YALE UNIVERSITY
DEPARTMENT OF POLITICAL SCIENCE

Hijacked Dreams

Technological Determinism and the Idea of Progress

by

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Thanks Dad, for inspiring me to explore the worlds of science and technology, and Mom, for instilling in me a passion for all things political. Without family, I could never have gotten this far.

Special thanks also to my advisor, Professor Kapustin, whose patience and wisdom since freshman year have been invaluable. I promise, this is the last draft!

The plain message physical science has for the world at large is this, that were our political and social and moral devices only as well contrived to their ends as a linotype machine, an antiseptic operating plant, or an electric tram-car, there need now at the present moment be no appreciate toil in the world, and only the smallest fraction of the pain, the fear, and the anxiety that now makes human life so doubtful in its value. There is more than enough for everyone alive. Science stands, a too competent servant, behind her wrangling underbred masters, holding out resources, devices, and remedies they are too stupid to use.

– H.G. Wells, *A Modern Utopia* (1904)[1]

[1] Herbert George Wells, A modern Utopia (New York: Scribner and Sons, 1904), 102.

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Introduction

What can mankind expect from the future? For the better part of the last 300 years, the answer to this question has been "progress." The modern idea of progress was born of the Enlightenment, and it is a belief that advances in reason will empower changes in the human moral, political, and material condition: these changes were believed to come in effect concurrently, driven by the broad impact of scientific reason upon disparate aspects of life.

This powerful idea faced serious criticisms in the late 19th and early 20th centuries, and ultimately ran aground on the shoals of the 20th century. In the present era this idea of progress is a suspect figure, popularly doubted and seen as a vestigial naiveté in many intellectual circles. Is this modern ambivalence a repudiation of the very idea of progress, or just a temporary setback? Its promises unfulfilled, the universal notion of progress is today broken down into constituent ideals – among them, political progress, social progress, and economic progress.

Essential faith in technology, science, and reason was formerly the dynamo at the center of this universal ideal, but the enlightenment idea of progress has been discredited for its broken promises, unfulfilled utopias, and misguided adherents. It has been reduced to a narrower thesis which privileges technology, rather than reason, as the key arbiter of human advancement. This reduction took place for political reasons essential to understanding present civilization.

In this paper I will examine the constitutive elements of the Enlightenment ideal of progress, highlight certain historical antecedents, describe its later transformation into the technocratic or technologically deterministic idea of progress, and explain its subsequent fall from grace. Finally, I will address the question of whether or not certain elements of this idea can or should be salvaged, and if so, how. The changing nature of the idea of progress is a function not only of changing technical and industrial circumstances, but of shifting social priorities and changes in the institutions of political power. The subject is important, but too often ignored, for if, as Charles Beard writes, "The world is largely ruled by ideas, true and false," there have been few more influential than the idea of progress.[2]

[2] "Introduction" to J. B. Bury, The idea of progress : an inquiry into its origin and growth (New York: Dover Publications, 1960) 357, ix.

Part 1: The Formation of the Modern Idea of Progress

This first section of the paper is divided into two parts. First I will discuss the ideal-type pre-modern ideas of progress and history. Two pre-modern narratives will be analyzed: the ancient Greek tradition, as well as the early Christian theological conception of "providential progress." These will illuminate certain historical antecedents to the modern notion while illustrating the contrasts between these pre-modern ideas and the subsequent ideological break of the Enlightenment. I will then define the generalized Enlightenment notion of progress while briefly explaining its development and history in the 18th century.

I. Analytic Dimensions of Progress

Philosophies of progress differ in their form and substance, but all must answer certain fundamental questions to satisfy analytic challenge. These problems concern the relationship of progress and history, as well as the constitutive elements of a given idea of progress itself. The following framework of inquiry will facilitate the exploration and comparison of the differing ideas of progress discussed in this paper.

1. How does a particular idea of progress assess (or not) the advancement of history? Without history, there can be no progress, for progress is the advancement from one phase or condition to another. Whether progress is a *process* or an *event*, it must be historically contextualized.

2. In what fashion does progress occur? Progress may be linear and accumulative, or it could be non-linear and abrupt in nature.

3. Does progress have an end state? Is there an end of history, or does a specific flavor of progress advance infinitely?

4. What is the nature of change which constitutes a particular idea of progress?

5. How is this progress spatially organized? How or why may it be so distributed?

6. What is the mechanism of progress? How can this means be distinguished from its end?

Answering these questions in the context of pre-modern Western notions of progress will present an illuminating contrast to subsequent investigations of the Enlightenment ideal of universal progress.

II. Pre-modern Ideas of Progress and History

Classical Era Notions of Progress and History

Classical Western ideas, as typified by the tradition of Ancient Greece, lacked what is now known as "scientific historicism." This idea of history emphasizes the importance of causality in the patterning of human events, and is an attribute of history as a "social science." The ideal-type Greek metaphysics were incompatible with a view to such capacity; Greek historicism, such as it existed, resonates more with the Arrendtian idea of history-as-storytelling: history as a moral and political reflection on human affairs. Greek thought distinguished between 'knowledge' and 'opinion.' The former is timeless and essential to the nature of the world, and is to be developed through reason. The latter is the human perception of transitory events, a perception which can never fully or objectively appreciate a changing reality. History in the scientific sense was therefore impossible to the Greeks, because transient sense perceptions could not provide a scientific record of events which would accommodate an exploration of causality.[3]

These metaphysical beliefs impacted the nature of Greek historiography, and helped to shape Greek notions of the past and future in relation to the present. The prevailing perspectives of the Classical Age believed in history as a cyclical or nonlinear process. 'History,' such as it existed, was interpreted as a process of either continual degradation from a previous Golden Age, or a series of cycles, endlessly repeated. This idea continued in Roman tradition, where it is succinctly captured by Marcus Aurelius who wrote that "All things from eternity are of like

[3] Robin G. Collingwood , The idea of history (New York: Oxford University Press, 1956), 20-1.

forms, and come round in a circle."[4] Ancient writers disputed the nature or length of these cycles – 200, 2000, 72,000 years? – but not their essential character.[5]

The practice of history itself in the Classical era took divergent forms: chronologies, horologies, genealogies and other patterns of historiography are all well-represented in the historical record. Can this help to explain the prevailing notion of history in ancient times? As Fornara explains in *The Nature of History in Ancient Greece and Rome*, history as an 'objective record,' an aggregate of all past events, was entirely alien to the philosophers and historians of yore: 'history' in this context was delinked from time, and referred always to a specific slice or perspective of events; Herodotus in this frame is a writer of "histories of famous deeds," rather than a raconteur of specific objective events.[6] This patterning of *historia* is consistent with the non-linear, cyclic conception of history in Greco-Roman tradition.

Progress in ancient times was unlinked from science or human agency. It was gripped by what Sklair calls a "spirit of pessimism."[7] Progress, if it was believed to exist at all, happens only as a coincidence of divine whims or eternal cycles. These cycles knew no end. While improvements within society could at times be described historically, they were not ascribed to science or scientific arts. Transition between different epochs was instead entirely the doing of divinities.

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[4] Leslie Sklair, The sociology of progress (London: Routledge & K. Paul, 1970), 5.
There is evidence of historicism in Classical times, but it was at odds with prevailing intellectual currents. Ludwig Edelstein, in The Idea of Progress in Classical Antiquity, details examples of progressivity in the life and writing of Seneca, Posidonius, and other period Hellenistic authorities. *See* Ludwig Edelstein, The idea of progress in classical antiquity (Baltimore: Johns Hopkins Press, 1967).

[5] Nisbet also demonstrates Greeks and other pre-Christian peoples held philosophies more diverse than a single simplistic idea of historical degradation, and that even if these were minority perspectives, intellectual vigor was devoted to the topic of 'progress' in one or another forms. (*See* Robert A. Nisbet, History of the Idea of Progress, 1994), 13) Perhaps the most significant disagreement originates with the Epicureans, whose view of history was grounded not in divine inspiration but first and foremost in the mechanistic interaction of atomistic particles as proposed by Democritus. In their reasoning, man and beast were once alike, until mankind improved through the continuous application of intelligence. (*See* Bury, 10).

[6] Charles W. Fornara, The nature of history in ancient Greece and Rome, (University of California Press : Berkeley, 1988), 92.

[7] Sklair, 9.

This process is clearest in the 'narrative of degradation,' where Golden Age men were larger and stronger than 'modern' man, while lacking knowledge. The decline from the Golden Age is commensurate with the growth of civilization, beginning with the gifts of Prometheus. With civilization comes evil, strife, and misery – the curses wrought by Zeus, through Pandora, as punishment for the theft of the Gods' arts. Alternate interpretations of the narrative of degradation – such as the different 'races of men' described by Hesiod – portray the same divine processes, executed by a different means: different epochs of men, all created by the gods, each more inferior to that which came before.

Even those Greek thinkers prepared to envision causes outside Olympus did not eschew such images of cycles or degradation. Inspired by ideas of seasons and natural processes, the rise and fall of cities and polities was believed to be motivated by similar eternal mechanisms. The proximate causes were in flux, but the effects were similar. Thucydides, for example, identifies shifts in Athenian culture and politics as a result of its economic changes, changes which led to the growth of Athenian empire. At the same time, the clout of Athenian empire eventually led Athens into disastrous war in Sparta. Just as other natural entities are born, grow, and then die, so too would the path of man be one of growth, decay, and death.

Finally, progress in the ancient Western tradition was strictly delimited. Only Hellenes, or perhaps certain Hellenic city-states, were included in the conventional vision of progress – or decay. Society as a whole would rise or fall through different means depending on the proponent, but commonly the folly of man was the proximate cause while the "essential nature of the universe" the true mover.

Judeo-Christian Providential Progress

Greco-Roman thought was deeply influenced by the ideas of historical cycles and historical degradation. Early ideas of Judeo-Christian progress represented the first counter-perspective. This alternative was the idea of a general, linear history: time as a series of events in sequence from a past into the future. This process can be conceptualized as a process of stages, or

as a continuous and smooth succession without any barriers or bulwarks to hinder 'advancement.' In such narratives, the Old Testament, through Genesis, is the "initial fixed point" of a story; the New Testament then offers a future terminus of the world, time, and history.[8]

St. Augustine was the first writer to formally situate history between these two points. In the *City of God*, begun after the sack of Rome in 410 C.E., Augustine creates a 'universal history' which begins with Creation and continues until the eternal end of the world. Augustine characterized the existence of mankind as a singular journey towards a particular end. This history was a record of human activity in relation to divine will. Augustine wrote to explain how a Christian empire had fallen, and developed the archetypal idea of "Providential Progress."

Augustine argued this linear view vigorously in response to his contemporary Christian 'cyclical scholars.'[9] Augustine sought to refute Origen and other period writers who he believed erred in their understanding of history and time:

> "The philosophers of this world believed that they could or should not solve that controversy in any other way than by introducing cycles of time, in which they asserted that the revolving of coming and passing ages would always be renewed and repeated in the nature of things and would thus go on without cessation." [10]

Augustine solved this 'temporal' problem through the bookending of history with Genesis and the Last Judgment.[11] Augustine's progress ended with the return of Christ, and was not

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[8] Georg Henrik von Wright *in* Arnold Burgen, Peter McLaughlin, and Jurgen Mittelstraf, eds., The idea of progress (New York: W. de Gruyter, 1997), 7.

[9] Many of these looked to scripture for textural support, especially *Ecclesiastes* (1, 9) wherein Solomon declares "There is no new thing under the sun." King James Bible, Project Gutenberg , 2nd version, 10th ed. (Champaign, Ill.: NetLibrary, 1999).

[10] Theodor E. Mommsen, "St. Augustine and the Christian Idea of Progress: The Background of the City of God," Journal of the History of Ideas 12.3 (1951): 356.

[11] Augustine was writing not only to combat the cyclical writings of near-heretics like Origen, but also, as Mommsen identifies, a host of Christians whose alternate conception of 'Christian Progress' was threateningly materialist. These authors identified the coming of Christ with Augustus' foundation of *Pax Romana*, and the spread of Christianity with the improvement of the material world. Eusebius, an intellectual heir of Origen, wrote that "*it was not through human merit that at no other time but only since the time of Christ most of the nations were under the single rule of the Romans; for the period of His wonderful sojourn among men coincided with the period when the Romans reached their summit under Augustus, who was then the first monarch to rule over most of the nations.*" To Augustine, these same thinkers additionally conflated the Millennium with material prosperity rather than divine righteousness on Earth.

accumulative in nature: earthly events little affected the eventual outcome, and the sudden break of the Second Coming would not be the result of a gradual transition. The most important change wrought by this 'progress' would be the quantum shift in existence which would occur with the return of Christ. This *progress* was less one of continuous change and more one centered on certain teleological events; it would certainly be limited in its scope to those faithful adherents of Christianity who would find themselves well positioned for eternity.

There was an additional variant of "providential progress" current in the late Roman Empire. This religious progress linked material progress and Christianity. The notion that Christ's arrival created – and would continue to create – improvements in material conditions was first suppressed and then embraced by Rome once Constantine made Christianity the favored Imperial religion. Constantine, writing in 312 after a battle victory, observed that *"the lawful recognition and observance [of the Christian faith] has bestowed the greatest success on the Roman name and singular prosperity on all affairs of mankind, blessings which were provided by the divine beneficence."*[12] This progress held a similar notion of history to Augustine's, but its progress could be measured in material condition, driven by the spread of Christianity and the divine will of Christ.[13]

This 4th and 5th century Christian dialogue therefore offers two important kernels for future conceptions of progress. First, Augustine provides an influential Christian framework through which the actions of all mankind can be placed in relation to a general narrative of Providence. Though the eventual 'progress' would be sudden in the Second Coming, the events

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(See Demonstratio Evangelica, 3, 7, 139) in Mommsen, 360).

[12] Mommsen, 359.

[13] Augustine sought to explicitly contravene such materialistic relationships with God, giving examples of Christian emperors struck dead and long-lived Pagan emperors; to him, temporal earthly power was irrelevant, something which God might distribute to all manner of men. He sought to contradict any hidden message of *Pax Romana* by highlighting wars and conflicts, for he wanted Christianity to be followed for its divine promises, not any potential of earthly reward. Finally, Augustine realized after the fall of Rome that if belief in this alternate "Christian Material Progress" became widespread, it would leave Christianity (and Christians) open to attack on many fronts – for it was under Christianity that the Imperium Romanum suffered its ignominious decapitation. Nonetheless, this idea remained influential.

of men were now situated in a linear-historical context. These theological notions of progress – in conjunction with continuing emphasis on 'regress' from Eden – formed the intellectual backdrop of the medieval period in the West.

Contemporaneously, Christian thought of this period borrowed from Roman Pagan traditions and frequently emphasized the material benefits wrought the Empire by Christ. Christians were once condemned for bringing misfortune to Rome; the reverse was now true. While Roman Pagan traditions were structured as contractual relations with the Gods, the tradition of *do ut des* ("I give that you might give") became a current in Christian thought, to the dismay of Augustine. Even if these early Christian Progresses failed to offer mankind a material platform to improve his condition through will, they trace a slackening of the pessimism of the Cynics and the Greek 'narrative of degradation.' Providential progress may therefore serve as an effective conceptual 'bridge' from ancient traditions to truly modern progress.

III. The Enlightenment Ideal of Progress

In *The Idea of Progress*, G.H. Hildebrand presents a framework for the idea of progress in general. Hildebrand postulates that any notion of progress must contain three principles: "*First, the belief that history follows a continuous, necessary, and orderly course; second, the belief that this course is the effect of a regularly operating causal law; and third, the belief that the course of change has brought and will continue to bring improvement in the condition of mankind.*"[14] This eloquent exposition highlights the three most critical constituents of the "modern" idea of progress, or what von Wright calls "The Great Idea of Progress."[15] Differences between the "Great Idea" and its antecedent progresses are easily observed across these axioms. It manifests an idea of history which sharply differs with that of the ancient tradition; it supposes particular causal laws as the

[14] These definitions are most applicable in the study of the "modern" idea of progress born of the Enlightenment. *See* "Introduction" to Frederick John Teggart, The idea of progress, a collection of readings (Berkeley: University of California Press, 1949) , 4.

[15] Georg Henrik von Wright *in* Burgen, McLaughlin, and Mittelstraf, 7.

agent of change, rather than divine whims or cosmic chance; lastly, it is a forward-looking progress which conceives of a future betterment of mankind.

This idea of progress is the focus of this essay, and its optimism and these principal features render it easily recognizable. This concept places the human-driven advancement of society as a continuing, accumulative process in a linear world history, achieved through the advancement of reason and continuing without end. Critically important, this process constitutes simultaneous advancement in both the economic, social, moral, and political realms as a product of the growth of reason – a process characterized by advances in science and applied technics. While this process was believed to be begun and led by the West, its powers were not geographically circumscribed; the West was merely the vanguard of the future of humanity. The universal, interconnected nature of these advances is eloquently captured by David Hume, in his essay "Of Refinement in the Arts," where he proposes that "*we cannot reasonably expect, that a piece of woollen cloth will be brought to perfection in a nation, which is ignorant of astronomy, or where ethics are neglected*."[16] Hume extends this notion as follows: "*...industry, knowledge, and humanity are linked together by an indissoluble chain... [they] are not advantageous in private life alone: they diffuse their beneficial influence on the public, and render the government as great and flourishing as they make individuals happy and prosperous*."[17] In this respect, Hume directly captures the spirit of an era and articulates the ways in which reason and knowledge were believed to be the shared foundation of improved prosperity, ethics, and politics.

In almost all of its most characteristic dimensions, this idea is a seismic break with all previous conceptions of history and progress. A vast number of intellectuals contributed to the full enunciation of this idea, but two Enlightenment figures in particular deserve recognition for their roles. Anne Robert Jacques Turgot and his friend, mentee, and biographer the Marquis Nicolas de Condorcet together espoused and developed the central vision of this idea of progress

[16] David Hume, Essays moral, political, and literary, ed. T. H. Green and T. H. Grose (London: Longmans, Green, and Co, 1875), 302.
[17] Hume, 302.

in the mid to late 18th century. Examining their specific claims and ideas will serve to more fully develop the concept described above and its tensions with its predecessors, the cyclical and providential 'progresses.'

Turgot and Condorcet operated in a turbulent and dynamic intellectual milieu, and both built on then-shocking ideas of the late 17th and early 18th centuries. The essential historical mentions in this dimension are the specific historical works of Rene Descartes and the general trend of humanism from the Renaissance through the early Enlightenment. Descartes provided the intellectual basis for the revival or birth of "true science" by first acknowledging the order of nature and secondly denying the active involvement of divinity in natural processes.[18] The latter category, best represented by Bernard Le Bovier de Fontenelle in his *Digression sur les anciens et les modernes* (1688), situated human behavior within the domain of nature and focused on human existence rather than spiritual speculation. Fontenelle was the typical voice of "les modernes," those within the Académie française who believed that modern advances in reason and the ensuing accumulation of knowledge made (then)-modern man more enlightened than his ancient predecessors in philosophy and the arts.

The 17th century repudiated the narratives of degradation, cyclical progress, and Providential Progress, supplanting them all with an expectation of secular, modern progress. Progress, the exploration of endless human potential, was enshrined as an axiom of history. It is in this general sense that Ritter's *Dictionary of Concepts in History* defines progress as "A doctrine based on the belief that the study of history reveals a pattern of continuous improvement in human society"[19] for surely this is what the Moderns of the 17th century believed. Pascal and Fontenelle expected that all of humankind would continually develop and expand human knowledge and wisdom, if natural processes were left uninterrupted. But the most essential nature of this philosophy was left unfinished until the 18th century, for the *a priori* case for

[18] Teggart, 12.

[19] Harry Ritter, Dictionary of concepts in history, (Westport: Greenwood Press, 1986), 339.

progress did not explain the causal laws or processes by which such progress could be expected to operate.[20]

Turgot's Conception of Progress

Here Turgot and Condorcet again enter the frame. Turgot is the archetypal voice of Enlightenment progress. Turgot's most important contributions answer two seminal questions for the case of progress: the nature of human agency, and the nature of progress as a historical process. This first subject may be framed as an intellectual response to the loose ends left by the *modernes*. While humanity had previously been implicated in the process of progress, it is Turgot who best describes the impact of human events. His paradigmatic account of history and the future exemplify and explicitly enunciate the claims of his philosophical cohort. To explore the analytical importance of Turgot's ideas, it is beneficial to revisit the six-part matrix describes earlier in this paper; this framework provides a clear template in which to place the new ideas of the Enlightenment as represented by Turgot.

