

The End of the Human Story

Humanity and Technology

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Richard A. Rhem
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The title of this lecture is “The End of the Human Story” – a title of intentional ambiguity. My Webster’s *New Universal Unabridged Dictionary* (second edition, 1983) lists ten meanings for the word “End.” Two of the ten meanings afford me the opportunity to reflect on the Human Story with all of the ambiguity to which my reflection has driven me.

The theme “Humanity and Technology” has forced me to think in concentrated fashion on our present human experience about a broad range of issues of which we are all aware but whose implications we seldom take into consideration. The result of my reflection on the theme has left me with the ambiguity reflected in the title. One could take the title to suggest that I am using “End” defined as “the last part of anything; final point; finish; completion; conclusion,” meaning that I will be claiming that the human story is approaching its last days.

On the other hand, “End” in the title might point to “the object intended to be reached or accomplished by any action or scheme; purpose; scope; aim;” or, “consequence; issue; result; outcome.” Therein lies the ambiguity of my title: will the explosive expansion of technology lead to humanity’s demise – the end of the story? Or, might technology be the means whereby humanity realizes its Divine intention, its purpose in process?

Put another way: will technology lead us to the gates of Hell, the final conflagration, or usher us into Edenic bliss, the Garden of Paradise, the City of God?

Lest I build too great expectations with such cosmic queries, let me say at the outset that both consequences are possible –

Coming to our end,
or
Realizing our End.

Which possibility will prevail I do not know. No one knows. But the value of reflection on the theme “Humanity and Technology” is bringing to awareness what must be the critical issue confronting the human family - not simply what as yet undreamed of possibilities there are for technological development but,

rather, given whatever technological advances that emerge, how will humanity respond in terms of control, utilization and application?

Technology is not a neutral instrument; it has and it will radically transform a cultural paradigm. Yet, at this moment in our cosmic journey, human decision-making can still determine whether technological development will spell our end or be a means of realizing the full blossoming of the human spirit – which would be simply Divine.

It is in coming to a sharpened awareness of the critical nature of the choices that even now confront the human family that the value of our theme lies. As one whose whole life has been given over to contemplating the human before the Face of God, I must admit that I have been shocked into a new awareness of the real situation of our present existence, literally teetering between the end and the End –between extinction and the next stage of human development.

I suspect I have hid my head in the sand regarding the present crisis of the human project because I am a Humanist; I am a member of “the lead pencil club.” Indeed, though I read this lecture from a typed copy which I first received on my computer, it first found the light of day one word at a time, written in my barely legible hand-scrrawl, as did all of the hundreds and hundreds of sermons, articles and letters I have written over my lifetime. Never having learned to type, the actual writing out of every form of communication I have produced has become part of the creative process for me.

Further, I should alert you; I often refer to myself as a Dinosaur, indicating my total lack of technological savvy and my belligerent pride in being “out of it.” And thus you should hear me with deep skepticism – I am not a well-balanced commentator on things technological; I have been dragged kicking and screaming into century twenty-one. Yet, I have found, in the intensive concentration on our theme, that even a Dinosaur can be born again. I will always remain technologically challenged, but I know now that I cannot hide from the wrestle of the Human with human potential for good or ill that technology holds forth.

Let me begin to address the subject by putting the issue of humanity and technology in an historical context. The tension between human values and technological development has a long history. Without attempting a full account of that history, let me simply point to what for me was new insight and understanding –the beloved Robin Hood of English legendary saga was not simply one who with his band of merry men took from the rich to aid the poor. In his *Rebel Against the Future*, Kirkpatrick Sale points out that the Robin Hood legends recount the struggle against the early English wool industry.

It is probable that one of the real figures at the center of the legend was the victim of an early industrial policy of the rising English monarchy to encourage a native wool industry by transforming some of the commonly

held central forests into private grazing lands for sheep, and his troubles with the Sheriff of Nottingham no doubt stemmed from a clash between his desire to keep on using the woods for food and fuel, as his father and forefathers had before him, and the royal policy (proclaimed in 1217-18) of cutting them down for pasturage. This conflict between old and new, custom and commerce, was dramatic enough to fix itself in the stories of the locals, take life in several early narrative poems (most effectively in the *Lytell Geste of Robyn Hode* of 1495), and eventually be resurrected by several early 19th-century Romantic novelists (notably Scott, in *Ivanhoe*), from where it passes into modern films and fables ...

But for all the enduring resonance of this tale, in historical fact it was the royal policy of clear-cutting and wool manufacturing over the forest commons that prevailed. The heartland forests were enclosed and harvested, laid bare for grazing, and within a few centuries nothing much was left of either the great Barnsdale or Sherwood forests but a few scattered clusters of conifers and a few stately oaks in tracts deemed unsuitable for development; wool weaving became the key industry of England and woolen cloth for centuries its most important export, an enterprise nurtured and protected by a succession of kings and parliaments down to the 19th century. Robin Hood's name may have lasted, and a legend about heroic commoners resisting the noble and the powerful may have become burnished by time, but in truth it was not the practice of robbing from the rich, nor the benefaction of the poor, that became the principle means of enterprise in middle England. (p. 2F)

Sale recounts the Robin Hood legend of the 13th and 14th century to introduce his history of the Luddites who are his "Rebels" whom he uses to address our contemporary crisis created by the present explosive technological advances. It is fitting, and perhaps not accidental, that this triangle of central Britain, seven centuries after it immortalized Robin Hood, was precisely the site of the risings of the Luddites.

The Luddites – many of them weavers and combers and dressers of wool, but many of them artisans in the cotton trades that became increasingly important at the end of the 18th century – were, like Robin's Merry Men, victims of progress, or what was held to be progress. Having for centuries worked out of their cottages and small village shops on machines that, though far from simple, could be managed by a single person, assisted perhaps by children, they suddenly saw new, complex, large-scale machines coming into their settled trades, or threatening to, usually housed in the huge multistory buildings rising in their ancient valleys. Worse still, they saw their ordered society of craft and custom and community begin to give way to an intruding industrial society and its new technologies and systems, new principles of merchandise and markets, new configurations of countryside and city, beyond their ken or control. And when they rose up against this, for fifteen tempestuous months at the start of the

second decade of the 19th century, they did so with more ferocity and intensity than anything Robin Hood ever mustered, and were put down with far more force than anything King John ever commanded.

