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Technological parables and iconic illustrations:

American Technocracy and the rhetoric of the technological fix

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Abstract

This paper traces the role of American technocrats in popularizing the notion later dubbed the “technological fix”. Channeled by their long-term “chief”, Howard Scott, their claim was that technology always provides the most effective solution to modern social, cultural and political problems. The account focuses on the expression of this technological faith, and how it was proselytized, from the era of high industrialism between the World Wars through, and beyond, the nuclear age. I argue that the packaging and promotion of these ideas relied on allegorical technological tales and readily-absorbed graphic imagery. Combined with what Scott called “symbolization”, this seductive discourse preached beliefs about technology to broad audiences. The style and conviction of the messages were echoed by establishment figures such as National Lab director Alvin Weinberg, who employed the techniques to convert mainstream and elite audiences through the end of the twentieth century.

Keywords

technocracy; technological fix; rhetoric; Howard Scott; Alvin M. Weinberg

Introduction

Confidence in societal progress via engineering solutions became a feature of industrial discourse from the early twentieth century.¹ This paper addresses the popularization of such modernist faith over subsequent decades, focusing on the narrative techniques that underlay them. It argues that effective rhetoric about the problem-solving powers of technologies was developed and delivered by two key apostles, the technocrat Howard Scott and national post-WWII laboratory director Alvin Weinberg. Their evangelizing of the transformative social and political potential of technologies was unusually enduring, influencing broad audiences through the end of the century.

The paper focuses on a specific but fertile article of their shared faith: the notion that technological solutions are superior to more traditional political, economic, educational, and other social-science approaches to problem-solving. In the most radical form of the claim, its proponents argued that technological innovation could bypass or entirely replace these traditional approaches to human issues. By tracing the idea through its networks of dissemination, and employing close textual analysis of newly available sources, the paper addresses how modern technological beliefs were packaged and spread for wider publics.

The account traces these discourses about technology, and the ways they were communicated, from the era of high industrialism between the World Wars through, and beyond, the nuclear age. Trust in the transformative social powers of technology was promoted most consistently in North America by a handful of self-identified “technocrats”, identified by John M. Jordan as the most radical of a wave of progressive technologists.² Centered initially on groups associated with autodidact engineer Howard Scott (1890-1970), the nascent concept was later refined and championed through the speech-making of physicist-administrator Alvin Weinberg (1915-2006) from the 1960s who dubbed it “the technological fix”.

The time frame, historical correlations and methodology of this study are noteworthy extensions of prior researches. Scott and Weinberg are both well known to historians of the twentieth century in the distinctive contexts of interwar Technocracy and postwar nuclear power, respectively, but they and their organizations have previously been studied

separately and over the periods of their greatest public prominence, and with attention to more diffuse themes.³ The present paper instead begins from such familiar but segregated accounts to trace the intersecting professional activities of these key promoters over some nine decades. Its focus is not the flowering and decline of a political movement, or of societal experimentation with novel energy supplies. Instead, the work specifically tracks the promotion of engineering solutions for societal problems, a notion that was condensed into popular faith in technological fixes.

The research is based on hitherto unavailable archival holdings that chronicle this broad timespan via a variety of unpublished correspondence, speeches, exhibition materials and limited-circulation texts. Importantly, the archives of regional Technocracy chapters extend some thirty years beyond the death of their founder to the end of the twentieth century, and document how narratives about the societal power of technology mutated during the post-Scott era for members and their targeted audiences. Similarly, the unpublished papers of Alvin Weinberg provide significant insights into how his private views and public addresses about technology altered over the latter decades of his career. The collections reveal how, in both contexts, their creators dedicated unusual attention to condensing and communicating their claims. These textual and illustrative materials consequently provide privileged access to evolving notions of technological fixes and to the development of influential rhetorical practices.⁴

Indeed, careful attention to the nature of this discourse, and its orientation toward wider culture, is at the methodological center of this piece.⁵ Focusing on a close-reading of the speeches, articles and illustrations employed by both Scott and Weinberg, I argue that the techniques of popularization adopted by them were markedly different from traditional engineering communications. This rhetorical interpretation illustrates how their style of dissemination, as much as the rationale of their arguments, promoted cultural confidence in technological fixes.

The work argues that self-evident and simple examples were presented as easily-absorbed tales that reshaped the radical discourse of interwar technocracy into a style of communication amenable to post-Second World War policy-making and public understandings of science and technology. Key determinants in this transition were the characters of Howard Scott and Alvin Weinberg as energetic missionaries, and the form and content of their rhetoric, which supported a form of persuasion more akin to religious discourse.

The resonances between expressions of technological confidence, social progress and religious faith had been remarked as early as the 1920s, with Dora Russell, for example, linking American industrial zeal (“the dogmas of machine-worshippers”) with the social ideals of the Russian revolution.⁶ Both the ideological and theological connotations of this conviction, and more particularly the style of communication by which it was promoted, are threads interwoven through this paper. It focuses on how the deceptively discrete and simple claim was proselytized to influence wider cultural creeds.

Scott and Weinberg preached tales of wise technological problem-solving to broad audiences. Their typical narrative structure resembled a parable, and iconic graphics replaced detailed illustrations. Recounting universalized tales of engineering authority and honed by years of repetition, the sparse narratives and concrete examples attracted successive waves of receptive audience.

The timescale, comparative approach, and attention to the style of dissemination to broad audiences argue that faith in the progressive nature of technologies was not limited to a naïve period of early engagement, but became a confidence embedded throughout modern culture by the late twentieth century.

Technocratic organizations and their seminal messages

Examples of what were later dubbed “technological fixes” are an important feature of Howard Scott’s rhetoric from the earliest communications of the Technical Alliance, an organization that he co-founded in 1919. Consisting initially of a group of some seventeen men and women, the loose affiliation included economic philosopher Thorstein Veblen (1857-1929), electrical engineer Charles Steinmetz (1865-1923), conservationist Benton Mackaye (1879-1975), architect Frederick L. Ackerman (1878-1950) and physicist Richard C. Tolman (1881-1948). Most of them identified publicly with what American contemporaries recognized as “progressive” and “reform” policies in the period before and after the First World War, and a number of the organization’s advocates subsequently were to occupy posts in the Roosevelt administrations during the 1930s and 40s.⁷

The purpose of the Alliance, stated their first pamphlet, was “to survey the possibility of applying the achievements of science to societal and industrial affairs.” By collecting sound facts and applying rational engineering principles to modern problems, the not-for-profit organization would champion the replacement of “maladministration and chaos imposed upon the industrial mechanism.”⁸ The theme of the group’s message was that technical experts, rather than politicians and financial interests, were the only viable providers of effective solutions for modern society.

Howard Scott was the public voice and Chief Engineer of the Technical Alliance and its successor organization, Technocracy Inc. Surrounded by myths, Scott’s limited engineering training and experience appear to have been important to his style of engaging with wide audiences. Described by historian William Akin as a “bohemian engineer,” he frequented Greenwich Village in New York through the 1920s. A persuasive and magnetic speaker, Scott’s self-confidence, informal speaking style and fluent command of data on industrial practices impressed his audiences, including established scientists and engineers.⁹

In the economic and industrial environment after the First World War, the ideas fostered by the Technical Alliance gained diverse attention. Labor organizations such as the Railroad Brotherhood and International Workers of the World consulted the group,¹⁰ and the *New York World*, aligned with the national Democratic Party, published a lengthy interview with Scott a year later.

The newspaper article provides the first recorded recounting by Scott of an anecdote of unusual persuasive power: a succinct example showing how a technical solution could replace social, legal and economic approaches:

For lack of anything better to say, I asked him a question which every advocate of a new order will recognize as an old acquaintance: “Won't you have to change human nature first?”