Turgot's understanding of progress begins with the subject of human agency. A 23-year-old Turgot delivered exceptional speeches on the nature of progress at the Sorbonne in 1750, while studying for the priesthood. In these speeches, Turgot sought to reconcile human agency and divine will. Theologically, Turgot framed God as the first mover, not an interventionist figure, while describing progress through the arc of history. Turgot's progress was human-directed and undertaken with an understanding of history and the past. While this incarnation of theory preserves the notion of a deity, this God of the Enlightenment is 'out of sight, out of mind' – man is the central focus and the principal actor of history. In this way, Turgot was able to 'solve' the problem of human agency in his idea of progress, by reducing God to an almost observational role.

Turgot draws from this well of agency in order to explain the place of progress in history. Long after abandoning his divinity studies, Turgot resumed his discussion of human progress.

[20] Teggart, 13.

His landmark work, *On the Successive Advances of the Human Mind*, perhaps best captures his attitudes on human agency and the progression of history, representative of the Enlightenment ideals as a whole.

> "Self-interest, ambition, vainglory, perpetually change the aspect of the world, deluge the earth with blood; and, in the midst of their ravages, manners are softened, the human mind enlightened, isolated nations brought closer together; commercial and political ties finally unite all parts of the globe; and the total mass of human kind, through alternations of calm and upheaval, good fortune and bad, advances ever, though slowly, towards greater perfection."[21]

For Turgot, it is these human qualities of ambition, motivation, and drive which change the face of the world. Though they may bring certain ills, they ultimately serve to foster the betterment of all mankind. This remarkably current vision of a globalized world created by collective striving explains why Turgot believed in progress as a historical and *accumulative* process. Because progress was created by the actions of mankind and embodied in human institutions and knowledge, the foundations of future progress would self-evidently be the result of past strivings.

The advent of agriculture is deemed the first step away from "primitive barbarism," and Turgot elaborates his understanding of the importance of food surpluses, which allow ambition to be directed towards the arts and sciences. The 'secret' of man, to him, is visible at this phase. "*Whence that leisure whereby genius… directs all its energies towards the cultivation of the sciences; whence that more vigorous and more rapid advancement of the human mind, which bears along with it all parts of society, and which, in turn, receives new energy from their perfection*."[22] The importance of reason – and science – are driven home repeatedly. From this foundation broader institutions can be constructed which further serve to propel mankind. In the same breath, Turgot puts forth roughly what should be expected of this progress: rapid advancement of "all parts of society." He devotes greater effort elsewhere to the particular forms which such advance may take.

[21] Teggart, 242.
[22] Teggart, 244.

Once his discussion is confined to the advancement of man's knowledge and reason, Turgot relies upon the scientific method for an explanation of how human reason advances. The 'cultivation of the sciences' and the 'advancement of the mind' are the mechanism of progress, and in fact are fueled by their own inventive output. This produces an expectation of *acceleration*, for the 'new energy' will produce ever more rapid advancement. Hypotheses, once tested, raise new questions and provoke still more hypothesizing, research, and answers. "*Ever dissatisfied, unable to find rest in aught but the truth, ever excited by the image of that truth which it thinks to touch but which flees before it, man's curiosity multiplies questions and disputes, and compels him to analyze ideas and facts in a manner ever more exact and more profound.*"[23] The key to the advancement of this reason and knowledge lies in man's ability to pass on and preserve knowledge, the "accumulated productions, opinions, experiences, discoveries, of all the ages" which serve as a "stepping-stone to posterity to mount ever higher."[24]

In addition to the question of human agency, Turgot devoted considerable attention to the problem history poses for progress. How can any 'progress' be judged through time when, by almost any measure, there would be periods of regress? Turgot was among the first to frame progress as a *historical trend* as well as a specific phenomenon. Societies "now retarded and now accelerated in their progress… pass from clime to clime."[25] Setbacks became part of a continuous process when history was viewed as the record of a progressive *trend* rather than an iron-clad reservoir of advancement.[26]

This idea is clearly explained in the context of civilizations and the world as a whole. Within individual civilizations, be they Roman, Chinese, or French, internal development allows for broader political outlooks and most lasting military victories. These combined create empires

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[23] Teggart, 246.

[24] Teggart, 245.

[25] Teggart, 242.

[26] Other contemporary luminaries felt no such need to even accommodate regress in their visions of progress. Edward Gibbon remarked in the conclusion to the sixth volume of *The Decline and Fall of the Roman Empire* that "Every age of the world has increased, and still increases, the real wealth, the happiness, the knowledge, and perhaps the virtue, of the human race" as a result of gifts which, once propagated, can "never be lost." Edward Gibbon, The History of the Decline and Fall of the Roman Empire, Sixth American ed. (Philadelphia, 1830), 390.

and nations. Empires are united, divided, and founded on the ruins of other empires, succeeding each other and in their revolutions revealing all possible permutations of states and political structures. Turgot describes this process as "an ebbing and flower of power from one nation to another, and… from the princes to the multitude, and the multitude to the princes." [27]

History has tides, and progress for all humanity likewise contains eddies and vortices of backwardness or periods of chaotic regression. Yet because the underlying causal processes are believed to be eternal, unsupportive conditions are presumed to be mere fleeting circumstance. Turgot's idea of progress grew from an appreciation of ancient arts, culture, and knowledge, composited with the recognition of some dimensions of modern superiority. Against the intervening centuries of regress, darkness, or stagnation, a more simplistic notion of progress would not survive scrutiny. This encompassing view of history, however, sallies forth and dispatches the problem of unequal development across time and space. Irregular peaks and troughs are the contingent effects of human-driven progress, consequences to be expected but not feared in light of the long-term implications of such a theory if true. Lastly, Turgot concludes that advances in reason and the development of modern empires render less odious the evils previously 'inseparable' from revolutions, and even war itself more and more should ravage only border towns and certain strategic areas. While this prediction is proven woefully inaccurate in the subsequent historical record, the underlying claim resists criticism, instead inviting the skeptic to merely taken a 'longer view.'

Certain tensions, apparent in Turgot's work, prove problematic both analytically and historically. The notion of human agency as a creative force is presented in tandem with the paralyzing effects of wayward ambition and passions; that the balance between creation and destruction should list one way or another is nearly as much speculation and faith as it is reason on Turgot's part, for this supposed quality of man is not subjected to any kind of empirical rigor. Additionally, the universality of progress is presumed but by no means proven. Politics, morality, and material condition are all said to advance from the same fount of reason, but the proposed

[27] Teggart, 244.

self-propelling nature of this process relies upon fertile social conditions. Turgot readily accepts this flaw, and mentions that those civilizations or places first enlightened through the sciences are not those leading the world today because superstition and rigidity prevented the full flowering of reason and the fruits of truth.

Ultimately, the single greatest strength of Turgot's theory proves its greatest point of tension. Progress as a 'trend' resolves the unpleasant problem that history-as-recorded often fails to cooperate with the narrative of human progress. At the same time, this idea of a 'trend' can be extended across an indefinite frame of reference; if the predicted advancement the theory describes is not observed, it may be explained away as a "temporary regress" or similar impermanent shortfall.

These strains are baked into the idea of progress as conceived by Turgot. Yet even though they would later prove to be serious vulnerabilities, Turgot's ideas resolved dilemmas first raised by the humanists of the 17th century. By carefully parsing human nature and human history, he is able to deliver an account of human agency which preserves the potential for progress without relying on naïve representations of behavior or individual motivation. The same keenly discerning approach sifts the events of history and identifies progress as a trend; this phenomenon is connected with human agency through the mechanism of reason.

Thus, to recapitulate the ideas of Turgot through the lens of this analytic matrix, progress is a continuous, linear process which is accumulative in nature. The rise of reason and the accumulation of knowledge drive the advancement of all society, and because these motivating factors know no limits, the only ceiling on this progress of perfectibility lies potentially in these natural laws themselves. Because reason and the accumulation of knowledge are not (necessarily) geographically circumscribed, the expansion and increasing interconnectedness of the world will bring with it widespread progress. While Turgot explores the nature of this mechanism in some depth, it is in this one dimension that his paradigmatic account of the trajectory of human progress is lacking: his sketch of its workings leaves certain questions unanswered.

Condorcet's Idea of Progress

It was Condorcet who best clarified the specific nature by which man could effect progress. Condorcet believed human agency could expand the body of knowledge and science in society *and by this means advance forward*; in this respect he is in full agreement with Turgot. In his final work, published posthumously, Condorcet details the historical trajectory of humanity and identifies reason as the key agent of progressive change. The *Outlines of a Historical View of the Progress of the Human Mind* (1795) expresses his expectations for a future where science and reason could become wholly unshackled from authority and instead serve as independent agents of positive change. [28]

The most salient feature of this Grand Theory of Progress, as it took shape in the Enlightenment, is its universality. This quality presumes social, moral, and political change to all be similarly affected by the advancement of knowledge. Bury's seminal work on progress highlights Turgot's ideas and Condorcet's hand in fixing this idea. Condorcet finds advancement of knowledge to be the mover of history, or, as Bury describes it, "the history of civilisation is the history of enlightenment."[29] Material or 'hedonic' progress is but one outcome of this process, as moral and political progress is presumed to follow from the same mechanism.[30] For as Turgot

[28] This Enlightenment ideal was built on important foundational work in the late 16th century, especially the contributing work of Sir Francis Bacon. While his general body of work is not especially historically minded, Bacon was the first writer to pronounce a link between knowledge, science, and industry. His work was crucial in the development of a general technical-scientific frame. The novel idea that science could lead to progress in industry and the material world is a critical underpinning of the later idea of progress. Though Bacon did not elaborate his ideas in *New Atlantis* or elsewhere into a conception of progress as a linear-historical process encompassing society and morality, he did develop a clear notion of *scientific* progress aimed towards the development of knowledge and the advancement of human mastery.

Beyond Bacon's contributions to the philosophy of modern scientific processes, his articulation of a particular future in *New Atlantis* is worthy of greater analysis. *New Atlantis* is one of a series of important 'utopian visions' – it is a pivotal bridge between two concepts: the idea of *progress* as a means of describing man's trajectory through time and history, and the idea of progress as it later became known, a force for social and civilizational change, often imbued with religious layers, fueled by knowledge and science. Bacon and Descartes both envisioned man's growing mastery of nature through the application of science. In this philosophy, technology serves as the praxis of science, the means towards mankind's advance. (*See,* Charles McLean Andrews, Famous Utopias (New York: Tudor publishing co., 1937), 317.)

[29] Bury, 209.

[30] Georg Henrik von Wright *in* Burgen, McLaughlin, and Mittelstraf, 7.

had envisioned a union of all modes of social action, so Condorcet most clearly links intellectual advancement and the accumulation of knowledge with the improvement of social, moral, and political conditions; a progress which culminates in a world where men acknowledge "no other master than their reason."[31]

It will be instructive to reprise the original six analytic dimensions of progress described earlier in the context of Condorcet's ideas. Condorcet approached history as a process with specific stages of advancement which could be demarcated by particular qualities: the transition from pastoralism to agriculture would mark one epoch, while the invention of alphabetical writing determines another. These epochs continue until the invention of printing augurs the truest transition from Renaissance era 'rediscovery' towards the Enlightenment. The ninth stage, which follows the invention of printing, ends with the formation of the French Republic; the tenth and final epoch is simply the "future progress of mankind."

These stages are undermined in their analytic value by virtue of Condorcet's misunderstanding of history or certain aspects of natural sciences. However, they still serve as valuable conceptual tools, highlighting pivotal advances in the sciences which affected the human condition. The distinctions drawn between each stage do not oppose the accumulative vision of progress proposed by Turgot, for each keystone advance is itself the product of the accretive advances of technical methods and human knowledge.

The tenth stage as described by Condorcet is an end, though in some respects an 'end' without end. The state of improvement which he believes certain "can have no limit but the absolute perfection of the human species."[32] This absolute perfectly may be nearly limitless in its scope, but there is reference to a certain perfection which may be attained. This is made possible by the mechanism of progress: science. When the causal laws of nature which produce this inevitable progress are pursued to their limits, mankind will achieve its "destiny."

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[31] Condorcet, Jean Antoine Nicolas de Caritat (marquis de), Outlines of an Historical View of the Progress of the Human Mind (London: J. Johnson, 1795), 327.

[32] Condorcet, (1795), 337.

Though at present "In a few directions, our eyes are struck with a dazzling light," "thick darkness still covers an immense horizon."[33] By folly of history the cause of progress is in some places retarded and in others advanced, but because the same causal laws hold common across the entire world and all mankind, the same fate is to be expected for all peoples and all places. This is especially true as nations interact more and more – for these meetings produce an exchange of ideas, and the intermeshing of economies promotes prosperity aligned with the rights of individuals and the growth of reason.

Once the spread of reason has triumphed, man will adopt a vigilant posture in order to "stifle, under the weight of reason" the first sprouts of resurgent tyranny or superstition. As a corollary of this inevitability, the spread of reason will provide ever-greater acceleration to the work of progress, because the increasing number of peoples and states so committed will provide greater resources to spread the knowledge and create the tools necessary for the emancipation of the mind and body of mankind.

Condorcet's last work is important because of the detailed manner in which it asserts the pivotal role of science and technology as forces of change *as well as* markers of progress. Music is rendered more brilliant by virtue of a greater understanding of "the vibrations of sonorous bodies," and art the more beautiful for modern understanding of optics. Politics is improved not only by the advancement of 'reason' and the enfranchisement of citizens, but also the application of mathematics. The Marquis was a contemporary leader in this last regard, developing mathematical voting schema to better democracy. The 'tribunal of reason' rejects superstition and hearsay for those facts supported by empiricism.

The advancement of science is one of the principal forces which drive progress, and this scientific-technical advancement is tied directly to the other flavors of 'progress' – Condorcet, as clearly as any other author of his time, established a *unified* vision progress:

> "... May it not be expected that the human race will be meliorated by new discoveries in the sciences and the arts, and, as an unavoidable consequence, in the means of individual and general prosperity; by

[33] Condorcet, (1795), 310.

> farther progress in the principles of conduct, and in moral practice; and lastly, by the real improvement of our faculties, moral, intellectual and physical, which may be the result either of the improvement of the instruments which increase the power and direct the exercise of those faculties, or of the improvement of our natural organization itself? ... we shall find the strongest reasons to believe, from past experience, from observation of the progress which the sciences and civilization have hitherto made, and from the analysis of the march of the human understanding, and the development of its faculties, that nature has fixed no limits to our hopes."[34]

Progress is in this sense an ideal and a process, rooted in history and achieved through the pursuit of knowledge: this quest for knowledge was believed to lead to an advance of the human condition and elevation of the human spirit itself. Progress in its universal sense encompassed all those factors which would propel humanity into the future, but the most important of these was the development and cultivation of knowledge; next to this, the application of this knowledge. Condorcet described the essential engine of this vision when he said "Toute découverte dans les sciences est un bienfait pour l'humanité."[35]

Summary

Turgot's position clarified the nature of history and the possibility of human-directed progress; Condorcet elaborated on these positions through the lens of science. Analyzed across the same six dimensions, Condorcet's idea of progress closely mirrors that of Turgot. The greatest difference beyond aesthetics lies in Condorcet's understanding of the causal mechanism behind this same linearly progressing, accumulative, nigh-infinite and universal progress. Turgot emphasizes the messy manner in which human behavior produces progress. Conversely, Condorcet considers the march of reason and the emancipation of humanity to be a considerably more orderly process, a belief reflected in his optimistic expectations and projections.

For while Condorcet's explication of natural 'causal laws' of progress explains the importance of the natural sciences to expanding social, moral, and political progress, it also creates an aura of inevitability and indeed determinism. If certain natural causal laws are

[34] Condorcet, (1795), 319.

[35] Condorcet, Jean Antoine Nicolas de Caritat (marquis de), Discours Prononcé Dans La Séance Publique, (1782). Speech delivered on his election to the Académie française, 21st February 1782, as delivered at the Palais du Louvre.

universally evident, what choice does man have *but* to follow this destiny? This potentially-deterministic principle is apparent at the level of societies and states, for while the individual has choices and freedom – indeed, the individual is to become ever more emancipated – society as a whole will be pulled through certain naturally mandated paths by virtue of these laws of progress.

This vision of progress anticipates the changes that the paradigmatic ideal was to soon undergo in the 19th century. The subtle elevation of *instrumental reason* by Condorcet hints at the rise of more technics-focused visions of progress, as when the Marquis wrote above that the human race may be meliorated by *instruments* which improve human faculties. While human reason remains the supreme agent of change, the 'rise of reason' may be facilitated by science or artifacts in ways which exceed the mere inspirational, hypothesis-generating role assigned by Turgot.[36]

Certain practices and tools, such as arithmetic or the printing press, are "contrivances that double the powers of the mind, by means of which it can extend indefinitely its limits,"[37] and in this respect, Condorcet introduces the prospect of technology as the key mediating factor in the advance of reason. Nascent discoveries serve not only as inspiration, but as *mechanisms* for the further development and perfection of man. This idea is a minor departure in his hands, but ultimately serves as the leaping-off point for much wilder revisions of the idea of progress.

The Enlightenment idea of progress secularized the historically-contingent progress of Augustine, and rejected entirely the cyclical notions of the ancients. Instead, the Enlightenment erected an idea for all times and all peoples, based on the principle that certain universal resources – human reason – could propel humanity forward across a bevy of important social dimensions. Utopias speculated on what the future would look like, but this progress was

[36] See above quote. The maintenance and distribution of knowledge is highlighted in the titling of Condorcet's epochs, as well as their delineation. Considerable attention is given to alphabets, writing, and language – all important tools to transmit knowledge. Precision and accuracy in the natural sciences are contributors to a global increase in the powers of communication. This communication is essential for it serves to both aid in the development of new knowledge and discovery, as well as to transmit and disseminate extant advances. This is especially important for those ideas which possess especially inspirational or emancipatory qualities.

[37] Condorcet, (1782), 59.

ambiguously grand in its declared goal of ultimate perfection. The instrumental dimensions of reason, science and technology, were believed to advance without end, and these would in turn increase man's mastery over the world without any limit beyond that proscribed by these same laws of nature. Man's inevitable destiny, a foregone conclusion, was to achieve the nearly infinite potential afforded by the power of reason.

Part 2: The Emergence of the Technocratic Idea of Progress

> "Thus, ultimately, will science lead, direct, and most efficiently aid, the nation in its progress toward the ideal, yet approachable, social state which has been the hoped for, if not the promised, land of every great political and social economist and philosopher, from the days when Cicero thought it his greatest honor to have written "On the Commonwealth." up to the present time. According to Cicero, the Roman Commonwealth, "by defending its allies," took possession of the world. Our own grander commonwealth, by defending and sustaining her as yet hardly recognized, but most powerful and most beneficent ally, Science, will, some time, control, and for vastly grander purposes, a greater world."
>
> – Robert H. Thurston, "The Mission of Science," 1884[38]

I. Introduction

The Enlightenment coincided with the onset of the Industrial Revolution in Europe, and Industrialization contributed to rapid and unprecedented changes in the organization of labor and society, beginning first in Great Britain before extending next to the Continent and the United States. The changes which began in the late 18th century and took full form in the 19th were also responsible for an important intellectual shift in the idea of progress. Urbanization and mechanization wrought revolutions upon the landscape and its inhabitants. The flywheels, steam engines, and locomotives changed human life so visibly that many came to see technology as the critical force of change in society, and technology and its specific artifactual incarnations were invested with agency. Factory, machine, and invention replaced the role of general 'reason' in the Enlightenment idea of progress.