The Luddites took their name from a mythical Ned Ludd – whose origins are still obscure ... – but they were conscious throughout that they were traveling on ground trod by an earlier set of courageous troublemakers; one of the earliest Luddite letters was posted from “Robin Hood’s Cave,” another was said to have come from “Ned Ludd’s office, Sherwood Forest,” ... (p. 3)

Sale writes of the critical nature of the Luddite rebellion as the Industrial Revolution was transforming English life. The response of the English establishment threatened to betray the very character of the nation, sensing as they did that the whole future of industrialization was at stake. Sale writes, ... the various Luddite armies that operated in 1811 and 1812 were so carefully organized and disciplined and so effective in their attacks, causing damage to machines and property ... that they seemed a strong and highly threatening movement of a kind Britain had not known before – of “a character of daring and ferocity,” the *Annual Register* for 1812 said, “unprecedented among the lower classes in this country.”

Then, too, they had enough popular support in the manufacturing districts to be able to carry on their secret, illegal activities for months on end without being betrayed, despite official bribes and threats, nighttime arrests, and interrogations, suggesting to certain minds at least that they were only the most visible part of a very widespread insurrectionary – possibly revolutionary – tendency in the land. Moreover, their threat to the established order, both real and exaggerated, called forth the greatest spasm of repression Britain ever in its history used against domestic dissent, including batteries of spies and special constables, volunteer militias and posses, midnight raids, hanging judges, harsh punishments, and a force of soldiers stationed in the troubled regions greater even than that which had sailed to Portugal with Wellington to fight Napoleon’s armies four years before.

Last, and perhaps most important, the Luddites were understood to represent not merely a threat to order, as riotous mobs or revolutionary plotters of the past, but, in some way not always articulated, to industrial progress itself. They were rebels of a unique kind, rebels against the future that was being assigned to them by the new political economy then taking hold in Britain, in which it was argued that those who controlled capital were able to do almost anything they wished, encouraged and protected by government and king, without much in the way of laws or ethics or customs to restrain them. The real challenge of the Luddites was not so much the physical one, against the machines and manufacturers, but a moral one, calling into question on grounds of justice and fairness the underlying assumptions of this political economy and the legitimacy of the principles of

unrestrained profit and competition and innovation at its heart. Which is why the architects and beneficiaries of the new industrialism knew that it was imperative to subdue that challenge, to try to deny and expunge its premises of ancient rights and traditional mores, if the labor force were to be made sufficiently malleable, and the new terms of employment sufficiently fixed, to allow what we now call the Industrial Revolution to triumph unimpeded.

The impact and implications of the Industrial Revolution were creating serious questions and deep foreboding in the minds and hearts of many of the thoughtful and reflective English folk of that time. Mary Wollstonecraft Godwin (living with but as yet not married to the poet Percy Bysshe Shelley), Shelley, his friend Lord Byron and Byron's physician, Dr. John Polidori, spent the summer of 1816 in Switzerland, a summer of perpetual rain. Creating their own entertainment, they decided to see who could write the most frightening ghost story. Mary Shelley was 18 when she began to write her story and 21 when the book was published under the title *Frankenstein, or the Modern Prometheus* (1818). The numerous film versions of the story are in the horror film genre and mask Shelley's real intention in the novel.

The name Frankenstein has been switched to the Monster in the dramatic versions of stage and film; whereas, in the novel, Victor Frankenstein is the student experimenter fascinated with the power of electricity in lightning. He determines to pursue the secret of life. The reference in the title to Prometheus reveals what was on Shelley's mind as she wrote – a modern Prometheus, not thief of fire, but attempting to become the Creator.

Patricia A. Neil, in an essay entitled "Mary Shelley's Frankenstein: Myth for Modern Man," stresses the serious intention of the author about concerns which continue very much with us as we wrestle with the tension between human values and the explosive technological advances we are witnessing. Neil writes,

The power of the myth of an unattended scientific creation, left to destroy innocent lives, assumes importance in the final decade of the twentieth century. The book questions the morality of Frankenstein's actions. Did he have a right to create and abandon the creature? In her novel, Mary Shelley anticipated the problem of a destructive force created by man, a force with no genuine means of control.

Kirkpatrick Sale likewise recognizes Shelley's serious purpose in writing of her myth –

... Mary Shelley's prescient tale of techno-madness, *Frankenstein*, published in 1818, was so vivid a message of the dangers of mechanization and the problems of scientific invention – "You are my creator," the monster tells the scientist at the end, "but I am your master" – that it has survived to today, unforgettable. Basically the same message, more philosophically put, would continue to be expressed as the century went on

by men like Thomas Carlyle, William Morris, John Ruskin, G. K. Chesterton, and Hilaire Belloc, and from time to time, in more literary form, by Charles Dickens.

Thus, the recognition of the potential and peril of scientific knowledge and technological development has a long history, but the pace and peril of that development is increasing in our day, not gradually, but exponentially, creating, according to Kirkpatrick Sale, more passion and urgency than at any time in the past two centuries. He claims,

... it stems from the now incontestable understanding that, as *Business Week* put it not long ago, “the United States is in the midst of an economic transformation on the order of the Industrial Revolution” – a transformation, like the first one, driven by swift technological and economic change and, like the first one, accompanied by vast social dislocations and environmental destruction. Call it “third-wave” or “post-modern” or “multinational” capitalism, this new order is something paradigmatically different, a high-tech industrialism of ever more complex technologies – computerization, robotics, biotechnology, artificial intelligence, and the like – and served by ever more remote institutions, notably the multinational corporation. And this new industrialism is sped along by the ministrations of the developed nation-states, especially the American one that generated the second Industrial Revolution, nurtured it with Cold War weaponry and space adventurism, and is now, with the Clinton Administration, prepared to launch it onto an “information superhighway” and an “automated battlefield” with unprecedented technological consequences. (p. 20)

