization that is currently based exclusively on Earth will naturally begin to build tiny clones of itself on Mars and on any of the moons in the solar system that possess the natural resources, such as water and a good range of minerals, needed to sustain life as we know it. Either this will happen or life here on Earth will find a way to poison itself or in some other way become extinct, as dreamers like Stephen Hawking and Elon Musk have begun to warn us. If and when this cloning process begins, the organism on Earth will have taken the first baby steps toward mastering the art of biological reproduction.

The ancient Greeks called their earth goddess Gaia. Soon we shall likely find a new referent for the name, to denote the emergent global conscious being that will outshine all of us and take control of our little lives. It will, for most practical purposes, be our new God.

V

The first task of any organism is to distinguish inside from outside, self from non-self. True to this pattern, Gaia – as we can provisionally call her – will live and grow within planetary limits that put almost all of the known universe beyond the pale. For any serious attempt to merge Gaia with the God of the monotheists this poses a problem.

The hubris of the monotheists was that their god created all things and reached out to infinity. A mere planetary agent falls laughably short of that ideal, however brilliant it may seem from within and however fully it may eclipse our view of the wider universe. Harari is so out of sympathy with the monotheist dreamers that he may not even see this issue, but anyone who seeks more than a merely human future in a post-humanist world had better confront it more squarely.

Cosmologists say our known universe, our Hubble Bubble extending out to the cosmic microwave background, is about 13.8 billion years old – about three times as old as planet Earth. Our bubble gets bigger every day, at a rate exceeding the speed of light, and is currently slightly less than a hundred billion light years in diameter. It contains around a hundred billion galaxies and a hundred sextillion stars. By contrast, Earth has a diameter of less than fifty light milliseconds.

Worse is to come, since our bubble is an arbitrary fragment of the bigger universe, much as our view from a humble hilltop is an arbitrary patch of the surface of the Earth. The bigger universe might be infinite, for all we know, and include innumerable planets as similar to Earth as you like. This bigger universe in turn might itself be just one among countless bubbles in an oceanic and eternal bubble bath beyond the little speck of soap we know and love in our Hubble Bubble.

Appreciation of the true size of Earth in the cosmic order is essential to break out of the idea that Gaia, for all her future glory when we really get going with the internet of things and so on, can be a goddess grand enough to exhaust the dreams of the monotheists. But it is equally essential to break out from the idea that the terrestrial fixations of the early monotheists bore any coherent comparison with the plain truth as it now presents itself to our telescopic gaze. The dreams of the early believers in YHWH or Christ or Allah are hopelessly obsolete, as Harari says in his discussion of the equally obsolete prototypical techno-religion of Marxism, which fixated on the mechanical and financial powers of industrial capitalism.

A techno-religion centered on a Gaia hosting a photonic network of cyborgs, in whatever variant may take the fancy of the would-be messiah, cannot ignore the cosmic background, and any attempt to embrace the entire cosmos soon dissolves, either into *Star Trek* space opera or within the hopeless mysticism of cosmic consciousness. The best such a new religion can do is prepare a comfortable deathbed for the last human beings who miss the bus to the cloud mind upload depot. Once the chosen few among the last humans are uploaded into the group mind that steers Gaia on its journey of discovery through the heavens, anything resembling the religions we can now conceive is worthless except as a sedative.

The point of introducing a high-tech Gaia here is not only to put us into the cosmic perspective that came up short in Harari's view of things but also to point out just how thoroughly such a Gaia does meet our needs as living beings in search of a vehicle to ride toward a better future. All life on Earth will be taken up one way or another in the global organism. Many species will remain only as genetic records and virtual reconstructions, and many humans will live on only in that sense too, but some among us will surely provide the human input to the captain and crew of Spaceship Earth, either as starter organisms for the cyber upgrades and so on the crew will need to steer the ship or as organic nodes in the global neural network that informs that captain and animates the ship. In either case, it will be a noble end for a special species, and no shame in the grand scheme of things.

A parenthetical paragraph on the transition from the God of the monotheists to Spaceship Earth may help us see beyond Harari's vision. The traditional godhead can be unwoven into three strands, reflecting the respective approaches through Judaism, Christianity, and Islam. The Judaic approach stressed cosmic law and order and seems to have found its most credible modern expression in the stated ideas of Spinoza and Einstein, which find a home of sorts in modern

physics. The Christian approach stressed life and love and seems to culminate in modern biology, where a humble respect for living beings is a natural corollary of scientific interest in their function and flourishing. And the Islamic focus on living in submission to an inner imperative reflects a psychic stance that more directly than the other approaches finds a resonance with those ideas from Buddhism and Kantian philosophy that figure centrally in modern psychology. So the three strands seem to find their scientific cash value, so to speak, in the three most salient areas of creative growth in modern science. The idealized patriarch can be said to have seeded science, and science provides the Infinite Improbability Drive of Spaceship Earth.

VI

The brief history of the human past and future that Harari has sketched out is entertaining and lucid. But it leads the reader all too readily to despair at human folly and conceit. If this is all we were and are, then perhaps we deserve to be left behind by Nietzschean supermen.