Industrialization also gave rise to the idea of a "progress without people," the notion that technological and industrial development could marginalize populations and harm many while

[38] Thurston continues: "The place of these modern methods in our political and social system can now be readily determined. Had it been asserted a generation ago that science should control our politics and dictate in every movement of our social system, and that it should be the guiding star of every political economist and of every philosopher, whatever his province, the claim would have excited a smile, and would neither have received consideration nor provoked rejoinder. But we shall see that this is precisely the place which will be ultimately, and of necessity, taken by science, and that it is to science that every great movement, whether political or social, industrial or ethical, must look for intelligent direction." Robert H. Thurston, "The Mission of Science," Van Nostrand's Engineering Magazine (1884: 19), 276. Thurston was a mechanical engineer and the first President of the American Society of Mechanical Engineers. *See* Howard P. Segal, Technological utopianism in American culture (Syracuse, NY: Syracuse University Press, 2005) for details on Thurston (48) and additional colorful portraits of 19th and early 20th century industrial-technological optimism.

enriching or benefiting a certain few.[39] This concept essentially represents a repudiation of the 'broad' claims of techno-scientific progress: technological progress is granted, but denied significant influence in moral and political spheres. From this vantage point, material progress may exist, but its distribution and holistic value is suspect.

These two notions of progress stem from the same reduction or 'corruption' of the Enlightenment ideal. The Enlightenment notion of progress, as discussed earlier, identifies technology as one mechanism of enlightenment by which progress may be effected. In this role technology is a means towards a greater end. The Industrial Revolution brought about a great shift, whereby this means was taken to be the universal 'cause' of the desired 'effect' of progress, and technological progress was thought not only to exemplify but to *certify* all other forms of progress. Technological determinism thus subtly usurped the broader Enlightenment idea of progress: once technological artifacts were granted agency the goal of the perfection of man and politics was supplanted by the drive towards the perfection of the technical arts.

Once the refinement of the *means* was assumed to indicate the perfection towards the *end* of progress, the idea of progress adopted a technocratic form. This hijacking of the earlier 'formula' for progress proved remarkably resilient, especially in the United States. Technocratic progress was the leitmotif of the 19th century, as well as a guiding principle of the nascent American republic; it is a direct descendent of the Enlightenment idea of progress, sharing the same inevitability and historical mode. This section will introduce the historical setting which inspired this idea and allowed it to take root, and then examine the idea of technologically deterministic progress. It will then prove instructive to examine variations of this idea, especially the importance of Marxist views of history, before exploring 20th century modifications of the concept. These ideas came to be regarded as the vanguard of the project of progress, and it is in direct response to these technocratic views that critiques arose alongside disenchantment and pessimism about the idea of progress generally.

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[39] This term, and a cogent defense of Luddism, may be found in David F. Noble, Progress Without People (Toronto: Between The Lines, 1995).

II. Historical Context of Technocratic Progress

The Industrial Revolution

The precise start of the Industrial Revolution is a subject of some disagreement, but it is little disputed that in Great Britain such process was considerably underway by the late 18th century. The first historian to precisely set a date for the opening of the Industrial Revolution was Alfred Toynbee, who found sufficient evidence to select 1760 as a pivotal date. This decision was based on the expansion of industrial iron-works and adoption of advanced loom design, among other mechanical inventions and organizational shifts. [40] More current research, based on detailed economic surveys of British exports and production in this period, find that it is in the years after 1782 (following the dip attributed the War of American Independence) that measures of industrial output first register truly dramatic gains. In these 18 years the annual growth rate first exceeds 2% per annum. [41] While some historians emphasize the importance of long-term historical developments in the preceding centuries, the difference is principally one of focus, rather than fact.

At this time England, Holland, and France were the most-developed countries of Europe across a wide series of measures; England led in many regards. Industrial production and per-capita income are commonly used to compare the era preceding industrialization with the 'new world' it produced. This comparison, however, does not adequately highlight several of the most fundamental differences between the new era of rapid development and change and the period which preceded it. Whereas economic development and population growth – if not social progress – are hallmarks of the machine age, the previous century is characterized by the stagnation of these same vectors; growth was "either painfully slow or spasmodic, or… readily

[40] Alfred Toynbee, Lectures on the Industrial Revolution in England: popular addresses, notes and other fragments, (London: Rivingtons, 1884).

[41] Phyllis Deane, The first industrial revolution, (Cambridge: Cambridge University Press, 1979), 3.

reversible," as described by Phyllis Deane in a history of the Industrial Revolution.[42] The post-industrialization counter to this stagnation was a new regime of constant growth. Key changes of any "Industrial Revolution," but especially this first one, were continual increases in population and economic output. Increasing specialization of labor and geographic integration were also characteristic of this process.

While these social-demographic changes are of great importance, they occurred in concert with rapid changes in the technical landscape. Machine Age innovations appeared to endow man with new powers over nature: coal and steam provided the speed to overcome time and space; iron produced new kinds of bridge spans; looms provided ever greater quantities of cheaper textiles. A shared characteristic of many of these innovations, often underlooked, is the fact that their operation necessitated the creation and maintenance of vast hierarchical-bureaucratic structures. Railway companies needed advanced communications and logistics infrastructure to coordinate around-the-clock year-round service; such advances literally changed time, when railroads standardized Railway Time in 1857, fixing upon Greenwich Mean Time over myriad local noons.[43] Stock-companies abounded which provided for the complicated

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[42] Deane, 8,11.

[43] While Railway Time was standardized at this early date by the companies themselves, local standard times persisted until later in the 19th century to some extent; railway time prevailed as standard time in England in 1880 and in Germany in 1893; an earlier 1884 convention in Washington, D.C. created international time zones. *See* Wolfgang. Schivelbusch, The railway journey: the industrialization of time and space in the 19th century, (University of California Press: Berkeley, 1986), 44. Although certain outliers persisted until these official dates, by 1855, 98% of public clocks in Britain operated under Greenwich Mean Time. In the United States, a failure between private railways to coordinate meant that separate railroad times were kept, with complications arising in stations serviced by multiple companies. The American Railway Association, first formed in 1881 for the purpose of time standardization, initiated a continent-wide system of time zones in 1883, creating four 15-degree-wide time zones offset from GMT, the same Eastern, Central, Mountain, and Pacific times held today. By late 1884 upwards of 85% of all American towns with populations of 10,000 or greater adopted these time zones. Congress passed the Standard Time Act in 1918, formalizing these boundaries and creating a fifth time zone for Alaska. For these and additional details on the standardization of railway time-reckoning, s*ee also* Eviatar Zerubavel, "The standardization of time: A sociohistorical perspective," American journal of sociology 88.1 (1982): 1, 7.

Perhaps the earliest effort to standardize time was begun by the British Post Office. The Post Office began in 1784 to operate its coaches based on precise schedules. The imposition of such schedules meant that mail coaches could not rely upon local time: solar time varies by approximately 4 minutes per degree of longitude. As the first service to directly and regularly connect distant communities, the postal service literally delivered standard time as

financing of international business ventures through minority ownership. Factory efficiency mandated the division of labor and the 'mechanization' of wage-earners, as the nascent class of workers came to serve particular, fungible industrial functions.

Role of Technology in Culture

The popular fascination with invention and technical artifice is well-demonstrated by the success and influence of the grand international exhibitions of second half of the 19th century. Beginning with the 1851 London Exhibition at Crystal Palace, a succession of urban industrial centers proceeded to garner millions of visitors to grand pavilions demonstrating new innovations and extolling the virtues of science and industry. The Columbian Exposition, held in Chicago in 1893 to commemorate the 400th anniversary of Columbus' arrival in the Americas, was the largest of these international events.[44] It presented some 65,000 exhibits: the world's largest enclosed building, the Ferris wheel, Cream of Wheat, and important demonstrations of electricity and other technical innovations.

The Columbian Exposition is historically important for its signal that America had become a true rival to Europe in industrial and technical might, but the "White City" as seen by one of its millions of everyday visitors would have been a series of amusements and mechanical marvels whose net effect would have been the promotion not only of specific technologies, but of technology and industry in general. Its 97,000 electric lights dazzled and amazed visitors, and the successful promotion of electricity and incandescent lighting at the fair was one factor which allowed Westinghouse to thereafter begin construction of its Niagara Falls hydroelectric power station.[45]

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well as mail. Each mail-coach carried a time-piece set to Greenwich Mean Time, which was used to calibrate post offices along the coach-routes. *See* Zerubavel, 1, 6.

[44] Gabriel A. Almond, Marvin Chodorow, and Roy Harvey Pearce, "Progress and Its Discontents," Bulletin of the American Academy of Arts and Sciences 35.3 (1981): 9.

[45] Judith. A. Adams, "The Promotion of New Technology Through Fun and Spectacle: Electricity at the World's Columbian Exposition," The Journal of American Culture 18.2 (1995): 45, 47.

Merritt Smith finds considerable popular evidence for the growth of a 'technological spirit' in the 19th century, nowhere more so than in the United States. Evidence is found in books, articles, paintings, prints, and even songs for that fact that then-contemporary figures identified moral progress alongside tremendous technical progress as the defining achievement of that century. The developing realm of advertising, especially from the start of the 20th century onward, served to produce ever greater volumes of technocratic imagery.[46] American progress personified in art took on ever-more industrial tones, and this period coincides with an explosion of utopian science fiction literature (in America and elsewhere).[47]

While the United States was especially eager in its acclimatization to this new ideology, Britain was yet the leader in industrial might and development in the 19th century. By the 1851 opening of the London Exhibition, a tangled net of railroad lines traversed Britain; materialist, technocratic progress was nowhere more accomplished at this time. The importance of these developments was recognized and aptly summarized by Prince Albert, a notable patron of science. The Prince Consort said the following in a private 1850 speech intended to garner support for the exhibition:

> Nobody who has paid any attention to the peculiar features of our present era, will doubt for a moment that we are living at a period of most wonderful transition which tends rapidly to accomplish that great end, to which, indeed, all history points — the realization of the unity of mankind. … The distances which separated the different nations and parts of the globe are rapidly vanishing before the achievements of modern invention, and we can traverse them with incredible ease; the languages of all nations are known, and their acquirement placed within the reach of everybody; thought is communicated with the rapidity, and even the power, of lightning.
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> … On the other hand, the great principle of the division of labor, which may be called the moving power of civilization, is being extended to all branches of science, industry and art. … So man is approaching a more complete fulfilment of that great and sacred mission … His reason being created after the image of God, he has to use it to discover the

[46] Merritt, R.S. and Marx, Leo, ed., Does Technology Drive History? (Cambridge: MIT Press, 1994), 16.

[47] R. Williams, "Utopia and science fiction," Science-fiction studies (1978): 203, 206. Changing conceptions of utopias (or dystopias) are a valuable measure of certain popular relations with science and technology; though space does not permit a digression, this work presents a helpful analytic framework and history for judging different SF conceptions of utopia through history.

> laws by which the Almighty governs His creation, and, by making these laws his standard of action, to conquer nature to his use. Gentlemen, the Exhibition of 1851 is to give us a true test and a living picture of the point of development at which the whole of mankind has arrived in this great task, and a new starting-point from which all nations will be able to direct their further exertions."[48]

Prince Albert's speech is representative of the optimism of his age, its striking imagery illustrative of an increasingly technocratic current in intellectual and popular sentiment. While its style and scientific orientation link it squarely with similar anticipatory commentary from a century earlier, this passage highlights the prevalent use of technology as indicator *and agent* of progress. Bury, writing before the start of the Great Depression, believed that the hopes and predictions of the 1851 Exhibition were at least partly borne out by history until the time of his writing. Even if material progress could not reliably be expected to produce universal happiness, the popular belief in progress grew ever more fervent in the second half of the 19th century, bolstered by the revelation of *The Origin of Species*.

III. The Invention of 'Technology'

The Age of Machinery

For the intellectual elite of the West in the late 18th and early 19th centuries, scientific knowledge was one way of measuring the advance of reason and tracking the progress expected to follow. Concurrently, the *popular* account of progress became increasing concerned with progress as demonstrated by advances in more tangible dimensions. Leo Marx here contrasts "science" as an abstract realm with the "mechanic arts," a world of artifacts easily represented in machine innovations. He identifies an important turning point in the early 19th century as the idea of 'technology' was invented. The transformation of the 'mechanic arts,' important though they were, into 'technology,' a more abstract yet powerful force, carries great importance.[49]

[48] Excerpt of Lord Mayor's Banquet speech delivered March 21, 1850 at the Mansion house; Theodore Martin, The Life of His Royal Highness The Prince Consort, Vol II, (London: Smith, Elder & Co., 1875), 247. (Bury appears to incorrectly cite the 3rd volume.)

[49] Leo Marx, "Postmodern Pessimism," in Merritt, R.S. and Marx, Leo, 242.

Although the linguistic shift was arguably incomplete until after the First World War, the gradual transition throughout the 19th century remains indicative of shifting ideas in popular consciousness.[50]

The nature of this change from practical arts to technology meant that artifacts could be conceptually transformed into systems and, ultimately, autonomous forces. Marx finds this shift evidenced in the multiplicity of meanings ascribed to the "Age of Machinery," as announced by Thomas Carlyle in 1829. Machinery in this mode meant empiricism, industrialization, the transformation of labor, and the rise 'of hierarchical-bureaucratic forms of social and industrial organization.[51] This broadening of the role and power of mechanics is characteristic of the shift to 'technology' and the general rise of the deterministic, technocratic view. 'Technology' implies a broader frame of analysis than does 'mechanical arts,' and because it need not refer to specific artifacts, it invites what Marx refers to as "metaphysical properties and potencies" which render it a "determinate entity, a disembodied autonomous causal agent of social change."[52]

This change in definition was facilitated by the ways that mechanization and development created new modes of life and relation. Certain artifacts appeared so profoundly novel, mysterious, and magical in popular opinion that they transcended mere artifice even before the mystifying label of 'technology' was placed upon them. The railroad system, for example, possessed certain metaphysical or orientational properties foreign to other artifacts. Schievelbusch describes railroad travelers as experiencing not only the destruction of "traditional time-space relationships," but the "dissolution of reality." The railroad made different communities aware of the importance of consistent time-reckoning, and shrank the time and distances separating distant places. When the locomotive first advanced from a simple artifact to a complex *network* of expedient travel throughout Britain, it allowed for a shift from autonomous

[50] The reader should be advised that here, as throughout this section, the principal concern of 'technology' or 'technical systems' lies with instrumental expressions and technical applications, rather than 'Technique' as a broader animating mode or idea; see the section below ("20th Century") for a brief description of Ellul's well-known conception of *technique* as a broader term.

[51] Leo Marx, "Postmodern Pessimism," in Merritt, R.S. and Marx, Leo, 244.

[52] Leo Marx, "Postmodern Pessimism," in Merritt, R.S. and Marx, Leo, 249.

cities and towns towards an interconnected whole. These implicit powers conjured in the public a sense of fear and awe.[53]

Technological Rationality

The hitherto unprecedented scope and impact of new mechanical arts in the 19th century allowed the creation of 'technology' as an idea, but the underlying requirement for this invention was social in nature. 'Technology' expresses a particular mode of societal relationship with technical artifacts and systems; it was only as a consequence of a change in this relationship that the term became meaningful or powerful in this way. The social processes at the root of this shift are cogently explored by Jurgen Habermas in his reflection on Max Weber's idea of "rationalization" and Herbert Marcuse's subsequent critiques thereof.

Weberian "rationalization" is minimally described as the process by which increasing portions of social action are subordinated to instrumental reason. This is most obvious in the expansion of institutions linked to, or otherwise guided by, science and technology. Marcuse's analysis of this concept postulates that rationalization is a form of political domination, since the extension of rationality destroys existing institutions and because technology, to Marcuse, may never be separated from contingent historical-social projections or certain interests or goals.[54]

This later critique fixates upon technological rationality as the underpinning of a system of political domination. This claim sheds light on the 'invention of technology' because this conception explains the mechanism by which technological systems first transmute 'means' into 'ends.' Rationalization is said by Marcuse to obfuscate its true repression by institutionalizing material progress via technical-scientific means as its principal goal. Faced with increasing power over the natural world and commensurate personal prosperity, society as a whole submits itself to the totalizing instrumentalization of rationality in acceptance of its claims of legitimation. The legitimation of this process is predicated upon the continual expansion of this project of

[53] Schivelbusch, 160.

[54] Jurgen Habermas, Toward a rational society: Student protest, science, and politics, (New York: Beacon Press, 1971), 82.

rationality as well as the perpetual expansion of its technical means and productive capacity. In this respect Marcuse and Habermas' notion of technology and science as a kind of "ideology" or form of domination, whether it be judged meritorious or not, demonstrates the process by which technocratic progress can "capture" the attention and institutions of society while developing a philosophy of legitimacy which creates a self-perpetuating legacy.

Weber's idea of rationality stems from his analysis of the capitalist-industrial-bureaucratic system girdling the dominant, developed nations of his era. Following this reasoning to its roots, the origins of 'technology' may be supposed to arrive as epiphenomena – a consequence of advanced systems and artifacts, and certain intrinsic metaphysical qualities – as well as following from the rise of new hierarchical systems and economic interests made possible (or necessary) by such technical developments.

IV. The 'Atrophy' of the Enlightenment Idea of Progress

The political ideals of the Enlightenment were articulated, however imperfectly, in the American and French revolutions. Enlightenment goals of republicanism, justice, and liberty in the newly formed states initially appeared to be, if not already achieved, near at hand. The early political leaders of this era, especially in America, were firm believers in the 'universal' idea of progress: reason and its instrumental artifacts were tools which would empower mankind to achieve not only prosperity, but moral-political betterment: the technical arts were a "necessary yet necessarily insufficient" means to achieve a broader progress.[55] Yet by the turn of the century, voices clamored for industrialization and improved technical capacity not merely as a foil for the perfection of society through moral betterment, but as the fundamental expression of society's progress. This transition is crucial to understand, because this modified notion of progress usurped its Enlightenment parent and became one of the leading axioms of the 19th and 20th centuries.

[55] Leo Marx, "Postmodern Pessimism," in Merritt, R.S. and Marx, Leo, 249.

It is worthwhile to precisely define this new technocratic vision using the same matrix deployed in Part 1 of this essay. The replacement of reason with technology resolves many of these questions, even as it muddles others. Technological development is a historical process, and the accumulation of scientific knowledge which underpins this development is accumulative by nature. Yet when technological development becomes the stated goal of progress, the nature of any historical 'end state' becomes murky; if man may advance his knowledge to an infinite extent, then so too would the measures of technocratic progress advance in form. As compared with the 'perfectibility' of mankind, the perfectibility of technology is at once more definite *and* ambiguous. It is simpler to identify particular measures of technological advance, but considerably more challenging, based on an understanding of natural laws, to conceive of an end to technological development.

Technocratic progress is 'dissociated' from Enlightenment values of political-social emancipation and moral perfection. It is evident that technocratic progress is changed principally in its means: advancing technology is newly judged the measure of progress, rather than advancing reason and knowledge. This change raises certain additional challenges to the Enlightenment ideal of progress as envisioned by Condorcet and Turgot. Because this idea of progress is indicated by technological advancement first and foremost, it emphasizes materialist progress and *prosperity* before *betterment*.

Human agency was a critical feature of the Enlightenment idea of progress, but the technocratic vision of progress is readily interpreted as a deterministic one for the ways in which it may obviate free will. Turgot proclaimed human ambition and passion to be the messy forces which actualized the march of reason and advanced mankind towards greater perfection (See Part 1), but the feedback loop between the cultivation of the sciences and the advancement of the mind is not made in the technocratic articulation. Instead, technology acts as an autonomous force: while human inventors are acknowledged, even idolized, theirs is merely an incidental role in a narrative of inevitability. If it is *technology* which drives history, then the maker of such technology is recognized only for their contingent contributions. This formulation resolves any

question of naïve individual motivation, but does so at the expense of disregarding general human agency in the longer course of history.

Thus, the 'atrophy' of the Enlightenment ideal of progress may be so called for the manner in which the Enlightenment primacy of reason is simplified and reduced into purely instrumental reason. Technological systems and artifacts are held to carry forth other modes of social progress. The emphasis on artifacts and other tangible developments means that the spatial distribution of this kind of progress is liable to suffer from great gaps of access and equality than a progress promulgated by reason alone. The value system embedded in this idea of progress is reflected in the conditions which produced this intellectual current: societies either rapidly impacted by the powerful effects of industrialization, or those captivated by the possibilities thereof by virtue of historical deprivation. This process is demonstrated in the case of the early United States.

