Pregnant with the Future: Science and the Political Imagination

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"The present is pregnant with the future."

Gottfried Wilhelm Leibniz, as quoted by Louis-Sébastien Mercier

I. Introduction: Uchronia

My title is taken from the epigraph of a book published in Paris in 1771[1], which was immediately banned by the authorities as subversive, and (perhaps propelled by this left-handed endorsement by the censors) went on to become an underground bestseller, going through eleven editions by 1800 and translations into at least four languages.[2] The book was Louis-Sébastien Mercier's (1740-1814) *L'An 2440. Rêve s'il en fut jamais*, a vision of Paris in the far future. Mercier was a *flâneur avant la lettre*, who knew his city intimately (he later published a twelve-volume portrait of the Paris of his own day, closely and shrewdly observed), and his fantasized city of the future was in barbed counterpoint to the ills of the present – no wonder it was banned. To the astonishment of the time-traveler, the Parisians of the year 2440 are polite, hard-working, and have abandoned high fashion for sturdy, plain clothing. There are still rich and poor, but the gap between them has narrowed, and no one goes hungry. France is still a monarchy, but

the king is an open-minded, open-hearted ruler who consults regularly with the wisest of his subjects and wanders the streets of his capital without pomp and circumstance in order to inform himself firsthand about the state of the nation. The palace of Versailles has fallen into ruins, a mute reproach to the wastrel extravagance of yore. Parisians of the far future still get around the city in horse-drawn carriages, but they no longer recklessly run over pedestrians, and the streets they traverse are broad and well lit. Great social and political advances have been made – the government works for the welfare of the many rather than amassing wealth for the few, the crime rate has sunk to almost zero, even Parisian traffic has been tamed. But science and technology have stood still or even slipped backwards: doctors have gone back to a few herbal medicines, the chief scientific institution is an overstuffed natural history museum exhibiting the great chain of being, the research program is lifted straight from Francis Bacon's (1561-1626) scientific utopia *The New Atlantis* (1627) (already retrograde in 1770, much less 2440), and the once vast collection of books housed in the royal library has been conveniently reduced by a bonfire that disposed of thousands of books deemed erroneous, malicious, repetitious, or just badly written: "We consigned to the fire that enormous mass [of books], as an expiatory sacrifice offered to truth, good sense, and true taste."[3]

Contrast this with another fantasy about the future of Paris, Jules Verne's (1828-1905) *Paris au XXe siècle* (comp. ca. 1863). Verne's leap of the imagination took him only a century forward in time, to Paris in 1960, but the face of the city has been altered more than in Mercier's seven centuries. Silent, speedy electromagnetic trains crisscross the city; gas-powered automobiles have completely replaced horse-drawn vehicles; correspondence is sent by the "photographic telegraph" (a kind of fax machine); shops

and streets are dazzlingly illuminated by electric lighting. The Paris of the future is dominated by science, technology, and industry – the best students enroll only in science courses; in libraries, the classics of French literature have been replaced by books with titles like *Harmonies électriques* and *Méditations sur l'oxygène*. The young hero of the novel, who aspires to be a poet and loses his job as a junior clerk in his uncle's bank, dies of starvation, cold, and a broken heart. Paris in 1960 has been transformed by technological marvels, but human nature has remained the same, dulled by complacency and driven by greed: "... the people of 1960 no longer wondered at these marvels; they enjoyed them calmly, without being any happier, for in their urgent expression, in their hectic pace, in their American rush, one sensed that the demon of money [*démon de la fortune*] pushed them forward relentlessly and mercilessly."[4]

These two exercises of the political imagination, separated by a hundred years but both projected upon the metropolis Paris, understand the ways in which the present is pregnant with the future very differently (although both are obsessed with the regulation of the murderous traffic in Paris streets). For Mercier, science and technology are static. Once the errors of antiquity have been corrected, science is largely ornamental, an edifying *Wunderkammer* of exotic animals and pretty optical effects. Technology has apparently already reached its zenith in 1770; seven hundred years later, Parisians are still getting around town on foot and in horse-drawn carriages. What must change is the human heart: the Parisians of the year 2440 have learned to keep to the right in two-way traffic, to cede the right of way to others, and to drive slowly. Everyone walks, including the king; only the old and infirm command carriages. Problems are solved through sound city planning and good citizenship. For Verne, in contrast, it is science, technology, and commerce that

drive change and remake society – at least at the superficial level of transportation and communication networks. But human nature is static, tragically so. The author of *Twenty-Thousand Leagues under the Sea* and *Around the World in Eighty Days* was hardly a luddite; he described the new technologies of silent, whizzing trains in detail and with gusto – and also with remarkable prescience, extrapolating from inventions already known to him. Problems are solved through science and engineering. Yet his Paris in 1960 is an unhappy place, bustling but soulless.

The contrast between Mercier's and Verne's fantasies about just how the present is pregnant with the future is emblematic of how the historical imagination was itself re-imagined between the late eighteenth and the late nineteenth century. Among historians of utopias, Mercier's bestselling vision of Paris in the year 2440 marks a signal innovation in ancient traditions of political fables: it is an ideal society distant in time rather than space, not a "nowhere" ("utopia") but a "nowhen" ("uchronia").[5] Verne's Paris of 1960 is in some ways a dyschronia, but that does not alter the fundamental fact that the realm of the most unfettered political fantasy has shifted from the spatial to the temporal – and to the future rather than the past tense. Both are rooted in a belief in progress: there is a reason why both Mercier and Verne situate their fantasy cities in the future, rather than in a past golden age – or on a remote island or still more remote planet. Progress need not be about the advance of science and technology. Mercier's future perfect of 1771 imagined the perfectibility of government and human nature, a long-term project. But by the time Verne was writing in 1868, progress was first and foremost scientific and technological, and its tempo had quickened to dizzying speeds. It is telling that while Mercier slows down Parisian traffic to a sedate stroll, Verne speeds it up to a

streamlined blur. For Mercier, the direction of history – and therefore of the political imagination – is forward; for Verne, it is *fast* forward.