Mr. Scott smiled dryly.

“Did you have to change human nature,” he asked “in order to keep passengers from standing on car platforms?”

“Go on,” I said, “I'm listening.”

“They put up signs first,” he continued, “prohibiting the dangerous practice, but the passengers still crowded the platform. Then they got ordinances passed, and the platform remained as crowded as before. Policemen, legislators, public service commissions all took a hand but to no effect; then the problem was put up to an engineer.”

“The engineers solved it easily. They built cars that didn't have platforms.”¹¹

As his audience appreciated, the “cars” were streetcars; the “platforms” were the open boarding areas and steps at one or both ends. By enclosing these areas and removing external hand-holds from which passengers could hang (and fall), engineering design could straightforwardly compel and correct human behaviors. Thus, where legislation and moral exhortations failed, engineers and their technologies could secure desired social outcomes. This first telling of the tale contained the seeds of a notion that was to spawn corollaries and compact coinings over subsequent decades. The central message of the anecdote was the superiority of technical innovation over social solutions (“technological fixes”), which entrained confidence in the power of inventions to compel societal change (“technological determinism”), implied the superior problem-solving abilities of engineers over other varieties of expert (“technocracy”) and their role in the consequent advance of civilization (“technological progressivism”). Linked to the potent tale, the hubris of these abstract ideas was contagious.

This single example was to develop a rhetorical life of its own. It was restated, recast and reapplied to explain the logic of engineering approaches to new socio-political situations over the following decades, and both its content and form informed the template for later promotion of the technological fix. As discussed below, its practiced delivery in numerous circumstances made the message generic enough to reduce technocratic ideology to an unassailable truth. So compelling was the tale that it was reproduced in American technocratic literature into the twenty-first century.¹²

The anecdote was timely. Horse-drawn streetcars had been largely replaced by motor vehicles by the end of the nineteenth century, and passenger safety gained rising attention. American streetcars had begun to incorporate features such as enclosed platforms and pedestrian fenders during the 1890s, and automatic doors and folding steps from the 1910s, although Scott's crediting of beneficent engineers was questionable.¹³ When he was interviewed in 1921, these improvements were becoming standard features of new streetcars, and older models in major cities were being retrofitted. Production of the mass-produced Birney Safety Car of 1915, in fact, peaked in 1921, and improved designs such as the popular Presidents' Conference Committee (PCC) streetcar were being introduced as late as 1936.¹⁴

The brief tale was supported by other American intellectual currents of the period. Economist Stuart Chase, arguably the most visible member of the Technical Alliance group during the mid-1920s, published on industrial inefficiency, waste and consumption.¹⁵ Traditional production methods and social configurations in factories were rebuked as ineffective and slow. "Efficiency engineers" became more prominent, with Commerce Secretary Herbert Hoover channeling the ideas of Frederick W. Taylor (1856-1915) regarding "scientific management."¹⁶ The tale of the safe streetcar fitted the wider narrative of bypassing old social problems via rational design.

A broader cultural current was the growing valorization of technology in American life. The "Machine Age", a phrase that exploded in popularity during the interwar period, reflected a new pace and confidence for modern society. New inventions provoked expectations of societal transformation, as argued by Bernhard Rieger, David Edgerton and others.¹⁷ The phrase signaled public awareness of the dependence of urban life on modern technologies, and labelled conflicting sentiments about the positive but unavoidable changes delivered by technological change. Scott's rational streetcar was the vehicle by which the inevitable future would be delivered.¹⁸

Channeled through the persuasive character of Howard Scott, this simple story was to survive organizational shifts. While the Technical Alliance faded from public view, the financial crisis of 1929 and the deepening economic depression brought Scott's ideas to much larger audiences during 1932-3, a period when effective actions were lacking from the two major political parties. Scott and a handful of former Technical Alliance members coalesced to revive work on an "Energy Survey of North America", intended to analyze national growth in engineering, rather than in economic, terms. Under the banner of "Technocracy", the group worked in vacant rooms at Columbia University's Industrial Engineering department, where for some eight months they collected statistics on industrial production.¹⁹ By mid-1932, some of their charts and predictions had been leaked to research bodies, labor organizations, economists and newspapers. Scott again served as the Director and charismatic spokesperson for the small cluster of technical experts, and over the next year was inundated with national attention. As he sloganized it, "the word technocracy, as representative of a new body of thought, means governance by science, *social control through the power of technique*."²⁰

The group's dedicated focus and confident explanations appeared to offer a quick route out of the economic crisis. Attracting a strong coterie of engineers alongside wider audiences, it excluded only active politicians and repeatedly disavowed political affiliations from either the left or right.²¹ The organization accreted unaffiliated supporters and interpreters over the following months. Its rapid rise was bolstered by its enigmatic character: as Scott noted in his only national radio broadcast some eight months after the group's formation, "to date, it has written fewer than 14,000 words but, judging from its response on this continent and abroad, those 14,000 words have done their work well."²² Indeed, the pared-down character of these populist appeals was to become central to the organization's enduring rhetorical style.

Public attention exacerbated divisions within the group, however. Scott's incautious statements and misleading background brought withering criticisms.²³ In 1933 he and a subset of adherents – notably geophysicist Marion King Hubbert (1903-1989) – legally incorporated their organization to consolidate publicity. Technocracy Inc consequently became the official voice of the movement, and more often than not the personal voice of its "Chief". Scott's communications consequently became the principal information channel.

From the mid-1930s the newly formalized organization founded local chapters across the United States and Canada, which preached its compelling tales via membership drives, exhibits, local speeches and lectures, and via regionally-circulated newsletters and magazines. Unlike its numerous competitors, Technocracy Inc proved long-lived. Dominated by the views of Howard Scott until his death in 1970 and beyond, its "continental headquarters" (CHQ) shifted successively from New York to Pennsylvania to Georgia and, during the 1990s, to a small town in the state of

Washington nearer the center of mass of its remaining supporters in the western USA and Canada. With its hierarchical direction but reliance on grassroots activities, the organization provided a remarkably stable and sparsely authoritative message through the century. This simple administrative configuration and carefully controlled content contributed to the wide dissemination of some of its views and survival into the internet age.

The most enduring of these notions was faith in technological solutions for complex social, political and economic problems, and the compact expression of what others came to call “the technological fix”.

Life history of a modern parable

Scott’s 1921 anecdote about streetcar design may have been a regular feature of his private conversations before, and certainly of public addresses after, the emergence of Technocracy Inc. With the example of streetcars replaced by railway carriages, for example, it is recorded some sixteen years after the *New York World* interview in another of Scott’s speeches:

People say you can’t change human nature. We of the engineering profession approach it in another way. The only method of regulating has been to prohibit. You have noticed the sign, “Passengers are prohibited from standing on platforms,” in railway cars. Engineers came along and designed a train without platforms and said, “Stand on them if you can.”