V. The Illustrative Case of Industrial Development in the Early United States

The unique geographic and political particularities of the American colonies made them especially fertile ground for the technocratic vision of progress. This new idea of progress emerged in the United States in conjunction with the demands of independence. The economic relationship between Britain and her colonies emphasized the industrial and trade might of the first, and the rural, agrarian nature of the latter. Colonists, enamored of their liberties, took considerable umbrage with 18th century taxes on manufactured and imported goods. Colonists came to consider the dearth of domestic manufacturing as a threat to liberty.

Manufacturing prowess came to be seen not only as a force for economic development, but as a shield with which to defend Colonial political values in the decades of oppressive tax acts preceding the war for independence. This is a prime example of a pattern of 'technological-industrial colonization,' whereby technology and industry begin with one role and subsequently expand in mission and legitimacy until the original reason for their introduction is either lost

altogether or sublimated into the narrative of legitimation for the system of self-propelling technology.

Benjamin Rush, scientist and president of the United Company of Philadelphia for Promoting American Manufactures, gave a speech before the outbreak of war in 1775 which proclaimed the importance of domestic industry to forestall the complete economic dependence of the Colonies upon the Old World. Even at this time, Rush was sensitive to public agitation about British labor conditions, and declared that such miseries as afflicted British industrial workers would not befall Americans because of differing circumstance. Rush emphasized that industry could employ women and children without siphoning men away from the most-valued vocation of farming.[56]

Andrew Hamilton and Tench Coxe are highly representative of the soon-dominant viewpoint by presenting mechanization and industrialization as the answer to the problem of the United States' economic and political fragility. This attitude cast mechanization first and foremost as an ally of political-economic development, rather than an agent of individual or societal perfection. Coxe, a merchant and manufacturer of arms, promoted early American industrial policy as a Pennsylvania delegate to the Constitutional Convention in 1787 and later as Hamilton's second-in-command at the Treasury department. In this latter role he proved essential in the outcome of Hamilton's "Report on Manufactures," (1791) as well as the foundation of the Society for Establishing Useful Manufactures.[57] Hamilton and Coxe linked the possibilities of America with the possibilities of technology, and even agrarian thinkers like Jefferson found great potential in new technical developments. The revolution impelled the rebelling colonies to increase their capacity to produce firearms, gunpowder, cloth for uniforms, and other materiel. Meanwhile, the post-war economic isolation from Britain, replacing pre-war

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[56] J. F. Kasson, Civilizing the machine: technology and republican values in America, 1776-1900, 1999),10-1.

[57] Jacob E. Cooke, "Tench Coxe, Alexander Hamilton, and the Encouragement of American Manufactures," The William and Mary Quarterly 32.3 (1975): pp. 369-392, 1. In this last role Coxe promoted domestic industry in a variety of ways, including one notable failed attempt at industrial espionage intended to advance the state of textile-mill workings by purloining plans for advanced machines from Britain. (See Cooke, 382).

industrial dependence, meant precipitously scarce supplies of many industrial products. Domestic industry thus became a patriotic endeavor as well as a necessity at the same time that leading intellectuals linked the success of the revolution – and the future of the country – with mechanical developments.[58]

The increase in political order and economic prosperity may have set the path for improvements in social welfare; either way, notice of this spectrum of advances helped certify the technocratic view of progress as an accurate reflection of the world. In this fashion, the idea of technology as a causal law of progress came to prevail. Technical development and industrialization were, in the American context, associated with certain political goals. Once these goals were achieved – immediately, liberty from the Crown – the justification for industrial emphasis shifted to the 'defense' of newfound liberties and the felicitous growth of the country. Manufacturing growth in America was once tied to a desire to *avoid* foreign luxuries and ensure the moral quality of American society.

Industry, once undertaken, soon found means to justify its continued growth and development. The technocratic vision of progress creeps into the original 'idea' of America the more that American success becomes associated with industry. Where success, independence, and vaunted social goals become intertwined or *perceived* as associated with technical sophistication and industrialization, there is fertile ground for the technocratic idea of progress.

VI. Towards Technological Determinism

Hard and Soft Technological Determinism

The political elevation of technology and industry in early America is a representative example of the rise of the technocratic view of progress: political or societal needs were met and advanced by virtue of technological artifice and development. However, this image subordinated

[58] Jennifer Clark, "The American Image of Technology from the Revolution to 1840," American Quarterly 39.3 (1987): 431, 434.

technology at first to the role of a supporting actor, rather than starring lead. Technology was one effective – or perhaps essential – means by which political order could be established and safeguarded; industrialization for the early technocratic republicans was not conceived foremost as a law of history. Rather, industrialization was a process which could be decided upon and promoted by the people and their government to advance the national interest. There remained the real alternative that America should remain a rural, agricultural nation of limited value-added production or industry. The vastness of its lands promised nearly unlimited expansion even without industry. This idea of progress only becomes deterministic when technology is given agency, that is to say, once a technology or technology in general are believed to effect change extrinsic to social forces.

Technological determinism as an idea posits that technology is the key motive force of history, that technologies shapes societies, and that change in technology follows an inevitable historical course. Technological determinism is conventionally defined in two variants: 'hard' and 'soft.' The first definition posits technology as the driving force of history and societal change, but does not allow for human interference in the course of technology's inevitable processes. Humans are consigned to an incidental role, rendered instrumental by their own creations: human society is organized around technology, and this organization is proscribed by the nature of an unchangeable system. Given technologies are either sufficient or necessary for particular schemes of social organization or development. The latter definition also presents technology as a crucial force of history, but acknowledges that the nature and application of technology may remain subject to social or political intervention.

Condorcet's stages of human advancement (discussed in Part 1) highlight the important role of certain technologies in advancing the human condition, be they alphabets or printing presses. Yet Condorcet was not deterministic in his account of man's relationship to technology. Bury succinctly describes Condorcet's position thusly: "Even if [for Condorcet] the compass of the human being's cerebral powers is inalterable, the range, precision, and rapidity of his mental

operations will be augmented by the invention of new instruments and methods."[59] While the global exercise of human reason was believed to be inevitable, the mechanical accoutrements of such reason were either incidental or instrumental.

Thorstein Veblen's Theory of Social Evolution

Thorstein Veblen developed a related idea in the 19th century, and his theory of social evolution may be the first technologically deterministic account of historical processes. Veblen's work is useful as an account in some important ways typical of the emergent technocratically deterministic view. The 19th century is peppered with figures who provide breathless accounts of the transformative impact of technical development, but Veblen is the first to use the term 'technological determinism' and the first to seriously demarcate historical *stages* where technology plays a critical role. [60]

Veblen's idea of social evolution was only hazily described, but certain artifacts were critical in producing new stages of social existence. Whereas Condorcet's idea only held that certain advances were *markers* of the advance of reason, Veblen developed instead the thought that certain *technologies* shaped human society; the difference may be seen in the manner in which the two describe the traversal through different epochs. For Condorcet, the focus is – as in his title – on the development on the *human mind*. Veblen's portrait of social evolution, however, is predicated upon the invention or discovery of certain contextually significant technological developments.

Although his beliefs often proved self-contradictory, and did not always align with determinism in the long sense, Veblen's theory of social evolution was premised upon a technocratically deterministic view of human social processes, if not history. Technological artifacts or systems herein are agents of science and rationality, and as such are able to pose challenges to those constitutive institutions of society premised upon superstition.[61] In this regard

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[59] Bury, 214.

[60] Andrew Murphie and John Potts, Culture and technology, (New York: Palgrave Macmillan, 2003), 12.

[61] John Cunningham Wood, Thorstein Veblen: Critical Assessments, (New York: Routledge, 1993), 406.

the emergence of particular technologies or technological systems, in a given society, would result in the erosion of certain institutions and the creation of different structures.

This social theory of change dictates certain modes of change which proceed once circumstantial technological conditions are met, or are otherwise driven my machine-industrial logic. Once a population comes to "live by and within the framework of the mechanistic logic," it stands to "*lose faith in any proposition that can not be stated convincingly in terms of this mechanistic logic. Superstitions are liable to lapse by neglect or disuse in such a community... that is to say proposition of a non-mechanistic complexion are liable to insensible disestablishment... superstition ... coming to signify whatever is not of this mechanistic or 'materialistic' character*."[62] 'Superstition' extends not only to the world of the clergy, but to any class of idea which cannot be placed in a 'materialistic' category. This idea of the industrial arts as the catalyst of social change emphasizes the way in which technology and technological systems change the relationship between humanity and the physical world.

This social evolution begins, much as does Turgot's, with the transition from subsistence agriculture or nomadic life to larger-scale enterprise. "*With a sensible advance in the industrial arts the scale of operations would grow larger, and the group more numerous and extensive. The margin between production and subsistence would also widen and admit additional scope for individual ambitions and personal gains*."[63] The continuing "advance in the industrial arts" proceeds to lead to the rise of property rights, and ultimately serves to regroup society on the basis of wealth and poverty and master and servant.

Veblen's conception of technological determinism is made perhaps most clearly by the example he gives of the relationship between industrial development, modern warfare, and the structure of states. In his book, *An inquiry into the nature of peace and the terms of its perpetuation*, the critical role afforded technology is evident. Cognizant of the accelerating developments in

[62] Thorstein Veblen, An inquiry into the nature of peace and the terms of its perpetuation (New York: The Macmillan Company, 1917), 361-2.
[63] Veblen (1917), 50.

the means of waging modern war, Veblen believes that any nation which seeks to assert its interests or protect itself must develop the industrial capacity to produce the industrial outputs of war. This fact of history – success in war predicated upon technological sophistication – is the seed of a deterministic account of state development and indeed international relations:

> "It appears, in the (possibly doubtful) light of the history of democratic institutions and of modern technology hitherto, as also from the logical character of this technology and its underlying material sciences, that consistent addiction to the peculiar habits of thought involved in its carrying on will presently induce a decay of those preconceptions in which dynastic government and national ambitions have their ground."[64]

Thus, the growth of technology will inevitably destroy dynastic, imperialistic forms of government as well as nationalism, in Veblen's account; both militant nationalism and imperialism are identified as sources of violent conflict. Yet he continues:

> "At the same time, popular proficiency in the modern industrial arts, with all that that implies in the way of intelligence and information, is indispensable as a means to any successful warlike enterprise... modern technology, with its underlying material sciences, is a novel factor in the history of human culture, in that addiction to its use conduces to the decay of militant patriotism, at the same time that its employment so greatly enhances the warlike efficiency of even a pacific people..."[65]

In this way, technology is believed to upend existing social conventions, but until its consequences fully disabuse populations of militant nationalism, it will newly empower certain warlike states.

In addition, Veblen valued the role that technology would play not only in making nationalism irrelevant, but in the ways which advancing mechanical arts could promote equality. In his best-known work, *The Theory of the Leisure Class*, Veblen expresses his hope that technology may eliminate some of the impetus for conspicuous waste and conspicuous consumption and, by destroying old social institutions, help promote gender equality. Technology is also important for the way it served to create such problems, however, since it is only by the advent of certain industrial-mechanical developments that the leisure class

[64] Veblen (1917), 313.
[65] Veblen (1917), 314.

may exist at all. The defining characteristic of the leisure class, its "conspicuous exemption from all useful employment," is possible only with the surpluses and development created by the transition from savagery to some limited form of industry, even if it may be lacking in modern or mechanical qualities.[66]

This view of social evolution is linear and accumulative in respect to the development of knowledge and subsequent invention of particular transformative technologies; steam engines would plausibly be granted to first require advances in metallurgy, for example. However, the nature of change *itself*, as affected by these causal artifacts, is less accumulative and more of an abrupt process in execution. Institutions are unwoven and remade in response to the challenges that these technological agents pose, a process which may be described as a hybrid 'event-driven process.' Because knowledge and technological sophistication may advance indefinitely, this form of social evolution may continue in certain ways as successive generations of technology pose new challenges to traditional social institutions.

Ultimately the Veblenian account is useful because it is almost an extreme case of the notion of 'autonomous technics.' In this concept of social evolution, emergent technologies reshape societies in consistent and (supposedly) predictable ways across culture; the impact and consequence of industrialization is the same in Japan or Germany; where the cultural soil is not immediately hospitable to this mechanizing logic, its inhabitants become susceptible to the augmented powers of those who accepted its premises sooner, and may therefore become forced converts of the same.

VII. Marxist Variations on the Technocratic Idea of Progress

It would be remiss to fail to highlight certain Marxist intellectual currents of this period.[67] Marxist views of history represent an important voice in the development of the technologically

[66] Thorstein Veblen, The theory of the leisure class: an economic study of institutions (New York: The Macmillan Company, 1912), 40.

[67] 'Marxism' as a term represents a hugely heterogeneous category of ideas. Karl Marx's works produced many different intellectual currents and quite a few bickering children. The objective here is not to establish or describe 'the one true way' but rather to trace and consider particular outgrowths of Marxism which proved influential in the context of this current discussion of a technocratic view of history.

deterministic idea of progress. The principal contribution of Marxism to this conversation is its discussion of the historically inevitable in relation to changing modes of social relation and production. Certain theorists of technological determinism go one step further, and argue that Karl Marx himself was technologically determinist by virtue of his beliefs about the relationship between the technological bases of production and social change. While it is outside the scope of this paper to fully answer this claim, the existence of such contemporary commentary suffices to demonstrate the powerful influence Marx's ideas hold on some later thinkers. One especially salient source for these beliefs may be found in *The Poverty of Philosophy*, where Marx writes:

> "In acquiring new productive forces men change their mode of production, and in changing their mode of production, their manner of gaining a living, they change all their social relations. **The windmill gives you society with the feudal lord; the steam-mill, society with the industrial capitalist**."[68]

This phrasing alone is enough to represent the relevance of Marx's ideas to the discussion of technological determinism.

Rather than parsing the tea leaves of Marx's writings, it may be more instructive to consider the Marxist ideas of Karl Kautsky, an influential force in early 20th century Marxism and the author of many important ideas about Marxist historiography. Kautsky's philosophy may rightfully considered to be representative of those Marxist conceptions of history which prove most applicable to the question of technological determinism and technocratic historiography; Kautsky mirrored Marx's steam-mill paradigm when he wrote that he "*[did] not intend to deny that every system of production demands certain definite technical and also psychological preliminary conditions in order to enable it to be realized*."[69]

Kautsky argued that "the advance and progress of the proletariat in capitalist society is irresistible"[70] and for this category of irresistible, deterministic thought his ideology has been

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[68] Karl Marx, The poverty of philosophy, trans. H. Quelch (Chicago: Charles H. Kerr & Company, 1920), 119. Elsewhere this may be translated as "hand-mill" but the notion is the same.

[69] Karl Kautsky, The Social Revolution, trans. A. M. Wood Simons and May Wood Simons (Chicago: Charles H. Kerr & Company, 1916), 184.

[70] Karl Kautsky, The Materialist Conception of History (New Haven: Yale University Press, 1988), 69.

called 'fatalistic.'[71] Kautsky amended this statement elsewhere to ameliorate such charges, but without success, as when he wrote:

> "If we speak of the necessity of the victory of the proletariat... we do not mean that victory is inevitable, or perhaps, as many of our critics perceive it, [that victory] must come of itself with fatalistic certainty, even if the revolutionary class does nothing. Here necessity is understood in the sense of the only possibility of further development."[72]

This same fatalistic thread brought about his fall from grace after the First World War, when Kautsky's law-based notion of history conflicted with the immediate demands of more revolutionary Marxists.

Jules Townshend chronicles the arguments laid out against Kautsky by the Neo-Hegelians, whose competing Marxist franchises he finds argued the following:

> "[Kautsky] saw socialism as the ineluctible product of evolving economic forces, implying that the proletariat did not have to work in a determined fashion to displace the bourgeoisie. When confronted with the question of whether to take militant action, it could afford to wait, happy in the knowledge that victory would ultimately be theirs, when the productive forces had fully matured, since revolutionary class consciousness was an epiphenomenon of economic development."[73]

Because Kautsky emphasized irresistible economic laws of nature, he was criticized for his failure to adequately include in his view of history a role for human agency. (While Kautsky did, in fact, accommodate human agency within his ideology of history, the resulting construct proves fragile or at worst circular in light of his forceful statements on the inevitability of the proletariat).

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[71] Paul Blackledge, "Karl Kautsky and Marxist historiography," Science Society 70.3 (2006): 337, offers a thorough account of the various accusations of 'fatalism' against Kautsky; claims which may have been injurious to the influence his political thought, but remain relevant and indeed supportive of this present discussion. Again, though Kautsky's fatalism or determinism remains a contested issue, the mere fact that he was accused or branded a fatalist is sufficient to demonstrate the ways in which his ideas contributed to the deterministic currents of Marxist historiography and a strain of positivistic, scientific approaches to history.

[72] Karl Kautsky, "Allerhand Revolutionares," Die Neue Zeit 22.1 (1903-04): 655-6, as cited in Gary P. Steenson, "Karl Kautsky: Early Assumptions, Preconceptions, and Prejudices" in John H. Kautsky, ed., Karl Kautsky and the social science of classical Marxism (Netherlands: E.J. Brill, 1989), 42.

[73] Jules Townshend, "Reassessing Kautsky's Marxism," Political studies 37.4 (1989): 659-60.

If Kautsky was vilified by Bolshevik-sympathizing militant Marxists after the first decade of the 20th century, his historiographical notions found refuge with those who sought to appropriate Marxist materialist conceptions of history to the end of determinism. This formulation proved inviting for many future authors, who adopted its logic as their own.[74] Kautsky's contributions to this strain of Marxism serve to highlight the ways in which Marxism in the late 19th and early 20th century was interpreted towards deterministic ends through the lens of scientism. While Marxist views of technocratic determinism point towards a particular socioeconomic end-vision which differs from the traditional mold, the postulated mechanisms and underlying historical processes as described by Veblen or Kautsky are similar.

VIII. 20th Century Modifications of the Technocratic Idea of Progress

The technocratic idea of progress was reevaluated and altered in the 20th century, reflecting changes in technology and society in the industrialized countries. In addition, new perspectives on international development reshaped the relationships between industrialized and non-industrialized countries; the emergence of international institutions and the two World Wars all served to inspire revision and reapplication of this idea of progress. While some of these revisions share the optimism and hope of the original technocratic picture, others prove sour or even apocalyptic while holding the same general views of history and agency.[75]

[74] Robert Heilbroner is among the most straightforward of those who would label Marx's theory of socioeconomic change technologically deterministic. Heilbroner expands upon Marx's aside in his piece, Do Machines Make History?, concluding that history proceeds in such a way that no society may split atoms until it has first come to appreciate the power of steam. *See* Robert L. Heilbroner, "Do machines make history?" Technology and culture 8.3 (1967): 335. For further examples of this genre, see also Lewis Mumford, The myth of the machine: Technics and human development, (New York: Mariner Books, 1967).

[75] This optimistic / pessimistic nomenclature may also be found in Langdon Winner's essay "Where Technological Determinism Went" in Stephen H. Cutcliffe and Carl Mitcham, eds., Visions of STS: Counterpoints in science, technology, and society studies (Albany: State University of New York Press, 2001), 12.

Rostow's Modernization Theory

The most prominent of these revisions forms the heart of modernization theory. This alteration applies the earlier ideas of progress to the question of economic development, and in so doing develops a deterministic thesis of social evolution predicated upon technological development. Walter Rostow is the father of this optimistic social-scientific application of the idea of deterministic progress. This idea stipulates that all societies move through immutable stages of development characterized and dependent upon certain forms of technology. While the mere 'application' of said technologies may be insufficient for the advance from one stage to the next, technology is a necessary element of the transition from pre-industrial to 'take-off' and ultimately 'modern' society, a state closely resembling the conditions of 20th century Western Europe or the United States.[76]

Rostow's thesis of technology-driven economic development is optimistic in nature because it takes the 'modern' condition to be a desirable goal and proposes universal means by which this advancement is to be achieved. Its determinism will bring net benefit to the world as developing nations 'take off,' improve the condition of their own peoples, and contribute more to the world at large as their capacity to do so increases in pace with their development.[77]

The central feature of Rostow's vision of economic development is his effort to create five specific categories of economic development which serve to describe any given state. This categorization is a function of his efforts to incorporate non-economic forces and broader historical trends to the study of economic development. Rostow identifies the most crucial of these forces to be the "complex linkages among science, invention, and innovation that generate

[76] *See* Walt W. Rostow, "The stages of economic growth," Economic history review 12.1 (1959): 1, for the principal introduction to this philosophy.

