Clay T. Whitehead

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Sent: Friday, April 28, 2006 3:30 AM
To: Margaret - GWU
Subject: delanceyplace.com 28/04/06-jane jacobs

In today's encore excerpt, we take a little extra space to note with great sadness the passing of Jane Jacobs, iconoclastic author of such works as the landmark Death and Life of Great American Cities and The Economy of Cities. Jacobs, in our view, was one of the great original thinkers of our age. who, according to architectural critic Inga Saffron 'almost single-handedly launched the movement to stop America's cities from being paved over by highways, housing towers and high-handed urban renewal projects. Written in 1961, Death and Life was a withering critique of the post-World War II planning establishment, which believed it could cure what ailed America's cities by replacing dense downtown neighborhoods with a monoculture of concrete public-housing towers. Mrs. Jacobs took the then-radical view that cities derived their richness from their natural, if sometimes scruffy, mix of people, buildings and commerce. Her observations were initially derided as the quaint musings of a simple housewife with no academic degree. It didn't help that she was a woman commenting on a largely male profession, or that she wore her hair in a childish page-boy with self-cut bangs and owlish glasses. But Mrs. Jacobs had her revenge. Her revolutionary ideas have been thoroughly absorbed into mainstream thinking, while her critics have been discredited with one public-housing implosion after another. A review in the New York Times grandly declared her book 'the most influential single work in the history of town planning' ':

"Great cities are not like towns, only larger. They are not like suburbs, only denser. They differ from towns and suburbs in basic ways, and one of these is that cities are, by definition, full of strangers. To any one person, strangers are far more common in big cities than acquaintances. More common not just in places of public assembly, but more common at a man?s own doorstep. Even residents who live near each other are strangers, and must be, because of the sheer number of people in small geographical compass...

So long as we are content to believe that city diversity (which equates with success) represents

accident and chaos, of course its erratic generation appears to represent a mystery. However, the conditions that generate city diversity are quite easy to discover by observing places in which diversity flourishes and studying the economic reasons why it can flourish in these places...

To generate exuberant diversity in a a city?s streets and districts, four conditions are indispensable:

1. The district, and indeed as many of its internal parts as possible, must serve more than one primary function; preferably more than two. These must insure the presence of people who go outdoors on different schedules and are in the place for different purposes, but who are able to use many facilities in common.

2. Most Blocks must be short; that is, streets and opportunities to turn corners must be frequent.

3. The district must mingle buildings that vary in age and condition, including a good proportion of old ones so that they vary in the economic yield they must produce. This mingling must be fairly close-grained.

4. There must be a sufficiently dense concentration of people, for whatever purpose they maybe there. This includes dense concentration in the case of people who are there because of residence.

The purpose of explaining them (in this book) one at a time is purely for convenience of exposition, not because any one-or even any three- of these necessary conditions is valid alone. All four in combination are necessary to generate city diversity; the absence of any one of the four frustrates a district?s potential.

Jane Jacobs, The Death and Life of Great American
Cities, Vintage Press, 1961, pp. 30, 150

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p202 n7 ref [illegible] to est KDKA. ~~[illegible]~~ & ff.

"Their advertisement..." They = ?

Sept 29, 1920 ad

sale of sets & adv of West

p203 n8 HP Davis lecture at Harvard U.

Radio News
" Merch 6/22

Grebe
Crosley
West.
RCA

6/22 incl West

20 ATT
~~West~~
GE

= "infringement suits"
Radio News 11/21
nothing in genl mags.
Learn from telephone ads
& phono ads,

Brands ← VP Mkty

M.C. Rypinski. (West).
sales
Radio ~~News~~ Merch 6/1/22.

Dept stores ~~start stns~~ to sell
radios on shelves.

USDA – farm stns?
DoC – WX ?
fairs to promote to rural

HP Davis
Radio Merch 6/22
7/22 West radio sets.
summer slump in sales.

musician boycott, want to be paid.

copyright cases 1925

4:00
7:30

HP 7/22

The People's Telephone:
Technological Populism and the System Idea

by Robert MacDougall

Theodore Vail

"It is not the telephone apparatus, central office equipment, or wires that independently afford or can afford any service," wrote Theodore Vail, president of the American Telephone and Telegraph Company (AT&T), in 1917, "It is the machine as a whole. All the telephones, all the equipment, all the central offices are vital and necessary parts of that machine." Today, as in Vail's day, the telephone network is a classic example of an integrated technological system. A single telephone, on its own, is essentially useless. It only acquires utility and meaning as part of a larger system—a network not only of wires and switchboards, but also of laws and commerce, cultural expectations and social forms.

Historians of technology have made the study of systems central to their work, yet rarely have we interrogated the idea of system itself. We should not adopt systems as organizing concepts before first investigating systems history and its implications. In the case of the telephone, it is quite clear that popular ideas about technological systems shaped the early development of the phone, and the telephone, in turn, altered the public understanding of systems.

The companies that formed to exploit Bell's patents—the companies that would become AT&T and its regional subsidiaries—enjoyed a patent monopoly in the United States until 1894, when Bell's patents expired. The Bell companies now faced a double threat: competition and hostile political action. In response, they audaciously appropriated their enemies' rhetoric, and, in due time, the "technological populism" that they embraced changed the way Americans thought about networks and networked technology.

The system idea embraced all sorts of activities, organizations, and processes, and construed them as consisting of discrete but interlocking components. By the start of the twentieth century, Frederick W. Taylor and his followers had spread the gospel of system and systematic management to factory, farm, and home. They imagined workers, farmers, and housewives all working together as human cogs in a single, efficient machine.

It is hardly surprising, then, that AT&T and its subsidiaries came to call themselves "the Bell System," using the term interchangeably to refer to both the physical networks of phones and wires and the corporate system that controlled them. This elision of distinction between the physical and the corporate is important, because it points to the fact that technological systems, and the idea of systems in general, had political and social implications.

In the late nineteenth century, people invariably associated systems and networks with order, hierarchy, and centralized control. The whole thrust of Taylorism shifted authority away from workers and lower-ranking managers toward standard operating procedures and predefined rules. Of course, reality did not always live up to the ideal. Undoubtedly there was a lot of ad hoc improvisation and jerry-built organization, and assuredly too, in some ways technologies decentralized authority and disrupted existing hierarchies. But the perception and public understanding of these organizations and machines was always one of order and efficiency.

The men who built the Bell System initially embraced this same vision of hierarchy and centralized control. By renting, rather than selling, telephones, the Bell System was willing from the start to forego immediate revenue in order to maintain ownership and control of the network. The more than six hundred patent infringement suits the company filed between 1877 and 1893 also demonstrated their will to control the network. Bell also devoted considerable effort into training and controlling its customers.

During the four years after the expiration of the Bell patents in 1894, over a thousand independent telephone companies sprang up everywhere, often in small towns or rural areas that the Bell companies did not serve, but many more competed directly with Bell.

"The Bell Trust," as its rivals called it, proved to be a fierce competitor. It slashed prices and expanded rapidly. But the competition expanded too, and by the first decade of the twentieth century, the Bell System was in genuine trouble. AT&T was financially over-extended and hemorrhaging business to its independent competitors. By 1907, Bell's market share had fallen from 100% to just 49%. In Midwestern states, such as Indiana and Illinois, independent phones outnumbered Bell phones by a factor as high as four or five to one.

Even more frightening to AT&T than competition was the specter of antitrust action and nationalization. Already, nearly every European state had nationalized its telephone system, and Canada too came close to doing so. In the United States, the American Populist Party platforms of 1892 and 1896 called for nationalizing the telephone. The next decade saw a flurry of state regulation and movement by both major parties towards government control. This was the era of muckraking and trust-busting; the threat of political action against AT&T appeared very real.

In 1907, at the nadir of Bell's financial fortunes, J.P. Morgan and other Wall Street financiers wrested control of AT&T from the Boston bankers that had owned the company since the 1880s. The new owners installed Theodore Vail, one of Bell's first general managers, as president. Although the reasons for Morgan's coup were financial, Vail and his colleagues understood the political and cultural aspects of the firm's woes. Much of the country distrusted, if not actively despised, the company.

The assault on Bell's legitimacy had its roots in the Midwest, nourished by hostility to monopoly and Eastern capital. Bell's competitors gave themselves populist appealing names such as the "People's Telephone," casting themselves as local Davids against a foreign Goliath. Unease with the classic nineteenth century ideal of systems also drove hostility toward Bell. To them, AT&T was a sinister concentration of power, "a wire spider, stretching his deadly tentacles" across the plains.

Such was the dilemma that Theodore Vail faced in 1907. He had to promote the Bell System and fight off competitors, while Bell's major advantages—its size and ubiquity—also were its biggest political liabilities. Vail proceeded to streamline Bell's corporate organization, encourage more scientific innovation within the company, and reverse AT&T's policy against interconnecting with other networks. However, his first major action as president was the launch of an extensive public relations campaign at the heart of which was a long and influential series of magazine ads created by the N.W. Ayer & Son advertising agency.

Walter Gifford, Vail's successor, observed that the company's old ways of lecturing and even berating its customers had failed. "We have got not only to be efficient, but we have got to be liked," he declared.

The campaign that AT&T launched after 1907, however, achieved something fundamentally more important and more powerful than simply portraying the company as being nice. They appropriated the populist rhetoric of some of its most resolute foes.

From trying to control its customers, Bell now talked about empowerment. The ads stressed how the telephone network gave power to all its users. Early Bell executives were openly skeptical that rural or working-class Americans had any real or valid use for telephone service. Now Bell embraced the notion that every American could and should have a telephone. From arguing that an efficient telephone system demanded a single centralized authority, the firm now declared: "Every Bell Telephone is the Center of the System."

This was a new way of talking about the telephone, as well as a new way of talking about technological networks. It differed manifestly from the classic late-nineteenth-century idea of system. Admiration of order, hierarchy, and control gave way to praise for flexibility, decentralization, and individual empowerment.

This strategy is so common today that one might not recognize how audacious it was in 1907. Inadvertently, AT&T succeeded in promoting a new view of technological systems as flexible, decentralized, and empowering to the individual. This view became the default rhetoric for talking about communication technology in the twentieth century. As rhetoric, it became as influential in its time as the old ideals of hierarchy and control once were. It became the language amateur operators used to describe wireless and radio during the 1910s and 1920s. It was how RCA and NBC spun television in the 1940s. It also is how we think about computers and the internet today.

Historians like to look for the ways in which modern technologies empower the individual. Certainly, the telephone can be empowering, and there is little doubt that it improved the lives and expanded the horizons of many ordinary Americans. But the very idea of populist technology, of the allegedly empowering nature of networks owned and controlled by mammoth corporations, has its own history and its own deep implications.

In the early twentieth century, AT&T built something besides a continental telephone network. It built a new understanding of networks and systems, and a language of technological populism that has survived and thrived for almost a century to block alternatives to private monopoly and co-opt public criticism of corporate control.

The People's Telephone: The Politics of Telephony in the United States and Canada, 1876–1926

ROBERT MACDOUGALL

My dissertation is a history of the telephone industry in North America, from the invention of the telephone in 1876 to the completion in the 1920s of a continental telephone network. The story takes place in both the United States and Canada, the first two nations to embrace the telephone; the approach is comparative and transnational. The dissertation is anchored by a close comparison of the telephone's development in Central Canada and the American Midwest, but it steps back from these regional case studies to tell a story that spans the continent.

In 1929 the sociologists Robert and Helen Lynd published *Middletown*, their classic study of life in one ordinary American city. The Lynds began their book with a catalog of the many technological changes that had arrived in the lifetime of one elderly "Middletown" resident: the railroad, the telegraph, the telephone, electricity, radio, airplanes, and automobiles. "Middletown" was in fact Muncie, Indiana, and the unnamed resident was William Harrison Kemper. An amateur scholar of Muncie himself, Kemper had written his own history of the town twenty years before, at the very start of the twentieth century. In it, he linked the inventions listed by the Lynds to broader

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transformations in the political economy, economic geography, and social structure of his country. Kemper wrote, "The history of a county like Delaware abounds with proofs that individualism is yielding to social interdependence; that the world, whether our scope of view be a county, state or nation, is coming to be all of a piece. Once every little community could live by itself, make its own clothes, wagons, tools, and all the articles necessary for its existence. But with the coming of the railroad, telegraph, telephone, etc., closer relations were established and communities and states became dependent upon each other. There is no isolation now."[1]

The trajectory described by Kemper from "isolation" and "individualism" to "social interdependence" is today one of our central paradigms for understanding the history of the United States in the half century following the Civil War. It lies at the heart of the "modernization" or "organizational thesis," which holds that the great transformation in this era, and the key to the emergence of the modern United States, was the general eclipse of small, informal, local groups by large, bureaucratic, national organizations. Technological advances in transportation and communication were used to build an integrated transcontinental society and economy in these years. Isolated "island communities," in Robert Wiebe's famous phrase, were absorbed, or feared absorption, into national and international networks.[2] The local seemed threatened by the national, the small by the big, in nearly every area of public life. Historians explaining this transformation have made reference to urbanization and industrialization, the visible hand of managerial capitalism, and the rise of a new middle class. But when Kemper reached for an explanation of the changes through which he and his generation had lived, he found it in the technological triumvirate of railroad, telegraph, and telephone. To him and many like him, the new networks of wire and rail were physical representations of their era's greatest change.

Because of the historical moment at which the telephone appeared, debates about the telephone and its future could hardly escape becoming arguments about the larger transformation of North America's economic geography and political economy. The telephone seemed to bring into every home and every life the changes the railroad and telegraph had begun. Copper wires strung from roof to roof and town to town offered an unmistakable illustration of the

1. Robert Lynd and Helen Lynd, *Middletown: A Study in Contemporary American Culture* (New York, 1929); G. W. H. Kemper, *A Twentieth-Century History of Delaware County, Indiana* (Chicago, 1908), 210.

2. Robert Wiebe, *The Search for Order, 1877–1920* (New York, 1967).

new interconnection and interdependence. Ultimately, I argue, the physical networks of poles and wires that were constructed in this era embodied prescriptive arguments about the organization of economies and societies and the scale of social and economic life. Great struggles—national markets versus local markets, large corporations versus small ones, and even more existential questions about national, regional, and local identities—were mapped on to prosaic disputes over the telephone and its wires.

My dissertation begins with case studies of two small cities: Kemper's Muncie, and Kingston, Ontario, Canada. I start with these local case studies because the first telephone systems *were* local. They were local networks, providing only local telephone service, largely built with local capital by local entrepreneurs. The history of the telephone in North America has traditionally been written as the history of the nation-spanning Bell system. I attempt to rescue the local character of telephony from obscurity by demonstrating the crucial importance of local politics—and the politics of localism—in shaping the instrument's birth.

I was immediately struck by differences between the shape, use, and culture of telephone networks in the American Midwest and Central Canada. Access to telephone service differed considerably. Telephones moved more quickly into middle- and working-class homes in Muncie than in Kingston. They spread from towns and cities into rural areas much sooner in the Midwest than in Canada, or indeed in any other part of the United States. The telephone also appeared in different kinds of public spaces. In the Midwest telephones in the 1880s were often installed in saloons, stables, and barbershops. In Canada in the 1880s the telephone was largely a privilege of offices and wealthy homes.

The relative cost of telephone service contributed to these differences, but so too did cultural factors such as ideas about communication technology and assumptions made by telephone companies and their consumers about who and what the new technology was for. Indeed, business and cultural choices were always deeply intertwined. In Muncie and many other midwestern towns, telephone users paid a monthly rate for unlimited local service; telephone companies in other regions were more likely to charge their customers by the call. These billing structures both reflected and encouraged two distinct cultures of telephone use. Adherents of one such culture embraced the social and indeed the frivolous uses of the telephone. They gossiped, courted, and sang on their telephones. Some made prank phone calls, and many eavesdropped on party lines. Adherents of the countervailing culture attempted to restrict such practices. They defined the telephone as a tool for business. They demanded higher

standards of privacy and etiquette on the telephone, and some tried to keep women, servants, or children off the lines. Wired into seemingly simple commercial and technical choices were all manner of assumptions about the value and appropriateness of different social connections and different kinds of speech.

In the early stages of my research, I hypothesized that the reason for these differences in the shape and character of telephony in the American Midwest and Central Canada may have been the presence of monopoly or competition. In much of the Midwest, competition in the telephone industry was vigorous and long-lived. After Alexander Graham Bell's American patents expired in 1894, the Bell telephone interests faced decades of fierce competition in the Midwest. This competition came from thousands of small, locally oriented telephone networks collectively known as the "independent telephone movement." In Canada Bell's patents were actually overturned almost a decade earlier, in 1885, but Central Canada saw nothing like the rise of independent telephones in the United States. The Bell Telephone Company of Canada preserved its monopoly in almost all of Central Canada's urban centers, relegating competition to the peripheries of the industry and the nation.

It was tempting, therefore, to ascribe the differences described above—the more rapid spread of telephony in the Midwest, along with a more raucous and perhaps egalitarian culture of telephone use—to the presence of competition in the midwestern United States and its relative absence in Central Canada. But this only begged further questions: Why did competition emerge in one region and monopoly in another? And how could the development of the telephone in other regions of both countries best be explained? The real variable, I was somewhat surprised to discover, was the role of municipal government. In the late 1870s and 1880s local governments in the American Midwest and West took an active interest in the early telephone industry. Before the advent of competition in the 1890s, and well before the emergence of state and federal regulation in the 1900s, midwestern town and city councils encouraged the construction of locally owned telephone systems, levied taxes and fees on "foreign" (that is, out of state) telephone companies, and actively regulated telephone rates and the placement of poles and wires. In Central Canada, by contrast, local governments may have wanted to take a hand in the telephone industry, but they had very little power to do so. Bell Canada's federal charter, declaring the telephone an instrument "for the general advantage of Canada," effectively immunized the company from municipal regulation.