My argument will be *first*, that tempo matters when the political imagination reorients itself toward the future; *second*, that developments in mid-nineteenth-century science radically altered the meaning of progress and accelerated its pace; and *third*, that the mid-nineteenth-century transformation of the idea of scientific progress from steady accumulation to accelerated but aimless advances in knowledge had deeply unsettling effects on all utopian thought.

II. The Telescoping of Time

Seven hundred years is about how long Mercier reckoned it would take for Parisians to learn to keep right on public thoroughfares, trade in elegant but uncomfortable clothing for something more practical, favor useful books over amusing ones, and abandon coquetry in the interests of domestic harmony. (There is some evidence he may have underestimated the time required.) A scant century is all Verne thought would be necessary to set up a fast, efficient urban train system, banish the works of Victor Hugo and other classics of French literature from bookshops and libraries, and turn Parisian women into skinny, badly dressed bluestockings: "The Frenchwoman has become American."[6] Indeed, part of the pathos of Verne's novel derives from the survival of a few old gentlemen and their libraries, living reminders of a less barbarous age, which still cultivated Latin verse, French prose, and the sinuous, graceful gait of the *Parisienne*.

Paris projected seven centuries into the future can only be visited in a dream, the same device that seventeenth-century fantasists used to visit other planets[7]: the far future is as

inaccessible and as unreal as the star Alpha Centauri. But Paris in a hundred years can be bridged by living memory. In Verne's novel and many other like it, the future comes just near enough to touch – and to exercise a backward causation upon the present. By accelerating the pace of change, the future for the first time becomes pregnant with the present.

The ism-utopias of nineteenth-century Europe – Saint-Simonianism, Fourierism, Owenism, Marxism – are all in fact uchronias, imagined futures. More than that, they are imagined as inevitable futures, the inexorable outcome of industrialization or modern science or the contradictions of capitalism: the miserable present is pregnant with a radiant future. But then the arrow of causation reverses itself: the future begins to act upon the present, or, put less paradoxically, imagination begins to reshape reality. As historians Frank and Fritzie Manuel have observed, once the future shimmered enticingly on the just-visible horizon, and once progress toward that goal was conceived as both irreversible and ever-quickening, it became almost a moral duty to hasten it on its way: "Once progress had become the absolute of human behavior there was an implied immorality in not bringing quickly to fruition the complete development of which humanity was capable at any moment."[8] On this view, certain deliberate measures could throw history into high gear and bring about the longed-for uchronia, if not in the here and now, then at least in the almost-then and almost-there. The tempo of progress became a moral matter. Or, to continue the obstetric metaphor, this time quoting Karl Marx (1818-1883): the political avant garde could "shorten and lessen the birth-pangs" of the longed-for new order of things.[9]

It is worth emphasizing how starkly this view of directed and accelerated progress contrasted with most Enlightenment versions of social and intellectual advance, which centered on the slow, insidious working of chance and unintended consequences – what G.W.F. Hegel (1770-1831) was to call "the cunning of reason". Adam Smith (1723-1790) and Immanuel Kant (1724-1804) provide sterling examples of this stumble-blunder dynamic of progress. In *The Wealth of Nations* (1776), Smith described how a bellicose feudal lord's desire for diamond buckles leads him to squander money that he would ordinarily have spent on maintaining a standing army, both enriching the burghers who make and sell such ornaments and pacifying the countryside. Ultimately, the confluence of such petty vanities overthrows feudalism – the farthest thing from the lord's intentions and yet the outcome of his actions (and those of his ilk): "thus, for the gratification of the most childish, the meanest, and the most sordid of all vanities, they [the lords] gradually bartered their whole power and authority."[10] Kant argued analogously that the most successful armies (he has those of Frederick II's Prussia uppermost in mind) require well-trained soldiers who can wield complicated weapons and realize the intricate strategies of their commanders. Rapacious rulers intent on laying waste to their neighbors' lands were therefore forced to educate their subjects, and an educated populace would, Kant believed, slowly but surely undermine tyranny.[11] Through the lazy meanders of history, violence and despotism would be domesticated in spite of themselves.

The French mathematician and *philosophe* M.J.A.N. Condorcet (1743-1794), the Enlightenment's most ardent apostle of progress, had at first also embraced this Trojan horse model of history: first France, then the rest of Europe, then the whole world would eventually become free and enlightened due to the unintended consequences of the

machinations of devious priests and brutal tyrants.[12] But at the very end of his life, while hiding from his political enemies during the bloodiest phase of the French Revolution[13], he speculated that society might now have evolved to the point at which progress was not only inevitable and irreversible but also controllable: for the first time, Condorcet believed, progress might be steered and stepped up. The means already lay ready at hand: universal elementary education and the creation of an organized scientific community that would span the globe and generations. Basic schooling for all would turn superstitious, timorous peasants into independent citizens who could resist the wiles of priests and the threats of despots. The result would be unprecedented (albeit not complete) human equality, both political and personal: "...the entire mass of a people can be instructed in everything which every man needs to know for household economy, for the administration of his affairs, for the free development of his industry and faculties, to know his rights, to defend and exercise them; ... to not depend blindly on those to whom he is obliged to confide the care of his affairs or his rights; ... to not be the dupe of those popular errors that torment [his] life with superstitious fears and chimerical hopes; to preserve himself against prejudice solely with the force of reason...". [14]