Issues of coercion and control melt away, he suggested, when replaced by benign physical environments that ensure safety. The same lecture gave a second example of engineering design that prudently guided appropriate social behaviors in factories. Instead of signs prohibiting dangerous use of equipment, he showed the picture of an accident-proof press. “You cannot be hurt by any operation of the machines. Put your hand in, and it won’t work. Even cigarette smoke will stop it. The product can be made responsible.”²⁴

In effect the machine, rather than the operator, embodies moral authority rather like a parent constraining the behavior of a willfully disobedient child. Yet Scott never analyzed his rhetorical anecdotes further, and seldom multiplied them. The canonical example of public transport appears again in a 1952 speech, but now linked to the fashionable topic in American psychology of behavioral conditioning:

[Y]ou see in the matter of conditioning, remember the old railway coaches that had the metal sign on them? They’re still running around. “Passengers are prohibited from standing on the platform of this coach. It’s contrary to law.” Well, that’s your legalistic, moral approach. It forbids people. That isn’t the scientific, technological approach. You design a car without a platform and say stand on it if you can. Very simple.²⁵

And again, during the late 1950s, the example reiterates the efficacy of engineering over morality and politics. The casual oratory now hints more overtly – and perhaps smugly – at the intellectual hierarchy of wise designers versus an obstinate public:

You see the technological approach to these problems is totally different than the moralistic, arid, legalistic approach... Well, the engineer just designs the car without a platform, and he says stand on it if you can. You’re a sucker if you try it – it isn’t there.²⁶

Scott’s delivery in each of these cases differs from his more general argumentative ploy of displaying graphs and quoting industrial statistics that indicate seemingly inevitable trends – in particular, the impending failure of capitalist economics.²⁷ The positivist reliance on quantifiable evidence is curiously replaced by an almost religious faith. The concise sketches are akin to New Testament parables: vaguely situated allegories that were seemingly universal in their applicability to new situations. The structure and aesthetics of the narratives and anecdotes arguably accentuated the appeal of these ideas. Delivered verbally and graphically with the imprecision of everyday language, they suggested common-sense truths having an archetypal generality. Like the best parables, Scott’s tales provided revelatory insights that appeared, in retrospect, self-evident to his audiences.

The rhetorical form of the parable traditionally compares and contrasts, with “bad” versus “good”, in this case, being exemplified by willful human misbehaviors versus astute engineering, respectively. Like traditional parables, which

communicate a moral or spiritual message, Scott's tales express modern realities with an overarching judgement: engineering designs effectively compel social change and circumvent resistance, and consequently should be the recognized as the most beneficent means of ensuring societal improvement. The stories contrast ineffective and wrong-minded societal actions – prohibiting, regulating and mandating – with the automatic social controls imposed by rational designs and their sage (and morally responsible) designers.

The parable-like role of the anecdotes and evangelistic tone of the public meetings is also suggested by Scott's deportment as an impressively tall, deep-voiced and revered figure addressed by acolytes as "the Chief", and by one Chapter's collection of such writings and speeches after his death into a publication of Biblical import, *The Words and Wisdom of Howard Scott*.²⁸ Anthropologist Margaret Meade, a close friend of Scott throughout his life, described him as "an extraordinary person, well over six feet in height, gaunt and rangy, Irish and somehow a man of the frontier, endlessly inventive and *prophetic*."²⁹ Scott's rhetorical tone matched his public persona. The secular sermons were typically extended by opportunities for collective enlightenment, with deferential audience queries receiving lengthy and discursive responses from the Chief. The sessions disseminated technocratic theory in an appealing demotic style usually supported by technological aids. Indeed, through the 1960s, most of Scott's interactions with members of the organization were in the form of long-distance telephone question-and-preaching sessions that followed some local chapter meetings.

The streetcar anecdote appears to have originated and remained with Scott himself. It is notably absent, for example, from the uncredited *Technocracy Study Course* written by the organization's co-founder M. King Hubbert. There, a relatively pale alternative is recounted instead to communicate the potency of technological determinism:

It is seldom appreciated to what extent... technological factors determine the activities of human beings... [T]housands of people cross the Hudson River daily at 125th Street, and almost no-one crosses the river at 116th Street. There is no law... It merely happens that there is a ferry at the former place which operates continuously, and none at the latter. It is possible to get across the river at 116th Street, but under the existing technological controls the great majority of the members of the human species find the passageway at 125th Street the more convenient. This gives us a clue to the most fundamental social control technique that exists.³⁰

What Scott had exemplified as clear-headed public protection ensured by thoughtful design becomes an anodyne technique of social regulation. In fact, Scott's paternalism and commonsensical tales contrast with a colder, *Brave New World* tone in Hubbert's *Course*.³¹ One of its lessons ("20. The Nature of the Human Animal") discusses at some length Ivan Pavlov's experiments and contemporary findings in endocrinology, arguing for the rational conditioning and shaping of social behaviors by the methods of science. By implication, popular beliefs and actions are shaped predominantly by their social environments, and must give way to rational approaches of experts able to engineer those environments to achieve desired behaviors. The appeal to rationality and scientific tone were central elements of the message.³²

Iconic imagery

Sometime during the 1930s, a graphic was prepared by Technocracy Inc to illustrate the original version of Scott's anecdote.³³ According to the present-day administrator of the organization, the streetcar image "along with a dozen others depicting mankind's evolution into the technological age was displayed along the upper walls on every Section Headquarters on the continent." It featured thereafter as one of the paradigmatic illustrations used to explain technocracy in public outreach programs (Figure 1).³⁴

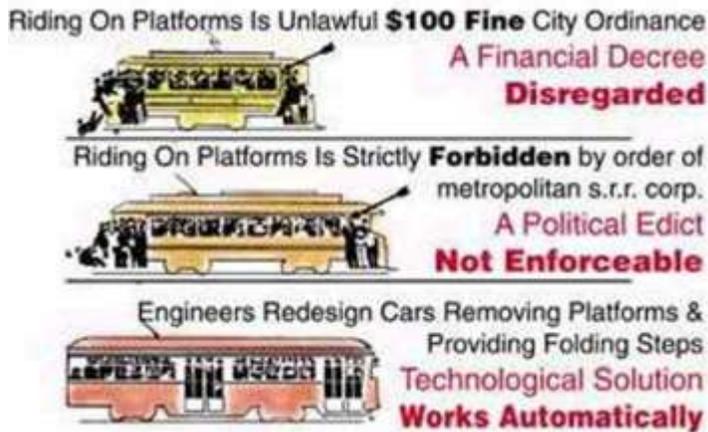


Figure 1: Technocracy and the technological solution to economic, political and social problems: rational streetcar design (n.d.). The origins of the four-color graphic, reprinted in post-card size, remain unclear; "Metropolitan s.r.r. corp" mentioned in the central panel of the illustration may refer to the Stockbridge Rail-Road, Massachusetts, although Technocracy Inc had no chapters in the state.

Versions of the illustration also were reproduced in post-Second World War technocracy publications, and carried various captions. Scott's example had been multiplied to serve distinct rhetorical purposes, often stretched to fit new symbolic functions. The parable featured in a 1945 article on streetcar usage in Vancouver, Canada, for example, to illustrate the more general claim of the inevitable progress of technologies and their consequent positive societal benefits. What safe streetcars had contributed for modern orderly cities, it suggested, other technologies would assuredly multiply.³⁵ In 1946, Technocracy member Leslie Bounds used the streetcar as a looser analogy to illustrate a general technique for eradicating crime. The caption was:

We can end chiseling and the greater proportion of crime in America, not by passing laws or the greater efforts to enforce existing laws, but by the simple expedient of making it impossible and unnecessary to commit the crimes.³⁶

Technological innovation would supplant laws and bypass traditional behavioral techniques such as moral guidance, education, and prosecution. Alongside this bold prediction, the author proposed a much more widely accepted forecast. Urban regeneration would replace slum neighborhoods, a technological transformation that would alter living contexts and, he argued, inevitably change the human behaviors that resulted from them.