These early developments had significant consequences for the future of telephony in both countries. The midwestern communities

in which municipal government became actively engaged in telephony during the 1880s were generally the same communities where independent competition thrived after 1894. And even where lively competition did not emerge, those towns with early and active municipal engagement in telephony seem to have constructed telephone networks and telephone cultures most like Muncie's—that is, with wider, earlier access to telephone service, more interconnection between town and farm, and a less genteel culture of telephone use. In towns and cities without such active municipal involvement in the industry's early days, telephone networks and cultures like Kingston's appear more common—with a better quality of equipment and transmission but more expensive service and less penetration as a social medium.

These trajectories highlight the role of government, and in particular local government, in shaping the development of the telephone. This is in itself a useful contribution to the existing literature on telephony and the histories of business and technology more generally. Scholars in the social construction mode have discredited the old deterministic approaches to the history of technology with the insight that new technologies are not independent of society but rather products of the social and cultural contexts in which they are formed. Yet while constructivists have rightly situated social and cultural factors at the center of their work, they have been slow to investigate relationships between politics and the shaping of new technologies. At the same time, it is common outside the academy to imagine that even the largest governments are impotent in the face of rapid technological change. Yet in the story of the telephone, the high-technology communications revolution of its day, we see active and important engagement by the very smallest levels of government. The town and city councils that put their stamp on the development of American telephony were not wealthy, powerful, or technologically sophisticated actors. Nor were their motives always salutary. They did, however, have a genuine and lasting impact on the development of the industry and the shape of telephony in North America.

Debates and contests over the telephone in these years returned again and again to the issues raised by William Kemper—questions of independence, interdependence, and scale. Municipal politicians and independent telephone promoters enlisted the telephone in the defense of regional autonomy and sought to build a communications infrastructure that was locally oriented and controlled. A competing vision was advanced by the Bell telephone interests and ultimately embraced by business leaders and federal politicians in both the United States and Canada. Bell's leaders worked to construct a single, continent-spanning telephone monopoly and promoted these efforts

with appeals to Progressive Era–principles of system, efficiency, and centralized control. What I have come to believe, and what I hope readers of my dissertation will also be convinced of, is that these fights were not really about the telephone, or not entirely so. Instead, they represented a debate between the defenders of a regionally oriented economy populated by small firms and the advocates of a newly integrated national or continental economy dominated by large nation-spanning corporations.

I cannot, of course, marshal all my evidence for this conclusion in a short synopsis of my dissertation, but one concrete example may suffice. The American Telephone and Telegraph Company (AT&T), the parent company of the Bell system after 1900, invested a great deal of capital and effort in the construction of a coast-to-coast long distance network. AT&T's independent competitors never had the organization or the money to build a telephone network on this scale. Still, the independents' smaller networks had advantages, too. A resident of Muncie like William Kemper who wanted telephone service in the early 1900s had to choose whether to connect to the Bell network or to the local independent. With a Bell telephone, Kemper could make long-distance calls to major cities like Chicago, New York, or Boston. With a telephone from the local independent, by contrast, Kemper could not talk to these distant financial centers. He could, however, call a farm in Roverton, Indiana, ten miles outside of Muncie, or the farmers in Mill Grove Township, just over the county line. One could not make those calls with a Bell telephone. The Bell companies had not yet established those rural lines. AT&T's very long distance network offered real advantages to certain users, but so too did the "middle distance" connections of the local and regional independents.

The point to be made here is that in choosing either network, telephone subscribers in the early 1900s were making significant choices about whom they wanted to talk to and indeed about what kinds of organizations and networks and economies they imagined themselves to be part of. They were, in effect, casting votes on how commerce ought to be organized and about the scale at which corporations and the economy should operate. In this way, competition between Bell and its independent rivals amounted to a kind of referendum on the organizational transformation of the age.

It is clear, moreover, that many of the principals in the telephone fight understood their debate in just this way. Independent leaders and promoters routinely asked why "foreign" corporations should be allowed to take money from midwestern consumers, or what business an Indiana farmer might have in calling San Francisco or New York. AT&T executives and publicists made their own arguments in return.

They sang the praises of consolidation and intercommunication, and they encouraged their customers to see themselves as part of an integrated national economy. These were not simply arguments about the way the telephone or even the telephone industry should be organized. These were arguments about the way the country should be organized and about the ways that commerce and information should flow.

The comparative aspect of this history is ironic in the end. In Canada the telephone was embraced by Central Canadian elites at its birth as a national undertaking and an instrument of Canadian unity. Yet the Bell Telephone Company of Canada fell victim to growing regionalism. It suffered from a failure to adequately serve French Canadians in Quebec, and it lost the western provinces to an uprising of prairie populism. In Canada modernization was not accompanied by centralization. A patchwork telephone system emerged that was both symbolic and symptomatic of a decentralized Canadian federalism and its distinctly regional economies. In the United States, on the other hand, the telephone was first enlisted in the service of local and regional autonomy. In the crucible of the telephone fight, however, the Bell interests forged a positive defense of national integration that would later be applied to many industries beyond the telephone field. I argue, in fact, that no American company in these years did more than AT&T to legitimize the nation-spanning corporation or to sell Americans on the desirability and the inevitability of national integration and interdependence.

When I began writing this dissertation, I knew that I wanted to write about the social and political construction of a new technology. I did not realize then that the project would also be about the social and political construction of business—for business is a technology, too—and at a larger level, about the social and political construction of national economies. The contests of the early telephone era were never only, or even mainly, about how much to charge for service or where to put telephone poles and wires. The telephone systems constructed by Americans and Canadians one hundred years ago were in fact proxies for all sorts of networks. They made physical the kinds of human networks that were and are the substance of economic, political, and social life. To trace the wires of those networks is to trace the outlines of two nations and the choices that made each one so much of what they are.

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BODIES, IDEAS, AND DYNAMICS: HISTORICAL PERSPECTIVES ON SYSTEMS THINKING IN ENGINEERING

David A. Mindell

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Bodies, Ideas, and Dynamics:

Historical Perspectives on Systems Thinking in Engineering

David A. Mindell

ESD Symposium, May 2002

I. Introduction

Today, the idea that technology consists not simply of individual machines but of systems of components and interconnections underlies much of engineering theory and practice. Yet this idea is relatively new in the history of technology; it evolved over a long period, spanning more than a century, as engineers grappled with the implications of machinery and collections of apparatus that spread over broad geographical areas. A historical perspective on systems thinking provides a critical background for contemplating new directions in "engineering systems," by highlighting the problems that have constantly challenged engineers, as well as the new puzzles posed by today's world.

This paper surveys the history of systems thinking in engineering in the United States, from the nineteenth century to the late twentieth. Throughout this period, engineers concentrated on certain kinds of technical systems and developed various modes of systems thinking to deal with them. Early in the 19th century, systems thinking developed as coherent philosophies in specialized areas like manufacturing and the military. Later in the century, the railroads emerged as a large-scale system with diverse flows and materials. From the late nineteenth century to World War II, systems thinking in the electric power and telephone industries focused on interconnecting disparate elements into larger wholes for systems spread over large geographic areas. World War II led engineers to conceptualize systems as integrated, dynamic entities, and to formalize methodologies for managing the complex organizations to design and operate such systems. These approaches flourished in the Cold War, although its techniques are still with us today in selected areas. Late in the twentieth century, engineers began to expand the boundaries of technical systems to include not only their internal or organizational dynamics, but also broader social and industrial contexts. Engineers now also recognize that the complexity of these systems means that accurate prediction or even simulation is not always possible.

A few caveats are in order. First, to focus the discussion, I'll discuss systems thinking primarily as it relates to engineering, and not in other arenas such as biology or economics. Second, I tend to focus on electrical technologies. Some have argued that electricity lends itself to systems thinking, forcing engineers to think in terms of circuits and flow.[1] Still, a similar story could be probably written about other endeavors like the chemical process industries. As a third qualification, for brevity I focus on the United States, but not to imply that American developments were first or primary; similar stories occurred in other countries as well. Finally, this paper cannot be comprehensive, but rather aims to point out some significant moments in a vast, complex story over a long period of time.

II. Re: "System"

After World War II, systems thinking diffused from engineering into a variety of disciplines, including the history of technology itself. Leading this endeavor has been Thomas P. Hughes, whose work covers a broad range of topics and periods. Hughes's work and his insights provide a foundation for an historical understanding of systems.[2] This essay, however, differs from Hughes in critical respects. Hughes's work had two goals: first, to delineate historical moments of thinking about systems, such as in electric power or air defense. His second goal is a model of technological change, which has come to be known as the "systems approach." Hughes himself was influenced by systems thinkers like Wiener and von Bertallanfy, and his writings sought to develop a systems model of technological change that is unchanging.

By contrast, here I seek to delineate a variety of meanings for "system." Beginning with early uses of the term, I show it has various meanings, and examine how it developed differently in a number of discrete environments.[3] Rather than seeking an overarching systems model of historical change, my goal here is an historical epistemology, tracing the history of systems thinking and its meanings. I borrow Walter Vincenti's idea of engineering epistemology, which

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[1] Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm* (New York: Penguin, 1989), 186.

[2] Wiebe E. Bijker, Thomas Parke Hughes, and Trevor J. Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press); *Networks of Power: Electrification in Western Society, 1180-1930* (Baltimore: Johns Hopkins, 1983); *American Genesis*. For the connections between Hughes and Chandler, see David Houndshell, "Hughesian History of Technology and Chandlerian Business History: Parallels, Departures, and Critics," *History and Technology* 12 (1995) 205-224.

[3] Here I echo Raymond Williams's approach from *Keywords* where he traced a number of words that seem to define the modern world, like "communication," "bureaucracy" and "revolution," according to their historical usages. Curiously, *Keywords* contains no entry for "system" or "technology." (New York: Oxford University Press, 1976).

he elegantly defined as "what engineers know and how they know it."[4] The goal is to outline what engineers knew (and thought, and said) about systems and how they knew it. Of course engineering knowledge consists of much more than textbooks or published papers. Each type of systems thinking accompanied characteristic technologies, institutions, and intellectual tools. Of particular interest is the level of self-consciousness on the part of engineers: whether they were engaging in something that today would we call systems thinking, or whether (and how) they used the term "system" itself. What, for example, did Bell Labs mean by "System Engineer" in the 1920s? When, for example did the term "system engineering" arise? Comparing engineering theory and practice along these axes over a broad span of time reveals both the changing nature of systems thinking as well as those elements that remained constant.

By *systems thinking* I mean the practice of treating technologies as aggregates of interconnected components, as opposed to focusing on individual machines. Such components may involve both organizational and mechanical elements, humans and non-humans. This is not to imply, however, that the idea of "system" has some stable essence that remains fixed over time. A system can be defined by the components themselves, or by the connections, or by their behavior as a group. Sometimes it can be broken down into smaller subsystems for analysis, other times it be analyzed only as a whole. Some system builders think about aggregates, others see the world in terms of flow, or feedback, or emergence. These views varied over time, depending on technical and historical circumstances.

Complicating the problem is the broad array of uses and techniques associated with the word "system," making it difficult to discern any unifying, or even common elements. One way to sort through the complexity, then, is to begin with the word itself – and to pay attention to how, and whether, engineers and technologists used the word. The word's history provides a useful framework for distinguishing and relating the variety of systems approaches.

Before the 19th century the word *system* had little technological or mechanical meaning at all. The *Oxford English Dictionary* (OED) lists hundreds of examples of historical usage for *system*, but before the mid-nineteenth century they refer to machinery only rarely. After about 1830, the OED shows that people began to use *system* for technological objects, and the word appeared in a few selected areas for the next hundred or so years. After 1950, *system*- terms

[4] Walter Vincenti, *What Engineers Know and How they Know It: Analytical Studies from Aeronautical History*

explode, reflecting the self-consciousness of post-war systems thinking. Still, the word's early history provides three useful categories for understanding its technological meanings:

> *Physiological systems* – elements linked in networks or trees, containing flows; early examples include the nervous or circulatory systems in the body.
>
> *Systems of philosophy* – coherent sets of ideas; early examples include legal systems, or Adam Smith's description of the "Capitalist system" in the *Wealth of Nations* as a method of organizing trade and exchange.
>
> *Dynamic systems* –sets of interacting physical units; early examples include the universe or the solar system. As natural philosopher William Paley wrote in 1802, "The universe itself is a system; each part either depending upon other parts, or being connected with other parts by some common law of motion."[5]

Though these three categories refer to non-technological uses of "system", they help distinguish among the wide variety of systems terms that appear after the industrial revolution.[6] Examples of physiological systems today include large technological systems that spread over broad areas. Today we find systems of philosophy in management techniques, and systematic approaches to problem solving. Modern examples of dynamic systems include feedback controls, network simulations, or complex adaptive systems.

III. The Nineteenth Century

By the 1850s, railroads had become an inescapable part of the American landscape, yet they were poorly captured by the term "machine." In general, the language of traditional "mechanical arts" proved increasingly inadequate to describe changes the technological world. Railroads not only physically spread their rails across the land, but also encompassed a host of

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(Baltimore, Johns Hopkins, 1990), 3-15.

[5] Paley, *Natural Theology* XXV (1819) 398, quoted in *Oxford English Dictionary*, entry "system," definition I.1.a.

bridges, tunnels, signals, capital, a skilled workforce, and a new corps of people called managers. Railroads shared some of these features with the roads or postal networks that preceded them, but added steam-power, complex machinery, and problems of real-time coordination to prevent collisions. In 1828, Jacob Bigelow revived an old term to capture the complexity of the new enterprise and others like it: *technology*.[7] Though the word did not enter common use for a long time, its appearance was not coincidental. The very notion of *technology* is closely linked, both conceptually and historically, to the notion of *system*. Both ideas draw attention to the numerous components of new phenomena like railroads, beyond simply the machines, and both imply a blurring of the boundaries between machine operation and human organization, between engineering and management.

In response to these and similar situations posed by the railroads, modern management emerged as a what Alfred Chandler called the "visible hand" to replace invisible market mechanisms with human coordination and control. Chandler describes the rise of modern management using the physiological sense of system, referring to "the functions of coordinating flows of goods through existing processes of production and distribution."[8] Indeed the tools for communication and coordination could not be separated from those of moving the goods themselves, as Chandler writes, "the railroad and the telegraph moved across the continent in unison."[9] According to Chandler, managers and engineers clearly saw their railroads in terms of communications, flows, and interactions. They even built up national "systems" of main lines and local and regional feeders – all coordinated by centralized management structures, including significant data collection and statistical departments.[10] Late in the century, this information process became mechanized. Punch-card innovator Herman Hollerith, in fact, explicitly made the analogy between information flows in his machines and railroad switchyards. Nor were the systems of flows limited to the railroads themselves. In Chicago, for example, the introduction of telegraphy, railroads, and grain elevators in the decades before the Civil War enabled farm

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[6] Ludwig von Bertalanffy makes a somewhat similar set of distinctions: systems technology, systems philosophy, and systems science. He also distinguishes between types of systems: real, conceptual, and abstracted. See "Preface to the Revised Edition," *General System Theory* (New York: George Braziller, 1969).
[7] Leo Marx, 1997, "Technology: The Emergence of a Hazardous Concept," *Social Research* 64 (No. 3, fall) 966:88.
[8] Alfred D. Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass.: Harvard University Press, 1977), 1. James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society*, (Cambridge: Harvard University Press, 1986).
[9] Chandler, *The Visible Hand.*, 195.
[10] Ibid., 98-99, Chapter 5.

products to flow as "golden stream," creating, in the words of historian William Cronon, "a new market geography that had less to do with the soils or climate of a given locality than with the prices and information flows of the economy as a whole."[11]

Other nineteenth century technologists and managers used *system* in its philosophical sense. In 1854, the inventor John Ericsson, who would later build the ironclad *Monitor*, wrote of a "new system of naval attack," by which he meant not a system of flows like the railroads, but a philosophy of mechanized warfare. That same year, British observers to the United States dubbed the "American system" the manufacturing techniques involving heavy mechanization and interchangeable parts, found at the Springfield armory and other machine shops.[12] This "system" referred to the overarching philosophy rather than flows of parts through workers and machines. Even in 1911, when management consultant Frederick Winslow Taylor famously quipped that "in the past, the man was first, in the future, the system must be first," he referred to his system of Scientific Management, not to the physical components of the production system. Indeed Taylor focused on designing optimal human behaviors for a given task, more than redesigning the task itself within larger flows and networks. His work built on the "systematic management" movement that had grown up around the railroads – emphasizing standardized tasks and forms as ways of unifying an organization.[13] Henry Ford clearly conceptualized his famous assembly line factories in terms of flows of parts and products, but he used the metaphor of the machine– a well-oiled set of tightly coupled parts – rather than "system." In sum, engineers' in the nineteenth century ended to use "system" in the physiological or philosophical senses, but without making direct analogies between the two.

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[11] William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: Norton, 1991), Chapter 3.

[12] David A. Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States* (Baltimore: Johns Hopkins University Press, 1984): Hounshell (pp. 331-35) has an excellent usage history of the term "American system of manufacturing," covering 1851-1937 that fills in much of the period missing in the OED. According to Hounshell, the common, repeated use of the term "American system" really dates from the 1880s, but the term "systems" was often used to describe the sum of techniques used in manufacturing. Merritt Roe Smith, "Army Ordnance and the "American System" of Manufacturing, 1815-1861," in idem. ed., *Military Enterprise and Technological Change*, 39-86. On Ericsson's "system of naval attack," see David Mindell, *War, Technology, and Experience Aboard the USS* Monitor (Baltimore: Johns Hopkins University Press, 2000), 121.