If Condorcet had great expectations for what a little reading, writing, and arithmetic could achieve in realizing the ideals of political, economic, and intellectual autonomy, his hopes for what a worldwide confederacy of scientists could bring about were positively grandiose. In a fragmentary meditation on Bacon's scientific utopia *The New Atlantis* (1627), Condorcet argued that universal education would greatly expand the potential pool of scientists, whose productivity in searching out new truths might be further increased if all banded together into "a universal republic of the sciences". The

coordinated efforts of the members of this voluntary republic, financed not by any state but by private contributions[15], would multiply observations and discoveries in the mature sciences by substituting sheer numbers for time. Because scientific advances, Condorcet contended, depended crucially on the chance of the right person being at the right place and time in order to make the right observation, they had in the past required centuries to unfold: how long had history awaited not only a genius like Newton, but also a Newton happily born into the propitious circumstances needed to nurture, appreciate, and build upon his gifts? The universal republic of science would rescue progress from time's roulette wheel: many eyes, many hands, many minds researching in concert would in effect spin the roulette wheel a hundred, a thousand, ten thousand times faster. The element of chance could never be completely eliminated from scientific discovery, but it could be tamed.[16] (It was no accident that Condorcet's specialty in mathematics was probability theory.) Time could be made to march in double-step and the arrival of the future brought nearer.

The progress of reason would no longer have to depend on the cunning of reason: in Condorcet's vision, scientists would take the reins of history into their own hands. This had far-reaching implications, for the progress of science was in Condorcet's mind inextricably linked to the progress of humanity. Not only science but society at large would enjoy immense benefits from Condorcet's universal republic: the human lifespan would be lengthened, human organs and faculties perfected, men and women placed on equal legal footing, agricultural yields expanded, fuel efficiency maximized – all as the result of "these great systems of observations, which have no limits of space or time, except those of our universe and the existence of the globe...".[17] Despite his euphoric

vision of social and economic progress driven by scientific progress, Condorcet did not enthrone scientists as rulers of his uchronia, in contrast to Bacon's vision of an island utopia governed by the sages of the House of Salomon.[18] In Condorcet's new, new Atlantis, there would be no new priesthood of scientists, no more than there would be guilds of lawyers who would dupe illiterate citizens by their exclusive mastery of complex and obscure legal codes.[19] Free, autonomous citizens did not bow to experts. Yet in the wake of Condorcet's final musing on progress, science – not politics -- became the locomotive of history. However much Auguste Comte (1798-1857), Henri Saint-Simon (1760-1825), Charles Fourier (1772-1837), and other nineteenth-century utopians might have taken issue with this or that feature of Condorcet's vision of the ideal future society, they followed his lead in enshrining science (and often scientists) at its center. Science now set the pace of progress – and by the mid-nineteenth century, the pace was vertiginous.

III. Scientific Progress, Expansionist and Explosionist

For Condorcet, there was nothing to be lost and everything to be gained by speeding up the pace of scientific progress: if the future would improve upon the present, and moreover improve upon it in foreseeable ways, then impatience was a cardinal virtue. But that was because Condorcet understood scientific progress as an orderly, cumulative process, in contrast to the chaotic, violent revolutions that seemed to be required for political progress. By the 1840s, however, scientific progress had begun to look a great deal more revolutionary, much to the dismay of the scientists themselves. In order to

understand their shock, it is important to distinguish between two doctrines of scientific progress, one expansionist and the other explosionist.

It is a cliché of intellectual history that the doctrine of progress emerges in the seventeenth century, and that Francis Bacon was its prophet.[20] For Bacon, it was technology rather than science that was the prototypical progressive enterprise; indeed, he reproached stagnant natural philosophy with the example of the advancing mechanical arts: "...the sciences still continue in their beaten track, and nearly stationary, without having received any important increase [for the last two thousand years]; nay, having on the contrary rather bloomed under the hands of their first author and then faded away. But we see that the case is reversed in the mechanical arts, which are founded on nature and the light of experience, for they (as long as they are popular) seem full of life, and uninterruptedly thrive and grow, being at first rude, then convenient, lastly polished, and perpetually improved."[21] But by the late eighteenth century, the foremost exemplars of progress had become mathematics and the natural sciences. Between circa 1750 and 1840, a steady stream of histories of various sciences poured from the press, all purporting to demonstrate the existence and extent of progress in those disciplines.[22]

What is striking about late eighteenth-century and early nineteenth-century views of scientific progress is not only their buoyant optimism, but also their circumscribed understanding of change. Scientific knowledge steadily improved, but it was not renovated. Once the foundations for the new science had been laid in the seventeenth century, so went the standard story, the edifice could be expanded but not remodeled. Certain achievements, Newtonian mechanics being the most oft-cited example, were permanent. Even Adam Smith's remarkable history of astronomy, which treated systems

of natural philosophy "as mere inventions of the imagination, to connect together the otherwise discordant and disjointed phaenomena of nature," concluded with a tribute to the Newtonian system, "the most universal empire that was ever established in philosophy."[23] Other fields--botany, chemistry, political economy--might await their Newtons, and in this sense scientific progress was open-ended. But the open-endedness was expansionist at the fringes, not transformative at the stable center. To continue Smith's imperial metaphor, new territories awaited scientific conquest, but old victories remained forever safe from reversal. Discoveries accumulated; generalizations endured.

Such underlying conservatism enabled early nineteenth-century commentators to contrast scientific progress with more wrenching forms of change in society, politics, and letters. In his famous essay "The Spirit of the Age" (1831), the British philosopher John Stuart Mill (1806-1873) located his own era in the sign of Proteus: "The conviction is already not far from being universal, that the times are pregnant with change; and that the nineteenth century will be known to posterity as the era of one of the greatest revolutions of which history has preserved the remembrance in the human mind, and in the whole constitution of society."[24] His was "an age of transition" between periods of stability, an age in which institutions and learning were all in flux, in which "[m]ankind have outgrown old institutions and old doctrines, and have not yet acquired new ones."[25] Mill found this vacuum in legitimate authority, intellectual as well as social, more alarming than exhilarating. Wherever the past had been disqualified to preach to the present, he warned, a Babel of opinions, each more unformed and uninformed than the last, threatened to overwhelm both the polity and the Republic of Letters.