And what Sale saw emerging a decade past has arrived with a vengeance such that one of the key players on the technology stage is worried. In the journal, *Wired*, April 2000, Bill Joy, co-founder and chief scientist at Sun Microsystems, a large and leading computer company, wrote a powerful essay in which he expressed his shock at the rapid advance of the technology in which he himself was engaged and the potential for bringing the human story to its end. The essay is entitled “Why the Future Doesn’t Need Us,” and a bold print subtitle gives the essence of the piece – *Our most powerful 21st-century technologies – robotics, genetic engineering, and nanotech – are threatening to make humans an endangered species.*

Bill Joy relates the moment that his unease with the whole current direction in which new technologies are being created arose. At a telecom conference, he listened to a Berkeley philosopher, John Searle, discuss with the famous inventor and futurist, Ray Kurzweil, the acceleration toward the time we were going to become robots or fuse with robots or something like that. John Searle said it couldn’t happen because the robots couldn’t be conscious, but Kurzweil said such a phenomenon was a near-term possibility. Joy writes,

I was taken aback, especially given Ray's proven ability to imagine and create the future. I already knew that new technologies like genetic engineering and nanotechnology were giving us the power to remake the world, but a realistic and imminent scenario for intelligent robots surprised me. Kurzweil gave Joy a preprint of his then forthcoming book, *The Age of Spiritual Machines* in which he described the utopia he foresaw – one in which humans gained near immortality by becoming one with robotic technology.

Joy was sobered and his unease intensified; he felt certain the dangers were being underestimated, failing to understand the potential of a tragic outcome. He found himself most troubled by a passage detailing a dystopian scenario – that is a scenario of a state or situation in which conditions and the quality of life are terrible. This is the disturbing passage which Joy introduces with the sub-heading “The New Luddite Challenge.”

First let us postulate that the computer scientists succeed in developing intelligent machines that can do all things better than human beings can do them. In that case, presumably all work will be done by vast, highly organized systems of machines and no human effort will be necessary. Either of two cases might occur. The machines might be permitted to make all of their own decisions without human oversight, or else human control over the machines might be retained.

If the machines are permitted to make all their own decisions, we can't make any conjectures as to the results, because it is impossible to guess how such machines might behave. We only point out that the fate of the human race would be at the mercy of the machines. It might be argued that the human race would never be foolish enough to hand over all the power to the machines. But, we are suggesting neither that the human race would voluntarily turn power over to the machines nor that the machines would willfully seize power. What we do suggest is that the human race might easily permit itself to drift into a position of such dependence on the machines that it would have no practical choice but to accept all of the machines' decisions. As society and the problems that face it become more and more complex and machines become more and more intelligent, people will let machines make more of their decisions for them, simply because machine-made decisions will bring better results than man-made ones. Eventually a stage may be reached at which the decisions necessary to keep the system running will be so complex that human beings will be incapable to making them intelligently. At that stage the machines will be in effective control. People won't be able to just turn the machines off, because they will be so dependent on them that turning them off would amount to suicide.

On the other hand, it is possible that human control over the machines may be retained. In that case, the average man may have control over certain private machines of his own, such as his car or his personal computer, but control over large systems of machines will be in the hands of a tiny elite – just as it is today, but with two differences. Due to improved techniques, the elite will have greater control over the masses; and because human work will no longer be necessary, the masses will be superfluous, a useless burden on the system. If the elite are ruthless, they may simply decide to exterminate the mass of humanity. If they are humane, they may use propaganda or other psychological or biological techniques to reduce the birth rate until the mass of humanity becomes extinct, leaving the world to the elite. Or, if the elite consist of soft-hearted liberals, they may decide to play the role of good shepherds to the rest of the human race. They will see to it that everyone's physical needs are satisfied, that all children are raised under psychologically hygienic conditions, that everyone has a wholesome hobby to keep him busy, and that anyone who may become dissatisfied undergoes "treatment" to cure his "problem." Of course, life will be so purposeless that people will have to be biologically or psychologically engineered either to remove their need for the power process or make them "sublimate" their drive for power into some harmless hobby. These engineered human beings may be happy in such a society, but they will most certainly not be free. They will have been reduced to the status of domestic animals.

And, now here is the shocker, in Joy's words: In the book, you don't discover until you turn the page that the author of this passage is Theodore Kaczynski – the Unabomber. ... Kaczynski's actions were murderous and, in my view, criminally insane. He is clearly a Luddite, but simply saying this does not dismiss his argument; as difficult as it is for me to acknowledge, I saw some merit in the reasoning in this single passage. I felt compelled to confront it.

Kaczynski's dystopian vision describes unintended consequences, a well-known problem with the design and use of technology, and one that is clearly related to Murphy's Law – "Anything that can go wrong, will."

... The cause of many such surprises seems clear: The systems involved are complex, involving interaction among and feedback between many parts. Any changes to such a system will cascade in ways that are difficult to predict; this is especially true when human actions are involved.

I started showing friends the Kaczynski quote from *The Age of Spiritual Machines*; I would hand them Kurzweil's book, let them read the quote, and then watch their reaction as they discovered who had written it. At around the same time, I found Hans Moravec's book, *Robot: Mere Machine to Transcendent Mind*. Moravec is one of the leaders in robotics research, and was a founder of the world's largest robotics research program at Carnegie Mellon University. *Robot*

gave me more material to try out on my friends – material surprisingly supportive of Kaczynski's argument.

According to Moravec, ... our main job in the 21st century will be “ensuring continued cooperation from the robot industries” by passing laws decreeing that they be “nice,” and to describe how seriously dangerous a human can be “once transformed into an unbounded superintelligent robot.” Moravec's view is that the robots will eventually succeed us – that humans clearly face extinction.

Joy wonders why more people do not share his concern and unease and suggests an answer:

... Accustomed to living with almost routine scientific breakthroughs, we have yet to come to terms with the fact that the most compelling 21st-century technologies – robotics, genetic engineering, and nanotechnology – pose a different threat than the technologies that have come before. Specifically, robots, engineered organisms, and nanobots share a dangerous amplifying factor: they can self-replicate. A bomb is blown up only once – but one *bot* can become many, and quickly get out of control.