[13] Frederick Winslow Taylor, *The Principles of Scientific Management* (New York: Harper & Brothers, 1911) p. 7. Daniel Nelson, Frederick *W. Taylor and the Rise of Scientific Management* (Madison: University of Wisconsin Press, 1980). Hughes, *American Genesis*, Chapter 5. JoAnne Yates, *Control Through Communication: The Rise of System in American Management* (Baltimore, Johns Hopkins University Press, 1989), 9-15. Beniger, *The Control Revolution*.

Edison and electric power

Echoing the pattern of the railroads, electric power grew up on a similar model, though more consciously planned as systems. Thomas Edison is hailed as a genius inventor for creating the light bulb, and indeed the light bulb has become a symbol for invention. But Edison's electric light succeeded because he designed not only light bulbs, but also a system that included generators and transmission lines. When developing his system in the late 1870s, Edison explicitly compared it to the competitor he intended to replace: gas lighting. Edison designed light fixtures to resemble gaslights. An economic analysis of the cost basis of electric versus gas lighting led him to concentrate on a high-resistance filament, which required less current and hence smaller transmission lines than the lower resistance model his rivals were pursuing. Edison described his invention in the physiological sense, as connected elements with current flowing between them. It was, in his words, "a system based on different inventions or discoveries, some of which have been made years before the others." [14] Edison also organized invention in the philosophical sense, initiating many of the features of a modern industrial R&D laboratory, especially an organization devoted to a "systematic" attack on technical problems.

During design, Edison clearly understood how the components of his electric lighting system interacted with each other. He was less clear, however, on the dynamics of the system, or how those relationships affected each other during operations.[15] Indeed, Edison's early systems had stability problems, which his engineers solved with cut and try methods, not according to any overall model of their dynamics. For example, when the generators at the Pearl Street Station began to oscillate, the only solution was to replace them with newer ones, not to detune the system to avoid the resonance.[16] This approach worked well when the systems were simple, and even up to moderate size, and up through the 1920s, engineers conceptualized electric power systems in the physiological sense, as sets of interconnected elements like generators, motors, traction loads, or transmission lines, each of which could be designed and analyzed independently and then combined. As local networks, engineers could treat them as hierarchical and centrally controlled, with all power emanating from a central station.

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[14] Edison to Butler, February 1879, quoted in Paul Israel, 1998. *Edison: A Life of Invention* (New York: Wiley), 189.

[15] Hughes, *Networks of Power*, 31.

[16] Nathan Cohen, "Recollections of the Evolution of Realtime Control Applications to Electric Power Systems," *Automatica* 20 (2, 1984), 145-62.

As alternating current replaced Edison's DC system, engineers began to focus more on the interactions between the components, and began articulating their dynamics. Engineers like Charles Proteus Steinmetz at General Electric studied the precise, quantitative relationships between elements in electrical systems, both in steady state and transient modes. At the same time, the growing size of the electric power industry allowed a formalization of Edison's laboratory. Around 1900 Steinmetz spurred G.E. to open corporate research laboratory, separate from the daily business of the company. The GE Lab focused mostly on chemistry and manufacturing issues, but Steinmetz's work exemplified how the separate, academically-oriented sphere enabled engineers to conceptualize the system in broader, more abstract terms than they would in an operating unit or a product design department.[17]

In the 1920s, local or regional power networks connected into national "grids" or "superpower" systems. Hughes has pointed out the importance of "load factor," as electric power systems expanded to equalize their average and peak demand.[18] No longer could individual systems be considered only as the power emanating from the station in the center of town. Now a system might incorporate a varied residential and industrial loads, coal-fired plant, and a hydroelectric station miles away – and connect to similar networks over a long transmission and tie lines. These new networks began to exhibit behaviors that could only be understood by looking at the system as a whole.[19] Stability problems with large, interregional electric power networks drove engineers to study the characteristics of large-scale power networks as complete entities, and to conceptualize them as systems in the dynamic sense.

This new approach was exemplified by a young electrical engineering professor at MIT, Vannevar Bush, who sought to bring a variety of systems under a single quantitative model. In his 1929 book, *Operational Circuit Analysis* Bush applied Heaviside's operational calculus to model systems of varying types. Bush noted that across fields in engineering like hydraulics,

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[17] Ronald Kline, *Steinmetz: Engineer and Socialist* (Baltimore: Johns Hopkins University Press, 1992). Hughes, *American Genesis*, 161-175. While Steinmetz had the vision, G.E.'s research laboratory was headed by Willis R. Whitney, a chemist, and focused primarily on physical chemical problems related to electric lighting.

[18] Hughes, *Networks of Power*, 218-21.

[19] See Committee on Power Transmission and Distribution, "Annual Report," *Trans. A.I.E.E.* 46 (June, 1927). For a general review of the subject of power system stability, see C.L. Fortescue, "Transmission Stability: Analytical Discussion of Some Factors Entering into the Problem," *Trans. A.I.E.E.* 26 (February, 1927), 984-994 and discussion 994-1003. Frederick Terman, "The Characteristics and Stability of Transmis sion Systems" (Sc.D. diss., MIT, 1924). Vannevar Bush, "Power System Transients," *AIEE Trans.* 44 (1925), 229-30. C. L. Fortescue, discussion of Bush and Booth, "Power System Transients," *Trans. AIEE* 44 (February, 1925), 97-103. This discussion, from six commentators, provides a good overview of the state of the stability problem in 1925.

mechanics, electricity, and acoustics, one finds the basic idea of the *circuit*, defined as "a physical entity in which varying magnitudes can be sufficiently specified in terms of time and a single dimension."[20] This project treated engineering systems as abstractions, and allowed engineers to work with analogies between them – especially to solve power system stability problems. Indeed Bush's students, like Harold Hazen, King Gould, Gordon Brown, and others began to build "network models" (what we would today call simulators) and calculating machines to model complex systems with smaller, laboratory based devices. By no coincidence did this work lead in the 1930s to contributions in calculating machines and servomechanisms – with the proposition that all circuits were similar came the recognition that basic ideas like feedback, amplification, flow and a few basic mathematical operations could characterize linear systems across a wide variety of engineering fields.[21] Put another way, one could study related systems because of the analogies between their physical dynamics. Again, the organizational conditions of research were related to the emerging view of systems. As engineering schools like MIT began to focus on "engineering science" after 1930, simulation and mathematical modeling provided general, high-level techniques that enabled engineers to move beyond consulting on industrial applications and to earn the prestige of scientists.[22]

III.A. Telephone

In the other new large technical system of the early twentieth century, the telephone network, engineers used the language of systems more explicitly than in electric power. AT&T chief Theodore Vail's famous motto "One policy, one system, universal service," captured the company's totalizing view, though its network was composed of vast numbers of small, interconnected units. Within AT&T, engineers referred to their national network as "the System," and beginning in the 1920s the company had job titles for "System Engineers" and a "Systems Development" department. Yet these were not systems engineers in the modern sense;

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[20] Vannevar Bush *Operational Circuit Analysis* (New York: J. Wiley & Sons Inc.: 1929), 1-2. John Carson, *Electric Circuit Theory and the Operational Calculus* (New York: McGraw-Hill: 1926).

[21] For more detail, see David Mindell, *Between Human and Machine: Feedback, Control, and Computing Before Cybernetics* (Baltimore: Johns Hopkins: 2002), Chapter 5.

[22] Bernard Carlson, "Academic Entrepreneurship and Engineering Education," and Alex Soojunk-Kim Pang, "Edward Bowles and radio engineering at MIT, 1920-1940," *Hist. Stud. Phys. Bio. Sciences* 20 (no. 2, 199), 313-337. Christian Lecuyer, "The making of a science based technological university: Karl Compton, James Killian, and the Reform of MIT, 1930-1957," *Historical Studies in the Physical* Sciences 23 (1), 1992, 153-80. Larry Owens, "MIT and the Federal 'Angel:' Academic R&D and Federal-Private Cooperation Before World War II," *Isis* 81

they did not have an abstract view of the system, nor did they manage a variety of subsystems. Rather, system engineers at AT&T concentrated on the concrete manifestations of the networks: the equipment layouts, power systems, and wiring diagrams for local substations.[23] The system was physiological, a thing, emanating from central switching stations.

As in electric power, the growing size of the national telephone network spurred the company to create a new organization. Bell Telephone Laboratories was founded in 1925 to focus on developing repeater amplifiers, which would allow the network to continue to grow arbitrarily large. Only a small part of Bell Labs concentrated on fundamental problems like those university researchers would address; rather, like Edison had done, they sought "systematized research," or a coordinated attack on a set of industrial problems.[24] Still, engineers at Bell Labs were freed from the daily concerns of the system and protected by AT&T's monopoly. An increasing number were trained with Ph.D.s and began to study the system as a dynamic entity.

The *Bell System Technical Journal* of the 1920s and 30s is replete with articles on topics like the statistics of switching, the interchangeability of bandwidth, and the economics of the network. Through innovations like Bode and Nyquist's work on the stability of feedback amplifiers, as well as Nyquist's and Hartley's work on transmission channels, engineers gradually began to formulate the system in abstract terms. The telephone network could be seen not simply as a set of wires delivering telephone conversations, but as a set of transmission channels able to convey any type of information through a finite bandwidth.[25] As Bell Labs founder Frank Jewett told the National Academy of Sciences in 1935, "We are prone to think and, what is worse, to act in terms of telegraphy, telephony, radio broadcasting, telephotography, or television, as though they were things apart. When they are merely variant parts of a common applied science. One and all, they depend for the functioning and utility on the transmission to a distance of some form of electrical energy whose proper manipulation makes possible

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(1990), 188-213. John W. Servos, "The Industrial Relations of Science: Chemical Engineering at MIT, 1900-1939," *Isis* 71 (1980): 531-49.

[23] "The Systems Development Department." *Bell Lab. Rec.*, April 1926, 69-73.

[24] Harold D. Arnold, "Systematized Research." *Bell Lab. Rec.*, June 1928, 316-17. Paul B. Findley "The Systems Development Department." *Bell Lab. Rec.*, April 1926, 69-73. Leonard Reich, *The Making of American Industrial Research: Science and Business at GE and Bell, 1876-1926* (Cambridge: Cambridge University Press, 1985).

[25] David A. Mindell, "Opening Black's Box: Rethinking Feedback's Myth of Origin," *Technology and Culture*, July, 2000. Harold Black "Stabilized Feedback Amplifiers." *Bell Sys. Tech. Jour.* (1934): 1-18. Harry Nyquist "Certain Factors Affecting Telegraph Speed." *Bell Sys. Tech. Jour.* 3, April (1924): 324 :46; "Certain Topics in Telegraph Transmission Theory." *Trans. AIEE* 47, February (1928): 617-44; "Regeneration Theory." *Bell Sys. Tech. Jour.* 11 (1932): 126-47.

substantially instantaneous transfer of intelligence."[26] Defining a technical language of signals was analogous to Bush's use of the circuit – it provided a common set of dynamics to model a variety of flows.

IV. World War II and the systems era

World War II coalesced systems thinking in several arenas. In response to technical problems like radar and automatic gunfire control, the sense of systems as dynamic entities came to the fore. Engineers now conceptualized their machines as integrated systems with feedbacks and dynamics, where the behavior of each part helped determine the behavior of the whole. Quantitative techniques arose from the merger of servomechanism theory, communications theory, and feedback control. Before the war, telephone engineers dealt with voice signals by analyzing them in the frequency domain, an approach that Bode and Nyquist then brought to feedback amplifiers. During the war, engineers began to use ideas of signals, noise, and frequencies to conceptualize a variety of dynamics: from radar reflections to the motions of aircraft. Most important, they also recognized that feedback and its dynamics were isomorphic across a variety of systems, from electronics to hydraulic and electric servos to the role of the human operator.

Others conceptualized the broad flows of material and information that comprised the war effort as itself a system, in the physiological sense. Operations Research emerged as engineers and planners recognized the need to concentrate on the operational aspect of military systems, not simply on their development, and began to understand the entire war effort as a flow of materials, from the point of production to the point of "delivery" (i.e. the battlefield).[27] Like the railroads, such systems of flow were tied together by human organizations to gather and process information. Information technologies, from punched-cards to digital computers, facilitated these processes, and systems approaches and computing intertwined in a symbiotic evolution. Gradually, the management sense of "system" as a philosophy and the engineering sense of dynamic systems began to merge. Engineers began to use the term "integrated" to

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[26] Frank B. Jewett, "Electrical Communication, Past, Present, and Future," Speech to the National Academy of Sciences April, 1935, reprinted in *Bell Telephone Quarterly* 14 (July, 1935): 167-99.

[27] Eric Rau, "The Adoption of Operations Research in the United States during World War II," in Thomas P. Hughes and Agatha C. Hughes, eds., *Systems, Experts, and Computers: The Systems Approach in Management and Engineering in World War II and After* (Cambridge: MIT Press, 2000). M. Fortun and S.S. Schweber, "Scientists

describe their systems. They defined a role for a coordinating organization to have technical oversight and management authority to "integrate" the entire project.[28]

By 1950, these ideas and techniques began the self-conscious era of systems thinking. As mentioned above, the *Oxford English Dictionary* shows that the term *system* exploded after 1950, *including systems engineering, systems analysis, systems dynamics, general systems theory*, and a host of others. Each field had its own innovators, its own emphasis, and its own home institutions and professions, but they shared common concerns with feedback, dynamics, flows, block diagrams, human-machine interaction, signals, simulation, and the exciting new possibilities of computers.

Consider, as an example, systems engineering. Among the first texts to use the term was Louis Ridenour's *Radar System Engineering*, published in 1947 as part of the Radiation Laboratory's series of textbooks.[29] The title refers to the physiological sense of system, that is "how to engineer a radar system," – where an individual radar is a connected set of components like magnetrons, waveguides, power supplies, and display tubes. Title does not refer to the philosophical sense of system, as in "how to system engineer a radar," but such ideas are nascent in the book: it covers not only wave propagation and noise models, but also the appropriate design of displays and the dissemination of information through a radar organization. Ridenour's text includes no discussion of feedback or servomechanisms, or of the dynamic characteristics of radar systems. A McGraw Hill text, *System Engineering*, published ten years later, included probability, analog and digital computers for simulation, queuing theory, game theory, information theory, servomechanism theory, and sections on "human engineering," management, and economics.[30]

The management aspects of systems engineering formalized in the mid 1950s when the Air Force stretched its resources to quickly build an intercontinental ballistic missile. In the Atlas project, management began to move beyond the model that had dominated the aviation industry

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and the Legacy of World War II: The Case of Operations Research (OR)," *Social Studies of Science* 23 (November 1993): 595-642.

[28] David Mindell, "Automation's Finest Hour: Radar and System Integration in World War II," in Hughes and Hughes, eds., *Systems Experts and Comptuers*.

[29] Louis B. Ridenour, *Radar System Engineering. Radiation Laboratory Series vol. 1*. (New York: McGraw Hill, 1948).

[30] Harry Goode, and Robert Machol, *Systems Engineering: An Introduction to the Design of Large-scale Systems*. (New York: McGraw Hill, 1947).

for decades. Aircraft had always been composed of large numbers of components from a variety of subcontractors, coordinated by the prime contractor who built the airframe. With a project like Atlas, dynamics, interconnection, and coordination became the dominant aspects of the project, so airframe companies, with their emphasis on structures and manufacturing, lost their central role. Rather, engineers with management experience, mathematical abstraction, and an understanding of dynamics and control coordinated the project. Simon Ramo and Dean Woolridge spun out of Hughes Aircraft corporation to found a systems-engineering contractor that soon became TRW. Ramo had cut his teeth at GE and Hughes Aircraft, and Woolridge came out of Bell Labs. Together with the Air Force's Western Development Division, they coordinated contractors and scheduling and oversaw the project's integration (in the Navy's Polaris project, the Special Projects Office performed a similar function).[31] Ramo became a promoter of systems engineering, which he defined as "the design of the whole from the design of the parts." As Ramo wrote, "Systems engineering is inherently interdisciplinary because its function is to integrate the specialized separate pieces of a complex of apparatus and people – the system – into a harmonious ensemble that optimally achieves the desired end."[32] Atlas included a physiological system of materials, logistics, computers and ground support, but once the missile launched it functioned as a dynamic system, independent of the larger network. Still, in Atlas, the philosophical sense of "system" dominated: the management expertise required for coordination.

SAGE, by contrast, created a distributed, real-time system that, like the telephone network, depended on information exchange and transmission during operations. SAGE was a continental air defense system that tied a series of radar tracking stations into a network of digital computers and command stations across the continent. The project emerged in the early 1950s from the Whirlwind digital computer built by MIT's Servomechanisms Laboratory. SAGE brought age-old problems of fire control into the world of digital electronics, information processing, and national systems. It also spawned a host of new systems-oriented organizations like MIT's Lincoln Laboratory and the MITRE Corporation. MITRE was founded to do systems engineering for SAGE, but with greater emphasis on coordination of subsystems than actual

[31] Harvey Sapolsky, *The Polaris System Development: Bureaucratic and Programmatic Success in Government* (Cambridge: Harvard University Press, 1972)). Benjamin Pinney, "Projects, Management, and Protean Times: Engineering Enterprise in the United States, 1870-1960," (Ph.D. diss., MIT, 2001).

management of contracts. SAGE's designers saw the system as an "organism," by which they meant a high-organized, coordinated system of units coordinating together toward a particular purpose.[33] The notions of systems embodied in SAGE were physiological and dynamic: everything working in concert, a geographically distributed network of humans and machines under yoked to the will of a small number of military commanders. Embedded in this project was the idea that these large, geographically diverse systems might themselves have dynamics akin to smaller, more integrated counterparts. Indeed one Air Force colonel called SAGE "a servomechanism spread over an area comparable to the whole American Continent."[34]

In Atlas and SAGE, systems engineering meant coordinating and controlling a variety of technical and organizational elements, from contract specifications to control systems, from computer simulations to deployment logistics. For the strategy to work, the system engineer required a certain amount of authority, a fact that was not lost on the participants. For its practitioners, systems thinking was objective, authoritative scientific way to transcend "politics" (whether public or military-industrial) with the outside neutrality of the expert. Still, the comparison between Atlas and SAGE illustrates the complexity and diversity already emerging within the systems sciences: one concentrated on management techniques for coordinating flows of materials and knowledge, the other focusing on a system as a concrete, dynamic entity spread over a large area.