Amidst this confusion, Mill made out the physical sciences to be a beacon: "While these two contending parties [of past and present] are measuring their sophistries against one another, the man who is capable of other ideas than those of his age, has an example in the present state of physical science, and in the manner in which men shape their thoughts and actions within its sphere, of what is to be hoped for and labored for in all other departments of human knowledge; and what, beyond all possibility of doubt, will one day be attained."[26] In the happy state already enjoyed by physical science, method had been perfected so as to "entirely preclude the possibility of material error when due pains are taken to arrive at the truth", and unruly dissenters were obliged, "without being forced, by irresistible evidence, to adopt the received opinion." The tyranny of truth was no tyranny; the coercion of evidence, no coercion. In the physical sciences, Mill believed, unanimity had been achieved without recourse, for example, to the nasty inquisitorial methods that the medieval Catholic church had used to persuade heretics. Just because this unanimity rested upon truth rather than force, it was enduring. Science would never again be shaken to its roots by an age of transition: "The physical sciences, therefore (speaking of them generally) are continually *growing*, but never *changing*: in every age they receive indeed mighty improvement, but for them the age of transition is past."[27]

Science was thus the model of the permanent revolution, accomplished only once and once and for all, never undone by reaction, restoration, or new revolutions. The language of "revolution" in fact gradually declined among nineteenth-century scientists, perhaps in self-conscious distinction to multiplying examples of all-too-impermanent political revolutions.[28] Science was at once dynamic and stable, constantly improving and yet unchanging. What made this paradox of conservative progress conceivable was the

assumption that though the number and import of facts about nature would change with time, fundamental insights into nature would not.

But by the 1850s, the scientific globe had begun to spin more swiftly – and with unnerving consequences. New theories sprang up like mushrooms and pushed out old ones. No scientific truth, no matter how hallowed by time and fame, was safe: in the 1830s, Newton's own corpuscular theory of light had been toppled by strong experimental evidence favoring the wave theory[29]; by the 1890s, even the Newtonian theory of gravitation was under fire.[30] It is difficult to date just when the perceived progress of science accelerated to the point of vertigo for its practitioners. Already in 1844, the German naturalist Alexander von Humboldt (1769-1859) concluded the preface to his monumental *Kosmos* with a disquieting reflection on transitory science and enduring literature: "It has often been a discouraging consideration, that while purely literary products of the mind are rooted in the depth of feelings and creative imagination, all that is connected with empiricism and with fathoming of phenomena and physical law takes on a new aspect in a few decades, due to the increasing exactitude of the instruments and gradual enlargement of the horizon of observations; so that, as one commonly says, outdated scientific writings fall into oblivion as [no longer] readable."[31] Theories succeeded one another at an ever accelerating pace; facts pointed to contradictory conclusions. There was no firm theoretical ground safe from such upheavals, for even celestial mechanics had begun to quake. The history of science would not stay written, for at any moment a theory solemnly pronounced dead might be revived. The expectations for scientific progress voiced in the early nineteenth century had not been disappointed; rather, they had been fulfilled with a vengeance. Never before had

science bustled and flourished as in did in the latter half of the nineteenth century. Scientists multiplied in number, and with them, new theories, observations, and experiments. With these efforts however science not only grew; it also changed, and changed at a rate that could be measured in months rather than generations. By 1872, the Austrian physicist Ernst Mach (1838-1916) had concluded that the history of science taught only the Heraclitean lesson of *panta rei*, for the revolutions of science were no longer permanent but rather perpetual in Mach's view: "In fact, if one learned nothing more from history than the mutability of [scientific] views, then it would still be invaluable ...The attempts to hold fast to the beautiful moment through textbooks have always been futile. One gradually accustoms oneself [to the fact] that science is incomplete, mutable."[32]

What Mach had remarked in a tone of elegiac melancholy, other observers noted with alarm. The American historian Henry Brooks Adams (1838-1918) complained that by 1900 the scientists "had reduced themselves to motion in a universe of motions, with an acceleration, in their own case, of vertiginous violence."[33] No one doubted the hurtling progress of science; it was, as Adams shuddered, as real as bombs or wireless telegraphy or airships.[34] Yet scientists themselves seemed sickened by the speed of it, and to have lost their bearings and their nerve. Adams' own estimate as to just when "the continuity snapped" in the scientific tradition --with the discovery of Roentgen rays in 1893, or "when, in 1898, Mme. Curie threw on his [the man of science's] desk the metaphysical bomb she called radium"[35] – was probably off by a matter of decades. But his conclusion that scientific progress now proceeded by bangs and booms – Mme. Curie's "metaphysical bomb" – was by the turn of the twentieth century undisputed.

IV. Conclusion: The Restless Imagination

One reason why Adams felt betrayed by the "vertiginous violence" of science's breakneck tempo was that he, along with Mill, had believed that science would provide a refuge from the restlessness of history, which around 1800 had been whipped into a headlong gallop by the French and Industrial Revolutions:

> Fifty years ago, science took for granted that the rate of acceleration could not last .... Two generations, with John Stuart Mill, talked of this stationary period, which was to follow the explosion of new power. All the men who were elderly in the forties [i.e. 1840s] died in this faith, and other men grew old nursing the same conviction, and happy in it; while science, for fifty years, permitted, or encouraged, society to think that force would prove limited in supply.[36]

The longing for a still, stable point at which history might pause for breath and take stock, or even stop entirely, is almost built into utopian (and uchronian) thinking. What is the point of change if the best of all possible worlds has already been achieved? At first, in the eighteenth and early nineteenth centuries, scientific progress seemed fully compatible with this yearning. Knowledge would steadily expand but not subvert. Science would even provide a model of how society could progress smoothly, without the jagged ruptures of political or economic revolution. The science-inspired utopias of the first half of the nineteenth century all aimed at social harmony as the highest good[37], keeping faith with the ends of utopias since Plato's Republic, if not with their means. Modernization would unfold at a stately, measured andante – and eventually, it would stop.