[77] Rostow's exuberant optimism extended to his work as National Security Adviser during the Vietnam war, where he exhibited a tremendous ability to ignore negative information about the progress of the war in Vietnam. For an account of Rostow in this foreign policy context, see David Halberstam, The best and the brightest (New York: Random House, 1972).

the flow of new production functions."[78] Differences in technological sophistication produce the differences in "economic dimensions" which lead to classification as either "traditional society, the preconditions for take-off, the take-off, the drive to maturity, [or] the age of high mass-consumption."[79]

Each of these social-economic 'epochs' is defined by its technological and industrial-productive capacities. The transition from traditional society to the 'preconditions for take-off,' for example, is the interlude in which a traditional society is transformed "*in the ways necessary for it to exploit the fruits of modern science*."[80] It is in Rostow's description of the "take-off" condition that his ideology begins to resonate more with the deterministic theses described earlier in this section. In the take-off stage, he writes, *"[t]he forces making for economic progress, which yielded limited bursts and enclaves of modern activity, expand and come to dominate the society. Growth becomes its normal condition. Compound interest becomes built, as it were, into its habits and institutional structure*."[81] This is meant to describe a system which, set in motion, develops a momentum unto itself.

This sequence 'terminates' in the age of mass consumption typified by the United States or Western Europe of the post-war period. While Rostow notes that in the 'drive to maturity' a society may initially 'exhaust' its applications of modern technology, by applying them across whatever resources it may possess – mechanizing its farms, industrializing the manufacture of clothing and the like. In this one respect technological development may become subordinated to, for instance, social welfare. This is relevant to the extent that Rostow identifies the animating forces of economic growth to be "changes in population, resource availability, investment, and technology"[82]; mature societies cease to be economic rocket-ships once fewer low-hanging fruit

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[78] Walt W. Rostow, Theorists of economic growth from David Hume to the present : with a perspective on the next century, 1992)., 430.

[79] Walt W. Rostow, The stages of economic growth: a non-communist manifesto (Cambridge: Cambridge University Press, 1990), 4.

[80] Rostow (1990), 6.

[81] Rostow (1990), 7.

[82] Rostow (1990), 251.

remain. What Rostow acknowledges, however, is that even in a society which shifts its focus to consumption of bicycles, automobiles, and sewing machines – rather than wheat, or railroads – the role of technology and industry remains strong, for in a democratic society driven by consumer interests, the provisions of any 'welfare state' are necessarily technological or industrial in nature.

Rostow's work came about on the eve of decolonization, and it is with respect to these newly minted nations that he has great optimism. For while the then-developed world had taken all of human history to emerge from its traditional state, the developing world would be dragged forward by the vanguard of the West; nowhere on earth could the influence of modernization be escaped. An enormous back-log of technological development awaited traditional and pre-take-off countries, who would therefore find their progress much accelerated.[83] Because these technological inputs would be the same, so too should similar results across geography be expected, albeit with fluctuations in speed or rate of adoption. While Rostow's progress doesn't quite offer infinite visions of development – he acknowledges that diminishing returns may reduce the rate of per-capita growth – it does anticipate that technological development can lead to improved living conditions for all the people of the world.

Ellul's Pessimistic Determinism

The pessimistic interpretation of the technocratic thesis is archetypically represented by Jacques Ellul, whose notion of *technique* identifies technology, technological systems, and associated organizations and culture as a world-altering phenomenon without modern peer and with little hope of interruption. While Ellul may dispute the label 'determinist,' such a

[83] Outside this example of "accelerated development," Rostow clearly considers technological progress to be highly accumulative in nature; his conception of progress is one of collaboration and steady development, with individual genius the exception rather than the rule. In technological development as in that of societies, there are no short-cuts from one stage to the next, though such advancement may take place at different rates depending on particular circumstances. *See* Walt W. Rostow, How it all began: origins of the modern economy, (New York: McGraw-Hill, 1975), 26.

distinction is aesthetic; Ellul's idea of a "technological system" is traced through history, and he identifies *technique* as the animating force throughout disparate historical periods.[84]

The key principle of Ellul's philosophy emphasizes the technical takeover of society. This results in technical systems and material-instrumental means becoming ends unto themselves which demand the reactive, responsive adaptations of man. This problem is exclusively modern because it is only in the industrial era that technical-industrial production and bureaucratic organization gained the "blind" autonomous capacity to thwart mankind's static (or linearly growing) ability for instrumental exploitation. Ultimately this idea of technique sees technology as but an amoral medium: "the harmful effects of technical progress are inseparable from its beneficial effects," Ellul writes.[85]

Ellul's idea of technological determinism is pessimistic for two reasons. First, Ellul's idea of civilization saturated with, indeed existing within technology, is thought to have negative consequences for the human condition. Especially in moral and spiritual categories, he finds *technique* to be harmful, for its endless instrumental drive for efficiency destroys the need and eventually capacity for moral decision-making – all decisions become reduced to mere technical calculation. Values become technological in nature, and the direction of society increasingly is determined not by human directives but by technological ones. This leads naturally to another classic Ellulian formulation, that of the efficiency principle: technique leads to the reduction of many possible means into *one*, that being the most 'technically efficient,' what Ellul calls "reason in the guise of technique."[86]

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[84] The notion of technique is complicated and merits only partial explication here; it is sufficient to recognize that Ellul finds a definition of technological progress which focuses only on productive capacity to be lacking, and includes in his idea of technique other notions of technical means. *Technique* is a considerably complicated term which refers not only to machines and technological knowledge, but any process which operates by similar causal or logical methodology. Robert Merton gives an excellent distillation in the foreword to Ellul's 1964 American edition by describing technique as "any complex of standardized means for attaining a predetermined result… it converts spontaneous and unreflective behavior into behavior that is deliberate and rationalized." Technique is a search for perfect efficiency in all respects, be it the development of a nuclear warhead or electric toothbrush. Jacques Ellul, The Techonological Society, (New York: Knopf, 1964), vi.

[85] Jacques Ellul, The technological bluff, trans. Geoffrey W. Bromiley (Grand Rapids: Wm. B. Eerdsmans, 1990), 54.

[86] Ellul (1990), 21.

Secondly, Ellul believes that the current state of Western civilization is almost certainly too deeply entangled with technology to be extricated from its present condition. This latter point is worth exploring further to understand the most important tenets of Ellul's philosophy. Why is current civilization doomed by technique? Technique at present is presented with no counterweight; there is nothing which can compete with its sway over man and society. Morality, public opinion, social structure, and the state are all forces which could oppose or shape technique. Yet he concludes:

> "[Public opinion] is completely oriented in favor of technique; only technical phenomena interest modern men. The machine has made itself master of the heart and brain both of the average man and of the mob. What excites the crowd? Performance … technique is the instrument of performance. What is important is to go higher and faster; the object of the performance means little. … He looks for nothing beyond the marvelous escape mechanism that technique has allowed him, to offset the very repressions caused by the life technique forces him to lead. He is reduced, in the process, to a near nullity."[87]

Even if public opinion could be swayed against technique, he argues, propaganda would be marshaled to resolve the impasse. Social organizations pose no threat either, for they are all organized around technique, whether sport or culture; no modern associations were centered around "human needs and instincts" – instead, "*Man, in modern societies, is not situated in relation to other men, but in relation to technique… Modern collectivities and groups have no existence beyond technique*."[88] Lastly, the state poses no obstacle to the domination of technique because it has not only abdicated its role of governance, but further come to value and depend on technique in such a fashion as to become an auxiliary in its promotion and enshrinement; the state serves to coordinate the system of technique.

If Ellul is shy about being called a pessimist, he takes no issue with identifying determinisms in the world.[89] To him, "*freedom is not an immutable fact graven in nature and on the*

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[87] Ellul (1964), 303.

[88] Ellul (1964) 305.

[89] Ellul actually describes himself as *not* being a pessimist, for the simple reason that he is "convinced that the history of the human race, no matter how tragic, will ultimately lead to the Kingdom of God. ... I take the reality we live in ... in relation to salvation and God's love, which leaves no room for pessimism." Reliance upon the existence of a God

heart of man … as a matter of fact, reality is itself a combination of determinisms, and freedom consists in overcoming and transcending these determinisms."[90] His goal is to have his reader "[grasp] the world nature of the technological phenomenon, and the extent to which it is robbing him of freedom, [so that] he confronts the blind mechanisms as a conscious being." In his own words, he seeks to "call to the sleeper to awake."[91] Ellul wants to awaken the 'sleepers' to the pervasive, inescapable influence of technique in Western civilization.

Writing decades later, Ellul introduced the idea of the "technological bluff," once the success of technique, the speed of its development, and the insatiable nature of its hunger became truly clear:

> "The proliferation of techniques, mediated by the media... has outflanked prior obstacles and integrated them progressively into the process. It has encircled points of resistance, which then tend to dissolve. It has done all this without any hostile reaction or refusal... for what would it be opposing? This is no longer clear, for insinuation or encirclement does not involve any program of necessary adaptation to new techniques. Everything takes place as in a show, offered freely to a happy crowd that has no problems."[92]

Society has been "neutralized" and can no longer present any conflict to this encroachment; it has become so familiar and expected, so ordinary, that it has created a gulf between reality and the discourse of techniques. Technique, aided and abetted by society, is undertaking "the great innovation," the elimination of the gap between humans and technique.[93]

Rostow's optimistic social scientific interpretation, and Ellul's pessimistic understanding of the idea of technocratic idea of progress both share a belief in its self-directing, "blind" capacity for influence. This quality has proven to be seminal in typifying the technocratic deterministic idea of progress, for without autonomous technology, artifacts and systems are

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or Gods, however, is shaky ground for saving Ellul from the label 'pessimist.' See Ellul's discussion *in* William H. Vanderburg, ed., Perspectives on Our Age: Jacques Ellul Speaks on His Life and Work, 3rd ed. (Toronto: CBC Enterprises, 2004), 85.

[90] Ellul (1964), xxxii.

[91] Ellul (1964), xxxiii.

[92] Ellul (1990), 18.

[93] Ellul (1990), 19.

merely tools of the reason-driven idealist. This property is an analytic vulnerability exploited by those who dispute the deterministic properties of this idea: the notion of technology as an animating force is opposed by the Social Constructivist school, among others to be discussed in the following section.

IX. Summary

This demonstration of the technocratic idea of progress shows the ways in which the Enlightenment ideal was reformulated in the forge of the Industrial Revolution. This change reduced the agent of progress from science, reason, and rationality to technology alone. This idea of progress is advantaged insofar as 'advances' prove easier to measure: the output of a loom, the speed of a train, or the power of a steam engine. Yet this 'benefit' served ultimately to undermine the ideology of progress. Advances in technical innovation were easily observed, but corresponding increases in 'social progress' or the other metrics of progress, as defined in Part 1, were neither as evident nor as quantifiable.

This incongruity proves to be an almost fatal strain for the technocratic idea of progress, for once observed, the disparity is not easily explained. Notions of 'cultural lag' or other processes may articulate why certain technologies fail to lead to the perfection of humanity, but over a long enough period of time the disconnect becomes ever more glaring. Turgot's notion of intermittent regresses as a part of general progress could not easily be applied when the presumed indicator *and* cause of progress, technology, was obviously advancing. This simplification of the idea of progress had doubters in the 19th century, but retained popular support into the 20th. It was not until the 20th century that intellectual critiques of this axiomatic ideology emerged broadly, accompanied by popular disillusionment. These critiques and their popular analogs are examined in the following section.

Part 3: Intellectual Dissent and Popular Disillusionment

> It is shown that, whatever the temperature to which a section of the atmosphere may be heated, no self-propagating chain of nuclear reactions is likely to be started. ... However, the complexity of the argument and the absence of satisfactory experimental foundations makes further work on the subject highly desirable.
>
> – "*Ignition of the Atmosphere with Nuclear Bombs*," Los Alamos National Laboratory report, 1946.[94]

Introduction

The technocratic idea of progress rose to preeminence with the same modern world it helped to inspire and create. As related above, the elevation of technology introduced elements of determinism. Because progress in technology is identified as the means of general advancement, the course of progress should be predictably synchronous with such technical developments. While technological development was an important factor in many important advances of the nineteenth and early 20th centuries, over time technology came to be subjected to greater scrutiny and criticism.

These critiques came from aesthetic, environmental, economic, religious, and other directions. But the commonality across all was the abandonment or erosion of the principle behind the technocratic ideal of progress: technology as the crucial agent of progress. Some wanted only to 'tame' the machines, to reassert their subordinate role as tools rather than autonomous technics; others possessed more extreme objectives. The underlying assumptions of the idea of progress were questioned.

Two kinds of analytical challenges to the technocratic idea of progress are especially illuminating. First, the notion of 'technology,' as described in the preceding section was influentially rejected by the social constructivist school. Technology was reframed as the product of social action, and in this new light there appeared new prospects to control or otherwise 'tame'

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[94] E. J. Konopinski, C. Marvin, and E. Teller, "Ignition of the Atmosphere with Nuclear Bombs" (Los Alamos National Laboratory, 1946), 1. Summary report LA-602, written by Konopinksi, Marvin, and Teller and declassified in 1973, examined the question of whether or not the temperatures and pressures associated with certain nuclear bombs might initiate a nuclear chain reaction which would ignite the atmosphere. Fortuitously, the conclusions of the report found that this was unlikely under even the most extreme of circumstances, owing to the scattering of resultant radiation; for some time during the Manhattan Project it was a question of uncertain answer.

technology. Technology subsumed in this fashion became but an especially important phenomenon of social agency. This strain is complemented by the second type of assault, the 'alarmist' view, which trespasses on technological determinism and technical agency by finding fault with the technocratic idea of progress and seeking to reign in technology. This assertion of human agency implicitly refutes the elements of optimistic 'inevitability' associated with the idea of progress. These divergent approaches both serve to critique the independence of technology as a social-historical force, leading to the conclusions that its potentially harmful qualities or effects may be diminished or otherwise undone by concerted human action.

What stimulated these critiques? The 20th century provided a series of powerful examples of the potentially destructive or dominating powers of technology and technological systems. While the 19th century was exceedingly peaceful by historical standards, the 20th century was punctuated by wars unprecedented in their scale or brutality. Industrial might and technical innovation were directed to deadly ends in the manufacture of dreadnaughts, mustard gas, submarines, atomic weapons and more. In the 20th century, tensions between the images of progress and reality became especially evident: the means had advanced, but the end remained out of sight or out of reach. This incongruity inspired intellectual critique and popular disillusionment, even if these forces were never unitary in intention or ideology.

I. Historical Context of Disillusionment

When the United States overtook Britain in industrial might, it also assumed the mantle of progress. Henry Luce, on occasion of the New Republic's fortieth anniversary in 1954, announced that "The business of America is to progress; and Progress is the business of America. We are a nation forever on the march."[95] From Luce's vantage point, "our material and political problems having been so largely solved," the paramount question was how America would lead the world forward – and to where. Luce recognized certain problems, e.g. "slums, Negro rights... traffic jams" which were but in the "process of solution," being largely technical in nature. Luce

[95] Henry Luce, "The Promised Land," New Republic Dec 6, 1954: 19.

made his observations near the apex of the influence of the technocratic idea of progress. Many of the injustices and ills of industry and technology had been righted in decades past; technology had 'won' the war and provided for a peace of unprecedented prosperity. But no amount of optimism could serve to hide the fact that certain fundamental problems remained unsolved, and in the decades following his pronouncement American society – and that of the entire developed world – was nearly torn asunder by these strains.

These changes and other tensions may have gone unrecognized, but they were not without their warning signs. The theme of disillusionment is as old as invention itself, but the unruly thread which pulled loose the technocratic vision of progress can be traced back most clearly to the 19th century. Brief examination of these early doubts will help explain how Luce could be wrong in his mid-century prognostication, even if so much else of his "American Century" came to pass. It will then be instructive to examine the more 'mature' historical context of objection from the second half of the 20th century.

Machine and Nature in the 19th Century

The earliest questioning of industrial revolution technology situated industrial forces as one half of a confrontation between machine and nature. More than the inhuman conditions of the mine or mill, this confluence is visualized through the physical uprooting of nature to make way for invading railroads. The image of the poet-reveler contemplating nature's meadow only to be interrupted by a train, "the whistle of the locomotive – the long shriek, harsh, above all other harshness," as Nathaniel Hawthorne described it, is not uncommon.[96] The trains of *Walden* interrupt the meditative calm of Thoreau's woods, their "smoke and steam and hissing" bringing with them "all the restless world."[97]

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[96] Julian Hawthorne, ed., Nathaniel Hawthorne and His Wife (Boston and New York: Houghton Mifflin and Company, 1884), 503. Note also, elsewhere Hawthorne describes "a tremendous shriek, careering along the valley as if a thousand devils had burst their lungs to utter it, but which proved to be merely the whistle of the engine on arriving at a stopping-place" in reference to the whistle of that train which runs between the fictional City of Destruction and the Celestial City in his dream's-eye. See Nathaniel Hawthorne, "The Celestial Railroad," The Works of Nathaniel Hawthorne (Boston and New York: Houghton Mifflin and Company, 1882), 221.

[97] Henry David Thoreau, Walden, or, Life in the woods (Boston: Houghton Mifflin Company, 1910), 196.

Yet for all the interruptions of railroads, Thoreau was not truly eager to reject technology; rather, he simply expressed his frustrations. Thoreau writes that in many instances, "it certainly is better to accept the advantages, though so dearly bought, which the invention and industry of mankind offer."[98] Hawthorne may have had more nightmarish visions of industry, stemming from his time serving as American consul in Britain, witnessing firsthand the effects of more advanced industry in "our old home."[99] Both the transcendentalist and the romantic may be said to raise the question of unintended technological consequences.

Thamus and Theuth

If their context was new, the ideas were not. An earlier historical example of this idea may be found in Plato's dialogues, where Socrates relates the (invented) story of Thamus and Theuth to Phaedrus, as follows:

> "At the Egyptian city of Naucratis, there was a famous old god, whose name was Theuth ... he was the inventor of many arts … but his great discovery was the use of letters. To [King Thamus] came Theuth and showed his inventions, desiring that the other Egyptians might be allowed to have the benefit of them; he went through them, and Thamus enquired about their several uses, and praised some of them and censured others, as he approved or disapproved of them. ... when they came to letters, this, said Theuth, will make the Egyptians wiser and give them better memories; for this is the cure of forgetfulness and of folly.
>
> Thamus replied: **O most ingenious Theuth, he who has the gift of invention is not always the best judge of the utility or inutility of his own inventions to the users of them.** And in this instance a paternal love of your own child has led you to say what is not the fact; for this invention of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. You have found a specific, not for memory but for reminiscence, and you give your disciples only the pretence of wisdom; they will be hearers of

[98] Thoreau, 44. His reasons in this context are principally material, coming in the context of a discussion about architecture and lodgings; he continues: "In such a neighborhood as this, boards and shingles, lime and bricks, are cheaper and more easily obtained than suitable caves, or whole logs, or bark in sufficient quantities, or even well-tempered clay or flat stones."

[99] In relation to Lancashire and Manchester, Hawthorne said "I have never passed through [Lancashire] without wishing myself anywhere but in that particular spot where I then happened to be" by virtue of its monotonous landscapes, black smoke, and disfiguring factory waste. Nathaniel Hawthorne, Our Old Home (London: Smith, Elder & Co, 1863), 226-7.

> many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome, having the reputation of knowledge without the reality."[100]

Thamus, King of Upper Egypt, was able to find fault with the innovations of Theuth where the inventor himself was blind. The 'unintended consequences' of industrialization became increasingly evident as the effects of the industrial revolution became more widespread and its methods more efficient and exacting; these changes in turn inspired the remarks of Thoreau, Hawthorne, and others.