Much of my work over the past 25 years has been on computer networking, where the sending and receiving of messages creates the opportunity for out-of-control replication. But while replication in a computer or a computer network can be a nuisance, at worst it disables a machine or takes down a network or network service. Uncontrolled self-replication in these newer technologies runs a much greater risk: a risk of substantial damage in the physical world.

Each of these technologies also offers untold promise: the vision of near immortality that Kurzweil sees in his robot dreams drives us forward; genetic engineering may soon provide treatments, if not outright cures, for most diseases; and nanotechnology and nanomedicine can address yet more ills. Together they could significantly extend our average life span and improve the quality of our lives. Yet, with each of these technologies, a sequence of small, individually sensible advances leads to an accumulation of great power and, concomitantly, great danger.

Joy summarizes what he sees as the clear and present danger that confronts us:

The 21st-century technologies – genetics, nanotechnology, and robotics (GNR) – are so powerful that they can spawn whole new classes of accidents and abuses. Most dangerously, for the first time, these accidents and abuses are widely within the reach of individuals or small groups. They will not require large facilities or rare raw materials. Knowledge alone will enable the use of them.

Thus we have the possibility not just of weapons of mass destruction but of knowledge-enabled evil whose possibility spreads well beyond that which weapons of mass destruction bequeathed to the nation-states, on to a surprising and terrible empowerment of extreme individuals.

That is a sobering conclusion from a very responsible and well-informed scientist who has made his mark as one of the chief architects of the present state of cybertechnology. And he declares, "... I trust it is clear that I am not a Luddite." Rather, he affirms a strong belief in the value of the scientific search for truth and the ability of great engineering to bring material progress. Why is he surprised to find himself in his present state of unease and foreboding? Because, he writes,

Perhaps it is always hard to see the bigger impact while you are in the vortex of a change. Failing to understand the consequences of our inventions while we are in the rapture of discovery and innovation seems to be a common fault of scientists and technologists; we have long been driven by the overarching desire to know that is the nature of science's quest, not stopping to notice that the progress to newer and more powerful technologies can take on a life of its own.

This is what he sees developing before our eyes. As this enormous computing power is combined with the manipulative advances of the physical sciences and the new, deep understandings in genetics, enormous transformative power is being unleashed. These combinations open up the opportunity to completely redesign the world, for better or worse. The replicating and evolving processes that have been confined to the natural world are about to become realms of human endeavor.

In designing software and microprocessors, I have never had the feeling that I was designing an intelligent machine. The software and hardware is so fragile and the capabilities of the machine to "think" so clearly absent that, even as a possibility, this has always seemed very far in the future.

But now, with the prospect of human-level computing power in about 30 years, a new idea suggests itself: that I may be working to create tools which will enable the construction of the technology that may replace our species. How do I feel about this? Very uncomfortable. Having struggled my entire career to build reliable software systems, it seems to me more than likely that this future will not work out as well as some people may imagine. My personal experience suggests we tend to overestimate our design abilities.

Given the incredible power of these new technologies, shouldn't we be asking how we can best coexist with them? And if our own extinction is a likely, or even possible, outcome of our technological development, shouldn't we proceed with great caution?

There is much more in Joy's essay, but what I have lifted up is surely enough to answer his question in the affirmative. Let me be clear – in all of this discussion of the accelerating pace of technological breakthroughs, I am over my head; nanotechnology is beyond my capacity to conceive. When I read of molecular level “assemblers” and that “one kind of nanomachine is the assembler, which is a tiny factory that can manufacture other machines, including replicas of itself,” I confess I am in a deep fog. But, I can at least catch some sense of the frontiers on which research and development is being executed. What it means that there will be robotic humans or human robots, I can hardly imagine, but I am now aware that this is no longer the stuff of science fiction; this is where we have arrived and where the next two or three decades will bring us if we survive – an open question!

Joy puts it this way:

The nuclear, biological, and chemical (NBC) technologies used in 20th-century weapons of mass destruction were and are largely military, developed in government laboratories. In sharp contrast, the 21st-century genetic, nanotech, robotic technologies have clear commercial uses and are being developed almost exclusively by corporate enterprises. In this age of triumphant commercialism, technology – with science as its handmaiden – is delivering a series of almost magical inventions that are the most phenomenally lucrative ever seen. We are aggressively pursuing the promises of these new technologies within the now-unchallenged system of global capitalism and its manifold financial incentives and competitive pressures.

This is the first moment in the history of our planet when any species, by its own voluntary actions, has become a danger to itself – as well as to vast numbers of others.

And then he continues:

“It might be a familiar progression, transpiring on many worlds – a planet, newly formed, placidly revolves around its star; life slowly forms; a kaleidoscopic procession of creatures evolves; intelligence emerges which, at least up to a point, confers enormous survival value; and then technology is invented. It dawns on them that there are such things as laws of Nature, that these laws can be revealed by experiment, and that knowledge of these laws can be made both to save and to take lives, both on unprecedented scales. Science, they recognize, grants immense powers. In a flash, they create world-altering contrivances. Some planetary civilizations see their way through, place limits on what may and what must not be done, and safely pass through the time of perils. Others, not so lucky or so prudent, perish.”

That is Carl Sagan, writing in 1994, in *Pale Blue Dot*, a book describing his vision of the human future in space. I am only now realizing how deep his insight was, and how sorely I miss, and will miss, his voice. For all its eloquence, Sagan's contribution was not least that of simple common sense – an attribute that, along with humility, many of the leading advocates of the 21st-century technologies seem to lack.

For Bill Joy, there must be relinquishment – the limiting of development of the technologies that are too dangerous, by limiting our pursuit of certain kinds of knowledge. And, positively, he cites the Dalai Lama in his *Ethics for the New Millennium* as a guide to a more humane future – the call to conduct our lives with love and compassion for others, developing a stronger notion of universal responsibility and recognizing our interdependency.

It is either such a course, or we stand in the shadow of catastrophe, the end of the Human Story.

As much as I affirm Bill Joy in his recognition of the threat with which we live and his call for relinquishment of the pursuit in which we are engaged, I wonder if that is either realistic or even the best course to follow.