Instead, science in the mid-nineteenth century accelerated and dragged history along with it. Among historians of science and especially among historians of technology, there is

some dispute about how socially transformative innovations in these fields really are.[38] But no one doubts that the lived experience of modernity is one of stepped-up speed. The most characteristic sentiment of modernity became evanescence: "All that is solid, melts into air."[39] One might think that these were propitious conditions for the exercise of the political imagination. If nothing endures, if the most rock-solid scientific truths crumble, if new technologies (automobiles, elevators, anesthesia, computers) regularly remake society, isn't this the heady atmosphere in which the bold imagination flourishes? Everything is possible; indeed, everything is possible right now, or very soon.

Yet paradoxically, the impact of science on the political imagination has been withering – at least as far as the *process* of science is concerned. The products of science, especially but not exclusively the weaponry deployed in the crushingly destructive wars of the twentieth century, have proved endlessly stimulating to the dystopian imagination.[40] Bleak futures imagined after nuclear armageddon or the unleashing of a renegade laboratory virus or the cloning of long extinct carnivorous dinosaurs or some other mad scientist caper are not in short supply – just check your local movie listings. Nor need one range much farther afield to find gloom-and-doom condemnations of modern science as instrumental rationality, cold-hearted and calculating, responsible for everything from the disenchantment of the world to the repression of instinct to the loss of the cozy *Lebenswelt* to the holocaust.[41] These latter critics are however notable for their complete failure to deal with the actual workings of science, not to mention its history: their target is modernity itself, and they pay science the left-handed compliment of equating it with modern reason *tout court*, with no further inspection or elaboration. These anti-modernists regret the rise of science (and often resent the rise of scientists at the expense

of humanists like themselves), but they do not engage with the dynamic of science that so riveted the imagination of earlier intellectuals like Condorcet and Mill.

The processes of science – its headlong momentum, its open-endedness, its voracious appetite for novelty, its global or even galactic ambitions, above all the temporary status of even its most fundamental truths – have failed to kindle the post-Enlightenment utopian imagination, and with good reason. Neither utopia nor uchronia can sustain instability, impermanence, and uncertainty as a way of life. Enlightenment prophets of progress underestimated the disruptive power of scientific innovation, both for science and its ambient society. In comparison to science, the forces of developing capitalism struck both reactionary and revolutionary political economists of the nineteenth and twentieth centuries as positively law-like. There was a science of economics but no science of science. Ultimately, the sheer pace and unpredictability of science disqualified it as an imaginative resource for liberals and conservatives alike. Liberals like Condorcet believed that discoveries about the workings of nature could only be emancipatory: the universal natural rights which he would have extended to women, slaves, and the colonized peoples of Asia, Africa, and the Americas were in his view buttressed by the universal natural laws of physics. Conservatives like the British political economist Thomas Robert Malthus (1766-1834), the most formidable critic of Condorcet's doctrine of human perfectibility, countered that science revealed how nature constrained human possibilities like an iron vise: a burgeoning population would inevitably collide with a limited food supply; only authoritarian measures could stave off mass starvation.[42]

Yet by the latter half of the nineteenth century, neither liberals nor conservatives could keep pace with the latest revelations of science, today's reversing yesterday's and itself

destined to topple tomorrow. Nature, or at least nature's spokesmen, the scientists, kept changing their mind. The German pathologist Rudolf Virchow (1821-1902) realized how dangerously this mad scramble had eroded public confidence in science, to the point of denying it a place in the school curriculum. When a scientific doctrine that had previously laid claim to general validity was unseated, Virchow remarked, "many people lose their faith in science. There the reproaches [to scientists] begin: you yourselves aren't certain; your doctrine, that is called truth today is a lie tomorrow; how can you demand that your doctrine become part of instruction and general knowledge?"[43] Short-lived scientific truths were marshy foundations upon which to erect lasting political edifices: "All that is solid, melts into air." Imagination might itself be of gossamer spun, but it demanded more durable building materials than science could supply.

Nestled within the image of a present pregnant with the future was a reassuring assumption of continuity: the future would be better than the present but still a recognizable offspring of the same species, neither a monster nor a sport. Moreover, the metaphor of pregnancy suggested the realization of possibilities in due term. The future would arrive in the ripeness of time, neither too soon nor too late. The organic process that insured the continuity of generations would also insure the continuity of history. The metaphor of a present pregnant with the future was still available in the 1790s to Condorcet. His vision of the future Tenth Epoch was an explicit extrapolation from his description of the Ninth Epoch of the late eighteenth century, specifically the new revolutionary republics of France and America: "Must not all nations one day approach the state of civilization that the most enlightened, the most free, the most unencumbered of prejudices, such as the French and the Anglo-Americans?"[44] Both the natural and

human sciences would also progress along the tracks already laid down. Condorcet imagined the Tenth Epoch during the Terror, which claimed him as its victim, but the example of progressive science steadied his hope that regressive politics was only a temporary setback in the saga of human perfectibility. Great things were yet to come – the emancipation of women, the liberation of European colonies in Asia and Africa, the alleviation of human sweat and toil by machines, the mathematization of the human sciences, the invention of a universal language, the prolongation of human life – but all, Condorcet insisted, were already germinating in the present.