Member Walter Palm reused the streetcar graphic in *The Technocrat* magazine two years later to argue more broadly and allegorically that

[i]t is futile to attempt to solve the social problems of this continent by business and political methods. An entirely new design is needed. Since our problems are technological, only a technological solution is adequate. The chart... illustrates the simplicity and ease with which problems are solved by our scientists, technologists and engineers.³⁷

And, in 1952, *The Northwest Technocrat* employed the same illustration to accompany an article on dangerous practices of transporting livestock to market:

This Chart depicts graphically Technocracy's scientific approach to our social problem; a technological, physical solution for what is fundamentally a purely physical problem. Result, greater safety and comfort, and the elimination of "crime".³⁸

Cattle, people and society at large, it showed, could be safeguarded by shrewd technological guidance. Nevertheless, in an era when tramways were being buried under asphalt to dedicate urban streets to buses and cars, the streetcar example no longer illustrated the leading edge of engineering wisdom and beneficence, but rather the past. Even so,

while the potency of the example faded, Technocracy Inc did not update its message. The course materials, public exhibits and lectures remained based on imagery conceived between the Wars (Figure 2).³⁹

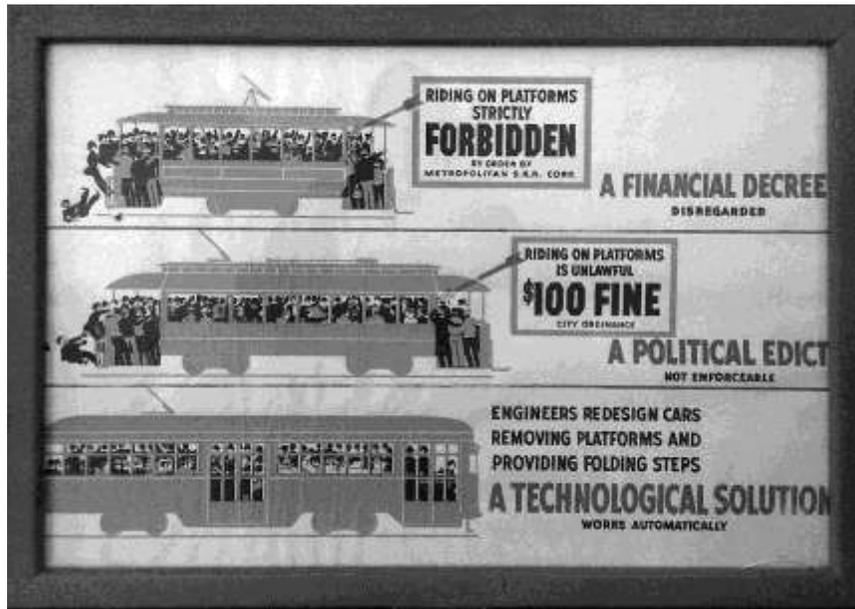


Figure 2: Later reproduction of the example of the streetcar as technological fix for social ills. As a four-color placard, the illustration was displayed in Technocracy Inc chapter houses across North America, but other versions appeared in Technocracy Inc literature between 1946 and 2001. All these later versions have inadvertently exchanged the top two text boxes of the original illustration, suggesting that the message was visually absorbed rather than analyzed.⁴⁰

Reproduced in regional speeches and periodicals, the rhetoric of Technocracy Inc may appear relatively limited in scope. As shown by the anecdote and its iconic depiction, the communications were generally repetitive rather than extensible. The simple narrative structure was the key to propagating its message. Contemporary analyses over some fifty years mapped new situations onto the writings and narrative archetypes of the interwar period. For members, this endurance may have reflected confidence in, or even nostalgia for, the stability and traditions of Technocracy Inc embodied by Howard Scott. But, as discussed below, the messages were periodically disseminated more widely, and their perennial usage suggests that they had sustained effectiveness not only within the organization but also for attracting wider publics.

From streetcars to nuclear weapons: the rhetoric of social solutions via science and technology

Scott's claims identifying technology and technologists as the solution to modern problems, developed and sketched between the late-1910s and early 1930s, can be summarized as follows:

- a) Social problems of modern society are caused, and ultimately solved, by technological change.
- b) Rational technological change of environments can produce new social behaviors rapidly.
- c) Conventional solutions – notably economics, politics and social initiatives such as education – are ineffective.
- d) Only technically competent people, by redesigning physical environments, are equipped to solve modern social problems.

One subsequent ally for at least the first two of these claims was scientist and urban planner Richard L. Meier, whose writings were castigated by a 1956 book reviewer as “reflecting naïve rationalism or the spirit of technocratic speculation.”⁴¹ Describing himself as a technological optimist, Meier's scholarly approach to technological solutions for societal ills was, however, the antithesis of the promotional techniques of American Technocrats. Meier's writings focused on careful analysis of socio-technological systems and resisted reduction to a catch-phrase, parable or icon.⁴²

³⁹“Technological parables and iconic illustrations: American Technocracy and the rhetoric of the technological fix”

Scott's four claims are more readily recognizable in the subsequent discourse of Alvin Weinberg, long-time Director of Oak Ridge National Laboratory (ORNL), essayist and public speaker. Weinberg, who had described himself early in his career as "a Progressive" who was concerned with the social responsibility and benefits of modern science, coined the term "technological fix" in 1965.⁴³ In Weinberg's words, "A technological fix is a means for resolving a societal problem by adroit use of technology and with little or no alteration of social behavior" and "technical inventions that could help resolve *predominantly social* problems."⁴⁴ His confident views mirrored the hubris of the technocrats and their faith in a society managed by technological innovations, and in which "social problems could be converted into technological problems."⁴⁵

The similarity of the views of Scott and Weinberg is suggested by a comparison of their respective rhetoric in public addresses:

a) Social problems of modern society are caused, and ultimately solved, by technological change

As Director of a National Laboratory dedicated to the development and application of nuclear energy, Weinberg was unusually frank in his acknowledgement of side-effects from modern technologies. An admirer of Rachel Carson's work on the unintended ecological consequences of DDT, he also was vocal about the unsolved problems of nuclear waste and endemic safety issues with reactor designs and management. Yet Weinberg was also an ardent optimist about the powers of technological innovation to solve any societal problem, and to do so more effectively and speedily than conventional social and educational approaches, or via political or religious ideologies.⁴⁶

b) Conventional solutions – notably economics, politics and social programs – are ineffective

During the financial crisis of the early 1930s, Scott was careful to distinguish the views of Technocracy Inc. from radical politics. This was reiterated periodically in the organization's rhetoric – notably during the Second World War, when the Canadian government banned the organization because of its perceived anti-war stance, and after the Second World War, when the Red Scare discouraged political and social nonconformity in North America. Instead, Scott argued that both the "Price System" (capitalist economics) and communism were outmoded, and that "Marxian political philosophy and Marxian economics were never sufficiently radical or revolutionary to handle the problems brought on by the impact of technology in a large size national society of today."⁴⁷ In their place, he proposed technocratic problem-solving to circumvent politics entirely:

Technocracy has proposed the design of almost every component of a large scale social system... a technological socialization is far more reaching, more drastic and more pervasive than anything that Marx or any socialist ever thought of.⁴⁸

Alvin Weinberg, in his published 1966 speeches mooted the value of technological fixes to replace "social engineering", made similar claims.⁴⁹ The "Marxian view", he noted, "seems archaic in this age of mass production and automation":

Technology has expanded our productive capacity so greatly that even though our distribution is still inefficient, and unfair by Marxian precepts, there is more than enough to go around. Technology has provided a "fix" – greatly expanded production of goods – which enables our capitalistic society to achieve many of the aims of the Marxist social engineer.

Like Scott, he argued that technological solutions could deliver a progressive society "without going through the social revolution Marx viewed as inevitable."⁵⁰

c) Rational technological change of environments can produce new social behaviors rapidly.

A recurring theme in Howard Scott's public addresses had been the rationale of public safety. A rare departure from his streetcar example was his more general claim concerning how safety can be designed into technologies. In an interwar speech, he derided the upsurge of "propaganda against auto accidents" and "great safety campaigns",

yet accidents increase. Why? Not because drivers do not know how to drive. With split highways,

one-way traffic, raised or sunk crossings, poles and trees moved back fifteen feet from the road, with 4 degrees horizontal and 4 degrees vertical curves only, and with the highways lighted by sodium lamps, accidents would be reduced by more than 90 percent.⁵¹

The precise figures provided a reassuring counterpoint to emotive calls for public education. Behavioral change through public advertising was ineffective, he suggested, not merely because of recalcitrant citizens but because the modern world placed unfamiliar demands on non-experts.