World Wars and the Great Depression

If certain intellectual hackles were raised in the 19th century, it was not until the fuller development of society-scale technological systems that more popular agitation and frustration developed. The 19th century popular relationship to technology is best exemplified in the public reaction to World's Fairs: shades of awe and inspiration at inventions like the electric light, telephone, Eiffel Tower or Ferris wheel. This wonder is reflected in the rise of magazines like *Popular Science*.[101] But as industrialization progressed, the cost of the 'advantages' Thoreau described became, if not more odious, more obvious to more people. There was, above all, a growing recognition that unfettered technological development had brought about certain negative outcomes not associated with the orthodoxy of the technocratic idea of progress.[102]

After the experience of the First World War, when millions of young men were gassed and thrown into the meat grinder of machine gun fire across Europe, the next most important development was doubtless the Great Depression. While labor unrest earlier spoke to the

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[100] Plato, The Dialogues of Plato, trans. B. Jowett (London: Macmillan and Co., 1871), 610. This story is found as the introduction to Neil Postman's *Technopoly*, a study of the technological usurpation of culture. See Neil Postman, Technopoly: The surrender of culture to technology (New York: Knopf, 1992).

[101] Mark Jannot, current editor of Popular Science, captures the sentiment of the publication when he writes that "the core belief that Popular Science and our readers share [is that] the future is going to be better, and science and technology are the driving forces that will help make it better." Popular Science: Mission, PopSci Media Group, 04/05 2011 <http://popscimediagroup.com/popularscience/index.html>.

[102] See also Mark Twain's 1889 novel *A Connecticut Yankee in King Arthur's* Court for an account of the hazard of unerring faith in technology; the novel's protagonist travels back in time but no technical artifice is able to save him or his project of early industrialization from the follies of mankind. Mark Twain, A Connecticut Yankee at King Arthur's Court (Baltimore: Penguin Books, 1971), 410.

concerns of political domination abetted by technological change, not until the Roaring Twenties crashed so abruptly did Western societies – especially America – stop to reflect. While Roosevelt's New Deal represented a great increase in the role of government in society, it was presented as an antidote to the out-of-control processes which produced the Depression. While industry was not directly blamed – indeed, industry was one of the key dimensions which the New Deal sought to revive – economic ideology was revisited. To the extent that the technocratic idea of progress implies prosperity to be derived (however indirectly) from technological development, economic laws were part and parcel of the inevitability of development.

Thus, it is noteworthy to recognize the occasions wherein Roosevelt or other authors of the New Deal assail these economic laws for their inviolability. At the Democratic Convention of 1932, Roosevelt said "*Our Republican leaders tell us economic laws -- sacred, inviolable, unchangeable -- cause panics which no one could prevent. But while they prate of economic laws, men and women are starving. We must lay hold of the fact that economic laws are not made by nature. They are made by human beings.*"[103] This understanding of causal relations denies technology a free hand in shaping economic progress, even if it does not articulate a specific relationship between technological development and economic change.

It is for this same reason that Roosevelt later championed the thoughtful use of technology, rather than acquiescing to its 'nature order,' when he said in a 1940 campaign speech that America must "*continue to make available the good things of life created by the genius of science and technology- to use them, however, not for the enjoyment of the few but for the welfare of all. For there lies the road to democracy that is strong.*"[104] Compare this measured attitude with the less 'restrained' technological forces described by Roosevelt's predecessor, Herbert Hoover, who said the following in a nationally broadcast address:

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[103] Franklin Delano Roosevelt, "New Deal Speech Before the Democratic National Convention," My Friends: Twenty Eight History Making Speeches Kessinger Publishing, 2005), 134-142. Original speech delivered July 2, 1932.

[104] Franklin Delano Roosevelt, November 2nd Campaign Address at Cleveland, Ohio. American Presidency Project, <http://www.presidency.ucsb.edu/ws/index.php?pid=15893> Accessed April 22nd, 2011.

> "Research both in pure science and in its application to the arts is one of the most potent impulses to progress. ... Our scientists and inventors are amongst our most priceless national possessions. There is no sum that the world could not afford to pay these men who have that originality of mind, that devotion and industry to carry scientific thought forward in steps and strides until it spreads to the comfort of every home; not by all the profits of all the banks in the world can we measure the contribution which these men make to our progress."

While Hoover's comments are colored by the occasion – the anniversary of the electric light-bulb – they are influenced by Hoover's politics and his pre-Depression disposition.[105]

Roosevelt's formulation is important because it draws into question the fundamental meaning of "economic laws" – whether they may be 'discovered,' as some sort of naturally occurring phenomena or law of physics, or 'invented,' like the laws which regulate securities trading or the milk-fat content of butter. This revision applies to laws good and bad alike: it should be held suspect, therefore, the idea that wages should endlessly outpace the cost of living in western societies, just as readily as the notion that bubbles or recessions should be the necessary hallmarks of a modern capitalist system. By coming to grasp the fact that an alteration of such expectations – the changing of these formerly inviolable 'economic laws' – may change society, Roosevelt establishes logic which recognizes that any such 'disembodied force' may, in fact, be subject to societal control and direction.

Just as important as the political-social dimension of this realization were concurrent changes in the technical establishment itself. Arthur Van Dyck, a fellow in the Institute of Radio Engineers, wrote in the *Proceedings of the IRE* in 1942 the following:

> "[T]echnology has come to blossom. But the blossoms are evil -- they are poisonous and they destroy. Instead of a more abundant economy and a greater security of life, depression resulted. Instead of a more harmonious, happier world, drawn together by more rapid transportation and communication, we have world war, with waste, destruction and cost which will be felt for half a century to come. ... Why has technology brought about bigger depressions instead of smaller ones, and why more terrible wars instead of none at all? A very large part of the answer is that engineers and scientists, busy with all the things they

[105] Herbert Hoover, October 21 Address on the 50th Anniversary of Thomas Edison's Invention of the Incandescent Electric Lamp American Presidency Project, < http://www.presidency.ucsb.edu/ws/index.php?pid=21967> Retrieved April 18, 2011. Note that this speech was just days before Black Thursday, October 24 1929, the start of the October 1929 Wall Street crash which marked the beginning of the Great Depression.

> accomplished, failed to do just one thing more. And that oversight was not to have an interest in, and not to keep some control over, the utilization of the things they created."[106]

Van Dyck's damning portrayal of "The Engineer in Modern Society" looks at the world c. 1942 and sees devastation in all directions, disasters made possible by technology and its complicit creators. Van Dyck considers all society's engineers and scientists to be so many Theuths, those who felt, "believing, in [their] own innocence and habits of truth-seeking and right-thinking," that "others would appreciate [technology's] possibilities for further advance, and would carry them on to right utilization." Science had left "nice, attractive packages of gunpowder and matches, and scattered them around a kindergarten, and walked away."[107]

Van Dyck sought to persuade the scientific and engineering community of the imperative to project the scientific method and the open, imaginative mind of the scientist into the realm of politics that the ever-more-rapidly changing technological developments would be greeted and used appropriately, so that willful ignorance would not leave these powerful inventions in the hands of "demoniac politics." In part calling for *more* technocratic politics, this desperate summons is so notable because it explicitly denies the unidirectional, positive consequences of technology. It is a tool, one which may careen out of control, but which can and should be subjugated by the wisdom of science and directed towards enlightened ends.

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[106] Arthur Van Dyck, "The engineer in modern society," Proceedings of the IRE 30.7 (1942): 305. N.b., the IRE would later merge with the American Institute of Electrical Engineers to form the Institute of Electrical and Electronics Engineers (IEEE), which persists today as a prominent professional body. The IRE began in 1912 as a rival organization, and eventually overtook the AIEE in size after WWII with the growing prominence of wireless technologies.

[107] Van Dyck, 305. Van Dyck is very clear here in his assignation of blame: "Lecturers, statesmen, politicians, businessmen, one and all," are responsible as well, for they "*have expounded upon and given tribute to the great effects upon life and civilization brought about by the rapid advances in technology during the last half century or so. But it has been oratory and flowery compliments and an acceptance of the fruits without full and correct understanding of them, or appreciation of how they came about, and what they implied for the future*."

Centralization of Power and the Technological Counterculture

Though the two World Wars and the Great Depression took place in the first half of the 20th century, there were also technological developments which changed the world in arguably more positive – or at least less overtly negative – fashion. These include widespread electrification, the growth of telephony, radio, the rise of the automobile, sound and video recording, television, aviation, and much more. By the time of Luce's optimistic announcement, the structure of DNA had been discovered, and a vaccine for polio had been developed. Although Europe had been destroyed by war, it was in the process of rebuilding, and the average citizen in America was 'better-off' in economic terms than ever before, their lives augmented by these technological powers.

Yet almost all of these inventions ultimately served either to aid or require the centralization of power. The automobile and the interstate highway system empowered the federal government; electricity (in the form of alternating current) necessitated centralized generating capacity. Just as the railroads of the 19th century produced hierarchical bureaucracies to keep the engines running on time, so too did many of these new technologies necessitate centralization for their most profitable development.

In no dimension was this quality more complete than in the domains of information and telecommunications. Tim Wu has authored a comprehensive account of 19th and 20th century "information empires," from the telegraph onwards. While different possible configurations of industry may have been able to coexist with these technologies, Wu establishes that a common pattern nonetheless emerges across these information businesses, one of centralization and control.[108] The centralization of power among certain monopolistic corporations was matched in the 1960s by the growth of the conglomerate as a corporate model. This last change, coupled with the momentous growth of computation in and following WWII, leads to the final historical example of disillusionment.

[108] Tim Wu, The master switch : the rise and fall of information empires, (New York: Alfred A. Knopf, 2010), 366.

While the 1960s and 1970s were turbulent years characterized by civil rights movements, de-colonization, and the anti-war movement, one reaction to technology is of particular note. This is the reaction by certain groups to the perceived political domination which followed from the centralization of computational power and rise of cybernetics. The links between 1960s counterculture and the computer revolution of the 1970s is well documented.[109] In comparison with the earlier post-war mainframe technologies (typified by IBM), in the 1960s and 1970s minicomputer manufacturers (e.g. Digital Equipment Corporation) produced machines vastly more affordable while still offering significant functionality.

As they became increasingly commercially successful, their new smaller designs made possible by technical advancement, the impact and reach of computers grew alongside the new economics; smaller businesses might not buy minicomputers. In the late 1970s, microcomputers – still smaller and more affordable devices – became increasingly popular, such as the Apple I, released in 1976. The microcomputer industry developed from 'homebrew' roots among enthusiast users who sought to democratize computing in ways theretofore impossible.[110] The changing face of the computer industry was due in part to miniaturization and other improved technical methods, but its path was guided by companies and individuals who opposed the centralizing power and expense of earlier systems.[111]

These movements – and the anti-nuclear movement, broader environmentalist movements, and many more – are indicative of a tide of rising resistance and dissatisfaction with the technocratic idea of progress; each questions the assumptions of that ideal in particular

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[109] See generally Fred Turner, From counterculture to cyberculture : Stewart Brand, the Whole Earth Network, and the rise of digital utopianism (Chicago: University of Chicago Press, 2006), 327.

[110] See generally Michael Moritz, Return to the little kingdom : Steve Jobs, the creation of Apple, and how it changed the world, 1st ed. (New York: Overlook Press, Peter Mayer Publishers, Inc., 2009), 352.

[111] Some commentators further attribute the success of the microcomputer *manufacturers* (predominantly based on the West coast of the United States, in Silicon Valley) over the minicomputer manufacturers (typified by the companies centered in the Greater Boston area around Rte. 128) to stem from the differences in cultural values embodied by these respective firms; the rise of the Silicon Valley upstarts was, in this lens, seen as a triumph of a more open and communicative culture over a more hierarchical, secretive and conservative one. See e.g., AnnaLee Saxenian, Regional advantage : culture and competition in Silicon Valley and Route 128 (Cambridge, Mass.: Harvard University Press, 1994), 226.

spheres of action. The early phases of the 20th century are thus aptly characterized as a period in which the 'means' of the technocratic idea of progress grew increasingly out of phase with its supposed 'end,' the cracks of this faith tracing their lines back to the unfulfilled promises of an earlier era. It is with these historical movements and technological circumstances in mind that the theoretical intimations of the era should be considered.

II. The Social Construction of Technology (SCOT)

The social constructivist school of thought has played an important role in contemporary studies of technology and technological systems. Typically, SCOT aspires to explain the social, political, and economic factors that underlie the development of specific technological artifacts. Detailed case studies have been made of bicycles, ballistic missile guidance systems, electrical power generation networks, Bakelite, and many other noteworthy inventions.[112] These studies examine principally the origins and development of a technology, rather than the later impact of its uses.

While some elements of this sociological inquiry go so far as to treat technology and humans as equal elements, the predominant efforts of SCOT are more concerned with notions of, as Bijker highlights, "interpretative flexibility," "closure," and "relevant social groups."[113] These terms refer to the purported social process of technological construction, whereby competing designs or discoveries are interpreted by different actors or actor-groups until one set of definitions resolves itself into the final, stable form of a technology.

This field is characterized by the incursion of sociology into science. In this realm, "all knowledge and all knowledge claims are to be treated as being socially constructed; that is, explanations for the genesis, acceptance, and rejection of knowledge claims are sought in the

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[112] See Wiebe E. Bijker, Of bicycles, bakelites, and bulbs : toward a theory of sociotechnical change (Cambridge, Mass.: MIT Press, 1995), 380. for bicycles, Bakelite; Hughes and MacKenzie are found in Wiebe E. Bijker, The Social construction of technological systems (Cambridge, Mass.: MIT Press, 1987), 51, 195, for power generation / distribution and missile guidance, respectively, alongside considerable additional SCOT case studies; David Noble, Forces of production: A social history of industrial automation (New York: Oxford University Press, 1986) for the case of the American metal-working industry.

[113] Bijker (1987), 4.

domain of the social world rather than in the natural world."[114] SCOT, according to its adherents, produces a multivariate, multidirectional model as a result of its treatment of artifacts as social constructs.

The social constructivist position has grown in prominence, and offers its adherents useful theoretical and methodological means to interrogate technology and particular technologies. SCOT as a philosophy is a sociological reappraisal of the relationship between technology and society, one which recognizes and re-elevates human agency. Though the field is diverse in nature, and the above representatives merely samples, as a whole social constructivists do not necessarily question the nature or goals of the current technological system in the way that Ellul does (*See* Part 2). The social constructivists are disinclined to make moral judgments on the inventions which result from particular processes, and SCOT inquiries or case studies generally evaluate only the conditions and processes by which technologies are adopted, not the impacts which such adoption brings.

This last task is the most glaring omission from much social constructivist work; excellent historical investigations of the social impacts of particularly modern technology shows that artifacts may have powerful and far-ranging impacts beyond the intentions or imaginations of their creators. To cease the exploration of the subject once a technology has become 'fixed' is to abandon the better half of the task, for generally speaking it is the use and impact of a device or system which is of greatest importance to society, rather than its creation alone. While the origins of a technological artifact are helpful in understanding its later role or effects, it is an incomplete picture. The contrasting importance of unforeseen effects is aptly demonstrated in historical studies of technology-driven social change, e.g. Carolyn Marvin's exhaustive and authoritative study of 19th century telecommunications infrastructure and its effects on society.[115]

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[114] "Social Construction of Facts and Artifacts," Bijker (1987), 18.

[115] For further reference, see Carolyn Marvin, When old technologies were new : thinking about electric communication in the late nineteenth century (New York: Oxford University Press, 1988), 269.

Though the social construction of technology arose as a means to study science and technology in the 1980s, its relevance to this section stems from a consequence of its nature: the notion that technology and technological systems are socially constructed is an implicit repudiation of the necessity of the technologically deterministic view of progress. Technology need not be said to be deterministic if it is in turn dominated by social forces. Under the terms of this philosophy, the technocratic idea of progress becomes quite implausible: technology *may* not come to dominate politics, economics, and society if its course is intimately entwined with these same systems. Technology may indeed have dominating or harmful effects, but its origins – and consequently, its continuing development – are principally the product of social forces.

Criticisms of the SCOT Approach

But the possibility that technology may be subordinated to social forces does not mean that this necessarily be so; in its shallow approach to investigating the origins of technology, SCOT adherents typically fail to follow the causal chain of techno-social relations to its logical end. For once a technologically has been 'constructed,' it is put to use, and in this act it may present certain embodied politics which affect the future development of technology. One way of representing this process in critical response to social constructivism is to consider a 'technological mode' of alienation, related to Marx's impressions of the systemic alienation of labor in capitalist systems.

Recalling the broad use of the term 'technology' in the preceding section, referring to technological systems and means of social relation, modern technological society's penetrative ability affords it the capacity to dissociate technological systems and artifacts from their social origins, and in so doing present the image of 'autonomous forces' which appear beyond control. Herbert Marcuse offers a clear appraisal of this context, extending Marxist analyses of Capitalism to the study of *technique*. Marcuse's notion of technological society is one which "completely

engulfs the individual," as opposed to industrial society, which left room for dissent and objection.[116]

The substitution of subjective reality with the objectivity of technological society is an effective means to find collective acceptance with the status quo:

> "Mass production and mass distribution claim the *entire* individual, and industrial psychology has long since ceased to be confined to the factory. The manifold processes of introjection seem to be ossified in almost mechanical reactions. The result is, not adjustment but *mimesis*: an immediate identification of the individual with *his* society, and through it, with the society as a whole. The immediate, automatic identification... is the product of a sophisticated, scientific management and organization. In this process, the "inner" dimension of the mind in which opposition to the status quo can take root is whittled down. ... The impact of progress turns Reason into submission to the facts of life."[117]

The result is that "the subject which is alienated is swallowed up by its alienated existence. ... The achievements of progress defy ideological indictment as well as justification; before their tribunal, the 'false consciousness' of their rationality becomes the true consciousness."[118] The ideology of technological society, for Marcuse, lies within production itself. The entire productive apparatus promotes the system, in the form of desirable and pleasurable products which are consumed with gusto. These products "indoctrinate and manipulate; they promote a false consciousness which is immune against its falsehood."[119] In so participating, consumers are bound to producers and to the system as a whole.[120]

Marcuse's investigation of technological alienation extends the traditional Marxist understanding of the forces capital appears to exert over labor to an explanation of the appearance of technology as an autonomous force and independent system. With this conception

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[116] "Democratizing Science and Technology with Marcuse and Latour" by Clayton Pierce, *in* Douglas Kellner, ed., Marcuse's Challenge to Education (Plymouth: Rowman & Littlefield, 2009), 135.

[117] Herbert Marcuse, One-dimensional man (Boston: Beacon Press, 1964), 10.

[118] Marcuse (1964), 11.

[119] Marcuse (1964), 12.

[120] See also Vaclav Havel, "The power of the powerless," The power of the powerless, ed. John Keane (Armonk, NY: Palach Press, 1985), 27 for another explanation on the dominating qualities of consumer culture, from the perspective of totalitarianism and cooptation rather than alienation.

in mind, the work of the social constructivists is best understood as an undertaking which demonstrates the theoretical possibility of human usurpation of technological path-determinism. At the same time, however, the relationship between society and technology serves to explain how, in a technologically saturated society, humanity would be directed and inclined to pursue a path colored by a techno-scientific world-picture; this theoretical possibility of escape may therefore be *de minimis* in light of the singular ability of technology to manipulate the world.

These and other shortcomings limit the utility of this position, increasingly in vogue. But as philosopher of technology Langdon Winner notes in one of his pointed critiques of social constructivism, even if "social constructivists appear much more concerned to gaze at themselves within that endlessly enchanting hall of mirrors -- sociological reflexivity," content to define themselves narrowly within a niche field of "innovation studies," their work is useful for its ability to "reveal the spectrum of possible technological choices," and to elaborate the role of contingency and the existence of these choices.[121] The second class of critiques considered in this section, the 'alarmist' reaction to the technologically deterministic idea of progress, share this belief in human agency, while emphasizing the urgency of certain choices.