Once scientific progress mutated from expansionist to explosionist, the metaphor of the past pregnant with the future lost its salience. Science advanced by leaps and bounds but at the cost of trampling all that had come before. (If one were to insist on sticking to obstetric metaphors, one might say that the birth of the future now implied the death of the present, a caesarean section that saved the child at the mother's expense.) The imagination scrambled to catch up with the latest scientific surprise, whether astonishing discovery or bold new theory. With the advent of Relativity Theory in the early decades of the twentieth century, the artistic avant garde turned self-consciously to science for inspiration.[45] The political avant garde might still intone Marxist pieties about "scientific socialism" but in fact decoupled its programs from contemporary science or, as in the case of Lysenkoism in the Soviet Union, actively tried to stifle it.[46] Even for political visionaries, science looked more and more like a locomotive racing toward an unknown destination at reckless speed.

But why should speed and surprises pose insuperable obstacles to the political imagination? Why not visions of flexible, adaptable, open societies, continually remaking

themselves as opportunity and inspiration present themselves? Some contemporary technologies, such as cell phones and the Internet, have excited utopian fervor.[47] Other observers of the current political landscape speak of "minor utopias", such as the focused projects of NGOs in the areas of environmental politics and human rights.[48] Yet these visions remain circumscribed by the pet technology or the NGO mission statement. To embrace speed and surprises for their own sake, as a model and a promise of a better kind of polity, still seems unthinkable. The stasis of utopia lingers in imagined uchronias. This is perhaps not just the *main morte* of utopias past, revenging themselves on uchronias future. The political imagination conjures up what might be, what could be, what should be. It weaves together possibility and desirability. Pure possibility borders on the humdrum present; pure desirability spins off into mad fantasy. Unlike the literary imagination, the political imagination must carry conviction: in order to inspire, it must ally itself with the true. By definition, it has estranged itself from the real as we know it, but for just that reason, it must call upon truths more powerful than the kind of political reality we happen to have now: truths about human nature, truths about universal rights, truths about the flow of history. The political imagination works by making the self-evident suddenly seem both contingent and false: the way we live now could be changed; it should be changed. It shakes current shibboleths by confronting them with deeper truths – preferably universal, eternal truths. This is the Platonic birthmark that has stained all utopias ever since: the ideal polity demands the ideal metaphysics; the good demands the true. It is not an accident that even secular utopian visions, even rabidly anticlerical ones like Condorcet's, ignite near-religious fervor.

This is why the prestissimo pace and aimless trajectory of modern science leave the political imagination cold. To understand the depth of the disappointment, one must return to Mill's hopeful prophecies of 1831. For Mill, the burning issue of the modern age was legitimate authority, and he found his model in the physical sciences. In contrast to the squabbles of politics, in which everyone felt qualified to voice an opinion, "[w]e never hear of the right of private judgment in science".[49] Of course, one could in principle object to every article of natural philosophy, but the perfection of scientific method and the near unanimity of scientists combined to silence would-be dissenters. Science ruled in the sign of truth, and was therefore authoritarian but not tyrannical. When society followed science in settling from its present "transitional state" back into a "natural state", the uninstructed would once again defer to those "in whom they trust for finding the right, and for pointing it out".[50]

For Mill, science had disclosed truths that would endure until the end of human history. By the turn of the twentieth century, few scientists could advance such claims so brazenly. Never before had science seemed so successful; never before had scientists been so reluctant to press their claims to truth. This was the paradox of breakneck scientific progress, for truths had become too temporary to merit the name. In the 1830s, Mill had believed scientific truths worthy of an almost religious fervor. In a passage that is all the more telling for being so uncharacteristic, Mill admired the Catholic clergy's passion for its faith. Not that Mill approved of burning heretics; yet he longed for this passion to be transplanted in all its intensity to the truth: "But the deep earnest feeling of firm and unwavering conviction, which it [the burning of heretics] pre-supposes, we may, without being unreasonable, lament that it was impossible and could not *but* be

impossible, in the intellectual anarchy of a general revolution in opinion, to transfer unimpaired to the truth."[51] As the Victorian poet Alfred Lord Tennyson (1809-1892) wailed in his bitter poem "Locksley Hall, Sixty Years After" (1886):

> Truth for truth, and good for good! The Good, the True, the Pure, the Just—
>
> Take the charm 'For ever' from them, and they crumble into dust.
>
> Gone the cry of 'Forward, Forward,' lost within a growing gloom;
>
> Lost, or only heard in silence from the silence of a tomb.

Did the passion, like the authority that once attached to scientific truths simply evaporate when these truths began to rush past one another at the speed of a landscape viewed from a railway car window? This is the gauntlet that modern science flings down to the political imagination: can passion be harnessed to vision if the vision is not solidified by truth? Or (a still more daunting challenge) can a new ideal of truth be imagined that can compass the fact that all truths are truths embedded in time? Although modern philosophers respect science as the gold standard of rationality, if not of reason, they have been loathe to draw the consequences for a concept of truth that dates back millennia, one that yoked the perfect polity to a Platonic heaven of eternal ideas. Although Enlightenment visions of the perfect polity were anything but Platonic, they were still undergirded by allegedly universal, eternal truths, more mighty than the powers-that-be and certain to triumph in the fullness of time. But when scientific progress turned explosionist in the mid nineteenth century, these foundations of the political imagination melted away. Science had succeeded brilliantly in understanding ever more of the universe, ever more profoundly – but its understanding was a permanent work-in-progress. The imagination is a famously, notoriously volatile, nimble faculty: can the

political imagination reconcile itself to the volatility of truths (the best we have, even if they live only as long as mayflies) – in short, to immersing itself in the flux of time, without utopias or uchronias?