Freeman Dyson, from 1953-1994, Professor of Physics at the Institute for Advanced Study, Princeton, and now Professor Emeritus, was invited to address the assembly of the world's major players at the World Economic Forum in Davos, Switzerland, in January, 2001, as was Bill Joy. Bill Joy took the precautionary side of the question, "Is our technology out of control?" Freeman Dyson took the libertarian side. There were no votes taken on who won the debate; however, as much as I am in sympathy with Bill Joy, I must admit to voting for Dyson's libertarian position. I surprise myself. I will not detail Dyson's arguments, but let me cite only his conclusion in which he appeals to none other than John Milton in his *Areopagitica*.

The last part of my reply to Bill Joy concerns remedies for the dangers that we all agree exist. Bill says, "Internationalize control of knowledge," and "Relinquish pursuit of that knowledge ... so dangerous that we judge it better that [it] never be available." Bill is advocating censorship of scientific inquiry, either by international or national authorities. I am opposed to this kind of censorship. It is often said that the risks of modern biotechnology are historically unparalleled because the consequences of letting a new living creature loose in the world may be irreversible. I think we can find a good historical parallel where a government was trying to guard against dangers that were equally irreversible.

Three hundred and fifty-nine years ago, the poet John Milton wrote a speech with the title *Areopagitica* addressed to the Parliament of England. He was arguing for the liberty of unlicensed printing. I am suggesting that there is an analogy between the seventeenth-century fear of moral

contagion by soul-corrupting books and the twenty-first-century fear of physical contagion by pathogenic microbes. In both cases, the fear was neither groundless nor unreasonable. In 1644, when Milton was writing, England had just emerged from a long and bloody civil war, and the Thirty Years' War, which devastated Germany, had four years still to run. These seventeenth-century wars were religious wars, in which differences of doctrine played a great part. In that century, books not only corrupted souls but also mangled bodies. The risks of letting books go free into the world were rightly regarded by the English Parliament as potentially lethal as well as irreversible. Milton argued that the risks must nevertheless be accepted. I believe his message may still have value for our own times, if the word "book" is replaced by the word "experiment." Here is Milton:

I deny not, but that it is of greatest concernment in the Church and Commonwealth, to have a vigilant eye how books demean themselves as well as men; and thereafter to confine, imprison, and do sharpest justice on them as malefactors ... I know they are as lively, and as vigorously productive, as those fabulous dragon's teeth; and being sown up and down, may chance to spring up armed men.

The important word in Milton's statement is "thereafter." Books should not be convicted and imprisoned until after they have done some damage. What Milton declared unacceptable was prior censorship, prohibiting books from ever seeing the light of day. Next, Milton comes to the heart of the matter, the difficulty of regulating "things, uncertainly and yet equally working to good and to evil":

Suppose we could expel sin by this means; look how much we thus expel of sin, so much we expel of virtue; for the matter of them both is the same; remove that, and ye remove them both alike.

This justifies the high providence of God, who, though he commands us temperance, justice, continence, yet pours out before us even to a profuseness all desirable things, and gives us minds that can wander beyond all limit and satiety. Why should we then affect a rigor contrary to the manner of God and of nature, by abridging or scanting those means, which books freely permitted are, both to the trial of virtue, and the exercise of truth. It would be better done to learn that the law must needs be frivolous which goes to restrain things, uncertainly and yet equally working to good, and to evil.

My last quotation expresses Milton's patriotic pride in the intellectual vitality of seventeenth-century England, a pride that twenty-first-century Americans have good reason to share:

Lords and Commons of England, consider what Nation it is whereof ye are, and whereof ye are the governors: a Nation not slow and dull, but of a quick, ingenious, and piercing spirit, acute to invent, subtle and sinewy to discourse, not beneath the reach of any point the highest that human capacity can soar to ... Nor is it for nothing that the grave and frugal Transylvania sends out yearly from as far as the mountainous borders of Russia, and beyond the Hercynian wilderness, not their youth, but their staid men, to learn our language, and our theologic arts.

Perhaps, after all, as we struggle to deal with the enduring problems of reconciling individual freedom with public safety, the wisdom of a great poet who died more than three hundred years ago may still be helpful. (From *The New York Review of Books*: "The Future Needs Us!" February 13, 2003.)

Preacher that I am, I suspect Dyson got to me with his argument based on the great Milton that the whole Creative Process has been fraught with risk. In the mythic story of Eden's test, the human failed; yet, it was Milton who spoke of the paradox of "The Fortunate Fall." Was it not in the fruit's seductive lure that the human became like God, knowing good and evil? And throughout the human story of triumph and tragedy there remains that sense expressed in the Genesis myth that the human is created in the image of God. Volumes have been written on that conviction and I will not attempt to discuss it further here, except to remark that such a conception of the human expresses a profound sense of the dignity, nobility and potential of the human creature. It speaks, as well, of the connectedness of the Divine and the Human, as the human mirroring in some significant manner the Creative Source and Ground of Being.

Again, as much as I affirm the call of Bill Joy to serious discussion about where technology is leading us and awareness of the risks and potential peril of the track we are on, I must say I simply do not believe the quest will be relinquished and further development halted.

But, acknowledging that I am incapable of conceiving the spectors Joy envisions, I want to contend that, not only will his call for relinquishment not be heeded, but to do so would be to halt the emerging Creative Process that is unfolding through the human. The potential catastrophe to the human endeavor must be as great as has been portrayed by such responsible seers – we may be on the threshold of effecting our end; we may be bringing down the curtain on the human story. But, what if relinquishment short-circuited the emerging process in which the Human Story might reach its End –that is, its purpose, its full blossoming in the great cosmic dance?

In the rapid pace of technological development, studies of over a decade ago may seem ancient. Yet, the questions with which we wrestle are not new, even if they suddenly appear more urgent. The Harvard scholar,

Professor of Divinity, Gordon D. Kaufman, wrestled with these questions in his wonderfully titled *In Face of Mystery* (1993). In a chapter, “The Corruption of Historicity: Freedom and Evil,” he claims it is possible to draw some notions about why and how our historicity becomes corrupted. After surveying the “corruptions of history,” he declares,

The central point with which we must come to terms is this: whether in the West or in more traditional societies, the processes of modernization (into which the development of our historicity and agency has brought us) now confront us with dilemmas that seem to be increasingly unmanageable by us, dilemmas which can eventuate not only in the extinction of various cultural traditions but in the annihilation of humankind itself. Our historicity, that which gives us our distinctiveness among all living beings, has proved to be a mixed blessing. But it is no longer possible to retreat into non-historical, non-agential modes of being (as we have seen): human life has become so thoroughly historicized that such moves backward into a simpler form of animality are inconceivable. We must, then, attempt to take responsibility for this situation in which we find ourselves, no matter how great its complexity and incomprehensibility. We have no choice but to move forward into a further widening and deepening of our historicity, and of the agency and responsibility which it makes possible.