III. Alarmist Critique(s)

> "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 of making them intelligently. At that stage the machines will be in effective control. People won't be able to turn the machines off, because they will be so dependent on them that turning them off would amount to suicide."[122]

This vision of disastrous risks of unfettered, unreflecting technological advancement comes from a bright academic who, amidst the turmoil of the 1960s at Berkeley, chose to retreat from society:

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[121] Langdon Winner, "Upon opening the black box and finding it empty: Social constructivism and the philosophy of technology," Science, Technology, & Human Values 18.3 (1993): 362-78. See here also for further critiques of SCOT as a methodology.

[122] Industrial society and its future, 1995, Washington Post, 4/2 2011 <http://www.washingtonpost.com/wp-srv/national/longterm/unabomber/manifesto.text.htm>.

Theodore Kaczynski, otherwise known as the Unabomber, the once-promising mathematician found responsible for 16 bombings and three deaths between 1987 and 1995. Kaczynski's stated intent was to gain a wider audience for the publication which eventually secured his capture, "*Industrial society and its future*." He believed that technology had a powerful negative role in shaping civilization, but not necessarily a deterministic one: his actions were meant to serve as a call to action for those who would be prepared to make the choices necessary to prevent the scenario described above.

While Kaczynski's is a most extreme conclusion to be drawn from the same failings and threats of technology recognized by others (including establishment figures as represented by Van Dyck, above), it is a fitting introduction to the alarmist perspective. This broad swath of intellectual attacks on the deterministic idea of progress asserts not only technology expresses deterministic *tendencies* but that these negative qualities can be suppressed, either through the elimination of the offensive technologies or through the reassertion of human control over the processes of civilization. The consequences of failing to act are frequently couched in apocalyptic terms.

This category overlaps roughly with another group of thinkers who postulate a deterministic or difficult-to-avoid future but are resigned to its consequences. An excellent snapshot is produced by Hans Morevec, an important leader in robotics research, who concludes generally that "Biological species almost never survive encounters with superior competitors." Here Morevec finds that humans are likely to be eliminated by our robotic progeny, just as North American mammals wiped out the marsupials of South America when the isthmus of Panama became traversable ten million years ago.[123]

[123] Extinction is nearly inevitable, he concludes, but may be preceded by a period of prosperity on the backs of robot labor. See Hans Morevac, Robot: Mere machine to transcendent mind (New York: Oxford University Press, 1999), 113. (Referenced in Bill Joy, "Why the Future Doesn't Need Us," WIRED 2000: 238-46).

The Limits of Growth

A more moderate account of this intellectual frame may be found in the environmentalist warnings issued in the late 1960s and early 1970s. These are well-represented by the Club of Rome's influential and best-selling 1972 report, "The Limits of Growth."[124] This think tank report proffered a view which in many ways updated the logic of Thomas Malthus for an era of modern economics and globalization.[125] At its heart was a belief in the ability to, if not accurately predict, at least broadly prognosticate the future of global development. This belief was developed from a multivariate model which predicted patterns of exponential growth in resource consumption, population, industrial development, agricultural production, and environmental impact to be matched by a merely linearly increase in technological capability to provide for new stock of finite resources.[126]

The Limits of Growth did not emphasize the importance of its specific predictions, derived from computer models; rather, its authors intended to highlight the problems inherent within certain trends, and in so doing change behavior. All scenarios developed by the researchers identified a cessation of growth at some point in the 21st century, the result of overshooting Earth's estimated carrying capacity. As related in the revised third edition (2004):

> "In our scenarios, the expansion of population and physical capital gradually forces humanity to divert more and more capital to cope with the problems arising from a combination of constraints. Eventually so much capital is diverted to solving these problems that it becomes impossible to sustain further growth in industrial output. When industry declines, society can no longer sustain greater and greater output in other economic sectors: food, services, and other consumption. When those sectors quit growing, population growth also ceases."[127]

[124] A related account may be found in the popularized Malthusian perspective put forward by Paul Ehrlich in 1968's *The Population Bomb*. See Paul R. Ehrlich, The population bomb (New York: Ballentine Books, 1968).

[125] For reference, see Malthus's famous 1798 account of impending overpopulation and mass starvation: Thomas R. Malthus, An Essay on the Principle of Population (Amherst, NY: Prometheus Books, 1998). (Reprint).

[126] D. H. Meadows, The Limits of Growth (New York: Universe Books, 1972).

[127] D. H. Meadows, J. Randers, and D. L. Meadows, The limits to growth: the 30-year update (White River Junction, VT: Chelsea Green, 2004), xi.

This principle was taken outside the context of any particular baseline resource or reserve figures, or perfect estimation of future developments; the slowing and eventual stoppage of growth was endemic to the modes of its current progression.[128]

The futures proposed by *The Limits of Growth* were more open-ended and flexible than other, more Malthusian entries, but no outcome was compatible with the idea of limitless growth, development, and prosperity enunciated by the technocratic idea of progress. In this immediate respect the deterministic nature of technological progress was rejected. Technology and technological systems are, however, still fingered among the key agents driving this "overshoot" of carrying-capacity. The five key factors are all intimately related to technical development, and are tightly interrelated (e.g. advances in agriculture allowing population growth, which drives consumption, etc.).

While human agency is recognized – as both the cause of the problem, and its possible remedy – these choices are constrained, and become more so with time. By the 30th anniversary edition, "ecosystems we might have preserved have been extinguished; resources that might have given wealth to future generations have been consumed" but many choices remain, though all fall alone one axis: those that would restrict "the throughputs that support human activities down to sustainable levels through human choice, human technology, and human organization." The alternative is "to let nature force the decision through lack of food, energy, or materials, or through an increasingly unhealthy environment."[129]

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[128] While *The Limits of Growth* does not particular explore 'collapse' scenarios, many highly creditable examples exist in the archeological record demonstrating the rapid collapse of well-developed civilizations. Later 20th century anthropological and archeological work has devoted increasing energies to explaining these collapses, and some of the findings raise questions of whether the kinds of factors cited by the Club of Rome report, if true, could not take much more rapid effect than otherwise expected. These studies and the expanding findings of paleoclimatologists of evidence of rapid climate change and Holocene climate instability prove highly relevant. See e.g. R. B. Alley, et al, "Abrupt climate change," Science 299.5615 (2003): 2005, Barbara W. Leyden, "Pollen evidence for climatic variability and cultural disturbance in the Maya lowlands," Ancient Mesoamerica 13.01 (2002): 85-101, or Edward R. Cook, et al, "Long-term aridity changes in the western United States," Science 306.5698 (2004): 1015.

[129] Meadows, Randers, and Meadows (2004), 13.

The results of the original 1972 modeling were criticized upon their release, and objectors similarly disparaged subsequent revisions for faulty assumptions and wishful or insufficiently-sourced figures. But these claims aside, many of the expectations of the original Club of Rome report were accurate – continued population growth, consumption growth, resource hunger, etc. The findings did fall afoul of reality in, e.g., its expectations of oil consumption in the 1970s (due, among other factors, to the oil shocks of that period). However, the most important oversight of the *Limits of Growth* may be in its consideration of factors the researchers considered linearly changing variables, technology foremost among these.

The failure to represent technological development as an exponentially advancing process has long plagued such economic-environmental portraits of disaster: Ehrlich is the most notable contemporary example of a figure whose doomsday prophecies were undone by technological advances, in the form of the Green Revolution.[130] While the *Limits of Growth* accurately recognizes that "exponential growth never can go on very long in a finite space with finite resources," its proximate failures were as much a factor of undervaluing technological adaptability as they were underestimating reserves and resources or overestimating consumption.[131]

The environmental-alarmist critique of technological determinism as represented by the *Limits of Growth* is powerful because its emphasis on empirical processes envisions a time (fuzzy in temporal distance) whereby the technocratic view of history will drive humanity off a resource cliff. In their representation of the 'unintended consequences' of endless development, such critiques are immensely valuable; if development unfairly devalues clean air or water, there may be significant moral, political, and social impacts. And, indeed, in the short term the reminder

[130] See Jack A. Goldstone, "The New Population Bomb," Foreign Affairs 89.1 (2010): 31-44, for a reappraisal of Ehrlich's 1968 thesis, or, for Ehrlich's own reassessment, P. R. Ehrlich and A. H. Ehrlich, "The population bomb revisited," The Electronic Journal of Sustainable Development 1.3 (2009).

[131] While the authors do state (particularly in their revisions) that "there is steady progress in developing technologies that discover new reserves and use materials more efficiently" these investments may wither when their capital inputs become overly burdensome, initiating the cycle of decline described earlier. Meadows, Randers, and Meadows (2004), 131.

that economic projections must assume finite resources is an important check on reckless optimism.

Criticism of Alarmist Methodology

In a broader analysis, a view of such finite resources is representative of a limited scope which undervalues innovation. Without disregarding the short-term shocks and intermediate consequences which may ensue from such a thesis, the underlying resource-constraint thesis undervalues the substitutability of important materials. The current global dependence on fossil fuels for energy production and transportation is an instructive example. If reserves were mismanaged, global energy security and geopolitics could be impacted in severely negative fashions. But there is no empirical basis by which development must 'cease' in a world of such finite fuels: there is bountiful generating potential to be found in alternative resources, be they nuclear, geothermal, solar, wind, tidal, or any number of other potential resources. [132]

Any failure to successfully transition to alternatives may be seen as a consequence of political circumstances, rather than technological failure; an inability to collectively shoulder short-term burdens to further long-term development. In terms of physics or in terms of current or near-term technology (if not the will-to-implement) alternative sources of energy are available as a ready substitute. If the 'finite resource' argument is extended to its fullest conclusion, one might observe that humanity is far from tapping the full physical potential of the earth, in terms of emitted energy or net energy as absorbed from the sun; it would not be especially unreasonable to even counter the claim of such resource constraint criticisms by observing the relatively established theoretical means by which resource extraction and human development might be extended beyond the Earth itself, e.g., by means of asteroid mining.[133]

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[132] See e.g. Ingvar B. Fridleifsson, "Status of geothermal energy amongst the world's energy sources," Geothermics 32.4-6 (2003): 379-88; Monique M. Hoogwijk, On the global and regional potential of renewable energy sources, Universiteit Utrecht, Faculteit Scheikunde, 2004; K. Zweibel, J. Mason, and V. Fthenakis, "A solar grand plan," Scientific American 298.1 (2008): 64-73.

[133] See e.g. S. D. Ross, "Near-Earth Asteroid Mining," Space (2001)., M. J. Sonter, "The technical and economic feasibility of mining the near-earth asteroids," Acta Astronautica 41.4-10 (1997): 637-47.

This finite resource hypothesis is coupled with an inability to consider the accumulative impact of technological innovation (at the level of artifact as much as at the level of technical systems). While the inevitability of technological innovation is by no means assured, the medium-term continuation of past trends may be expected to continue in accordance with extant knowledge of immediate technical challenges and remedies.[134]

While this evaluation only answers the environmentalist critiques as represented by the Club of Rome's report, other alarmist premonitions tend towards the same problem exhibited by social constructivist theory. Human agency and the contingency of human choices merely raise the *possibility* that the present historical trajectory may be altered; many alarmists recognize the world as being on one such path, even those resembling the anarcho-primitivism of Kaczynski. The entrenched forces which augur the present technological society, in ways described earlier, function to suppress such dissent and render it ideologically foreign and impotent. Human choices are of reduced relevance if almost all humans choose to continue in the present system.

IV. The Uprising, Quelled

The uprising against determinism described in this section has been, for the most part, thoroughly suppressed. The mechanism of this suppression has not been the actual resolution of the tensions raised by the critiques of technocratic progress (and 'technology' in the broad sense), but instead an overpowering counterforce. Regardless of the exact cause-effect relationship

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[134] A modern standard of "laws of technological innovation" is Moore's Law, an axiom of the semiconductor industry. Here an initial (rough estimate) of the growth in transistors per silicon chip die came to be taken as 'received word,' and semiconductor development has followed a blistering pace of exponential development for more than 40 years; this law serves as the basis for the strategic planning of major companies and R&D labs even as it necessitates the constant surmounting of new technical challenges in increasing integrated circuit complexity and chip design. See e.g., M. Lundstrom, "Moore's law forever?" Science 299.5604 (2003): 210; Gordon. E. Moore, "Lithography and the future of Moore's law" (Proceedings of SPIE 2438, 2, 1995); for mechanisms on the industrial practices following therefrom, Radhakrishna Hiremane, "From Moore's law to Intel innovation—prediction to reality," Technology 1 (2005).
While the 'law' is kept accurate by the self-interested workings of certain industries, it nonetheless serves as a vivid and quantifiably precise example of the ways in which technological innovation may continue for extended periods at exponential rates, even if specific challenges give rise to novel industry developments – e.g., the increasing power consumption and thermal profile of die design led to an increase in parallelism or other trade-offs in designs, as in N. S. Kim, et al, "Leakage current: Moore's law meets static power," Computer 36.12 (2003): 68-75.

between society and technology, the institutional unions of the two are powerful forces which represent, and are represented by, important and influential parties. The uprising against technology was one component of a broader countercultural critique, one which ebbed alongside most other vanguardist forces amidst the forceful reassertion of cultural-political status quo in the 1970s and 1980s. The resultant condition following this successful repulsion is eloquently described by William Barrett:

> "There is by this time widespread anxiety and even panic over the dangers of the atomic age; but the public soul-searching and stocktaking rarely, if ever, go to the heart of the matter. We do not ask ourselves what the ultimate ideas behind our civilization are that have brought us into this danger; we do not search for the human face behind the bewildering array of instruments that man has forged; in a word, we do not dare to be philosophical."[135]

The net effect of this reprisal has been to limit the dimensions in which the institutional or philosophical underpinnings of the modern world may be effectively questioned.

The study of social constructivism, as examined earlier, does not pose a true risk to the systemic-institutional incarnations of the ideology of determinism, first and foremost because it is equipped to address the *origins* of technologies and technological systems, not their subsequent impact. Society may be shaped by extant technological systems and institutions in ways which predispose its constituents to persist in certain developmental pathways and make particular political decisions; one "world picture" burned so decisively into the global retina that its afterimage manipulates subsequent interpretations of reality.[136]

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[135] William Barrett, Irrational Man (New York: Random House Digital, 1990), Google Books. <http://books.google.com/books?id=zXUbw10SrlUC>, 3. Barrett wrote Irrational Man in 1969, and in its introduction despaired at the decline of the role of philosophy. The book was an attempt to introduce existentialism to the English-speaking world, where many of its key texts had not been available in translation. The formulation captures the essence of the phenomenon whereby society writ large may fail to question the assumptions of its present form, a problem recognized then and now by many others looking to 'awaken' the world to its disastrous trajectory.

[136] Referring here to Heidegger's notion that "the fundamental event of the modern age is the conquest of the world as picture," whereby "man contends for the position in which he can be that particular being who gives the measure and draws up the guidelines for everything that is." Formulations like Ellul's may correspond to the notion that one definition 'ran way' with reality and clouded any ability to change its static interpretations of the world. See "The

Systems of *technique* have achieved this through the successful co-optation of many opposing forces, the net result of which was to reinforce existing ideological paradigms or at best 'adapt' the mechanisms of domination to suit and supplant any *au courant* opposition. Krishan Kumar describes the process as follows in his extensive study of utopias and anti-utopias, referencing the influence of Marcuse in critiquing the mechanisms of late 60s protest movements:

> "The enormous technical bureaucratic apparatus of modern societies allowed most manifestations of the counter-culture easily to be absorbed and used in the interests of repression. Zen, existentialism, the bohemia drug culture 'are quickly digested by the status quo as part of its healthy diet.' The surplus created by modern technology was used not to abolish want but to shore up 'surplus repression.' Instead of satisfying the real human needs of all, the modern consumer industry ceaselessly stimulated new artificial needs which kept humans on the treadmill of increasing income constantly chasing ever new kinds of goods and services. The contrived condition of 'rising expectations' led to the Hobbesian war of all occupational groups, the weakest going to the all and creating new areas of poverty amidst unprecedented riches." [137]

Marcuse's representation of counterculture forces as fodder for the industrial mass consumption and mass media economies is chilling, and his political take on the idea of the 'hedonic treadmill' is useful insofar as it represents consumer culture as a tool of control and subversion held in the hands of powerful elites (as discussed in greater detail in the preceding section).[138]

In this frame it is possible to see almost all of the processes of industrial development – from the agitations of Coxe and Condorcet onwards – as the product of self-interested dealings supported by elites and others positioned to personally benefit, an unending revolution instituted for the benefit of the technological dictatorship by its nature unsatisfied with anything short of totalizing power and domination. Adherents not a party to either category may therefore be

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Age of the World Picture" in Martin Heidegger, The Question Concerning Technology (New York: Harper & Row, 1977), 134.

[137] Krishan Kumar, Utopia and Anti-Utopia in Modern Times (New York: Basil Blackwell, 1987), 398 paraphrasing Marcuse (1964), 14.

[138] See "Experienced Utility and Objective Happiness: A Moment-Based Approach" by Daniel Kahneman in Daniel Kahneman and Amos Tversky, eds., Choices, values, and frames (New York: Cambridge University Press, 2000), 673, for a review of the idea of the hedonic treadmill in behavioral economics literature; the idea is an outgrowth of adaptation theory, postulating that humans become acclimated to increased levels of prosperity until happiness reverts to a stable mean.

considered the ignorant victims or unwitting stooges of the aforesaid groups, wrongly convinced of their part in a mythical narrative of emancipation. This is consistent with Weber's explanation of how industrial capitalism represents the 'end stage' incarnation of Reason, an emergent system of rationality which extends its tendrils in all directions, trending towards total bureaucracy.[139]

This suppression was not just a reflexive phenomenon. The forces mentioned earlier opposed to the deterministic aspects of technocratic progress largely sought to take action by organizing politically, whatever their particular disposition or cause. Therefore, the suppression of these protest or opposition movements was deemed critical by establishment forces of industrial capitalism, representatives of the political interests most empowered by the status quo. The new conservatism movement of the 1980s, heralded in the United States by Ronald Reagan and in Great Britain by Margaret Thatcher, worked to isolate and destroy these rival political forces to restabilize conventional political hierarchies.

The year 1980 is a useful if imprecise "turning point" and in the United States in particular President Reagan's election victory is associated with the reaffirmation of conservatism and the decline of the Left's influence in politics. The success of these overt political measures – attacks on trade unions, the restructuring of economies through privatization, hostility towards civil rights, and the rejection of the philosophy of the welfare state – served to severely weaken these opposition forces. It is for these reasons that constituents of these opposition forces hold such virulent antipathy towards the conservatism of this era: one representative formulation from 1986 held that "the Reagan administration is attempting to restabilize patriarchy and capitalism simultaneously, by disciplining the working class, women, youth, and racial minorities."[140] The conservative task of this period was made easier by the growing disillusionment, not only with the technical establishment, but also the institutions of politics. Liberal programs of the 1960s had failed to live up to their ambitions, and a new generation of political figures was prepared to

[139] See Herbert Marcuse, "Industrialization and capitalism," New Left Review 1 (1965): 30, 5 for an investigation into the consequences of Weber's ideas in this context.

[140] James W. Messerschmidt, Capitalism, patriarchy, and crime: toward a socialist feminist criminology (New York: Rowman & Littlefield, 1986), 166.

capitalize on undercurrents of dissatisfaction, in ideological influence if not always immediate policy measures.[141]

This suppression was not, however, final or complete in nature. Opposition groups were weakened, but not destroyed; alternate ideas lost their luster, but not their expression. In the generation since, some of these counter-currents have been able to better re-organize. In the sphere of communication, if not policy actions, some of these revisited ideas have once again come to the fore, as for example in the renewed attention given to the subject of global warming at both a scientific and political level. Yet whatever the counter-force, the status quo remains entrenched, and the content of discourses reflect the influence of present institutions when, e.g., debates over global warming are couched as battles between environmental and business interests. But if this wave of conservatism overwhelmed anti-deterministic efforts in the 20th century, these ongoing political, spiritual and cultural struggles still opened new political fronts and raised questions about the inevitability of technological determinism's totalizing qualities.