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NOTES

[1] "Le temps présent est gros de l'avenir." Mercier was in turn quoting Gottfried Wilhelm Leibniz, *Nouvelles essais sur l'entendement humain* [comp.1703-5], in *Philosophische Schriften*, ed. Leibniz-Forschungsstelle der Universität Münster, 6 vols. (Berlin: Akademie-Verlag, 1990), vol. 6, p. 55: "On peut même dire qu'en consequence de ces petites perceptions le present est plein d'avenir, et chargé du passé, que tout est conspirant ... et que dans la moindre des substances, des yeux aussi perçans que ceux de Dieu pourroient lire toute la suite des choses de l'univers."
[2] Clare Jackson, "Progress and Optimism," in Martin Fitzpatrick, Peter Jones, Christa Knellwolf, and Ian McCalman, eds., *The Enlightenment World* (London/New York: Routledge, 2007), pp. 177-193, on p. 191.
[3] Louis-Sébastien Mercier, *L'An 2440. Rêve s'il en fut jamais* [1771], ed. Raymond Trousson (Bordeaux: Ducros, 1971), p. 250.
[4] Jules Verne, *Paris au XXe siècle*, ed. Piero Gondolo della Riva (Paris: Hachette, 1994), p. 43. The manuscript of the novel was lost after Verne's death and recovered only in the 1980s. For the convoluted history of the text, see ibid., pp. 11-22.
[5] Frank E. Manuel and Fritzie P. Manuel, *Utopian Thought in the Western World* (Cambridge, Mass.: Harvard University Press, 1979), pp. 458-459.
[6] Jules Verne, *Paris au XXe siècle*, ed. Piero Gondolo della Riva (Paris: Hachette, 1994), p. 119.
[7] Johannes Kepler, *Somnium* [1609], trans. and ed. Edward Rosen (Madison: University of Wisconsin Press, 1967). On the long history of extraterrestrial utopias, see Karl S. Guthke, "Nightmare and Utopia: Extraterrestrial Worlds from Galileo to Goethe," *Early Science and Medicine* 8(2003): 173-195.
[8] Frank E. Manuel and Fritzie P. Manuel, *Utopian Thought in the Western World* (Cambridge, Mass.: Harvard University Press, 1979), p. 505.
[9] Karl Marx, *Das Kapital* (1st ed. 1867), Vorwort , CH
[10] Adam Smith, *The Wealth of Nations* [1776], ed. Andrew Skinner (London/New York: Penguin, 1986), III.iv, p. 512.
[11] Immanuel Kant, "Idee zu einer allgemeinen Geschichte in weltbürgerlichen Absicht," [1784], in *Kant's Werke*, ed. Königlich Preussische Akademie der Wissenschaften, 10 vols. (Berlin/Leipzig: Walter de Gruyter, 1968-77 [reprint]), vol. 8.1, pp. 15-31, on pp. 27-28.
[12] Condorcet's earlier views on progress had been much influenced by those of his mentor, Anne-Robert-Jacques Turgot: see Keith Michael Baker, *Condorcet: From Natural Philosophy to Social Mathematics* (Chicago: University of Chicago Press, 1975), pp. 353-359.
[13] The story of Condorcet's final days is movingly told by Charles Coulston Gillispie, *Science and Polity in France: The Revolutionary and Napoleonic Years* (Princeton: Princeton University Press, 2004), pp. 326-338.

[14] M.J.A.N. Condorcet, *Esquisse d'un tableau historique des progrès de l'esprit humain* [1795], ed. Alain Pons (Paris: Flammarion, 1988), p. 275.
[15] Condorcet's plan permitted contributions from the state, but he feared that exclusive sate financing could compromise the organization's independence. M.J.A.N. Condorcet, "Fragment sur l'Atlantide [comp. 1794]," in M.J.A.N. Condorcet, *Esquisse d'un tableau historique des progrès de l'esprit humain* [1795], ed. Alain Pons (Paris: Flammarion, 1988), p. 345.
[16] "Ce plan doit embrasser les portions des diverses sciences; autrement la découverte de la vérité resterait dans la dépendance du hasard, et les heureux effets des sciences ne deviendraient probables que dans une longue suite de siècles, si elles n'attendaient leurs progrès que des travaux successifs ou simultanés d'hommes isolés, et n'ayant entre eux que des communications passagères." M.J.A.N. Condorcet, "Fragment sur l'Atlantide [comp. 1794]," in M.J.A.N. Condorcet, *Esquisse d'un tableau historique des progrès de l'esprit humain* [1795], ed. Alain Pons (Paris: Flammarion, 1988), pp. 310-311.
[17] M.J.A.N. Condorcet, "Fragment sur l'Atlantide [comp. 1794]," in M.J.A.N. Condorcet, *Esquisse d'un tableau historique des progrès de l'esprit humain* [1795], ed. Alain Pons (Paris: Flammarion, 1988), p. 333.
[18] Francis Bacon, *The New Atlantis* [1627], in Bacon, *The Great Instauration and the New Atlantis*, ed. J. Weinberger (Arlington Heights: Harlan Davidson, 1980), pp. 55-58.
[19] M. J. A. N. Condorcet, *Vie de Turgot* [1786], in F. Arago and A. Condorcet-O'Connor (eds.), *Oeuvres de Condorcet* (Paris, Firmin Didot Frères, 1847-49), vol. 5, p. 204.
[20] J.B. Bury, *The Idea of Progress* [1932] (New York: Dover, 1987); Sidney Pollard, *The Idea of Progress* [1968] (Harmondsworth: Penguin, 1971); Richard Foster Jones, *Ancients and Moderns* [1936] (New York: Dover, 1982).
[21] Francis Bacon, *Novum organum* [1620], in Basil Montagu, ed., *The Works of Francis Bacon*, 16 vols. (London: William Pickering, 1825-34), vol. 14, p. 54; Bk. I, Aph. 74.
[22] Rachel Laudan, "Histories of Sciences and their Uses: A Review to 1913," *History of Science* 31(1993): 1-34, on pp. 5-12.
[23] Adam Smith, *The Principles which Lead and Direct Philosophical Enquiries: Illustrated by the History of Astronomy* [1795], in *The Works of Adam Smith*, with an Account of his Life and Writings by Dugald Stewart, 5 vols. (London: T. Cadell and W. Davies, 1811), vol. 5, pp. 188-189.
[24] John Stuart Mill, "The Spirit of the Age" [1831], in J.M. Robson et al., eds., *The Collected Works of John Stuart Mill*, 32 vols. (Toronto: University of Toronto Press, 1981-1991), vol. 32, pp. 228-229.
[25] Ibid., p. 230.
[26] Ibid., p. 239.
[27] Ibid., pp. 239-240; emphasis in the original.
[28] I. Bernard Cohen, *Revolutions in Science* (Cambridge, Mass.: Harvard University Press, 1985), pp. 273-280.
[29] For a detailed analysis of the experimental and mathematical controversy see Jed Z. Buchwald, *The Rise of the Wave Theory of Light. Optical Theory and Experiment in the Early Nineteenth Century* (Chicago/London: University of Chicago Press, 1989). To get some idea of how disquieting the episode was for scientists, see J.C. Poggendorf, *Geschichte der Physik* (Leipzig: Johann Ambrosius Barth, 1879), pp. 643-649.