There are further frightening problems. We will, for example, soon have to decide what kind of beings we should seek to become in the future, into what sorts of beings we should seek to transform ourselves. The most obvious point where this question is beginning to make itself felt is in recent developments in biology. We can now conceive the possibility of bringing about changes in the very genetic basis of human life, and we shall soon need to decide whether we want to do that. If so, in what directions should the biological substructure of human existence be moved? Should we think of our desired future as some sort of continuation or extension of the historical existence which is now ours? Or would some other mode of being, something above or beyond historicity, be more desirable? Can we even imagine a transhistorical mode of human existence? Would it be a form of life “beyond freedom and dignity,” to use B. F. Skinner’s famous phrase? – an existence in which we were conditioned or programmed in such a way as to function perfectly, without anxiety, stress, guilt, failures, crime, insanity; in short, without the enormous human problems which we have just been noting? If we could make the necessary genetic modifications to bring off a mode of existence of that sort, would that really be a gain? Or a tremendous loss? Are anxiety, guilt, failure, the threat of meaninglessness inseparable from the powers of creativity and freedom which make responsible historical existence possible? And is self-responsible historicity, with all its problems, more desirable than a perfectly programmed life, well tuned and adjusted, in a society without major issues that need to be addressed?

It is difficult to know how to answer such questions, or even to grasp what they mean. We have no concepts for thinking clearly about what we are here trying to conceive. The imaginative works of science-fiction writers may provide some suggestions, but it is difficult to know what should be taken seriously there and what is just fantasy. The old religious dreams about a heaven in which human life goes on in a perfected form, without any problems or difficulties, express the attempts of earlier generations to imagine a form of human existence beyond historicity; but the fundamental absurdities and incoherences of all such pictures simply confirm the difficulty (or impossibility?) for humans either to conceive or imagine a genuinely transhistorical mode of existence. This might seem to argue that in posing questions of this sort we have simply moved beyond our depth, and that we should, therefore, not bother ourselves with them.

But that option is really not available to us, for the possibilities of actually changing the biological base of human life are clearly opening before us, and we shall have to make decisions about these matters soon. The human movement through a long history into historicity has always been a movement into the unknown; it has often involved fearful dangers and has resulted in tragic losses. To be historical beings means to take risks in face of unknown futures. Who is in a position to say that gaining some degree of genetic control over human evolution is not an appropriate next step in the development of our humanity, a next major move forward toward our fuller humanization? Our evolving into historical beings in the first place involved massive evolutionary modifications in the central nervous system and the brain, the development of the hand, the change to an upright posture, and the like. Why suppose these biological modifications are now completed?

Clearly, we are in fact ill-adapted in many ways. We have bodies which gained their fundamental form and capacities during the long period when humans lived in small packs or hordes, the form of their life shaped largely by activities like hunting and food-gathering. But modern civilization is far removed from those sorts of patterns; historical changes in human existence have far outstripped the biological evolution which produced the physical organisms undergirding our existence. If it is becoming possible now to more directly adapt the biological organisms of future generations to match the character and strains of modern life, why not attempt it? Would this not be an important – even necessary – extension of the whole evolutionary-historical development which has produced humanity?(pp. 221-223)

Kaufman is speaking of biological modification which sounds less threatening than the nanotech and robotics of which Bill Joy speaks; yet, his argument, I think, would be the same – in this risky cosmic dance into which our lives are woven, the story is of creative, evolving emergent forms and structures that

introduced radical transformations along the way. Was there any way to predict at the moment of the Big Bang that creatures of conscious awareness would evolve billions of years in the future? To cite Kaufman once more: ...The traditional notion that God works through all of cosmic history – and is working in human history in particular toward the creation of a thoroughly humane order (that is, toward human salvation) – now becomes understood in terms of the modern notion of the evolutionary-historical process within which humanity has emerged and developed: the serendipitous creativity underlying and working through all reality is expressing itself here (over many aeons of time) in a trajectory toward human and humane orders of being. In a slow, long-term development of this sort the direction in which things are moving may, of course, remain unclear for a very long time. Not until a stage of considerable differentiation and specification has been reached is it possible to imagine, or make judgments about, what is really happening; and even then many quite diverse possibilities remain open. But each new stage of the ongoing biohistorical process specifies a bit more precisely what directions the movement is going and what outcomes may be expected, as some possibilities are cut off and eliminated, and others are opened up and increasingly realized; and there may come a moment of decisive “revelation” of what is going on in the process as a whole.

Thus, for example, at the moment of cosmic time in which the earth was gradually cooling and solidifying from the ball of fire it had earlier been, there would have been no way to anticipate or predict that in due course it would become a womb and home for living creatures. Later on, when living organisms began to appear in the sea, it would hardly have been possible to guess that they would eventually evolve into myriads of species of life – birds, insects, animals, plants with infinite varieties of flowers and fruits, and so on. Even with the appearance of mammals it could hardly have been suspected that anthropoids would appear further down the road. And with the emergence of fully formed *Homo* there was still no sufficient basis to foresee the development of ancient Egypt, Babylon, India, China, Greece, or Rome – and certainly not the various forms of modern civilization. However, if from the vantage point of modern humanity we look back over this long cumulation of events, we may begin to discern what appears to be a more or less continuous line of development up to the present.