One of SAGE's offshoots illustrates the dynamic view of systems it embodied: Jay Forrester developed Systems Dynamics as an adaptation of servomechanism theory for modeling other types of systems, beginning with industrial and moving toward urban and policy settings. Forrester defined management "as designing and controlling an industrial system" and argued that an industrial system was fundamentally an "information feedback system" like a servomechanism. The idea was that an understanding of a systems' dynamics could move from feedback systems in engineering to broader domains, facilitated by the advent of computers as

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[32] For a history of systems thinking in the Atlas project, see Hughes, *Rescuing Prometheus* (New York: Pantheon Books, 1998), Chapter III. Simon Ramo is quoted on page 67.

[33] Kent C. Redmond, and Thomas M. Smith. *From Whirlwind to MITRE: The R&D Story of the Sage Air Defense Computer* (Cambridge: MIT Press, 2000); *Project Whirlwind: The History of a Pioneer Computer* (Bedford, Mass.: DEC Press, 1980). George E. Valley, "How the Sage Development Began." *Annals of the History of Computing* 7, no. 3, July (1985): 196-226. Paul Edwards *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996). Hughes, *Rescuing Prometheus,* Chapter II.

[34] Quoted in Joesph Weizenbaum, *Computer Power and Human Reason* (New York: Freeman, 1976), 30.

simulation tools.[35] Norbert Wiener's *Cybernetics* made a similar move, arguing that the feedback control and statistics could evoke the analogies between the dynamics of computers, organisms, social systems, even the mind itself and find applications in a variety of the social sciences.[36]

These approaches were diverse enough that precisely characterizing them is outside the scope of this paper. They did, however, share a common set of assumptions about how various aspects of the world might be understood in abstract, quantitative terms, and modeled with a series of feedbacks, flows, dynamics. Computers, both analog and digital, figured prominently in the image and the practice of these systems sciences. They could simulate systems and make predictions about the system's behavior in an uncertain environment. Social systems could be modeled with similar techniques as technical systems. Both the computer, and the analysts themselves carried the prestige and authority of science: providing dispassionate, expert advice free of political influence.

V. Systems Analysis and the Spread of the Systems Approach.

Hughes argues that systems techniques were developed by engineers to deal with the "messy complexity" that arises within any large, technological project. Yet these early, formalized systems techniques were explicitly designed to eliminate uncertainty, to reduce complexity to calculation. Far from capturing a rich nuanced picture of the world, systems thinking often involved a top-down, hierarchical view of systems, with an accompanying political structure. If the system could be modeled, then everything emanated from the models, and from the modelers.

The RAND corporation, for example, developed techniques that became known as "systems analysis" to evaluate policy options. Systems analysis mixed quantitative and probabilistic techniques like operations research, game theory, probability and statistics, econometrics, and linear/dynamic programming. Extending the "war as a production system" view of OR during the war, RAND focused on developing a science of warfare: bringing quantitative certainty to one of humankind's most chaotic endeavors. In their classic *The Economics of Defense in the*

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[35] Jay W. Forrester, *Industrial Dynamics*. (MIT Press, Cambridge, MA, 1961). *Urban Dynamics* (Pegasus Communications, Waltham, Mass., 1961).

[36] Norbert Wiener, *Cybernetics: or, Control and Communication in the Animal and the Machine* (Cambridge: Technology press, 1948). Steve J. Heims, *Constructing a Social Science for Postwar America: The Cybernetics Group, 1946-1953*. (Cambridge: MIT Press, 1993). Vyacheslav Gerovitch. *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* (Cambridge: MIT Press, 2002).

Nuclear Age, Charles Hitch and Roland McKean stated their philosophical move from economics and management to military strategy: "the problem of combining limited quantities of missiles, crews, bases and maintenance facilities to 'produce' a strategic airforce that will maximize deterrence of enemy attack is just as much a problem in economics…as the problem of combining limited quantities of coke, iron ore, scrap, blast furnaces, and mill facilities to produce steel in such a way as to maximize profits."[37] If war is a series of flows, of materials, information, even deterrence and destruction, then it can be planned with the techniques developed for analyzing flows of materials in industry – and optimized for efficiency and cost.

In a similar vein, When Robert McNamara entered the Pentagon in 1961, he brought systems analysis to national defense, modeling it as a single, large production system. McNamara's group of 'Whiz Kids' (many from MIT and RAND) modeled the 'production' of national defense as a series of inputs and outputs. McNamara introduced, for example, the Planning-Programming-Budgeting-System (PPBS), originally developed at RAND in the 1950s, to overhaul budgeting practices within the Defense Department. He also established the Office of Systems Analysis at the Pentagon and used systems analysis as an aid in decision-making on weapon development and budgeting. Systems analysis helped empower the civilian leadership of DoD over the military services, but perhaps at the cost of their own perspective. As historian David Jardini writes, "through systems analysis, McNamara and his staff felt empowered to replace the complexity of real life with simplified models that were lent illusory precision by their quantitative bases."[38] Indeed, McNamara's interest in systems approaches also informed the quantitative modeling of warfare in Vietnam, and may well have contributed to the disaster there.[39] For some, Vietnam proved the pitfalls of systems thinking when it was applied unthinkingly to a problem for which it was ill suited. By no coincidence did the student protesters of the 1960s refer to "the System" as the symbol of what was wrong with the world.

Systems experts developed great confidence in the power of quantitative methods to incorporate and overcome numerous types of complexity, a confidence that spurred attempts to

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[37] Hitch and McKean, *The Economics of Defense in the Nuclear Age* quoted in David Jardini, "Out of the Blue Yonder: The Transfer of Systems Thinking from the Pentagon to the Great Society, 1961-1965," in Hughes and Hughes, eds., *Systems, Experts and Computers*, 311-57. Also see Roger Levien, "Rand, IIASA, and the Conduct of Systems Analysis," in the same volume: 433-61.

[38] Jardini, "Out of the Blue Yonder," 326-7, 342.

[39] Paul Edwards, *The Closed World: Computers and The Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996), Chapter 4.

apply systems methods to a variety of problems outside of engineering. During the 1960s and 70s, systems techniques, and frequently systems organizations themselves, were brought to bear on a variety of civil problems: urban poverty, mass transportation systems, health care, education and housing. Such attempts met with mixed results. Military organizations generally had more authority to effect solutions in their given sphere than did civil organizations, and the civil problems tended to require more negotiation, compromise, and consultation than technically focused-military problems did during the crisis atmosphere of the Cold War.[40] In the words of TRW's historian, "in many 'civil systems' ventures TRW personnel quickly abandoned the systems approach and embraced ways of managing appropriate to the industry."[41] Systems analysts pointed to the detrimental effects of politics in stifling their projects, but in doing so pointed to the limitations of their models, which excluded politics as an external variable.

During the 1950s, a host of new disciplines appeared that we might call the systems sciences, including cybernetics, operations research, general systems theory, systems analysis, and systems dynamics – each had its own techniques, and unique character. All viewed the world in terms of flows, feedbacks, and interactions, and analyzed systems by breaking them down into component parts, understanding the characteristics of those parts, and then recombining them. These approaches were considered "engineering science," wherein expert analysis brought objective, quantitative analysis to complex problems, from nuclear targeting to procurement contracts.

The Cold War systems sciences achieved great success, particularly in areas with clearly defined technical goals. Apollo was the apotheosis of systems techniques in the 1960s. NASA employed systems engineering (borrowed from the Atlas program) to break down the project into smaller units, subcontract those units, manage the interfaces between them, and integrate them back into a whole. Apollo had the virtue of being a clearly-defined goal, one susceptible to a technical solution.[42] It also was significantly determined by the dynamics of the system: issues of propulsion, guidance, and control dominated, as opposed to other systems where physiological or network effects came to the fore. Systems engineering of course became an established

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[40] Davis Dyer, "The Limits of Technology Transfer: Civil Systems at TRW, 1965-1975," in Hughes and Hughes, eds., *Systems, Experts, and Computers*: 359-84.

[41] Dyer, "Limits of Technology Transfer," 378.

[42] For a good account of how NASA's systems engineering was transferred from Atlas and implemented in Apollo, see Thomas J. Kelly, *Moon Lander: How we Developed the Apollo Lunar Module* (Washington: Smithsonian Institution Press), esp. pages 42-47. Also see Stephen Johnson, *The Secret of Apollo: Systems Management in*

technique in engineering, valuable for product development and managing large projects, a field still generating a host of research and publications.[43] The systems sciences reached their limits, however, in Vietnam, the Great Society programs, and other civil systems with complex interactions, heavy political components, and vaguely defined boundaries.

American and European Space Programs (Baltimore: Johns Hopkins University Press, 2002). Richard Chapman, *Project Management in NASA: The System and the Men* (Washington: NASA, 1973).

[43] See, for example, Mark W. Maier and Eberhardt Rechtin, *The Art of Systems Architecting*, (CRC Press:, Boca Raton, Florida), 2000, 2nd ed.

VI. Three definitions today

The premise of this conference is that we are entering, or already in, an era of "engineering systems," wherein the engineering profession must think holistically about large scale, complex systems. Indeed, beginning in the 1970s, engineers turned their attention to large (sometimes global-scale) systems that exhibit complex behavior. Sussman describes this era with the term CLIOS (Complex, Large, Interconnected, Open Systems) that explicitly include social, political, and economic variables in their models and definitions, and other new formulations are emerging as well.[44] Yet now field is so large, so complex itself, that we risk proliferation and confusion – if systems are everything, everywhere, then they are nothing. What, after all, could possibly unite an aircraft accident with the process for managing a large project? What is similar about a city's atmosphere and a product design process? The three definitions of systems thinking, now hundreds of years old, help us begin to answer these questions:

Physiological systems. Some of the earliest systems thinkers were the railroad managers, faced with moving flows of goods across a broad continent. Indeed, infrastructures and large-scale systems, from manufacturing to product design, are still critical areas of systems thinking and can be understood as interlinked flows of material and information. Flows cut across different types of systems and result not from centralized direction but from the sum of local interactions. Engineers in manufacturing now explicitly think about "flow," about a manufacturing process as a "value stream," and about local interactions like "pull" that allow production systems to respond in real-time to customer demands.[45] In accident investigations, engineers have discovered how interactions between small, otherwise-innocuous events can lead to unpredictable behaviors, what Perrow calls "system accidents."[46] Safety itself becomes an emergent property – if the proper rules are engineered into all the components from the start, the overall system will be robust. These components, however, are not limited to hardware but must include political and social processes like management, the motivations of designers and

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[44] Joesph Sussman, *Introduction to Transportation Systems* (Boston: Artech House, 2000), 6.
[45] James Womack, Daniel Jones, and Daniel Roos, *The Machine that Changed the World: The Story of Lean Production* (New York: Haper Collins, 1990). James Womack and Daniel T. Jones, *Lean Thinking* (New York: Simon and Schuster, 1996).
[46] Charles Perrow, *Normal Accidents: Living with High Risk Technologies* (Princeton: Princeton University Press, 1999), 2nd Edition.

coworkers and legal regimes.[47] Castells identifies a "network society" that is characterized by the relationship between traditional geographic places, personal identity, and the new "space of flows."[48]

Systems of Philosophy Engineers now recognize that technology is a human endeavor, and that the line between engineering and management is often blurry. Hughes argues that the Central Artery and Tunnel in Boston began to treat the "messy complexity" of politics, social movements, and local interests not as external influences to be factored out, but as internal variables.[49] The growth of the Internet made it clear that distributed, unplanned systems could grow to be incredibly complex and powerful. Management of engineering projects is itself a complex endeavor, and may exhibit characteristics of other complex systems. Organizations can also be characterized as complex systems exhibiting behaviors like learning and stability. Our understanding of R&D has moved beyond a linear model of basic to applied research followed by development, leading scholars to speak about "innovation systems," that include everything from education to tax policy to education infrastructure. Systems architects now recognize that politics is a real constraint on what systems are able to achieve, and may mean that the "best" solution is not always the technically optimal one.[50]

Dynamic systems – Systems are increasingly non-linear and no longer exhibit clean distinctions between structure and behavior. In fact, a fixed structure leading to a determined behavior is often undesirable, as compared to a flexible system where both can change. Feedback and interactions dominate, and cause systems to evolve. Analogies to living systems are no longer to simple feedback loops but rather to complex adaptive systems. Theories of complexity are beginning to emerge that capture a variety of phenomena across different types of systems. Emergence, for example, the process whereby macro-behaviors arise out of numerous interactions of micro-behaviors, is recognized as critical phenomenon. Rather than holding to the notion "that all phenomena in the universe are reducible to the laws of physics" one should

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[47] Nancy Leveson, *Safeware: System Safety and Computers* (New York: Addison Wesley, 1995), 138, 152.
[48] Manuel Castells, *The Rise of the Network Society* (London: Blackwell, 1996).
[49] Hughes, *Rescuing Prometheus*, Chapter 5.
[50] Maier, and Rechtin, *The Art of Systems Architecting*.

recognize that "all phenomena are *constrained* by the laws of physics." Optimization is rarely possible.[51] Simulations may replace predictive models as the primary tools of analysis.

An historical epistemology of "system" as developed in this paper sheds some initial light on the dizzying questions surrounding the role of systems thinking in engineering today – if only by making it clear that "system" has a long, multithreaded history. The three definitions of systems from the eighteenth century – physiological, philosophical and dynamic – help cut through some of the multiplicity and overlap, and to link today's multiple voices on systems with their historical antecedents. We need not see the variety of today's systems as an endless proliferation, but rather as an evolution of a rich idea, one that has always had multiple meanings and that has drawn both its limitations and its power from analogies between them.

[51] Holland, John H. (1998). *Emergence: From Chaos to Order* (Reading, MA: Perseus, 1999). Also see, for examples, Joe Sussman ed., *Ideas on Complexity in Systems: Twenty Views* in this volume.

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Long Lines: AT&T, Long Distance Telephony, and Corporate Control

Robert MacDougall

In this paper I argue that the importance of long distance telephone service to the American Telephone and Telegraph (AT&T) Company in the 1900s and 1910s was not commercial, but political and cultural. Long distance service played a key role in justifying the centralization of corporate control in the telephone industry and the nation at large. The so-called Bell System was not a single firm before the 1910s, but rather an association of regional operating companies with considerable autonomy. As AT&T's leaders fought to curtail that autonomy, long distance service offered a powerful technological justification. Outside the Bell System, the transcontinental network also served as a symbol of interconnection and integration. It became central to AT&T's campaign to convince Americans not only of its own legitimacy, but also of that of nation-spanning corporations in general.

On January 25, 1915, the American Telephone and Telegraph Company held a lavish ceremony to commemorate the United States' first coast-to-coast telephone call (see Figure 1).[1] Alexander Graham Bell in New York spoke by telephone to his old assistant Thomas A. Watson in San Francisco. "Mr. Watson, come here, I want you," Bell said, repeating the words he had spoken in the very first telephone call, nearly 40 years before. Watson got to deliver the punch line, such as it was: "Why, Mr. Bell," he replied, "it would take me a week to do that now!"[2] Bell's words traveled 3,500 miles from New York to San Francisco, across thirteen states and over 130,000 telephone poles supporting nearly 3,000 tons of

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[1] It is somewhat anachronistic to use the abbreviation "AT&T" for the American Telephone and Telegraph Company in this era; I do so only for brevity. Some documents in this era did refer to "the A.T. & T. Co.," but the familiar acronym "AT&T" only came into general use in the 1930s or after.

[2] Numerous company publications included descriptions of the inauguration of the transcontinental line. See for example *The Story of a Great Achievement: Telephone Communication from Coast to Coast*, (New York, 1915); "Coordinating the Nation," *Telephone Review* (January 1915), 24; and Arthur Pound, *The Telephone Idea: Fifty Years After* (New York, 1926).

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URL: http://www.thebhc.org/publications/BEHonline/2005/macdougall.pdf.

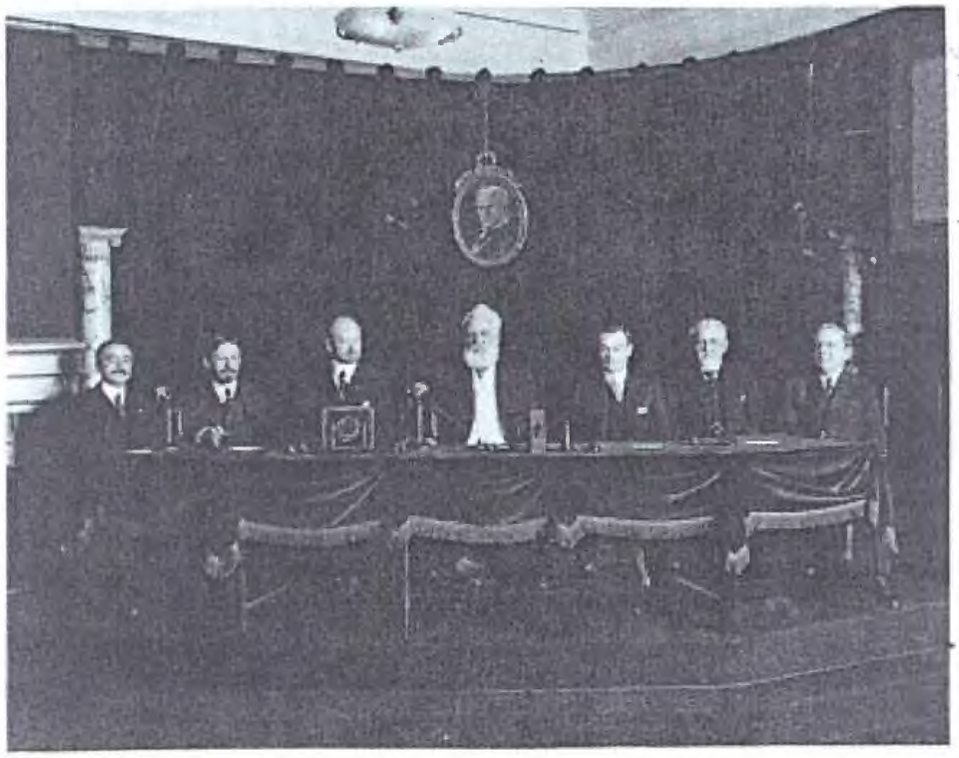

FIGURE 1

Alexander Graham Bell (center), and Mayor John Purroy Mitchell of New York (at Bell's right) with other dignitaries and company officials, at the official opening of transcontinental telephone service, New York, 25 Jan. 1915. Above Bell is a portrait of AT&T president Theodore Vail.
Source: *The Pageant of America* Photograph Archive, vol. 4, "The March of Commerce," New York Public Library, plate number 4.644.

copper wire. Another circuit connected President Woodrow Wilson in Wash Washington and AT&T President Theodore Vail in Georgia.[3] The real spectacle, as AT&T executives were quick to point out, was not simply this call but the system in its entirety, a now truly national long distance network that connected more than nine million telephones from coast to coast (see Figure 2).