A remarkably similar example was recounted by Weinberg some thirty years later: “a safer car... is a quicker and probably surer way to reduce traffic deaths than is a campaign to teach people to drive more carefully”.⁵² Indeed, the direct inspiration for Weinberg’s example was safety campaigner Ralph Nader, whose sister was a sociologist at ORNL. Nader was an early supporter of Weinberg’s views, but echoed just as precisely the speeches of Howard Scott: “The illustrations of the remedial “fix” have been with us for years everywhere – from the automatic coupler on the railroads to a stairway railing”.⁵³

Weinberg reinvigorated the potency of Scott’s and Nader’s railroad, factory and car safety examples by providing more dramatic illustrations of what he described as “Quick Technological Fixes for profound and almost infinitely complicated social problems, ‘fixes’ that are within the grasp of modern technology, and which would... eliminate the original social problem without requiring a change in the individual’s social attitudes”.⁵⁴

Among his more provocative examples were the atomic bomb as a means of bypassing international negotiation, the intra-uterine device as a method of birth control that could side-step cultural norms about family size, a border wall between North and South Vietnam to end conflict, and the installation of air-conditioners in slums to literally cool down summer tensions and prevent urban unrest.⁵⁵

d) Only technically competent people, by redesigning physical environments, are equipped to solve modern social problems.

Both Scott and Weinberg broached this claim indirectly. It had been overt in the writings of Thorstein Veblen, who argued in 1921 for a “soviet of technicians” as a body of experts to govern society.⁵⁶ Scott, however, consistently shunned such a prediction, and instead argued for special qualities of engineers that transcended politics, social policy and ethical orientation:

Engineers do not disagree on facts. They all know which direction a stone will drop. They all know that a straight line is the shortest distance between two points. If there is anything else they want to know as engineers, they find it out; and when they find it out, there isn’t the slightest disagreement... As engineers, they are no more radical than a yardstick and no more conservative than so many degrees Fahrenheit.⁵⁷

Instead of a revolution that would replace politicians with technologists, Scott claimed that engineering methods would inevitably be recognized as the *only* means of exerting order in the modern world. As the “application of the knowledge of science and the methods of technology to social management”, Technocracy would provide “a blueprint for the operation of the North American Continent, in the same way that an engineer draws up the blueprint for an engineering project, or for a new design of engine, or for a continental telephone system”:

In doing this, Technocrats are not... influenced by any ethical ideal, but they are primarily concerned with function. The question in their minds is this: What design of social mechanism will operate at the maximum of efficiency with a minimum of oscillation?⁵⁸

A generation later, Alvin Weinberg was even more cautious. His established role as Director of a National Lab may have provided insights and constraints unfamiliar to Howard Scott. Weinberg seldom broached a direct criticism of politicians, but repeatedly turned his sights on social scientists:

The technologist is appalled by the difficulties faced by the social engineer; to engineer even a small social change by inducing individuals to behave differently is always hard even when the change is rather neutral or even beneficial... By contrast, technological engineering is simple: the

rocket, the reactor, and the desalination plants are devices that are expensive to develop, to be sure, but their feasibility is relatively easy to assess, and their success relatively easy to achieve once one understands the scientific principles that underlie them.

Unlike the Technocrats, who eschewed politicians, Weinberg argued for a revision of the working environment he knew best. He pleaded for the American government to “deploy its laboratories, its hardware contractors, and its engineering universities around social problems.”⁵⁹ Thus the physical scientists and technologists who had so effectively conducted the Manhattan Project and postwar development would be reassigned to tackle societal issues via technological methods. Clever engineers would consequently serve as tools of government, rather than as replacements for it. Technical specialists would supplement, if not entirely supersede, legislators and educators.

Such comparisons show that Scott and Weinberg shared similar rhetorical ploys, and a significant subset of intellectual convictions. The content, form and tone of their messages were distinctive. While both typically sprinkled their engineering discourses with technical detail, their presentations to broader audiences gave descriptions of technological fixes, instead, in the form of generic parables trimmed of context. The compact nature of the brief anecdotes and easily-absorbed imagery promoted their effectiveness and retention, and presented an appeal to common sense. The effectiveness of technological solutions to social problems, they claimed, was a self-evident truism.⁶⁰

The style of spreading this message was equally important. Meier limited his promotion of technological solutions to professional audiences, and usually in dry articles and books. Both Scott and Weinberg, by contrast, actively promoted their messages via speeches to broader publics. Scott, an Establishment outsider, preached his familiar examples mainly to the converted, but Weinberg, as Director of a postwar National Laboratory and policy advisor to the American government, was prolific in public speaking to audiences ranging from college commencement exercises to community groups, and publishing multiple instances of his essays in a wide range of scholarly journals for greater impact.⁶¹

From technocratic parables to tales of technological fixes

This close examination of rhetorical style illustrates close affinities between the oratory of Howard Scott and the subsequent advocacy by Alvin Weinberg. Tracing a “sound bite” from post-WWI conversations to post-WWII speeches, meeting hall placards and technocratic publications, suggests continuities with the later-twentieth century promotion of the technological fix.

There is circumstantial evidence to suggest that technology analysts of the 1960s such as Richard Meier, Alvin Weinberg, Ralph Nader and some of their peers encountered technocratic rhetoric through novel promotional methods during and after the Second World War. The message of Technocracy Inc was widely circulated via numerous local Chapters, periodicals and public meetings. Scott’s streetcar anecdote and illustration were popular amid what was admittedly a small coterie of adherents, but their circulation was relatively high among American engineers and technologists compared to the general population, suggesting a plausible route to wartime technologists and postwar designers such as Meier and Weinberg. From 1933, a technocracy group had been active in Weinberg’s native Chicago, the city that was to be the center of the Manhattan Project group in which he worked during the War.⁶² Technocracy had similar appeal and publicity in southern California, where Richard L. Meier worked as a chemist during the War.

The visibility of the Technocrats in fact grew after the war, a period when young American professionals such as Meier and Weinberg were rapidly adapting to the novel environment of Big Science (a term coined by Weinberg), with its new context of national labs and government-sponsored research projects. The fresh setting encouraged larger-scale thinking and the application of scientific knowledge to new contexts. Both Meier and Weinberg had been early members of the Federation of Atomic Scientists in 1945, a group of Manhattan Project scientists and technologists who championed the need to apply science more effectively to societal improvement. And Weinberg’s subsequent career at Oak Ridge, Tennessee had close ties to the Midwest and industrialized northeast which, along with the western USA and Canada, remained the heartland of Technocracy Inc.⁶³

To attract such audiences, Technocracy Inc employed a communicative technique that Howard Scott dubbed “symbolization”, first mooted in 1937, trialed in mass demonstrations two years later, and systematized in the decade

⁶⁰“Technological parables and iconic illustrations: American Technocracy and the rhetoric of the technological fix”

after the war. Centered on iconography, motorcade processions, and visual and audio spectacles, the practice had apparently arisen among the members emulating Scott's own public presentation, but was rapidly theorized by key participants. Symbolization sought to arouse curiosity and attract fresh audiences by subliminal appeals:

The balance of the public is not interested and is incapable of assimilating the necessary facts and implications... At the proper moment, the trained organization of Technocracy may find it necessary to present Technocracy to the masses in assimilatable [sic] form...⁶⁴