One major contrast Harari hangs upon to defend this despairing perspective is that between facts and values. Science is all about facts and religion is focused on values. Given that polarity, the clear fallacy of deriving values from facts makes the enterprise of building a scientific foundation for a human future look hopeless. Scientists tell us how the world is, but they cannot be the ones to tell us what to do or how things ought to be. So religious hucksters have a clear field to propagate the folly and conceit that we need to outgrow.

The problem with this contrast is that it is nowhere near as absolute as it may seem at first sight. Scientists endorse the values of truth and honesty, with strict protocols designed to ensure that experimental evidence adduced to support a theory connects with that theory in a transparent and rigorous way, in accordance with an explicit methodology, so values are essential both for their work and to shape their lives more generally. Conversely, religious figures cannot help but presuppose a factual background to the visionary values they espouse. The Christian values of faith, hope, and charity only make sense in a world where people need faith to raise them from despair, hope to move them to work for the future, and charity to help other people who may be weaker or more heavily burdened. The Marxist values of freedom, equality, and solidarity only make sense in a world where workers are everywhere in chains, where members of the working class are replaceable units of production, and where their fight for freedom can only be won by working together against the class enemy. Given a background of facts, appropriate values are usually not hard to identify.

A clean distinction between facts and values is only possible when humans are conceived as being free to choose their fate. I can know the facts, but I am still required to choose freely either to act in reasonable recognition of those facts or to deny them and insist on following a quite different imperative. That further choice obviously depends on values that go beyond the facts, and the unstated presumption is that I always have that further choice.

However, as Harari points out with reference to recent work in neuroscience, the human sense of having free will is largely if not entirely illusory. We feel free but we act in stereotyped ways, which are often predictable to anyone with access to the relevant facts. In practice our freedom consists not so much in acting unpredictably but rather in acting in accordance with values that we already and wholeheartedly endorse. A scientist who can pursue the search for truth unhindered is free. A religion that can hold sacred those values that its believers already and spontaneously accept as binding will succeed. Citing Daniel Kahneman, Harari recalls the limits on our rationality and the extent to which stereotypes arising from our animal prehistory constrain our decisions. Together with the observation that many of our conscious decisions could be predicted in principle by a

neuroscientist armed with results from the relevant brain scanning devices, the outcome is dismaying for anyone who is still proud of their sense of inner freedom.

The philosopher Daniel Dennett has explored this issue more thoroughly than most. For him, human freedom is an evolved capability that requires cognitive resources to exercise. Those who can muster more or better resources can act more freely; for them, the disconnect can be greater between the facts about them and their environment on the one hand and the values they espouse and enact on the other. Clearly, there is a horizon here beyond which facts and values come together in confusion, and this horizon expands in evolutionary time, so we can expect it to vanish beyond human ken when the Gaian superself takes command of Spaceship Earth.

What all this means for the people who live within the global superorganism is that their ability to distinguish facts from factoids, truth from lies, and authentic values from propaganda slogans – as well as their own real selves from the virtual images projected upon them – will fade. Unless they fiercely guard what little sovereignty they still possess, they will become enslaved by the global systems they serve. Even if they fight back with all their might, the chances are high that the group mind will outwit them and leave them utterly defeated before they can score at all; resistance will be futile. Gaia becomes a *Star Trek* nightmare – the Borg.

This would be an excuse to despair beyond all hope of redemption if it were not for a loophole that permits an easy escape. We simply identify with the global god-mind, and go with the flow even when its ways are inscrutable to us. The philosophical background here is well founded in the history of religious mystics through the ages. The human self is an illusion – for this insight we already have the Buddha and his disciples to thank. The ultimate referent of the word “I” is not little old me; and not even the God of Ages, the One who spoke to Moses, Jesus, and Muhammad; but rather a mystery beyond all human fathoming. The human self of the Cartesian *cogito ergo sum* is a trusting soul who can only rest in the faith that God will not deceive him. Perhaps we do best to assert that the ultimate referent of the word “I” can be conceived as a geometric point at infinity (which was how the young Ludwig Wittgenstein saw the self in his solipsistic *Tractatus Logico-Philosophicus*). This mathematical metaphor can fortify us in resisting any false resolutions of the mystery of the mind’s “I” that could otherwise tempt us.

Returning to Earth, the superhuman commander of Spaceship Gaia will know more than the crew, and so the right response for a humble human crew member is to submit to the commands sent forth from the holodeck in the firm faith that all is for the best as we plot a course for the future. This is no techno-religion but a sound strategy for survival in Globorg. And it marks the transition from autonomous humanity to membership in the planetary biome.

The human animal rises above its roots in celebration of the free and potentially infinite self. The coming internet of things will animate many of the presently inert objects around us with levels of interactivity that plug us firmly into a global network, whether we like it or not. Physically, we shall be embedded in Globorg as parts of its body. Psychically, we can be sentient parts of its mind. We can say: “I am Globorg.” So could Professor Harari.

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(typo corrected November 22)