The ceremony coincided with the Panama-Pacific Exhibition in San Francisco celebrating the completion of the Panama Canal. The telephone company's boosters compared this other spectacle of technology to their transcontinental network, and judged the Canal wanting. The U.S. government had spent $310 million constructing the Canal, one AT&T

[3] Vail was at Jekyll Island, Georgia, reportedly recuperating from a bad fall.

FIGURE 2

The Merger of East and West

"But there is neither East nor West, border, nor breed, nor birth,
When two strong men stand face to face, tho' they come from the ends of the earth!"
—KIPLING.

In the "Ballad of East and West," Kipling tells the story of an Indian border bandit pursued to his hiding place in the hills by an English colonel's son.

These men were of different races and represented widely different ideas of life. But, as they came face to face, each found in the other elements of character which made them friends.

In this country, before the days of the telephone, infrequent and indirect communication tended to keep the people of the various sections separated and apart.

The telephone, by making communication quick and direct, has been a great cementing force. It has broken down the barriers of distance. It has made us a homogeneous people.

The Bell System, with its 7,500,000 telephones connecting the east and the west, the north and the south, makes one great neighborhood of the whole country.

It brings us together 27,000,000 times a day, and thus develops our common interests, facilitates our commercial dealings and promotes the patriotism of the people.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy *One System* *Universal Service*

AT&T sang the praises of the transcontinental telephone system
Source: *Telephone Review* (Aug. 1913).

pamphlet reported; the telephone company spent twice that amount constructing "this other canal, this even more intimate connection between the two seaboards." The transcontinental telephone network was "the highest achievement of practical science up to today," AT&T's publicists declared. "No other nation has produced anything like it, nor could any other nation. It is *sui generis*, it is gigantic—and it is entirely American."[4]

In public and in private, AT&T executives in the 1910s sang the praises of long distance communication and the utopia of peace and prosperity it might one day achieve. Theodore Vail, a prime mover behind the construction of the transcontinental line, was always ready to wax rhapsodic on the subject. He declared "intercommunication" to be "the

[4] *The Story of a Great Achievement*, 11-16.

basis of all civilization." "Prosperity is in direct relation to its completeness and perfection," he told one audience in February 1913. Once the universal telephone network was completed, he told another, "distance will be annihilated, and the whole world will be united in common interests, common thought, [and] common traditions."[5]

The fanfare surrounding the transcontinental call, however, and the emphasis AT&T placed on its long distance service in general, appear out of proportion to the commercial importance of the long distance telephone at this time. There seems to have been no great clamor for coast-to-coast telephone service before or even some time after 1915. As late as 1935, AT&T would estimate that less than 10 percent of the Bell System's revenues came from interstate traffic and that less than 1.5 percent of telephone calls crossed even one state line.[6] Vail's successor Walter Gifford admitted in 1928 that the long distance network was still "a seventh day wonder" to most Americans, rather than a real part of their everyday lives.[7]

The high cost of long distance telephony was obviously a factor. The charge for a three-minute call from New York to San Francisco in 1915 was $20.70—roughly equivalent to $375 today.[8] Such service was prohibitively expensive for the vast majority of telephone users. However, demand would have been uncertain even at a lower price. "No one pretends that the New York—San Francisco line will immediately 'pay'," reported a *McClure's* magazine article published on the eve of the coast-to-coast call. "The public will have to acquire the habit of talking transcontinentally, just as it had to learn to use the telephone at all."[9] The public acquired this habit only slowly. The New York to San Francisco circuit did not pay for itself right away, nor would it for many years.[10]

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[5] Theodore N. Vail, *Views on Public Questions: A Collection of Papers and Addresses* (New York, 1917), 99, 313.

[6] James M. Herring and Gerald C. Gross, *Telecommunications: Economics and Regulation* (New York, 1936), 213.

[7] Conference of Publicity and Personnel Representatives of the American Telephone and Telegraph Company, *Proceedings*, 11-13 April 1928, Historical Collections, Baker Library, Harvard Business School [hereafter, HBS], 89.

[8] M. D. Fagen, ed., *A History of Engineering and Science in the Bell System*, vol. 1: *The Early Years, 1875-1925* (Warren, N.J., 1975). Adjusted for inflation, $20.70 in 1915 had the same purchasing power as $376.47 in 2003. John J. McCusker, *Comparing the Purchasing Power of Money in the United States (or Colonies) from 1665 to Any Other Year Including the Present* (Economic History Services, 2004), URL: http://www.eh.net/hmit/ppowerusd/ (accessed 8 May 2005).

[9] "Telephones for the Millions," *McClure's* (Nov. 1914): 45-55.

[10] AT&T's major commercial reward for its coast-to-coast lines came with the rise of network radio broadcasting in the 1920s and 1930s—not from person-to-person calls but from the use of the lines to transmit radio programming between network affiliates. Many Americans had their first occasion to use the long

Histories of the telephone written in the heroic mode celebrate Theodore Vail's determination to build a national long distance network as evidence of his foresight and commanding vision. However, Vail had other reasons for leading his company in that direction. The importance of long distance to Vail and to AT&T was not commercial, but political and cultural. First, the transcontinental telephone circuit played a key role in justifying a reorganization of the Bell System, which curbed the autonomy of local and regional operating companies and centralized power at AT&T. More broadly, AT&T's long distance triumph served as an immense and compelling symbol of interconnection and economic integration at a time when Americans remained highly ambivalent about such trends. Long distance proved central to a seminal public relations campaign through which AT&T not only polished its own corporate image, but also worked to convince Americans of the legitimacy of nation-spanning corporations in general.

In celebrating its long distance network, AT&T repeatedly blurred distinctions between the actual physical system of phones and wires and the corporate structure of companies and people around it. Ideas about how the technology of long distance worked or should work were extrapolated to the organization of human systems. Thus, questions of corporate control powerfully shaped technological choices at AT&T—and vice-versa. The transcontinental telephone network came to embody an argument about corporate organization and, ultimately, about the organization of society and the economy as a whole.

Long Distance and the Local Operating Companies

To understand the significance of long distance to AT&T and the larger Bell System, it is first necessary to recognize the distinction between the two. For much of the twentieth century, it was fair to regard AT&T and the Bell System as virtually the same. Between the 1910s and the 1980s, the American Telephone and Telegraph Company was the parent and head of a single corporate system, its management famous for loyalty, uniformity, and homogeneity. It was, for a time, the single largest corporation in the world. In the nineteenth century, however, it was neither the parent nor the largest part of the Bell System. It is not, in fact, strictly correct to refer to the Bell telephone interests of the 1900s as the "Bell System" at all.

In the 1880s and 1890s, the American Bell Telephone Company of Boston owned Alexander Graham Bell's original patents on the telephone. However, American Bell did not have the capital or the personnel to bring telephone service to the whole country. In each part of the country, local agents and entrepreneurs established their own operating companies and then contracted with Bell in Boston for an exclusive right to lease its

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distance telephone during World War II. Long distance traffic in the United States increased by approximately 350% between 1941 and 1945.

telephones and offer telephone service in the respective local areas. In 1880, four years after the telephone's invention, there were over one hundred such companies, offering telephone service in 998 American cities and towns. American Bell owned stock in several of these undertakings—particularly the largest and most profitable exchanges like New York and Chicago—but many more were the product of local capital and local enterprise alone.[11]

The so-called Bell System was thus not a single entity before the 1910s, but rather an association of affiliated operating companies, each with considerable autonomy. Before the turn of the century, executives at American Bell and the local operating companies rarely spoke of a single "Bell System." Only their competitors and enemies, who accused Bell of being a monolithic and monopolistic trust, used that sort of language. Bell executives spoke instead about "American Bell and its associated companies," carefully emphasizing the independence of the regional operating firms.

When first organized in the late 1870s and early 1880s, the various Bell operating companies were quite limited in size and scope. Many served only one city or town. As the decade continued, a wave of mergers and consolidations reduced the total number of Bell licensees while increasing the size of the territory each served. In 1880, the operating companies' national association counted eighty-six companies among its members; by 1887, that number had dropped to thirty-four.[12]

The American Bell Telephone Company's annual report for 1882 noted this trend and warned that it "should not be encouraged" if it meant shifting control of telephone operations out of local hands. But the same report the next year praised the consolidation of local operating companies and predicted that the trend would continue. "The tendency toward consolidation of telephone companies . . . has continued," read the 1883 report, "and is . . . in the interest of economical and convenient handling of the business." The reason for this change of heart was the dawning emergence of long distance telephone service: "The connection of many towns together . . . made it of importance to bring as large areas as possible under one management," American Bell's directors reported. "As methods are devised for making the telephone commercially useful over

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[11] Theodore N. Vail, "Report on the Operations of the Telephone Business," 19 March 1880, box 1080, AT&T Historical Archives [hereafter, ATTA]; Robert W. Garnet, *The Telephone Enterprise: The Evolution of the Bell System's Horizontal Structure, 1876-1909* (Baltimore, Md., 1985).

[12] National Telephone Exchange Association, *Report of the Proceedings of the National Telephone Exchange Association,* HBS, 1880, 1887. Membership in the NTEA was voluntary, so these numbers do not necessarily include every operating company in the country, but a majority of the Bell-affiliated operating companies certainly belonged; the trend of growth in size and reduction in numbers is noted by the members of the NTEA and borne out by other evidence.

long lines, the advantages of this centralization of management will be still more apparent."[13]

That 1883 report bore the signature of American Bell's president William Forbes, but it is likely these were really the words of the company's general manager, Theodore Vail. Vail was in those years American Bell's most active and energetic executive, and the argument that long distance communication required the consolidation and centralization of management would remain the central theme of his long and spectacular career. A telegraph operator in his youth, Theodore Vail first made his name in the 1870s as a manager for the U.S. Postal Service, where he centralized procedures and oversaw initiatives like Fast Mail and Railway Mail, two examples of systems integration in the service of long distance communication.[14] Vail left the Postal Service in 1878 to become American Bell's first general manager.[15] There he became the company's and probably the nation's first and most influential advocate of long distance telephony, and there he championed the idea of uniting all of the nation's telephone exchanges in one universal system.[16]

"The Bell System was founded on the broad lines of 'One System, One Policy, Universal Service,'" Vail declared in 1910. This meant, he said, "the idea that no aggregation of isolated independent systems, not under common control . . . could give the public the service that the interdependent, intercommunicating, universal system could give." Although that slogan appeared only in 1908, Vail claimed the idea was not new. "In

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[13] *Annual Report of the Directors of the American Bell Telephone Company to the Stockholders*, HBS, 1882, 3; 1883, 4.

[14] Richard R. John, "Theodore N. Vail and the Civic Origins of Universal Service," *Business and Economic History* 28 (Winter 1999): 71-81. For Vail's life, see Richard R. John, "Vail, Theodore Newton," *American National Biography Online* (Feb. 2000): http://www.anb.org/articles/10/10-01671.html (accessed 8 May 2005); and Albert Bigelow Paine, *Theodore N. Vail: A Biography* (New York, 1929). For a broad sample of his writing and ideas, see Vail, *Views on Public Questions*.

[15] Technically, the company Vail joined in 1878 was the Bell Telephone Company, not American Bell. The original Bell Telephone Company, founded in 1877, reorganized as the National Bell Telephone Company in 1879 and as the American Bell Telephone Company in 1880.

[16] It is not clear when this vision was first born in Vail's mind. Sometimes he said it was "co-existent with the business." At other times, he said he could not say with any certainty when the idea of "one great big general system" first came to him, but it was certainly implied by the expansive language in AT&T's founding charter, written in 1885. See *Annual Report of the Directors of the American Telephone and Telegraph Company to the Stockholders*, HBS, 1909, 18-19; New York State, Joint Committee of the Senate and Assembly Appointed to Investigate Telephone and Telegraph Companies, *Report* (Albany, N.Y., 1910). The AT&T charter is reprinted in Frederick L. Rhodes, *Beginnings of Telephony* (New York, 1929), 196-97.

fact," he said, "the theory was evolved and developed before the business, and the business has been developed on that theory."[17]

This version of history would have been a surprise to the many managers of Bell's local operating companies in the 1880s. They valued their independence highly and resisted efforts by Vail and others to bring the industry under one common control. Morris Tyler of New Haven, the first president of the National Telephone Exchange Association, scolded American Bell for trying to standardize the operations of its many licensees. "While treating everybody alike, the fact has been overlooked that everybody is *not* just alike," he complained in 1885. "Questions of most grave importance connected with this matter of the relation of licensor and licensees are now staring us suddenly in the face."[18]

Nor did the operating company managers share Vail's enthusiasm for the long distance telephone. The technology needed for long distance transmission remained uncertain in the 1880s and 1890s, as did the public demand. Local managers, in the business of providing local telephone service, showed little enthusiasm for constructing expensive long distance lines. "Will it pay?" they asked.[19] The answer was far from clear. Doubters in the company gave an unprofitable line from Boston to New York City the name "Vail's Folly."[20] Though "fondly regarded" by some, long distance service had "always been a source of actual loss to the company," Morris Tyler declared in 1886.[21] Tyler's fellow managers scoffed at the sort of pronouncements on the bright future of long distance to which Vail was so often given: "It was almost suggested that the life of the average American would be incomplete were he to omit from his daily routine the pleasure of telephoning to his friends in Japan," said one.[22]

The American Telephone and Telegraph Company was established in 1885 as a subsidiary of American Bell with special responsibility for the construction and operation of long distance telephone lines. Vail left American Bell in Boston to become president of the new company. Its founding charter, drafted by Vail and his lieutenant Edward Hall, suggested the scope of his ambition:

> The lines of this association . . . will connect one or more points in each and every city, town or place in the State of New York with one or more points in each and every other city, town or place in said state, and in each and every other of the United States, and in Canada and Mexico; and each and every other of said cities, towns and places is to be connected with each and every other city, town

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[17] *AT&T Annual Report* (1909), 18-19.
[18] NTEA, *Proceedings* (1885), 14-15; emphasis in original.
[19] Ibid., 62.
[20] Herbert N. Casson, *The History of the Telephone* (Chicago, 1910), 172.
[21] *Annual Report of the Directors of the Southern New England Telephone Company to the Stockholders*, HBS, 1886.
[22] NTEA, *Proceedings* (1885), 61.

> or place . . . and also by cable and other appropriate means with the rest of the known world.[23]

But AT&T in the 1880s had no authority over the management of the various telephone operating companies, and Vail could never force the Bell licensees to cooperate with his plans for long distance service. One of AT&T's first major undertakings, for example, was a long distance circuit from New York to Philadelphia. On completion of the line in 1886, neither of the local companies on either end had made the technical adjustments necessary to connect their systems to AT&T's long distance lines. The Philadelphia company, in particular, did not show "any disposition . . . to cooperate," reported Edward Hall, and "the purpose for which the line was intended [was] practically defeated."[24]

Calling his position in the company "embarrassing and unpleasant," Vail resigned the presidency of AT&T in 1887, but the struggle over long distance telephony continued without him.[25] The technology of the telephone and the long distance telephone in particular changed considerably in the next twenty years, but positions in the debate over long distance remained remarkably consistent. Advocates of centralization like Vail and Edward Hall were also boosters of long distance telephony, while defenders of local management like Tyler—and later, the Bell System's many independent competitors—remained very skeptical about the commercial importance of long distance. Those on both sides of this debate repeatedly combined and intertwined arguments about the physical shape of America's telephone networks and arguments about the proper organization of telephone management. The technical debate and the organizational debate were essentially the same.

In 1889, telephone engineer John J. Carty presented a paper at the annual meeting of the National Telephone Exchange Association called "The New Era in Telephony." Carty and co-authors Angus Hibbard and Frank Pickernell of AT&T began by asserting the importance of long distance telephone service and praising the work of the American Telephone and Telegraph Company in bringing such service about. Rising demand for a "perfected" long distance system "may be said to have created a new era in telephony," Carty and his co-authors declared. This

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[23] Rhodes, *Beginnings of Telephony*, 196-97.

[24] Edward J. Hall to John E. Hudson, 21 Jan. 1888, box 1011, ATTA. See also Garnet, *The Telephone Enterprise*, 79-81.