[141] See "Introduction" to Cheryl Hudson and Gareth Davies, eds., Ronald Reagan and the 1980s: perceptions, policies, legacies (New York: Palgrave Macmillan, 2008), 12.

Part 4: After the Fall

They [Nazis and Communists] pretended, perhaps they even believed, that they had seized power unwillingly and for a limited time, and that just round the corner there lay a paradise where human beings would be free and equal. We are not like that. We know that no one ever seizes power with the intention of relinquishing it. Power is not a means; it is an end. One does not establish a dictatorship in order to safeguard a revolution; one makes the revolution in order to establish the dictatorship.

– George Orwell, *1984* (1949)[142]

If you have built castles in the air, your work need not be lost; that is where they should be. Now put the foundations under them.

– Henry David Thoreau, *Walden* (1854)[143]

I. Introduction

The preceding sections have presented an introductory demonstration of the Enlightenment idea of progress, its most significant subsequent modifications, and these descendent progresses' erosion and intellectual implosion amidst the tribulations of the 20th century. While the idea of progress remains accessible in its multitudinous incarnations, its modern description is often a tale of disillusionment as much as hope. Entering into the second decade of the 21st, the salient question for the inquiring philosopher of progress is simply 'what may be saved?' or, more bluntly, 'salvaged' from the wreckage. In the latter half of the 20th century the technocratic idea of progress was forced to jettison some portion of its universalizing *progressive* components, like so much dead weight, under an onslaught of attacks initiated when its early promises went unfulfilled. It retained its deterministic, self-propelling skeleton, carried along by two centuries of intellectual momentum.

When its opposition was repressed, some efforts were made to reclaim these old high ideals, but success was incomplete. This is evident in the present persistence of 'dissociated progresses': social progress, economic progress, moral progress, environmental progress, etc. Even if technology may be seen as a common theme across these different dimensions, its

[142] George Orwell, 1984 (New York: Signet Classic, 1950), 263.
[143] Thoreau, 261.

importance is analyzed one step removed from human actions. But the autonomous imperative of technological progress soldiers on: e.g., America must "win the future" through improvements in innovation, research, and technology, its president says, not for moral or social prerogatives, but to ensure continued economic growth and competitiveness.[144]

Yet no matter how complete the **political** *Reconquista* of the techno-scientific worldview, the questions raised in its opposition remain; they are not resolved, merely left unanswered and postponed. At present, there are two prominent approaches to the problematic relationship between technology and politics: one may herald the rise of technology, implicitly accepting the technocratic thesis of determinism, or instead denounce the harmful effects of technology for its ability to facilitate systemic domination and pervert human values to mechanistic ends.

Neither suffices: blind adherence to the idea of technological determinism unrealistically reduces human agency, which only serves to excuse the harmful impacts of technology and the exclusion of certain groups from its beneficial effects. Conversely, a broad rejection of industrial-technological culture and society is a naïve solution: even if it were effective, it romanticizes any alternatives and ignores the emancipatory potential of technology. Furthermore, this dichotomous formulation is itself a function of the political manifestation of technological

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[144] See: Barack Obama, Transcript of Remarks by the President in State of Union Address (Washington, D.C.: The White House Office of the Press Secretary, 2011). In this Obama is reflective of a common current. The anxious links between technologically-driven economic development and the political success of nation-states is not uncommon. See, e.g., Dan Senor, Start-up nation : the story of Israel's economic miracle, (New York: Twelve, 2009). Similar language can also be found in the 2008 Party Platform of the Democratic Party, among many other outlets, as where the renewal of American democracy is premised upon "us[ing] the tools of government and technology" in order to create a "a new era of connectedness, teamwork, and progress." Renewing America's Promise: 2008 Democratic Party Platform, 2008, The American Presidency Project, 04/11/2011 <http://www.presidency.ucsb.edu/ws/?pid=78283>.

Presidential and political language shares the same focus on linking technological-economic matters today as it did a hundred years ago, when Theodore Roosevelt spoke of the national imperative of technical education in his 1906 State of the Union "*The far-reaching usefulness of institutes of technology and schools of mines or of engineering is now universally acknowledged... In international rivalry this country does not have to fear the competition of pauper labor as much as it has to fear the educated labor of specially trained competitors; and we should have the education of the hand, eye, and brain which will fit us to meet such competition*." Theodore Roosevelt, State of the Union Address, 1906, The American Presidency Project, 4/10/2011 < http://www.presidency.ucsb.edu/ws/index.php?pid=29547>. (Speech Delivered December 3, 1906).

determinism: one cannot truly be 'against' technology, certain primitivist efforts to the contrary; an extreme 'anti-technological' attitude may reduce to some Promethean level, but no further.[145] One may merely object to specific artifacts, or particular modes of employment, development, or distribution of technologies. This phraseology of false choices clouds the existence of true options. What would constitute such an alternative interpretation?

II. Critical Theory of Technology

The clearest recourse lies in a reappraisal of the fundamental relationship between society and technology. The ultimate success of such a new perspective must take measure of the important critiques of technology mentioned here, without abandoning the laudable intentions and objectives of the philosophers of progress, from the Enlightenment onward. One of the best-known such projects of renewal has been undertaken by Andrew Feenberg, whose Critical Theory of Technology calls for "a critical rationality capable of reflecting on the larger context of technology."[146] Feenberg represents that the relationship between technology and society is bidirectional: just as society informs technology, so does technology deeply influence society. "*What human beings are and will become is decided in the shape of our tools no less than in the action of statesmen and political movements. The design of technology is thus fraught with political consequences*," he writes.[147] According to Feenberg, it is because such developments are so frequently antidemocratic in character that the ensuing technological system possesses its frightful properties.

This project of reclamation must be premised on two fundamental points. First, that technological systems and artifacts are not in all circumstances value-neutral. If technologies are bereft of politics, then "[their] immense and often disturbing social and environmental impacts

[145] Does one reject the car but allow the horse-and-buggy? Perhaps better to eliminate the domestication of animals altogether, but then the question remains as to whether flint tools are too dangerous to be allowed, or whether fire itself is a step too far. Such attitudes cannot truly 'reject' technology, only claim to limit or control it.

[146] Andrew Feenberg, Critical theory of technology (New York: Oxford University Press, 1991), v.

[147] Feenberg (1991), 3.

are accidental side effects of progress," as Feenberg writes.[148] If technologies may be fairly assessed on their character and their potential impact, humankind has a chance to direct development in directions most amenable to freedom and human values, rather than the direction best supportive of a particular mechanistic paradigm divorced from the human condition. Secondly, the possibility of choice must be emphasized in the development of new technologies, as emphasized by the multivariate processes detailed in social constructivist case studies. If care is taken to embrace democratic principles in this developmental matrix, technological developments should advance in a manner more compatible with human needs.

Feenberg reduces the importance of choice to the following explanation: "In choosing our technology we become what we are, which in turn shapes our future choices."[149] Choices have been made for us in the past, and these choices have brought about the current hierarchies of power and control in the technological societies in the West. At the same time these choices have nearly mandated that these extant forces extend their logic and power into new domains – at present generally through soft means, like the development of market and technological forces, versus more muscular measures, as in colonization and imperialism. The world at large is not obliged to accept the permanent consequences of these choices: collective action is not yet so restricted as to prevent serious reform of this underlying world-substrate.

This Critical Theory of Technology relies upon a shift in the locus of technical control – control emanating from somewhere within the technoscientific frame – to stimulate a reversal sufficient to enable democratic forces to reconstitute the fabric of the technological system; control from below replacing control from above and in so doing setting a new course for development more compatible with morality and equality. Even if this is implausible technically, or even if the denizens of the technological ruling societies appear disinclined to accept any new responsibilities (a consideration acknowledged by Feenberg), it remains a *possibility*, an

[148] Feenberg (1991), v.
[149] Feenberg (1991), 14.

opportunity separate from alternatives of blind faith in, or pessimistic resignation to, technological determinism.

Such an approach does not deny the deterministic properties of technology as such. Rather, it recognizes such powers as endowed, rather than constitutive or necessarily following from the nature of technology. Through this lens, technology is 'empowered' by certain political forces, which in the present circumstances are inclined towards domination. Technology as constructed and empowered by these forces is both an expression of, and tool towards, continued domination. So long as the emancipatory collective will is absent to provide political remedy to these powers, technology can continue to serve this function of determinism.

III. The Internet as Digital Utopia

What can be said of Progress? Its cousin and bellwether, Utopia, fell on hard times in the 20th century, without much relief in the 21st. Kumar concludes his study of modern utopias with a reminder that,

> "Utopia has, for four centuries, accompanied that hope of progress and that striving for betterment. It has been itself a principle expression of that belief and a potent agent of that impulse. It now struggles against a confused but widespread sense that this has been an illusion, or an impossible dream. … utopia as a form of the social imagination has clearly weakened … it has not in recent times found the power to instill its vision in the public consciousness."[150]

Kumar feared that, without utopias, man would lose his ability to imagine a future worth creating, his powers of reason withering in the desert of a directionless history, doomed to an existence of mere impulses. The importance of utopian thinking in this dimension is extended by Karl Mannheim, for whom utopian thinking transcends reality and "burst[s] the bonds of the existing order."[151] When social groups situate paradise within reality, and attempt to realize these "wish-images," Mannheim argues their ideas can take on a revolutionary function. Utopia is a

[150] Kumar, 423-4.

[151] Karl Mannheim, Ideology and Utopia (New York: Harcourt, Brace and Co., 1949), 173.

necessary imperative to pierce the fog of the future and normatively direct action towards one of many possibility-states.

Still, Kumar surveyed the wasteland of the 20th century from the perspective of 1987; his concerns in some ways came too soon. In short order the Soviet Union dissolved, and with it, a source of much thermonuclear anxiety. In the 1990s, millennial spirits sprouted alongside fiber optic cable as the internet and telecommunications revolution built on the explosive growth of computing in the preceding decades. The electronic pulse of the global network may offer a new chance for just the kind of technics-driven shift Feenberg called for, while simultaneously offering up the solution to Kumar's feared dearth of utopian ideas.

The internet is a global system of computer networks linked through a vast array of telecommunications infrastructure. A series of critical protocols which dictate its function were created with certain design specifications and goals in mind: decentralization, individual freedom, trust, and openness are in some ways constitutive qualities of the internet, by virtue of its design. The internet was developed under the auspices of the Defense Advanced Research Projects Agency (DARPA); the Advanced Research Projects Agency Network (ARPANET) was the first packet-switching network, and it was the first network of the network-of-networks known as the internet. The ARPANET and its early successors were designed and used by computer scientists possessed with solving *a particular set of architectural problems.* The original aims of the ARPANET - to connect certain academic and military networks - provided the context in which packet-switching was developed as an efficient but content-agnostic medium of communication. This original architecture remains largely intact, and in its earlier years the internet was believed by its users to represent a new community of possibility.

This sentiment of new communitarian possibility is exemplified by John Perry Barlow's "Declaration of the Independence of Cyberspace," an online manifesto shared following the passage of the Telecommunications Act of 1996 in the United States. He begins, "*Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us.*

You have no sovereignty where we gather."[152] Barlow, a prominent co-founder of the Electronic Frontier Foundation, planted a flag of digital independence asserting the vast hopes he had in a world whose individuals were now interconnected as never before.[153]

The declaration is couched in revolutionary terms, where cyberspace was a place of possibility, an anarchic utopia-to-be, a "Castle in the sky" just waiting for some last-minute foundation work.[154] It continues:

> Governments derive their just powers from the consent of the governed. You have neither solicited nor received ours. ... Cyberspace does not lie within your borders. ... It is an act of nature and it grows itself through our collective actions. We are creating a world that all may enter without privilege or prejudice accorded by race, economic power, military force, or station of birth. We are creating a world where anyone, anywhere may express his or her beliefs, no matter how singular, without fear of being coerced into silence or conformity.[155]

In terms which parallel the 'alternate locus' imagined by Feenberg, Barlow declares the rise of the internet as a world of freedom united by common purpose. Its unique nature frees its 'inhabitants' from the constraints and restrictions of the 'other' world: "*Your legal concepts of property, expression, identity, movement, and context do not apply to us. They are based on matter, There is no matter here*." This Cyberspace is its own world of free minds, and from this stronghold one may imagine an assault on the "giants of flesh and steel" to remedy the corporeal injustices unknown in a world of bits. The ultimate objective of this assembly is clear to Barlow in his cyber-saber-rattling: "*We believe that from ethics, enlightened self-interest, and the commonwealth, our governance will emerge...*

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[152] A Declaration of the Independence of Cyberspace, February 8 1996, Accessed April 15 2011 <http://w2.eff.org/Censorship/Internet_censorship_bills/barlow_0296.declaration>.

[153] The EFF was founded in 1990 to promote digital civil liberties; n.b. that in this declaration, Barlow refers to himself as a "cognitive dissident," and his home web address as his "Home(stead) page," linking his rebellion with the West and all the images it may conjure.

[154] N.b., 'Cyberspace' as a term was invented in the 1984 science fiction novel *Neuromancer* (William Gibson, Neuromancer (New York: Ace, 1984)), where it was an important component of the 'cyberpunk' genre. This and other earlier historical examples of imagined interconnectivity are important precursors (or in some cases contrasts) to the ideals expressed with the mass rise of the Internet subsequent to its liberalization with the disbandment of its governmental/military oversights in the 1990s.

[155] Barlow, (1996).

We will create a civilization of the Mind in Cyberspace. May it be more humane and fair than the world your governments have made before."[156]

Barlow and other cyber-utopians illustrate a vivid picture of how progress might fight its democratic resolution in a new world of reason and liberty made possible by and through technology. But as the internet grew, regulation encroached on Barlow's techno-utopia, alongside the rise of cybercrime.[157] The original cohorts of utopian users failed to conceive of the changes which came to the internet in the decades since it first came online – its tremendous world-scale success, or the ways it has been diverted from their mission of liberation. Today some scholars of information systems speculate as to whether the internet will merely succumb to the same conditions of monopolistic control endemic to any other new medium of communication, while others chronicle the vast array of corporate and sovereign interests arrayed against the ideas and institutions that grew out of those early ideals.[158]

In short, as the internet has matured it has come to better resemble those other parts of the industrial-technological society which it continues to supplant or reshape. Even on a purely technical basis, the visions of early pioneers are not enough to ensure the internet's present structure remains democratic. While the internet has enabled the rise of networking tools which have served to fuel protest and democratic movements in powerful ways, the internet can also serve as a force for effective surveillance and control. That a large portion of this surveillance should be undertaken with (relatively) little objection, is because in the most technologically dominant societies it is conducted for the purposes of advertising.

Yet although countries like the People's Republic of China are known to employ significant internet filtering and surveillance, even more conventionally 'free' countries like the United States have been found to use the internet for the purposes of mass surveillance and

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[156] Barlow, (1996).

[157] Jeanette Hofmann, "Et in Arcadia Ego: From Techno-Utopia to Cybercrime," Paradoxes of modernization: unintended consequences of public policy reform, ed. Helen Margetts, Perri 6, and Christopher Hood (New York: Oxford University Press, 2010).

[158] See Wu, 366 and Jonathan Zittrain, The Future of the Internet - And How to Stop It (New Haven: Yale University Press, 2009). respectively.

intelligence-gathering, as when a collaboration between prominent Internet Service Providers and the federal government allowed for the large-scale raw data mining of a significant portion of internet traffic.

IV. Conclusions

The internet, judged as a particular artifact or system, holds up to moral scrutiny better than the nuclear bomb or poison gas; it is hard to see it as one of Van Dyck's matches just waiting to ignite a terrible conflagration. But as history has shown, even the best-intentioned of technologies can be put to uses unforeseen by their creators. The internet can summon mobs as well as protests, and its power to change is matched by its attractiveness as a platform for distraction and consumption. While it presents certain favorable qualities to act in the capacity sought by Feenberg, its nature alone is insufficient to guarantee a transformative outcome.

The missing factor likely lies not in any particular artifact or technological system, but in political will. The combination of political drive with technological means may offer sufficient purchase for society to reclaim its soul from the course it presently it had no hand in charting. But this reprises the earlier ontological problem, for without sufficient political power to shape the conditions of technological development, new technologies will continue to reinforce the status quo, which may in turn suppress such technologies as would undermine the present system of society.

Despite this potential obstacle, an analysis of present circumstances would appear to reveal that it is the political wherewithal which is most absent. Currently existing technological means exist to enable new forms of collective action which could conceivably create a new nexus of control and power in society.[159] Changing circumstances may further fracture the collective

[159] It must be emphasized that the possibilities of a particular technology often operate in both directions. Cellular telephones and their complementary data tethers, for example, have appeared to play a prominent role in facilitating and documenting political action, whether in the 2011 'Arab Spring' or in other less revolutionary circumstances. But even where such communication infrastructure is not controlled by forces allied with the status quo, who might simply turn it off – and in the context of telecommunications media in the West, the scale of deployment and maintenance, abetted by policy decisions, has meant that such infrastructure is increasingly concentrated in very few

'bargain' of technological society, if the interests of the system additionally diverge from those of its average constituent. Failing a radical revision in the political motivations of such citizens, the prospects for reform appear dim.

This task is made more difficult in many circumstances because the political power of elite groups continues to grow relative to the clout of the general population. For example, the income inequality gap has grown into a chasm in recent decades in the United States, with serious consequences for the political influences of the less wealthy.[160] As a result of these shifts, the requisite political power which must be mounted by any opposition forces becomes greater in proportion to the ever-growing strength of the few.

Yet despite this powerful realignment, the ultimate victory of the phantom forces of determinism may come not from their powers of suppression and coercion, but from seduction and subversion. Unable to fill the mantle it took from the Enlightenment idea of progress, technological society has swallowed its opponents whole, masked alternatives from view and supplanted the more holistic, reason-driven idea of progress with another, more limited portrait of technocratic development. Now, even if alternative conceptions can be spied through gaps in the fabric of this world-picture, a slumbering society is unwilling to awaken to the difficult

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hands – these kinds of devices offer as-yet-unparalleled means for control and surveillance, too. The panopticon may finally be realized in a world of closed circuit television and the constant monitoring of location allowed by modern cell phones. Research is currently put to work predicting customers most likely to switch brands or create traffic reports, but empirical models have shown the ability of cell carrier data collection to accurately predict when two proximate but unheard parties are discussing politics, or predict future locations based on past trends with greater than 90% accuracy. The potential ramifications of such a capacity for controlling populations or subtly influencing mass psychology are readily apparent. For details on the potential of such data, see Robert Lee Hotz, "The Really Smart Phone," The Wall Street Journal April 23 2011, sec. C: 1.

[160] Jacob S. Hacker and Paul Pierson, Winner-Take-All Politics (New York: Simon and Schuster, 2010) presents a detailed political/intellectual history of those processes since the 1970s which have characterized this realignment. Insofar as "economic rewards ... [are] largely a function of the distribution of power" (Volker Bornschier and Thanh-Huyen Ballmer-Cao, "Income inequality: a cross-national study of the relationships between MNC-penetration, dimensions of the power structure and income distribution," American Sociological Review 44.3 (1979): 487-506, 487) such shifts in distribution can empirically signal changes in power. The U.S. Census Bureau also provides detailed statistics, in the United States context, of increasing income ratio disparities between higher quintiles compared with any lower quintile over the past 40 years. *See* U.S. Census Bureau, Selected Measures of Household Income Dispersion: 1967 to 2009, 2010).

responsibilities and choices which must be made to ensure a sound transition: the faculties of reason blinded by technological rationality.

The contingent deterministic properties discussed in this paper are not enough alone to demonstrate that technology itself rules universally. Technology is able to dictate patterns of human behavior where it is rendered powerful by structures of political oppression and domination; progress may be defined in narrow terms, for the ends of a select few. But the Enlightenment idea of progress need not have evolved in this way alone. Technology can equally serve the goals of a progress defined in more democratic terms. If this paper has exposed the false deterministic pretensions of technocratic consciousness, it has merely revealed the problem. The dilemma between these two antipodes may only be resolved by political choices. Failure to take action will result in the Enlightenment progress of liberty, democracy, and human perfectibility fading in memory, until a society of dreamers will be able to awaken to a nightmare only – if they wake at all.

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