[30] See for example Henri Poincaré, *Les Méthodes nouvelles de la mécanique céleste*, 3 vols. (Paris: Gauthier-Villars, 1892-1899), vol. 1, pp. 3-4.
[31] Alexander von Humboldt, *Kosmos* [1845-1862], 4 vols. (Stuttgart: J.G. Cotta, 1874), vol. 1, p. xxiv.
[32] Ernst Mach, *Die Geschichte und die Wurzel des Satzes von der Erhaltung der Arbeit* [1872], 2nd unrev. ed. (Leipzig: Johann Ambrosius Barth, 1879), p. 3.
[33] Henry Adams, *The Education of Henry Adams* [1907], with an Introduction by D. W. Brogan (Boston: Houghton Mifflin, 1961), pp. 452, 495.
[34] Ibid., p. 496.
[35] Ibid., p. 452.
[36] Ibid., pp. 493-494.
[37] Barbara Goodwin, *Social Science and Utopia: Nineteenth-Century Models of Social Harmony* (Sussex: Harvester Press, 1978), especially pp. 143-173. The scientific inspiration of Saint-Simonianism is sometimes denied, but see Antoine Picon, *Les saint-simoniens. Raison, imaginaire et utopie* (Paris: Belin, 2002), pp. 177-220.
[38] See for example David Edgerton, *The Shock of the Old: Technology and Global History since 1900* (London: Profile Books, 2006).
[39] Marshall Berman, *All that Is Solid Melts into Air: The Experience of Modernity* (New York: Penguin, 1982), pp. 90-129. The title quotation is from Karl Marx and Friedrich Engels, *The Communist Manifesto* (1848).
[40] The literature in this subject is vast. Fredric Jameson, *Archaeologies of the Future. The Desire Called Utopia and Other Science Fictions* (London/New York: Verso, 2005) offer a thoughtful overview.
[41] Another sprawling genre, particularly in German: two of its most influential works are Edmund Husserl, *Die Krisis der europäischen Wissenschaften und die transzendentale Phänomenologie* (The Hague: Nijhoff, 1954), and Max Hokheimer and Theodor Adorno, *Dialektik der Aufklärung. Philosophische Fragmente* (Amsterdam: Querido, 1947).
[42] "I have read some of the speculations on the perfectibility of man and of society with great pleasure. I have been warmed and delighted by the enchanting picture which they hold forth. I ardently wish for such happy improvements. But I see great, and, to my understanding, unconquerable difficulties in the way to them." Thomas Robert Malthus, *Population: The First Essay* [1798], with a Foreward by Kenneth E. Boulding (Ann Arbor: University of Michigan Press, 1959), p. 5.
[43] Rudolf Virchow, "Die Freiheit der Wissenschaften im modernen Staatsleben," *Amtlicher Bericht über die Versammlung Deutscher Naturforscher und Ärtzte* 50(1877): 65-77, on p. 73.
[44] M.J.A.N. Condorcet, *Esquisse d'un tableau historique des progrès de l'esprit humain* [1795], ed. Alain Pons (Paris: Flammarion, 1988), p. 266.
[45] Linda Dalrymple Henderson, *The Fourth Dimension and Non-Euclidean Geometry in Modern Art* (Princeton: Princeton University Press, 1983).
[46] Nils Roll-Hansen, *The Lysenko Effect: The Politics of Science* (Amherst, NY: Humanity Books, 2005).
[47] See for example Paul Levinson, "The Little Big Blender: How the Cellphone Integrates the Digital and the Physical, Everywhere," in Anandam Kavoori and Noah Arceneaux,

eds., *The Cell Phone Reader: Essays in Social Transformation* (New York: Peter Lang, 2006), pp. 9-18.
[48] Jay Winter, *Dreams of Peace and Freedom: Utopian Moments in the Twentieth Century* (New Haven/London: Yale University Press, 2006), pp. 169-203.
[49] John Stuart Mill, "The Spirit of the Age" [1831], in J.M. Robson et al., eds., *The Collected Works of John Stuart Mill*, 32 vols. (Toronto: University of Toronto Press, 1981-1991), vol. 32, p. 239.
[50] Ibid., p. 304.
[51] Ibid., p. 305.