[25] Quoted in John Brooks, *Telephone: The First Hundred Years* (New York, 1976), 85. Vail stayed on as president of New York's Metropolitan Telephone Company until 1889 and remained around the periphery of the industry thereafter, consulting from time to time, offering advice, and always promoting long distance. "The time is coming when the [local] exchanges will do little more than pay the expense of operations. The toll line [long distance] revenue will make the dividends," he told AT&T management in 1901. Theodore N. Vail, "Policy and Plans for Expansion of Business," 1901, box 1080, ATTA.

new era, they argued, had three major elements, all intertwined: long distance service, interconnection among operating companies, and uniform technical standards across the system. "During the past, very much has been lost by a lack of uniformity," Carty said. "The methods of the east and the west have differed widely. . . . In this 'new era' in which a perfected service is to be given, such engineering cannot possibly be successful." Local management must begin "adhering to uniform practices," he insisted, and "remedy . . . the loose methods of past years."[26]

The "New Era" paper, dubbed "seminal" in later years, proved highly controversial at the time. It amounted to an attack, in the name of long distance service, on the autonomy of local operating companies and their ability to set technical standards on their own. Appreciating the negative reaction he might receive from an audience of local managers, Carty did not read his paper to the entire membership of the NTEA, but only to a special closed-door executive session—a first for the association. Local managers attending the session demanded to know if Carty's paper was officially "backed" by AT&T or "simply the opinion of three of their experts." No answer to this question was forthcoming. They held a vote on whether or not to publish Carty's paper in the minutes of the NTEA conference—another first. The motion to publish carried by a close vote of 11 to 9, followed immediately by passage of a resolution that the NTEA took no responsibility for any papers presented at its meetings.[27]

At the NTEA's annual meeting the following year, AT&T's Edward Hall extrapolated from the "New Era" paper, arguing for standardizing the human organization of the telephone industry along with its technical operations. Hall began by calling the Bell corporate system an "artificial person," but the metaphor at the heart of his paper was that of the corporation as "mechanism" or machine. "I do not see why we should not go at this [organizing the corporation] just as we would at the construction of any piece of mechanism," Hall said. "Surely [our corporation] is more complicated and more delicate than any of our electrical apparatus, and at the same time, its motions are attended with such consequences that we cannot afford to make any mistake." Hall criticized the "tangled . . . old-fashioned 'rule of thumb' method" in practice at most local operating companies and displayed organizational charts—a novelty in 1890, the first some present had ever seen—that made explicit his analogy between telephone circuits and lines of managerial communication and control.[28] Hall's view of the "new era" was a simple extrapolation of Carty and Vail's. The connection of wires across the country, Hall argued, required the connection of telephone companies across the country, and that required the centralization of authority and power. "As all the parts [of the Bell

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[26] NTEA, *Proceedings* (1887), 34-43.
[27] Ibid. (1889), 44-45.
[28] Ibid., (1890), 43-56.

corporate system] are inter-related," Hall said, "it is evident that there must be somewhere a single central authority, or division means chaos."

Debate was lively, but few of the regional operating companies rushed to adopt Hall's new scheme. "Will it not always be true that the parent Company must vitally depend on men who are in charge locally?" E. B. Field, president of the Colorado Bell Telephone Company, asked in later years. Field challenged Hall's machine metaphor directly, saying, "I would rather be building an organization that makes *man* supreme and not the Company, that is, all round intelligence, which administers the Company's affairs, and not a machine."[29]

Financial control, not clever metaphor, would drag reluctant managers into the "New Era" of long distance telephony and centralized control. In 1900 New York-based AT&T replaced Boston-based American Bell as the parent company of the Bell organization. This was not a hostile takeover, but a voluntary stock swap designed to take advantage of New York's more liberal regulatory environment. However, transforming the long distance subsidiary into the parent company of the entire organization proved to be a more than symbolic change. With capital obtained from a circle of New York financiers led by John Pierpont Morgan, AT&T began to increase its ownership of the various regional operating companies, while the New York bankers increased their control of AT&T. At the turn of the century, AT&T controlled just 45 percent of the total voting stock of all the local and regional licensees. By 1910, that figure was more than 80 percent. Eventually, distinctions between the parent company and its subsidiaries would be almost meaningless; by 1934, AT&T owned at least 99 percent of the stock in sixteen of the twenty-one operating companies.[30]

Carty's "New Era" truly arrived in 1907, when the Morgan-led syndicate completed its takeover of AT&T. The New York financiers then forced the resignation of the Bostonian owners and directors who had led the Bell companies since 1880. As the new president of AT&T, Morgan installed Theodore Vail, returning him to the office from which he had resigned twenty years before.[31] This alliance made sense. Like Theodore Vail, J. P. Morgan was a builder of systems. Both men believed in stability and profit through corporate consolidation and centralized control. It was Morgan's investment firm more than any other that imposed order and oligopoly on the American railroad industry in the 1880s and 1890s,

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[29] E. B. Field to John J. Carty, 8 Sept. 1909, box 2029, ATTA; emphasis in original.

[30] Federal Communications Commission, *Proposed Report, Telephone Investigation* (Washington, D.C., 1938), 26-28.

[31] J. Warren Stehman, *The Financial History of the American Telephone and Telegraph Company* (Boston, Mass., 1925); N. R. Danielian, *A.T.&.T.: The Story of Industrial Conquest* (New York, 1939), 57-66.

combining dozens of regional railroads into a few giant systems.[32] In the 1890s and early 1900s, there were frequent rumors that Morgan was planning to take over the independent telephone movement in the same way, merging thousands of local systems into one great telephone network. In the end, however, it was the Bell companies that the House of Morgan would consolidate and control.[33]

With the blessing of their new owners, Vail and his lieutenants moved to turn the associated Bell companies into one single, centrally controlled "Bell System." Vail named John Carty to be AT&T's chief engineer and expanded the power of Carty's department over the engineering practices of the other Bell companies. Carty centralized research and development in New York, shutting down laboratories in Boston and Chicago, and he ordered Western Electric, the manufacturing arm of the system, to stop taking orders for equipment from regional offices. In order to eliminate what Carty called "excessive and uneconomic diversity," the central engineering department of AT&T would thereafter make all decisions regarding equipment and operations.[34]

Taking a cue from the engineering department, Vail and Edward Hall, now vice-president of AT&T, worked to systematize and centralize the human organization of the Bell System. All problems "must be dealt with on broad lines," Hall wrote, "and by methods which are applicable to the whole territory."[35] In the spring of 1908, Vail and Hall restructured AT&T's management completely, beginning with long distance operations, in order to centralize decision making and to standardize procedures.[36] Reorganization of the regional operating companies followed. These changes faced "pockets of resistance on the part of local management," in

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[32] Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass., 1977), 158-75, 195-203; Charles Perrow, *Organizing America: Wealth, Power, and the Origins of Corporate Capitalism* (Princeton, N.J., 2002), 200-201.

[33] See for example "Consolidation Talk," *New York Times*, 30 Dec. 1899, p. 11. See also Stehman, *Financial History of AT&T*, 56-59; Harry B. MacMeal, *The Story of Independent Telephony* (Chicago, 1934), 112. In histories of the telephone critical of the Bell System (for example, Danielian's *AT&T*), Morgan often makes a brief appearance as a mustachioed villain, pulling the levers of finance to discourage investment in independent telephone firms. In histories of the telephone friendlier to Bell, Morgan rarely appears at all. Few historians have highlighted Morgan's role in cementing a national telephone monopoly in America, or noted how natural it was that Morgan and Theodore Vail should be allies in this project.

[34] John J. Carty to Edward J. Hall, 17 July 1907, box 6, ATTA; Neil H. Wasserman, *From Invention to Innovation: Long-Distance Telephone Transmission at the Turn of the Century* (Baltimore, Md., 1985), 110.

[35] Edward J. Hall to Frederick Fish, 30 Oct. 1902, ATTA.

[36] "Application of Some General Principles of Organization," Oct. 1909, box 2029, ATTA; Garnet, *The Telephone Enterprise*, 135-38.

the words of one internal company history, but such resistance was broken by the steady extension of AT&T's financial control.[37] "When we acquire the ownership of all the stock of any company, we are in a position for the first time to say just how it should be handled," Hall wrote in 1909 with evident satisfaction.[38]

While making these changes to the Bell System, Vail also made the extension of long distance service one of the system's top priorities. In 1908, Vail and Carty vowed that AT&T would inaugurate transcontinental telephone service before the completion of the Panama Canal. Company histories praise Vail's boldness in making such a promise, for in 1908 the technology to transmit an intelligible conversation 3,000 miles did not yet exist.[39] However, such histories do not mention how long distance, and the transcontinental project in particular, served AT&T in both curtailing the autonomy of local operating companies and justifying that change. AT&T's growing holdings of operating company stock gave Vail the power to centralize control of the Bell System, and the transcontinental network gave him a reason to do so.

"A nationwide intercommunicating system . . . requires uniformity in operating methods and instrumentalities," Vail wrote in 1914 as the transcontinental network neared completion (see Figure 3). "It requires coordination of effort and co-operation in the highest degree, which can be obtained only through one system, one policy, one centralized administration." In local telephone service, he conceded, a variety of methods might be adequate, but in long distance service there could be only "one best way." No aggregation or loose affiliation of smaller systems, Vail argued, could have achieved a coast-to-coast telephone call. "For interconnecting service and distant communication, uniformity in methods of operation and apparatus is necessary, in fact, imperative." The transcontinental telephone call was thus the "supreme test" of the Bell System, perhaps the only application that truly demanded the kind of integration and centralized control Vail worked so hard to attain. Whether or not anyone would actually pay to use it was almost beside the point.[40]

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[37] "The Central Union Telephone Company/Chicago Telephone Company," [1980?], ATTA, 1.

[38] Edward J. Hall to Theodore N. Vail, 27 Sept. 1909, box 1010, ATTA.

[39] On the technical history of the transcontinental line see Fagen, ed., *Engineering and Science in the Bell System,* 195-348; Hugh Aitken, *The Continuous Wave: Technology and American Radio, 1900-1932* (Princeton, N.J., 1985), 233-45; John Mills, Frank Jewett, et al., "A Quarter Century of Transcontinental Telephone Service," *Bell Telephone Quarterly* (Jan. 1940): 3-58.

[40] *AT&T Annual Report* (1914), 42.

FIGURE 3
Completing the transcontinental telephone line: a hole digging crew near the Nevada-Utah state border, May 1914.
Source: *The Pageant of America* Photograph Archive, vol. 4, "The March of Commerce," New York Public Library, unpublished photographs.

AT&T publicity returned repeatedly to the need for centralization, not only in material meant for the general public, but in internal publications as well. Bell employees received a steady diet of speeches and memoranda explaining and justifying the system's corporate reorganization. They were even led in songs at company gatherings that extolled the virtues of centralization and standard operating procedures.[41] For the trans-continental telephone system to succeed, Bell employees were told, local management had to surrender its old autonomy and authority. Embedded in the great project of the transcontinental telephone system was the technological justification for this otherwise unpopular organizational change.

The success of the rhetorical offensive can be read in the archives of the Cumberland Telephone and Telegraph Company, a Bell licensee based in Nashville that served a territory stretching from Indiana to Louisiana

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[41] *Everybody Join In: The Blue Bell Songbook* (New York, [1920?]), Donald McNicol Collection, Queen's University Special Collections. The "Blue Bell Song," one melodious example out of many, laid out the three-branch reorganization of the company (Contract, Plant, and Traffic) to the tune of "America (My Country 'Tis of Thee)": "Blue Bell, it is of thee / Symbol of unity / Of thee we sing / Let's all cooperate / In each United State / to make our service great / Let Blue Bells ring . . . 'Contract' quote proper rate / 'Plant' keep the wires straight / 'Traffic' all woes abate / Ring clear the Bell."

between 1880 and 1911. Cumberland's executives prided themselves on their independence and autonomy from the parent company, and resisted attempts by American Bell to take control of their operations in the 1880s and 1890s. "The American Bell Telephone Company does not own a dollar stock in our company," boasted one of Cumberland's directors in 1885. "Our company is the only one [of the Bell licensees], or at least one of the very few, of which this statement may be truthfully made."[42] There was a regional element to Cumberland's prized independence; its managers strove to keep it "a company that is controlled by Southern men, financed with Southern money, and its affairs directed by Southern brains."[43] However, there were also differences in policy and outlook between Nashville and New York. Leland Hume, a Cumberland manager, questioned AT&T's insistence on state-of-the-art equipment and scientific management. "I sometimes get afraid that when we are studying so much about the higher classics of the telephone business we will sorter (*sic*) forget the business itself," he said in 1903. Cumberland president James Caldwell resisted the cost of long distance construction while urging the extension of low-cost telephone service to middle and working-class homes.[44]

When AT&T finally did acquire a controlling interest in the Cumberland company in 1911, however, James Caldwell conceded to the takeover in language that seemed to come directly from Theodore Vail. In a letter explaining the purchase to his shareholders, Caldwell specifically cited the alleged imperatives of the transcontinental network. "The absorption of your Company into the national system was both logical and inevitable," Caldwell wrote:

> [T]he very nature of the art and the public convenience compelled it, for the telephone on the desk must be in contact with, and in speaking reach of every other telephone throughout the continent, and this can only be done through one unbroken homogenous system where every hand that touches has an incentive to push in the same direction. . . . [P]ractically and psychologically that one universal system can only be the American Telephone and Telegraph Company.[45]

It is remarkable how thoroughly Caldwell capitulated here to Vail's determinist argument. There must be a national long distance network,

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[42] "The Telephone in Indiana," *Electrical World* (26 Sept. 1885), 132.

[43] *Cumberland Telephone Journal* (15 May 1903), 12.

[44] Hume in *Cumberland Telephone Journal* (15 May 1903), 15. For Caldwell, see the *Annual Report of the Directors of the Cumberland Telephone and Telegraph Company*, HBS, various years.

[45] James E. Caldwell to Cumberland Telephone and Telegraph Company Stockholders, 27 Dec. 1911, HBS. Caldwell retired after writing this letter, and AT&T moved the headquarters of Cumberland Telephone and Telegraph from Nashville to Atlanta.

the argument went; the technology demands that it be organized in a certain way. Therefore, the Bell System—this term crucially eliding any distinction between the physical telephone network and the corporate system that operated it—must also be organized in this fashion. "The very nature of the art," Caldwell said, ". . . compelled it."

Much as the assembly line and scientific management shifted the balance of power between worker and employer in the late nineteenth-century American factory, long distance service and the technical and organizational integration it was deemed to require shifted the balance of power in the telephone industry for nearly a century.[46] For AT&T, of course, it was not the power of the factory worker that had to be curbed, but, rather, men like James Caldwell, the small-to-middling entrepreneurs who operated America's local and regional telephone networks, both inside and outside the Bell System.

For decades, historians of technology have both argued against simplistic theories of technological determinism and marveled at the persistence of such ideas. Why are arguments asserting the imperatives of technology so common and so resilient? It is in part because they are so useful. We know that decisions about technology are made to promote various social, cultural, or political arrangements, but if such arrangements can be ascribed to technological imperatives, it removes them from the realm of social, cultural, and political debate.

Long Distance and the Independents

In 1894, after the expiration of Alexander Graham Bell's original patents on the telephone, the Bell telephone companies suffered several years of furious competition from thousands of smaller telephone systems, known collectively as the independent telephone movement. The independents reached their zenith in 1907, when they controlled more than half of the six million telephones then operating in the United States. In some areas, notably the Midwest, independent telephones outnumbered Bell telephones by a factor of five or six to one (see Figure 4).[47]

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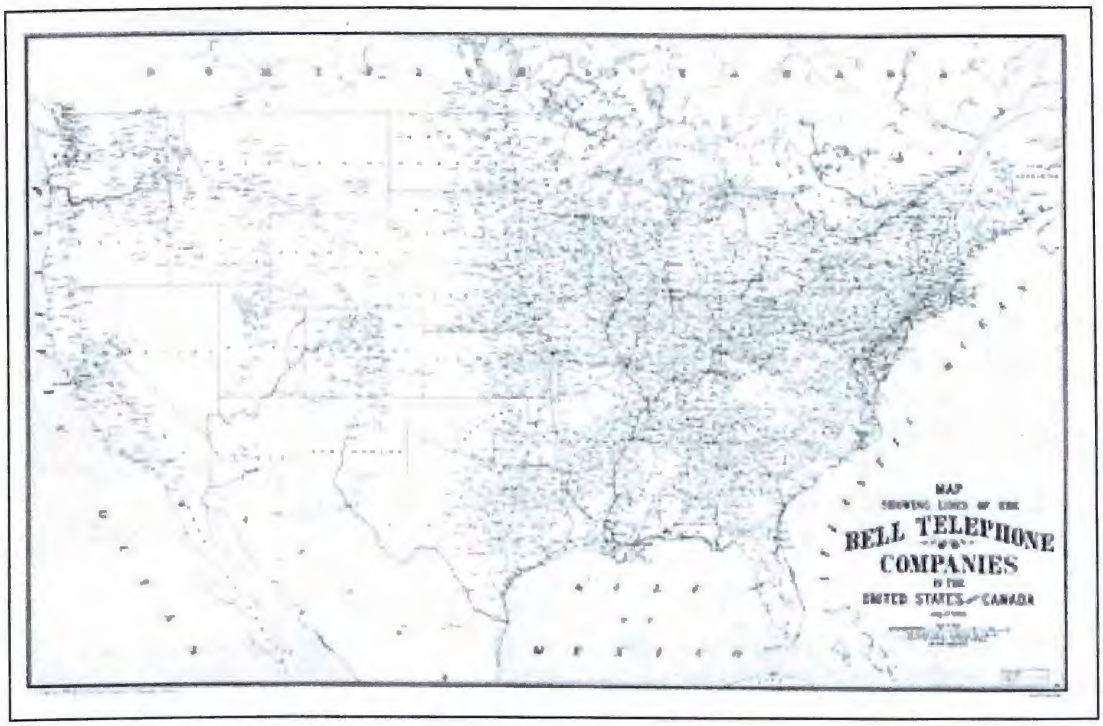
[46] There was candid assertion of this goal in the literature of scientific and systematic management. See, for example, Frederick Winslow Taylor, *The Principles of Scientific Management* (New York, 1911); Robert F. Hoxie, *Scientific Management and Labor* (New York, 1915). On the balance of power in the American workplace, see James Livingston, "The Social Analysis of Economic History and Theory: Conjectures on Late Nineteenth-Century American Development," *American Historical Review* 92 (Feb. 1987): 69-95; David Montgomery, *The Fall of the House of Labor: The Workplace, the State, and American Labor Activism, 1865-1925* (New York, 1987).