It is striking to realize that this line was not visible until the last half of the nineteenth century; before that (even one hundred years earlier) it could not be seen at all. It seems, thus, that with a trajectory of this sort what is going on is by no means evident at all points along the way; the events which give it its distinct character and significance become determinate only in the course of the process itself. Only as certain crucial thresholds were crossed did new possibilities appear and in due course become realized; and only after many such decisive thresholds were crossed did beings appear with a vantage point enabling them to see that it was possible to interpret this whole development as somehow implicit from the beginning. One speaks of a “process of development” when one can specify

certain points or stages through which a particular trajectory has proceeded, the process as a whole being marked off and defined by some (at least implicit) beginning and end. “End” and “beginning” and “process of development” are thus all logically interconnected with one another; they illuminate and determine one another conceptually, and no one of them can be clearly understood – as the “end” or the “beginning” of “this particular process” – without the others.

Because of these conceptual interconnections we are inclined to think of the end of a particular process of development as implicit from its beginning; and if it happens to be the process of our own development into humanness that we are considering, it will be of importance to us to attempt to see, on the basis of the direction it seems to have followed up to the point at which we humans now find ourselves, where it may be going.

In a fascinating essay, “Praying in a Post-Einsteinian Universe,” David S. Tooland writes,

What we think of as matter – whether it be a subatomic quark, a yellow low star like our sun, or a beehive – must be thought of as bound and condensed energy, captured in an eddy out of the torrential, buzzing flow set loose by the first chord of our cosmic symphony. We, the plants and the stars are warps or disturbances in the field of this ballooning, random energy. (*Cross Currents*, Winter 1996-97, p. 450)

Tooland writes,

We are all thermodynamic systems (heat users), and that means we are precarious balancing acts, moment by moment converting random energy into information/organization and, in the enterprise, losing structured energy in the form of waste. ...The universe is a gigantic communications network, a complex circuitry of instructions – most of which we can barely decipher. Consequently, the gap between nature and human culture has increased considerably ... The natural sciences, we may now say, do archeological digs into the primitive signs and protolanguages of atoms and DNA molecules; the humanities deal with the more developed sign systems and meanings of the animated star dust we call human cultures. (p. 452F.)

Animated stardust! What a magnificent image of the human –stardust that has over billions of years evolved/emerged in human consciousness. In poetic expression, Tooland declares,

Offspring of stars, children of earth, we are great mothering nature’s soul-space, her heart and vocal chords – and her willingness, if we consent to it, to be spirited, to be the vessel of the Holy One. (p. 464)

In his book, *Sodom and Gomorrah*, Charles Pellegrino concludes with a chapter entitled, “God, the Universe, and Everything,” in which he begins by describing the immensity of the energy of nuclear power, and then writes,

These are the realities of the world we are creating. The same fire that warms and lights our homes can, at any moment, be turned against us. This is how it has been since *Homo erectus* times. The difference is that now we are handling much stronger fires. Our rocks contain traces of metals forged in the hearts of supernovae. They are the ash of stars that lived and died when our solar system was dust. Refined, arranged in specific geometries, and tweaked in just the right way, the primordial ash of Creation can be made to echo, billions of years later, the last shriek of an exploding star. If we have retained as much dryopithecine savagery as Bronze Age and Iron Age Scriptures suggest, then the shriek may yet manifest as brief reincarnations of distant suns burning hellishly in the centers of our cities. If we are wise, and perhaps even if we cling to some of the lessons contained in those very same Iron Age Scriptures (“Thou shalt not kill,” would be a good start), the shriek will be harnessed, for decades to come, as a warm, steady glow in the reactor core. Born of Auschwitz, Pearl Harbor, and Hiroshima, Indian Point 3 (especially in this era of American and Russian nuclear disarmament) stands to become the ultimate realization of Isaiah’s beating swords into plowshares.

There seem to be no limits to what the human mind is capable of dreaming and producing. But the one thought that stands foremost in my mind, as I study the cyclic collapse of past civilizations and dream of new machines for the advancement of our own civilization, is that as we begin forging the keys to the universe, we must be very, very careful that those same keys do not also open the gates to hell. (p.334F)

Pellegrino’s book was instigated by Father Fernando, a Jesuit and director of Sri Lanka’s Institute for Integral Education, along with his colleague Arthur C. Clerk. The book closes with a dialogue with Father John MacQuitty and explorer Robert Ballard. Pellegrino speaks of the human evolutionary story. By the time of the dryopithecines – only a few seconds ago, by a rock’s standard of time – the numbers of nerve cells and the complexity of synaptic connections in the savage brain had been rising for millions of years. When the australopithecine “Lucy” stood upon the shores of Lake Turkana, the columns of her neocortex were already more alive with neurotransmitters, neuromodulators, and electrical charges than anything yet seen upon the Earth. As if following some true compass, the australopithecine lineages were diversifying into newer, even larger-brained tribes. Sooner or later one of those diverse branches was bound to reach a neural threshold. By the time Mitochondrial Eve appeared, the threshold had been reached and exceeded. Out of inanimate carbon, hydrogen, phosphorus, and sulfur had emerged consciousness. Carbon and calcium knew fire and flint, and most important, it knew itself. Knowing itself, and lonely, it amassed in the

river worlds. With consciousness and massing behavior, both promise and dread entered the world. Anything that thinks can build. Anything that builds can destroy. “The first thing that must be asked about future man,” Charles Darwin said, “is whether he will be alive, and will know how to keep alive, and not whether it is a good thing that he should be alive.”

“The first thing I’d like to ask about future man,” Father Mervyn Fernando once told me, “is whether the evolutionary process stops with our present civilization or are there further stages ahead? If you look back to the origins of man, if you are really paying attention, you can get bearings and sights to peer into the future. As the diversity of life on Earth increased, some organisms became increasingly complex. Increasing complexity brought increasing consciousness, and now one conscious organism has spread from pole to pole, over the oceans and under them, enclosing the Earth in a single thinking envelope. And the envelope is becoming more and more unified. We see this happening before our very eyes.”

The way Father Fernando viewed civilization, five billion people, seemingly mindless of what was actually happening, were creating a world mind connected by a network of satellites, telephones, and fax machines. The planet was acquiring a nervous system, and there was no telling what shape it would eventually take. What surprised me is how closely the priest’s vision of man’s ascent and ultimate fate agreed with the news of NASA scientist Jesco von Puttkamer:

“The origin and persistence of consciousness are the key to our evolutionary vocation,” said von Puttkamer, who was part of the rocket team that put Scott Carpenter into orbit. “And it may be that we are already creating our next evolutionary stage.”