Employing searchlights, road signs, billboards, radio broadcasts, and exhibition trucks, the processions represented the regimentation and efficiency of the organization through the members' adoption of regulation grey suits and vehicles. The events evoked comparisons with European fascism, but the Technocrats stressed the role of modern technologies and media to communicate their matter-of-fact and emotion-free scientific rationale. Symbolization, according to Scott, was more effective than the commercial advertising of the day, designed as a holistic form of iconography intended to condense the organization's themes and ideology into rapidly-absorbed visual representations. Uniform dress, machine-like social organization and the monad (a yin-yang symbol in vermilion and chromium) became visual metaphors for the logic and modernity of technological solutions to societal problems. Like the streetcar graphic, the varied methods of symbolization were designed to win over audiences by sidestepping analysis.⁶⁵

In the summer of 1947, Technocracy Inc implemented Operation Columbia, an all-out "symbolization activity" that was to be repeated across North America over the following decade. A fleet of several hundred regulation-grey vehicles made a two-week round-trip lecture tour and membership drive through cities along the west coast between Los Angeles and Vancouver, Canada.⁶⁶ It was supported by mass mailing campaigns in the cities to be visited, an associated "Tech Net" of shortwave radio amateurs to maintain communications through the parading convoy, some one-hundred "sound cars" carrying public address systems and truck-mounted war-surplus searchlights to attract local audiences. Grey-suited volunteers distributed technocracy literature at the roadside to passing cars and visitors on foot, and in rented arenas in major cities; Vancouver alone drew some 5000 paying attendees.⁶⁷ At each venue an exhibit bus displayed iconic posters, including the ubiquitous streetcar graphic. The following summer, Operation Golden Gate attracted some 400 cars and 2500 technocrats from around the USA to parade around the Bay Area, followed by a road tour to Los Angeles. Subsequent publicity spectacles on a less ambitious scale included Chapter-organized motorcades and picnics through the early 1950s.⁶⁸ Either first- or second-hand, the local activities and national press attention surrounding symbolization events likely provided the first exposure of many young postwar North American technologists like Weinberg and Meier to technocratic ideas.

There are hints of direct influence between technocrats and technological-fixers, for example in brief records of conversations and correspondence between Technocracy Inc co-founder M. King Hubbert and Alvin Weinberg between 1961 and at least 1967.⁶⁹ Nevertheless, demonstrating a causal link between these seminal promoters is not the primary aim of the present work. Instead, it prioritizes the atypical but shared nature of this technological discourse and its direction towards wide audiences. The rhetorical appeals and imagery employed by Scott and Weinberg – but disdained by Meier – were unconventional in engineering communications, and arguably proved effective in encapsulating and spreading their confidences about the social powers of technology.

Revisiting the rhetoric of technocratic fixes after Scott

The association between technocracy and technological fixes developed gradually over the remainder of the century. Word-usage statistics indicate that the terms "technocracy" and "technological fix" rose significantly in circulation from the mid-1960s, suggesting the impact of Alvin Weinberg's public discourse.⁷⁰

Over the same time period, the words were used increasingly by critics as pejorative labels. The term "technocrat" came to signify the member of a technological elite in a position of political power, and "technological fixes" became associated with seeking to replace human concerns and democratic decision-making with coldly rational but simplistic engineering manipulations. It is ironic that technocracy, which had touted the improvement of social environments by benevolent engineering interventions that bypassed politics, was increasingly criticized as a dangerous expression of modern governance. The popular understanding of technocracy – as reductive rational forces within conventional government – accorded more closely with Alvin Weinberg's views, which never acknowledged the term.⁷¹

The later activities of Technocracy Inc contributed inadvertently to this alienation from its audiences. Following Howard Scott's death in 1970, the organization retained and only cautiously expanded upon Scott's views, somewhat akin to a nascent religious tradition. Reminiscent of the apostolic period of Christianity, the canon of speeches, articles and pamphlets was collected and reused, to be quoted in relation to contemporary technological and societal issues. The *Technocracy Study Course* was repackaged in abbreviated form, to act almost as a catechism for the organization's beliefs. The technological examples were recounted but not extended. Instead, the texts were subtly recast in ways that suggest the influence of Alvin Weinberg's independent advocacy. The organization accompanied the term technocracy with straplines that highlighted and streamlined its link to societal change. Technocracy was now defined pointedly as "the scientific method applied to sociological problems" and promoted as "the Technological Social Design, permitting science to formulate a scientific socio-economic structure."⁷²

And while a seminal successor to Howard Scott failed to materialize, the organization fielded a handful of lesser evangelists for technocracy and prophecies of imminent societal catastrophe. With regional chapters and membership income falling, Technocracy Inc increasingly directed its energies towards a kind of missionary work: converting influential public figures thought to have a public identity relating to socially-responsible science, futurism or an anti-establishment orientation. Targets included science writer Isaac Asimov (then representing Zero Population Growth), ecologist-ethicist Garrett Hardin (author of controversial essays on managing environmental resources), *Omni* magazine editor Ben Bova, and dozens of others.⁷³

Replies to the letter-writing campaigns were rare and unpromising. Aimed at critical public figures rather than broad audiences, the initiative had eschewed the compelling parables and icons for less concrete arguments that had little persuasive power. Garrett Hardin responded, "the problems of human relations and the allocation of scarcities cannot be altered or escaped by worship of technology" and the editor of the *Bay Area Skeptic* retorted, "do not assume that I am interested in exchanging letters on your Utopian Technocracy." Few others replied at all.⁷⁴

A senior technocrat mourned the social decline of their technological faith:

I do feel that Technocracy Inc. has lost its credibility and its appeal especially to people of technical and scientific sophistication, and indeed, to the public at large... In general it sounds more like a political opposition party, constantly nagging away at the status quo. How tiresome. And how futile. Where is the scientific thrust that focused on the unidirectional and irreversible progression of science and technology that gave rise to the concepts of Scott's Technocracy in the first place?⁷⁵

For his part, Alvin Weinberg in later life acknowledged with regret that certain technological solutions could not be implemented in a liberal democracy. Yet his autobiography championed the original tales of bombs, air conditioners and border walls as rational technological fixes applied to societal problem-solving, just as Howard Scott had confidently recounted the original streetcar parable three-quarters of a century earlier until his final years.⁷⁶

Conclusion

This paper has tracked the rhetoric of what came to be known as "technological fixes" – technological approaches for solving societal problems – from the end of the First World War to the late twentieth century. While such amorphous confidences emerged from the activities of numerous technical workers operating in early twentieth century environments of modernity, their reduction to a compact article of faith that could be readily expressed, promoted and absorbed can be attributed to two eloquent prophets: Howard Scott and Alvin Weinberg.

Expressed as a modern parable, Scott's streetcar anecdote proved remarkably appealing to audiences over decades. When he first related it, the example cited a contemporary transformation familiar to citizens in American cities and towns in an age of high industrialism. The appealingly rational tale of cool engineering wisdom triumphing over undisciplined citizens was compelling for his audiences. And the message embodied in the simple iconography could be readily absorbed – so much so that details of the increasingly nostalgic streetcar designs were scarcely noticed by audiences over the following decades. The success of the lesson in wider culture owed much to its brevity and superficial generality, making it impervious to contemporary analysis and historical revisionism. Alvin Weinberg's appropriation and extension of this metaphor – recounting logical anecdotes of engineering wisdom as new parables

of the modern age – brought the notion of technological fixes to receptive audiences at graduation ceremonies, government policy-consultations and peer conferences.

Of equal note is how effectively the notion of technological fixes was disseminated. The simple messages were refined to their essentials by years of repetition. Aiding their spread and survival was the lack of documentary precision or elaboration, allowing them to be translated into allegories fitting new contexts and arguments.⁷⁷ Communicated matter-of-factly by Howard Scott and Alvin Weinberg as a handful of parables, the simple anecdotes were immune to criticism and easily recounted or displayed by supporters. And the rhetorical style appears to have yielded similar effects for both proponents: both Scott and Weinberg rehearsed their examples without extension or correction through their final years.