[47] Historians have not studied independent competition in American telephony particularly well. Many recent histories of the telephone, based on the corporate archives of AT&T, pay little or no attention to independent competition. Earlier works typically describe independent competition only to lament it as an error or

Vail and other AT&T executives argued that the independents must be defeated in the American marketplace because of their inability to offer long distance service on a truly national scale. "It is extremely important that we should control the whole toll line system of intercommunication throughout the country," AT&T executive George Leverett wrote in 1901. "We need not fear the opposition in a single place provided we control the means of communication with other places." "Without long distance

FIGURE 4
Map showing lines of the Bell Telephone Companies in the United States and Canada, 1904



Source: Map Collection, Widener Library, Harvard University.

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aberration. Claude S. Fischer, "The Revolution in Rural Telephony, 1900-1920," *Journal of Social History* 21 (Fall 1987): 5-26, and Milton L. Mueller, *Universal Service: Competition, Interconnection, and Monopoly in the Making of the American Telephone System* (Cambridge, Mass., 1997), are both useful. The only really detailed histories of independent telephony, however, are celebratory works by self-interested participants: Paul A. Latzke, *A Fight with an Octopus* (Chicago, 1906); MacMeal, *The Story of Independent Telephony*; Charles A. Pleasance, *The Spirit of Independent Telephony* (Johnson City, Tenn., 1989). See also Robert MacDougall, "The People's Telephone: The Political Culture of Independent Telephony, 1894-1913" ***Business and Economic History On-Line*** 1 (2003).

connections the telephone is of restricted value today," agreed a 1906 publication of Bell's New England Telephone Company.[48]

The independent telephone movement never succeeded in building a long distance network on the scale of AT&T's. Some independent companies did make efforts to interconnect with one another and offer long distance service across their territories, but those efforts never truly rivaled AT&T's transcontinental lines. It is not clear, however, that this was the fatal weakness AT&T publicity held it to be.[49] Many independent telephone executives disavowed any interest in offering long distance service. Their customers were happy without it, they said. "Ninety-eight percent of all telephoning is local, and of long distance telephoning, ninety-eight percent is to points within a radius of one hundred miles," said Frederick Dickson, the president of Cleveland's Cuyahoga Telephone Company, in 1905. "The Bell argument is that if we would connect with them, we could talk to Boston, New York, etc.," said William Crownover, the director of a small telephone system in rural Iowa. "True, we can if we have money enough to pay the bill," he continued, "but telephone service is not valued by the number of miles of naked wire we have at our disposal, but by the number of patrons in our immediate vicinity."[50]

Given the high cost of long distance construction, the low revenues, and the limited demand, one could argue that the independents' failure to construct a transcontinental network actually gave them a competitive advantage over the Bell System.[51] Long lines were expensive, both for the customers who used them and for the companies that built them. The decision to emphasize long distance service imposed or at least implied other technical choices: more powerful transmitters in each telephone, higher quality wires, measured pay-by-the-call service rather than flat monthly rates, and sacrifice of local coverage for long distance construction. While the Bell companies were building long expensive lines to connect the nation's urban centers, Bell's independent rivals built up cheaper middle-distance networks, particularly connections between

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[48] George Leverett to Frederick Fish, 17 Oct. 1901, box 1375, ATTA; *The Telephone: A Description of the Bell System*, 19.

[49] If long distance service was not the reason for the Bell System's eventual success against the independents, what was? A complete answer would go beyond the scope of this paper, but must surely include a number of key patents, dominance in the country's most lucrative urban markets, a canny public relations campaign, and a general preponderance of both economic and political clout. For more on all of these topics, see my dissertation: Robert MacDougall, "The People's Telephone: The Politics of Telephony in the United States and Canada, 1876-1926" (Ph.D. diss., Harvard University, 2004).

[50] William Crownover, "Should Independent and Mutual Companies Co-Operate," *Telephony* (May 1907), 309; Frederick S. Dickson, "Telephone Investments—and Others" (Cleveland, Ohio, 1905), HBS, 40.

[51] This argument is suggested in Kenneth Lipartito, *The Bell System and Regional Business: The Telephone in the South, 1877-1920* (Baltimore, Md., 1989), 116.

medium-sized towns and their nearby rural areas. By 1907, independent leaders in the United States declared it an "undisputed fact" that these rural connections were "the potent weapon in the hands of the independents."[52] Successful independent telephone systems found a market niche by offering cheaper service and a different kind of coverage than the Bell companies.

For telephone users, choosing between the regional telephone networks of the independents and the national network of the Bell companies became both a personal and a political choice. Of what kind of network did Americans want to be a part? Where did their friends, their livelihood, and their future lie? The choice between AT&T's national network and the regional clusters of the independents amounted to a referendum on alternate visions of America's economic life. The local and regional lines of the independents represented one of the final defenses of an old economic order that was regionally oriented and locally controlled. AT&T's transcontinental system, by contrast, both represented and facilitated an increasingly integrated national economy.

Long Distance and the Public

The threat that independent competition posed to the Bell System was already fading by the early 1910s. In absolute terms, the number of independent telephones in the United States would continue to rise until the 1920s, but independent market share declined precipitously after 1907.[53] Vail and other executives at AT&T did not feel secure, however. More frightening to them than independent competition was the specter of antitrust action or even nationalization. Most European states had taken over their national telephone systems by the turn of the century. Canada came close to doing so in 1905, and three Canadian provinces acquired the telephone networks built by Bell Telephone Company of Canada. The American Populist Party platforms of 1892 and 1896 called for the nationalization of telephone and telegraph. The next decade saw a flurry of new state regulation and movement toward national regulation by both major parties. In 1913, Woodrow Wilson's Postmaster General wrote a major report calling for the government to take over the telephone industry. Internal memos at AT&T reported that at least 20 senators and 44 congressional representatives approved the plan. The company took seriously the threat of hostile political action.[54]

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[52] G. F. Wonbacher, "Proper Development of the Rural Telephone," *Western Telephone Journal* (July 1908), 242.

[53] U.S. Bureau of the Census, *Historical Statistics of the United States*, vol. 2 (Washington, D.C., 1975).

[54] Postmaster General, *Government Ownership of Electrical Means of Communication* (Washington, D.C., 1914). The AT&T memo is Chester I. Barnard, "Review of the Government Ownership Situation," 6 March 1917, box 1364, ATTA.

Top executives at AT&T also worried about a more general crisis of corporate legitimacy. The size and power of America's leading corporations had grown immensely in this era. Between 1898 and 1902, mergers and combinations absorbed more than 2,600 American companies. The one hundred largest corporations in the United States increased their aggregate size four-fold in those four years and gained control of more than 40 percent of the nation's industrial capital.[55] Such rapid growth provoked a powerful political and cultural backlash. Agrarian populism, urban progressivism, a militant labor movement, an antimonopoly movement, and municipal home rule all were, in various ways, reactions to the growth of giant nation-spanning corporations and assaults on what Supreme Court Justice Louis Brandeis famously called "the curse of bigness."[56]

"It is a dangerous thing to be a monopoly at the present time," AT&T vice-president Nathan Kingsbury told an audience of telephone executives in February 1914. "Business is uncertain, harassed, worried." What worried Kingsbury were muckraking journalists, crusading politicians, and a public inclined to see large corporations like AT&T as greedy, swollen trusts. Men like Kingsbury and Vail considered public hostility to big business frightening and very real. "Many predict panic and disaster . . . the old barriers seem to be forced aside by the spirit of universal discontent and universal unrest," Kingsbury said. "Already the results of this new movement . . . [have] been economically and socially greater than the results of the French Revolution."[57]

Two years earlier, the leaders of some of the largest industrial and financial concerns in the country had met to confront the very crisis Kingsbury described. Among those present were the financier J. P. Morgan and Standard Oil heir John D. Rockefeller, Jr. These men discussed plans to develop a bureau of investigation and publicity that would promote the legitimacy of the great business interests and counter public hostility to the consolidation of corporate power. Nothing came of their meetings directly, but those present praised one among their number for already doing just the sort of work they all believed was required. "Mr. Vail, as president of the Telephone Company, has done this kind of work . . . for many years with great success," Rockefeller said. "He has made it a regular business . . . he constantly and persistently kept up a campaign of education." Only months after the breakup of Standard Oil, Rockefeller was envious of Vail's achievements. "The fact that his Company, one of the greatest, if not the greatest single monopoly in the country, is allowed to

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[55] William G. Roy, *Socializing Capital: The Rise of the Large Industrial Corporation in America* (Princeton, N.J., 1997).

[56] Louis D. Brandeis, *Other People's Money and How the Bankers Use It* (1914; Boston, 1995).

[57] Nathan C. Kingsbury, Address before Telephone Society of New York, 17 Feb. 1914, Telephone Pamphlets, Widener Library, Harvard University, 3-6.

continue unmolested . . . is indication enough of his success," Rockefeller said.[58]

What had Vail done that so impressed Rockefeller? He had embarked on a seminal public relations campaign for AT&T and the Bell System, what Roland Marchand called "the first, the most persistent, and the most celebrated of the large-scale institutional advertising campaigns of the early twentieth century."[59] The AT&T publicity bureau not only ran advertisements; it also courted reporters, authors, politicians, libraries, and schools. It planted press releases with friendly editors, subsidized flattering books about the company and the telephone, and produced a flood of "educational" pamphlets, booklets, and films.[60]

Much has been written about this justly famous campaign. What is interesting for our purposes is the role that long distance and the spectacle of the transcontinental telephone network played in AT&T's publicity. Bell's opponents saw the continent-spanning network of which Theodore Vail was so proud as a sinister concentration of power. There was a strong regional component to anti-Bell sentiment. Commercial and political opposition to the Bell System was most powerful in the Midwest, where farmers and businesspeople were anxious about their increasing dependence on, and vulnerability to, Northeastern capital. The railroads were of course the great symbol of this increasing interdependence, but the telephone could also be cast in that role. Midwestern populists and muckrakers called the telephone network "an octopus," or "a wire spider, stretching his deadly tentacles [*sic*]" across the plains (see Figure 5).[61]

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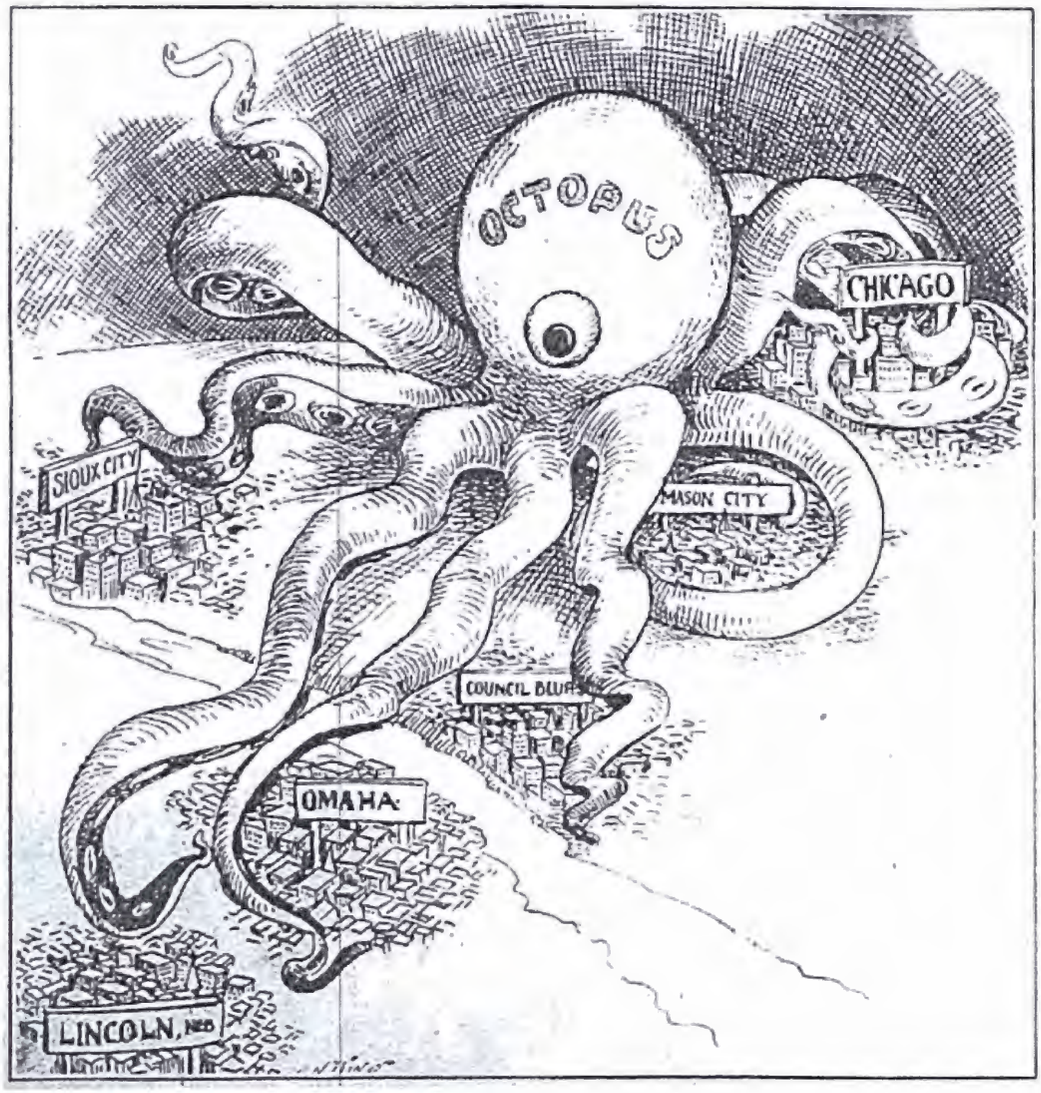
[58] The quotations come from a letter Rockefeller wrote to a family adviser one week after the meeting; see John D. Rockefeller Jr. to Frederick T. Gates, 27 July 1912, reprinted in John M. Jordan, " 'To Educate Public Opinion': John D. Rockefeller, Jr. and the Origins of Social Scientific Fact-Finding," *New England Quarterly* 64 (June 1991): 292-97. Vail's proposals are described in Theodore Vail, "Memorandum Concerning a Proposed Economic Bureau," Rockefeller Foundation Draft Report, April 1914, quoted in David M. Grossman, "American Foundations and the Support of Economic Research," *Minerva* 20 (Spring-Summer 1982): 59-82. Discussions apparently trailed off because Rockefeller wanted to create a research institute, while Vail and Morgan wanted only a public relations bureau. See also John Ensor Harr and Peter J. Johnson, *The Rockefeller Century* (New York, 1988), 127.

[59] Roland Marchand, *Creating the Corporate Soul: The Rise of Public Relations and Corporate Imagery in American Big Business* (Berkeley, Calif., 1998), 48.

[60] Marchand, *Creating the Corporate Soul.* See also James D. Ellsworth, "The Start of General Magazine Advertising," Jan. 1931, box 1066, ATTA. A nearly complete collection of AT&T's early institutional advertisements exists in the N. W. Ayer Collection, National Museum of American History, Smithsonian Institution, Washington, D.C.

[61] For example, "Wiggins's Great Discovery," *New York Times*, 21 June 1891, p. 17; Latzke, *A Fight with an Octopus.*

FIGURE 5



Independent publicity portrayed the Bell companies as a monstrous octopus.

Source: "The Octopus Releasing Its Grasp," *Telephony* (April 1907), 235.

Given public anxiety about corporate "bigness," one might have expected AT&T's publicity to de-emphasize the size and the unity of the Bell System. Given the regional basis of much anti-Bell sentiment, one might have expected a retreat from arguments about the way long distance was shrinking and unifying the nation. However, the publicity around AT&T's transcontinental network did neither. It offered instead a positive defense—indeed, a celebration—of economic integration and corporate consolidation. "American business men have been made neighbors through contacts over the wires of a nation-wide telephone system,"

proclaimed one typical advertisement. "Drawn together by bonds of communication [,] . . . America's industries operate not as individual and isolated enterprises, but as closely coordinated parts of a gigantic mechanism that ministers to the nation's needs." Such publicity emphasized not the power of the telephone company itself but the power the company and its long distance network might provide to its subscribers. "The multiplication of power in a businessman . . . depends upon the increased number of people whom he can, by personal contact, interest in his purposes. He does this by the telephone," said an advertisement from 1914. "Your line is connected with the great Bell highways, reaching every state in the union," another advertisement read. "You have the use of switchboards costing upwards of $100,000,000 . . . the benefits of countless inventions. . . . You command at all times the prompt attention of one or more operators."[62]

As visual answers to images of a monstrous Bell octopus, AT&T offered the friendly handmaiden of Science and a series of giant businesspeople, looming over a nation the telephone made small (see Figure 6). AT&T publicity asked Americans, in particular the white-collar Americans who were the market for long distance service, to imagine themselves as that colossal telephone user, empowered rather than threatened by the network's size.