For more than a decade von Puttkamer had been speaking about what he liked to call “the soul in the machine.”

“It is an attempt,” he told me, “to explain why machines, in my opinion, as they get more complex, do become more responsive to humans. They become more sophisticated. They become more automatic. They become more independent. The robot spacecraft Voyager 2, as it flew past Saturn, was in a sense very independent from humans. One command beamed up from Earth triggered a whole chain of commands. So if you look at the inanimate matter all these automatic systems are made from –“

“Oh, my God!” I remember cutting him off in mid-sentence; then we both trailed off. The soul in von Puttkamer’s machine had raised something new in my mind and was raising a chill, a gooseflesh on my arms.

“Do you mean,” I said at last, “that as biology has done with carbon and phosphorus and sulfur, so, too, are we doing with silicon, plastic, and steel? A

computer's circuits, and the nerves bundled in my neocortex, move pulses of electrons around in organized fashion. Are you suggesting that by creating artificial intelligence, we may actually be creating our next evolutionary offshoot, that we are creating life?"

"In a sense, yes. The computer chip is still inanimate matter, but it is obviously more than sand."

"But what is it that is more?"

"An ever-increasing complexity," said von Puttkamer, "which shows itself in terms of a consciousness." As he followed the neural networks of modern computers backward through time, back through the ancestral and already primitive brain of Voyager 2, back past the human brains that had created the machines, and into the Earth itself – all the way back to atoms of carbon or silicon – he began to see that there must have been a continuing chain of increasing degrees of consciousness, which started with the simplest form of matter. "It has to start somewhere, and I figure it starts at the electron. The electron could actually be the unit of consciousness, meaning that human brains are simply the electron's way of reaching increased complexity."

"You make it sound as if electrons do this by design," I said.

"And who's to say there is no grand design?"

"I try not to view nature that way."

"You wear the badge of Darwin with too much pride, Charlie. Be careful. It can blind you. A good scientist leaves all possibilities open, even the possibility that there is a grand design. Look at us, for example. We are building more and more complex machines, and we really don't know why. We are just doing it. Somewhere we think it's the right thing to do, almost as if we were following some deep-rooted instinct. We build Voyager 2 and plan to follow it with a whole generation of more sophisticated space-faring robots. We are forever reaching on, and if somebody asks us why we are doing it, basically we have no answer. We are just supposed to be doing it."

I never was able to stop thinking about those electrons ...the way von Puttkamer had spoken about them. How is it that certain nerve fibers arranged in certain ways allow us to think? A lot of matter from diverse places (salts from Antarctica, calcium from a Triassic pond) was assembled, not very long ago, into the first diploid cell of the yet-to-be-born, from which unfurled genetic blueprints for a gridwork of brain cells. And although the electrons coursing through the neural grid are the basis of every thought we have, they somehow produce a mind that, as it asks questions and designs computers to help answer them, feels quite separate from the cells themselves. The electrons are working in our best interest,

supposedly. But when I imagine what I would look like if all the organic molecules in my body could be made invisible, so that I could look in a mirror and see only the paths of freely moving electrons, I know that the outline of my entire body would be there in every detail, brightest at the brain and spine; even the nerves in my fingertips and eyelids would show up as streams of electrons. As von Puttkamer would have it, the electrons, being among the very first particles to come out of the Big Bang, waited more than twelve billion years for planets like Earth to form and then to sprout life, waited for moments such as this. Perhaps it is really the electrons who are thinking these words. Perhaps our bodies are little more than vessels serving their interests, and as we set forth to design increasingly advanced artificial brains, it is possible to believe that the *sine qua non* of our existence is to build larger, faster electron vessels, perhaps even to eventually clear the decks for them, as the dinosaurs once cleared the decks for us.

Viewed in this light, the history of the universe has been a tremendous waiting game. In the beginning, electrons emerged as the perfect parasites, fresh and hot from the Big Bang, awaiting only the arrival of the perfect host. If this is true, it is not I but the electrons coursing through my brain ... who are looking back across all time and asking, "Where did we come from?" (p. 337F.)

Father MacQuitty asked Charles Pellegrino where he saw humanity going. Pellegrino answered:

"I'm not as optimistic as the others," I said. "I've known Karnak, Jericho, Bet-She'an, and Babylon too well to think we've got that much of a shot. There is a long, difficult road ahead, and it diverges here, near the border of the third millennium A.D. A thousand years from now we will either be an archaeological curiosity that our own descendant star farers look back to and ask, 'How did they ever accomplish so much with so little?' or we will be another in a long line of vanished civilizations – mysteriously advanced for our time and full of promise – just another lost Eden, romanticized and over-glorified forever. It's the doors of heaven and Earth or the gates of hell, the universe or nothing. That is the choice man is coming to."

"Then you were wrong about something," MacQuitty said. "What do you mean?"

"You once told me that if this is how far we've come, we have not come very far. But that is not the whole story, my friend, is it?"

"No," I conceded. "That is not the whole picture. I'm afraid the real story is this: Whatever we're coming to, we're almost there."

Is there an End for the human story, an End in terms of an intention arising from a Creative Spirit as the Font of Being with a bias toward Life, Conscious Life with

awareness stumbling on its way toward an End of Love and Peace and cosmic wellbeing? Or, will we creatures who find ourselves at this point in the evolutionary trajectory, consciously holding the keys to the City of God as well as the Gates of Hell, instead of realizing our End, end the story in technological catastrophe?

One will live in hope or fear not by an analysis of technological potential, not by peering into the depths of space or probing the mysteries of microbiology. Finally, this is a spiritual decision, a matter of trust or not. I do not think we can simply halt the ongoing march of the human quest; that will go on. The issue of the ongoing quest will depend not on whatever technology is devised, but on the human spirit, the human family that has become the co-creator of the future. In our conscious awareness, we know we are “animated stardust,” creatures in process, on the way to an as yet unimagined future which is our End.

I know we can end it all;

I choose to believe and so to bet that, rather, we will realize our End – by God!

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