The potency and fertility of the rhetorical claims are noteworthy. The idea that technological design could be the most effective and rapid means of solving societal problems seemed, to the Technocrats and many engineers through the century, to be self-evident. This confidence entrained even more influential hidden assumptions, e.g. that the inevitable benefits of technological solutions are generally beyond dispute, and that technologies necessarily determine social outcomes. Faith in progress and belief in technological determinism were implicit but readily-accepted implications of the anecdotes. Thus the style as much as the meager content of the messages delivered wide-ranging beliefs to non-engineering audiences as well as to technological experts.

This case study illustrates the careful attention given by the historical actors to their style of dissemination in order to persuade broad audiences, and argues for a similar attention on the part of historians. The identification of parables, icons, proselytizing and symbolization is helpful for understanding how brevity, imprecision and imagery proved not merely compelling, but inspirational, for audiences over decades. From the viewpoint of historical methodology, this account suggests the value of close reading of such popular discourses to better understand their role in the growth of modern cultural beliefs. For policy-makers, social analysts and historians of culture and technology, the promotion of technological fixes is salutary in illustrating how the power of simply-expressed ideas communicated by confident technical experts can shape the beliefs and actions of generations.

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Notes

[1] Jordan, *Machine-Age Ideology*; Segal, *Technological Utopianism*; Brick, *Transcending Capitalism*. By contrast, Edwin Layton argues in his revised 1971 *The Revolt of the Engineers* that few American engineers during the “progressive era” were radicals. On varied disciplinary perspectives, see Misa et al (eds.), *Modernity and Technology* and Hard & Jamison (eds.), *The Intellectual Appropriation of Technology*.

[2] Jordan, *Machine-Age Ideology*, pp. 212-14.

[3] Prior accounts of American Technocracy have generally focused on the organization’s rise to popularity and fall from attention before the Second World War, neglecting interactions and influences later in the century. Jordan’s excellent account of industrial ideology centers on the interwar period, but does not focus on Technocracy and its particular claims about technology. Similarly, most scholarly attention to Weinberg has concerned his role in nuclear engineering and policy (e.g. Johnston, *The Neutron's Children*).

[4] The principal sources for this paper are the Technocracy Fonds at the University of Alberta archives and the University of British Columbia archives (henceforth UAA and UBCA, respectively), rich in late-20th century documents from Technocracy regional chapters and deposited up to the early 2000s. Weinberg’s unclassified papers are divided between the University of Tennessee Modern Political Archives, Baker Center for Public Policy, Knoxville, and a more extensive complementary collection at the Children’s Museum of Oak Ridge, Tennessee (henceforth MPA and CMOR, respectively), with the latter first made available in 2016.

- [5] On discourses directed towards experts, see, e.g. Overington, "The scientific community as audience" and Winsor, *Writing Like an Engineer*.
- [6] Russell, *The Religion of the Machine Age*, p. 202. See also Noble, *The Religion of Technology*.
- [7] Scott, 'Origins of Technical Alliance & Technocracy'.
- [8] Technical Alliance, 'The Technical Alliance: what it is, and what it proposes,' New York, 1918. UBCA RBSC-ARC-1549 Box 1.
- [9] Akin, *Technocracy and the American Dream*, pp. 28-9. For a supporter's account, see Parrish, *An Outline of Technocracy*.
- [10] Two articles appeared in the IWW periodical: Scott, 'The scourge of politics in a land of Manna' and 'Political schemes in industry'.
- [11] Wood, 'The birth of the Technical Alliance', 16.
- [12] E.g. Technocracy Inc, *Technocracy: Technological Continental Design*.
- [13] Streetcar safety arguably was driven not by responsible innovation but by the pressure of financial losses to transport companies to compensate injured passengers and by impending government-mandated design changes. "Open platforms gave way to platforms with gates, gates to fully enclosed platforms. Faced with the threat of government action, companies took preemptive action... In a single month in mid-1894, the patent office awarded twenty patents to inventors of fenders and guards..." [Welke, *Recasting American Liberty*, pp. 30-1]. Patents included Rowntree and Spencer, 'Combined street-car pneumatic door device and brake-release mechanism' and Beck, 'Steps for railway and street cars'.
- [14] Similar designs of the period included the Peter Witt trolley and J. G. Brill streetcar designs circa 1916; see Middleton, *The Time of the Trolley*. Engineering rationalism was nevertheless not deterministic: older open platform designs such as the cable-drawn cars used in San Francisco co-existed with the safety designs adopted in other cities, and horse-drawn trolleys worked alongside electric streetcars in New York through the 1920s.
- [15] Chase, *The Tragedy of Waste*. See also Westbrook, 'Tribune of the technostructure', who coins the phrase "technocratic progressive" to describe him.
- [16] On Taylorism, see Kanigel, *The One Best Way*.
- [17] Rieger, *Technology and the Culture of Modernity*; David Edgerton, *The Shock of the Old*.
- [18] E.g. Wilson et al., *The Machine Age in America*; Banham, *Theory and Design in the First Machine Age*.
- [19] The term "technocracy" was coined independently by several individuals, notably in 1919 [Smyth, 'Letter to the Editor']. The term also gained currency in other countries, notably interwar Germany; see, for example, Lenk (ed.), *Technokratie Als Ideologie*.
- [20] Scott, 'Interview, *St Louis Post-Dispatch*' (emphasis added).
- [21] The most thorough account of this period is Elsner, *Messianic Scientism*. On the later history of the organization, see Adair, *The Technocrats*.
- [22] Scott, 'Radio address, Hotel Pierre'.
- [23] For a well-rounded contemporary journalistic investigation of Scott's career, claims and philosophy, see Raymond, *What is Technocracy?*
- [24] Scott, 'Public lecture by Howard Scott'. On technology-related accidents, which became an important rhetorical element for Howard Scott, see Burnham, *Accident Prone*.
- [25] Scott, 'Birthday talk by Howard Scott'. The replacement of overt force by calm rationalism in redirecting behaviors is characteristic of the claims of behavioral psychologists between and after the Wars. B. F. Skinner's (1904-1990) "radical behaviorism" was then current, informing his novel *Walden Two* and his subsequent text *Science and Human Behavior*. The technocratic and behaviorist devotion to quantification and rejection of

psychological interpretation have evident links with logical positivism, then at its zenith for American philosophers of science.

[26] Scott, 'Design, direction or disaster'.

[27] These trends concern the central claims of technocracy: the rise of production, consumption and waste, the precipitous drop in employment owing to increasing efficiency, and the consequently inevitable collapse of the "Price System", or conventional free-market economics – a term popularized by the Technical Alliance's theorist, Veblen, in his *Engineers and the Price System*. Graphs are prominent in successive editions of the *Technocracy Study Course* and in vue-graph transparencies and exhibition placards employed between the 1930s and 1990s. For collections of exhibition and lecture materials, see UBCA RBSC-ARC-1549 Box 2 and UAA 96-123-8.

[28] Technocracy Inc, *The Words and Wisdom of Howard Scott*.

[29] Meade, *Blackberry Winter*, pp. 195-8 (emphasis added).

[30] Hubbert, 'Lesson 22: Industrial design and operating characteristics', in: (ed.), *Technocracy Study Course*, pp 242-68; quotation p. 242. The example is reminiscent of Winner's discussion in 'Do artifacts have politics?'.

[31] Huxley, *Brave New World*. British biologist Julian Huxley (1887-1955), brother of the author, vaunted technocratic ideals that were satirized in the novel [Armytage, *The Rise of the Technocrats*, p.274].

[32] Hubbert, *Technocracy Study Course* (1934), with successive editions in 1937, 1938 and 1940 and multiple reprintings.

[33] The original source and exemplars of the illustration have not been located and appear to be unknown by current administrators, but probably date from the mid-1930s when Technocracy Inc generated publicity materials. The top two vehicles are consistent with electric trolley car designs in operation between the 1890s and 1910s. The bottom-most form could be as early as the Peter Witt trolley of 1916 but is reminiscent of the 1936 PCC design. Streetcars increasingly were replaced by buses from the 1930s, however, and disappeared almost completely from North American cities by 1960.

[34] George Wright to author, email, 26 Feb 2016. The iconic illustrations generated by the 'Energy Survey' of the Technical Alliance and subsequent research by Technocracy Inc appear repeatedly in presentations to local audiences, public exhibits, and the higher-budget regional publications (e.g. *Technocracy*, *The Technocrat*, *The Northwest Technocrat*, and *Technocracy Digest*, each published from the mid-1930s). Fewer illustrations accompanied the typically typewritten and mimeographed newsletters that included, at best, hand-sketched line drawings. Among the most common illustrations were graphs of rising production, energy consumption and technology capacity such as railway miles; a hierarchical organization chart of the planned "North American Technate"; a map of the area of its intended coverage, consisting of Canada, the USA, Caribbean, and Central and northern South America; and, the "Energy Certificate", an IBM-like card intended to replace money with an accounting of energy allocation. UAA Technocracy funds.

[35] Urquart, 'Ring out the old, ring in the new'.

[36] Bounds, 'What's yours is mine', 7.

[37] Palm, 'Why North America faces social change', 9.

[38] 'L.L.B.', 'Subsidies and sabotage', 22.

[39] The use of outmoded graphics was not likely intended as nostalgic appeals to long-standing members, but instead reflected lack of contemporary research by the organisation and the image's satisfactory effectiveness in attracting fresh audiences.

[40] Reproduced in various grayscale versions in Bounds, 'What's yours is mine', p.7; Palm, 'Why North America faces social change', p.9; 'L.L.B.', 'Subsidies and sabotage', p.22; Technocracy Inc. *Technocracy: Technological Continental Design*. 1990 and 2001, respectively. Color placard photographed at Aldergrove, British Columbia premises of Technocracy Inc, courtesy of current Director George Wright.

[41] See, Baran, 'Review of Meier'.

- [42] Meier, *Science and Economic Development and Modern Science and the Human Fertility Problem*.
- [43] Oak Ridge Operations Manager, 'Dr Alvin A. Weinberg security clearance meeting 29 Sep 1948', 29 Sep 1948, MPA Box 14, Folder 4.
- [44] Weinberg, 'Beyond the technological fix', p.1; ---, *The First Nuclear Era*, p. 150; original emphasis.
- [45] Weinberg to H. Brooks, letter, 17 Jun 1966. CMOR Cab 5 Drawer 4, Chron 1966-2.
- [46] For a lucid exposition of his views, see his collected essays and autobiography, Weinberg, *Nuclear Reactions and The First Nuclear Era*.
- [47] Scott, 'History and purpose of technocracy', p 9.
- [48] Scott, 'History and purpose, p 11.
- [49] "Social engineering", for Weinberg, was a catch-all and rather derisory term that included education, sociologically-informed interventions, legislation aimed at controlling behaviours, and even religious ideology. By contrast, J. M. Jordan employs the term to connote conventional engineers solving social problems.
- [50] Weinberg, 'Can technology replace social engineering?', 5.
- [51] Scott, 'Public address by Howard Scott'.
- [52] Weinberg, 'Can technology replace social engineering?', 7.
- [53] Nader to Weinberg, letter, 22 Oct 1966. CMOR Cab 7 Drawer 1, Nader file; Weinberg to Nader, letter, 7 Jun 1966, CMOR Cab 5 Drawer 4, Chron 1966-2.
- [54] Weinberg, 'Can technology replace social engineering?', 5.
- [55] E.g. Weinberg and James C. Bresee, 'On the air-conditioning of low-cost housing', unpublished report, 16 Jan 1968, CMOR Cab 5 Drawer 4, Chron 1968-1.
- [56] Veblen, 'A memorandum on a practical soviet of technicians'.
- [57] Wood, 'The birth of the Technical Alliance'.
- [58] Ivie, *America Must Show the Way*, pamphlet (New York: Technocracy Inc, 1938); quotation p. 21.
- [59] Weinberg, 'Can technology replace social engineering?', 5 and 8. See also ---, 'Social problems and national socio-technical institutions'.
- [60] In this respect, the communications of Scott and Weinberg were similar to those of F. W. Taylor, whose case for Scientific Management was founded on empirical but anecdotally recounted case studies.
- [61] Weinberg's first 1966 essay on technological fixes appeared in at least eight journals ranging across physics, engineering, science policy, behavioral psychology and social science over the next two years, and anthologized in numerous books thereafter. On its genesis, see Johnston, 'Alvin Weinberg'.
- [62] Elsner, *Messianic Scientism*, p 65.
- [63] Scott, 'Origins of Technical Alliance & Technocracy'.
- [64] Dickinson, *Technocracy Digest*.
- [65] "Symbolization of Technocracy", CHQ circular, November 1940, UAA 69-123-1 folder 5; Smith, 'Symbolization Drives'.
- [66] A film of the event made for internal consumption documents its meticulous organization, and describes a "long line of grey cars... extending nearly ten miles back from the Canadian border." Technocracy Inc, 'Operation Columbia'.
- [67] Adair, *The Technocrats*, p.101.

[68] E.g. Technocracy Inc, 'Operation Bakersfield', 'Operation Ohio Valley'.

[69] Hubbert to W. T. Thagard and Weinberg, letter, 19 Sep 1961, CMOR Cab 6 Drawer 1, Hubbert file; Hubbert to Weinberg, letter, 31 Mar 1967, CMOR Cab 5 Drawer 4, Chron 1967-1, mentioning face-to-face encounters and topics of energy production and national resources.

[70] Google Ngrams analysis of key terms. Michel et al., 'Quantitative analysis of culture'.

[71] The principal publicist of Technocracy Inc in the post-Scott period actively sought to correct the conflation of the characteristics of his organization with other expressions of technologist-dominated governing elites such as the Kremlin. See, for example, John A. Taube to S. Bialer and J. Afferica, letter, 4 Aug 1986, UAA 96-123-5 folder 149.

[72] The course materials long served as the standard instruction for members of the organization, being revised five years after Howard Scott's death as *Technocracy: Technological Social Design*, revised and retitled *Technocracy: Technological Continental Design* (emphasis added) and reformatted for internet distribution in 2004. The streetcar example is incorporated for the first time as a graphic in the shorter post-1970 versions.

[73] John A. Taube to I. Asimov, letter, 6 Feb 1980, UAA 96-123-5 folder 143; --- to B. Bova, letter, 18 Aug 1982, UAA 96-123-5 folder 146. Hardin, 'The tragedy of the commons'; 'Lifeboat ethics: the case against helping the poor'.

[74] Hardin to Taube, letter, 18 Oct 1981, UAA 96-123-5 folder 144; Robert Shaeffer to J. A. Taube, letter, 11 Oct 1983, UA 96-123-5 folder 146. Media coverage increasingly portrayed technocracy as an outmoded faith preserved by old men [Livingston, 'Technocracy still lives'; Maloney, 'Technocracy dreams at the fringe'; Hawthorn, 'Diehard few keep utopian dream alive '].

[75] Walt Fryers to J. A. Taube, letter, 22 Feb 1988, UAA Box 96-123-4 Item 135.

[76] Weinberg, *The First Nuclear Era* and 'Technology and democracy'.

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