The very term "Bell System," as used in AT&T publicity, actually dates from this era. As already noted, Bell executives before 1907 were reluctant to describe the Bell companies as a single system. After 1908, however, Vail and his publicity bureau were not shy about proclaiming the unity of the parent company and its subsidiaries. Every AT&T advertisement after 1908 bore the new slogan: "One System, One Policy, Universal Service."[63]

Another slogan appeared in AT&T advertisements at this time: "Every Bell Telephone is the Center of the System." Such a statement might seem to contradict the drive at Bell towards more centralized authority. However, this slogan demonstrates the nuance of the AT&T campaign, and the multiple audiences AT&T imagined for the spectacle of the transcontinental call. Even as long distance service was employed within the Bell System to justify greater standardization and centralized con-

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[62] AT&T Advertisements, *Life* (15 Jan. 1914), 91; *Life* (17 Dec. 1914), 1137; *Telephone Almanac* (New York, 1928), n.p.

[63] AT&T's advertising agency actually balked at introducing Vail's slogan, "One System, One Policy, Universal Service," in 1908. It was an election year, and the advertising bureau feared that open advocacy of monopoly would provoke antitrust sentiment and political attacks. Nevertheless, Vail insisted; see Robertson T. Barrett, "The Beginnings of Institutional Advertising in the Bell System," 1931, box 1198, ATTA; George Griswold, Jr., "How AT&T Public Relations Policies Developed," *Public Relations Quarterly* (Fall 1967), 8.

FIGURE 6
AT&T publicity answered the visual trope of the monstrous octopus with friendlier images like this handmaiden of science.

Source: *Telephone Almanac* (New York, 1928), n.p.

trol, it was also celebrated outside the Bell System as a model of a dynamic, flexible, interdependent system. Vail took to calling the long distance network "an ever-living organism," even "a living conscious being."[64] "The Bell Telephone System. . . is more than the vast machinery of communication, covering the country from ocean to ocean," said another advertisement of the day. "Every part is alive, and each gives additional usefulness to every other part."[65]

Vail liked to tell reporters of a time he saw "something new" in a telephone exchange. "I asked Mr. Carty to explain it . . . but he did not

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[64] *AT&T Annual Report* (1914), 18-20; Casson, *The History of the Telephone*, 140.

[65] The advertisement appears in Milton Mueller, "The Telephone War: Interconnection, Competition, and Monopoly in the Making of Universal Telephone Service, 1894-1920" (Ph.D. diss., University of Pennsylvania, 1989), 276.

understand it," Vail would say, referring to his chief engineer. "We called the manager. He didn't know, and called his assistant. He didn't know, and called the local engineer, who was able to tell us what it was," Vail concluded.[66] Why did Vail repeat this anecdote? It appears to be a denial of centralized, hierarchical control. Yet, in this story, the telephone itself was the means by which Vail's dilemma was resolved. Vail called Carty on the telephone. Carty called his assistant. His assistant called the local engineer, and there an answer was found. The telephone, in other words, allowed information and ideas to travel through a giant corporation, from lowly workers to middle managers to chief executives and back again. The telephone was the instrument that made possible a vision of a corporation that was large but flexible, united but dynamic.

This was the ultimate message of AT&T's seminal public relations campaign. Giant corporations like AT&T need not be feared by the American people, or thought dangerous to democracy, for the telephone itself would transform them, replacing monstrous trusts with dynamic industrial democracies. Because anyone could call anyone else, it was argued, the telephone broke down undemocratic hierarchies and made static chains of command obsolete.[67] The telephone could resolve the very dangers that AT&T as a giant monopoly seemed to represent. The spectacle of long distance extended this idea outward to encompass the whole country. "The nation became an organized body as it increased its use of the telephone," said commemorative publicity for the trans-continental call, "and there was no loss of the spirit of self-help and democracy that was its birthright." "Drawn together by bonds of communication," another ad proclaimed, "America's industries operate not as individual and isolated enterprises, but as closely coordinated parts of a gigantic mechanism that ministers to the nation's needs."[68]

A remarkable book called *Romance of the Machine*, by the physicist Michael Pupin, one of the fathers of the transcontinental telephone network, took this rhetoric to its millennial extreme. In 1899, Pupin invented the loading coils that helped make truly long distance telephony possible. Three decades later, he portrayed the telephone network he had helped to build as a model for American democracy and indeed the world. "I wish to describe the romance of the telephone," he wrote. AT&T's

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[66] Quoted in a number of locations, for instance Herbert N. Casson, *The History of the Telephone* (Chicago, 1910), 167.

[67] Fifty years later, Marshall McLuhan would reiterate this idea. "The pyramidal structure . . . cannot withstand the speed of the phone to bypass all hierarchical arrangements," he wrote. See Marshall McLuhan, *Understanding Media: The Extensions of Man* (New York, 1964), 238. The fact that McLuhan would argue this half a century after Vail is not proof that the idea was true—AT&T in McLuhan's era had certainly never abandoned organizational hierarchies or chains of command—but it may be proof that the idea stuck.

[68] "Coordinating the Nation," 24; *Telephone Almanac*, n.p.

transcontinental telephone network was the largest and most delicate machine ever built, he said, and the company that owned it was the "most perfectly co-ordinated industrial organization in the world." The United States was pioneering a new kind of "economic democracy," and the telephone was the heart of that transformation. It "consolidated" the nation without controlling it, "harmonized interests" without reducing freedom. From Pupin's vantage point in 1929, the future of a networked nation remade in the image of the transcontinental telephone network was bright indeed. "Who can contemplate . . . the industrial democracy inaugurated by our telephone industry," Pupin asked, "without being assured that it is a joyful message of an approaching civilization which will be more just and generous to the worker than any which the world has ever seen?"[69]

Conclusion

In the years around the completion of the transcontinental circuit, AT&T beat back the challenge of independent competition, escaped government antitrust action, and avoided all but the most congenial regulation. A large part of this success must be attributed to the company's canny and persistent public relations efforts. If one compares the literature of the telephone industry in the 1930s or 1940s to the public debate around the telephone in 1900 or 1910, it is very striking how successful AT&T was in defining or redefining the terms with which people talked about the telephone. In many ways, the arguments AT&T made about the telephone still form our default rhetoric for discussing new communication technologies: The telephone was not an instrument of giant corporate trusts; it was the instrument that transformed those trusts into dynamic, democratic institutions. The telephone would not threaten the autonomy of middling entrepreneurs; it would magnify their power. The long distance network would not erase local communities; it would turn the entire nation into one close-knit neighborhood.

Historians typically turn to the story of the railroad to explain how the large managerial corporation emerged in North America, but it is the history of the telephone that tells us how that new corporate order gained wide popular support. At a moment in American history when an economy once populated exclusively by small, local firms was giving way to one dominated by nation-spanning corporations, the universal telephone network served the advocates and architects of the new order as a heroic spectacle of integration and consolidation. The ideal of the single,

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[69] Michael Pupin, *Romance of the Machine* (New York, 1930), esp. 77-81. The engineer and quasi-socialist Charles Proteus Steinmetz made similar arguments in this era about his employer, General Electric: "The industrial corporation is far from the inflexible, rigid machine which it appears to the outsider. . . . It is this flexibility which gives it economic power and strength." See Charles P. Steinmetz, *America and the New Epoch* (New York, 1916), 175.

universal telephone system was "sent forth," according to one public relations executive at AT&T, "to do battle with the slogans of the 'curse of Bigness'."[70] It is clear in retrospect which slogans won. AT&T in these years not only sold the United States on the telephone and the transcontinental telephone system. The spectacle of the long distance network was also instrumental in convincing Americans of the virtues of interdependence over independence, of big corporations over small, and of the promise of living in a networked nation.

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[70] Quoted in Marchand, *Creating the Corporate Soul*, 86.

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ON THE COVER

EXHIBIT REVIEWS

ESSAY REVIEW

George Gilder

CAPITALISM IS FOR GIVERS

Blessed be the altruist.

The *New Republic*, that thoroughly secular voice of American liberalism, recently found reason to celebrate the Pope: Flaunting the Pontiff on its cover as a friendly old coot and man of the people—suggestive perhaps of Peter Falk's "Columbo" in a terry cloth wrap—the liberal magazine proclaimed him an ardent enemy of Reaganomics and foe of capitalism. The article itself, which was written by Nicholas von Hoffman, quoted heavily from the latest encyclical *Laborem Exercens*. According to von Hoffman, the Pope emphatically rejects the free-market ideas, founded on a concept of *homo economicus* and governed by the invisible hand of Adam Smith, that supposedly prevail in the Reagan Administration and the circles of supply-side theory.

This article, attacking the religious and moral presumptions of capitalism, aroused only one letter of rebuke, a lame libertarian slur on the Pope. In fact, as I have learned from the barrage of derision heaped on any references to religion or faith in a book of economics, most of America's capitalist intellectuals readily and even fervently grant the essential correctness of the von Hoffman claim. Capitalism, in their view, is fundamentally amoral and materialist. The idea that our economic system finds its roots in the religious order—and will wither in the world of secular self-interest to which its advocates consign it—arouses bitter hostility among conservatives.

Yet the belief that economics comprises a separate realm, almost completely divorced from the religious foundations of civilized life, is preposterous on its face. If religion is true, its truth must necessarily apply to the economic sphere—to all the great ventures of enterprise and production to which all societies devote so much of their time and treasures. The fact is that the central truths of most of the world's religions—and particularly the Judeo-Christian tradition—apply luminously to capitalism.

• • •

Capitalism begins with giving. Not from greed, avarice, or even "self-love" can one expect the rewards of commerce, but from a spirit closely akin to altruism, a regard for the needs of others, a benevolent, outgoing, and courageous temper of mind. Such a universal trait as self-interest—altogether as prevalent in any socialist backwater or deadening bureaucracy as in the realms of great enterprise—will reveal virtually nothing of the rare sources of riches in human society. Not taking and consuming, but giving, risking, and creating are the characteristic roles of the capitalist, the key producer of the wealth of nations, from the least developed to the most advanced.

The evidence begins in the works of "economic anthropology," from Marcel Mauss's classic *The Gift* to Claude Levi-Strauss's *The Savage Mind*. Most studies of primitive society abound with tales of gifts, offerings, "prestations," presents, tributes, and ritual exchanges, all the elaborate patterns of giving and receiving that preoccupy tribal groups when they struggle to transcend the limits of their lives of labor and subsistence. In fact, Levi-Strauss avers that "gift exchange and potlatch is a universal mode of culture."

In this voluminous literature anthropologists readily assert that these "gifts" are not offered without an expectation of return. "Reciprocity," as Levi-Strauss writes, is the "very essence of social life. Such gifts are either exchanged immediately for equivalent gifts, or received by the beneficiaries on the condition that on a subsequent occasion they will return the gesture with other gifts whose value often exceeds the first, but which bring about in their turn a right to receive later new gifts which themselves surpass the magnificence of those previously given . . . give back with proper 'interest' gifts previously received."

Like most analysts of this activity, Levi-Strauss describes it in economic terms: "give back with *interest*," a right to "reciprocation," and "conditions" for "exchanges." But both Mauss and Levi-Strauss insist that the exchanges are not

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chiefly economic. "These reciprocal gifts," writes Levi-Strauss, summarizing Mauss, "have a much more important function in these societies than in ours . . . this primitive form of exchange . . . is what Mauss calls 'a total social fact,' i.e., an event which has at the same time social and religious, magic and economic, utilitarian and sentimental, legal and moral significance." The two French intellectuals lament the more abstract, "purely economic" modes of exchange found in modern society, in which gift-giving is said to play a trivial or merely ceremonial role. As socialists, they maintain that modern capitalism, with its impersonal marketplace, leads to alienation and conflict, to a psychologically shallow and paltry existence, contrasting with all the magic, moral, and sentimental resonance of life among savages.

The anthropological literature, however, does not sustain the idea that the exchanges of primitive society produced a more benevolent form of social existence than prevails in the modern world. As in all societies, the generous spirit warred continuously with the appeals of envy and rapine. Aborting the drive to give and create was the impulse to steal and destroy. The ceremonial offerings often took place between tribes that were otherwise feuding, and some successful tribesmen made gifts chiefly to appease the jealousy of others. The potlatch itself was sometimes accompanied by long sieges of fighting and violence that wrecked and wasted most of the accumulated wealth and good will. The tendency to romanticize primitive life is one of the less illuminating biases of anthropology.

Nonetheless, how ever complex and tangled in motive and historical development, these pervasive efforts to transcend selfishness, to extend human intercourse, to reach out to others with offerings to them constitute the psychological and anthropological roots of capitalist wealth. Presumably because the compensation was not specified beforehand or paid in what we call money, anthropologists everywhere depict this activity in the idiom of giving and gifts. Although the acknowledged champions in this field were the Kwakiut of Alaska and British Columbia (celebrated by Levi-Strauss for a "genius . . . in their expression of the fundamental themes of primitive culture"), such activities were also common in hundreds of other well-documented societies.

Capitalism is not an artificial or transitory phase of human existence, to be replaced at will by some superior economic system shortly to be invented by the economics faculty at MIT. Capitalism—the system of private property with freedom to give, explore, and create—partakes of the very essence of all good and productive human activity.

Feasting and potlatching illustrate a capitalist tendency to assemble and distribute wealth. But many primitive societies, for all their gift-giving, remained poor. No matter how many coconuts or cowrie shells or cattle are ultimately exchanged, the two parties may well end up, indeed often did end up, little better off than before. The crucial question with regard to gift-giving as a prototype of capitalism is the source of capital gains, or the increase in the total value of the society's goods. How do societies become rich?

Trading itself provides part of the answer. Many theorists have focused on voluntary exchange as the secret of the creation of wealth. Any such exchange presumably does improve the positions of both parties, or they would not have agreed to make it. Free market transactions continually improve the distribution of goods in a community by moving them from owners who value them less to owners who value them more. Value lies always essentially in the eyes of the beholder. Subjective profits do steadily expand the real wealth of the tribe.

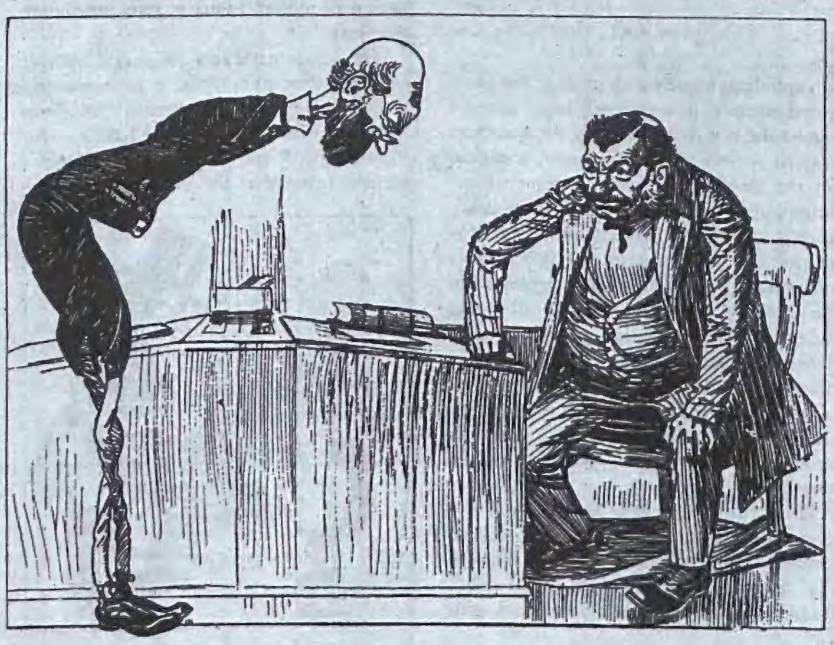
A further explanation comes from Adam Smith. Smith argues that the extent of the market—the reach of the exchange system—determines the possible range for the division of labor, the process of increasing specialization that he sees as the source of economic growth. Only if the fisherman can trade his extra fish for other things he needs can he afford to specialize in fishing; only if the baker can trade his surplus bread can he afford to build an oven and man it. The progress of economies can indeed be measured by the extent of the system of exchange.

In explaining the extraordinary productivity of capitalism, however, the anthropology of the potlatch impels us to focus not on the exchange mechanism (the market) but on the prior gift and its creation. It is not the exchange that elicits the goods and generates the increase in their value; it is the gift that evokes the desire to reciprocate and thus induces exchange. The gift comes first. Similarly, it is not the market that expands the division of labor. It is the process of invention and specialization—the production of new goods—that expands the market.

The anthropological evidence suggests that capitalism begins with the gift and continues with competitions in giving. These competitions succeed in generating new wealth largely to the extent that they are contests of *altruism*, defined as a regard for, or orientation toward, others (from the Latin *alter*, meaning other).

A gift will only elicit a greater response if it is based on an understanding of the needs of the recipient. Not everyone would react to the receipt, on his front lawn, of 16,000 coconuts—or of one swaybacked but very holy cow—by working obsessively to surpass it. As any perplexed recipient of expensive but horribly inappropriate Christmas offerings can attest, giving is difficult and requires close attention to the conditions of others' lives, their tastes and preferences, their existing possessions, their ambitions and goals.

The circle of giving (the profits of the economy) will grow as long as the gifts are consistently valued more by the receivers than by the givers. In deciding what new goods to assemble or create, the givers therefore must be willing to focus on the needs of others more than on their own. They must be willing to forgo their own immediate gratifications in order to produce goods of value to the beneficiaries. They must save before they can give. Without a monetary economy, such gifts could be seen as a necessary way to escape the constraints of barter, to obviate the exact coincidence of wants and values required by simple trading. The primitive entrepreneur became impatient with the tangled negotiations of exchange and



started simply donating his product. It worked. He had invented a form of capitalist investment, giving up his wealth in order to save it; parting with his goods in order to partake of a growing diversity of goods donated by his peers.

In investments, capitalists relinquish resources to others in the hope of surprising transformations, new goods and services, new value to be reinvested. One does not normally make gifts without some sense, possibly unconscious, that one will be rewarded, whether in this world or the next. Levi-Strauss speaks of the Law of Reciprocity; even the Biblical injunction affirms that the giver will be given unto. The essence of giving is not the absence of all expectation of return, but the lack of a predetermined return. Like gifts, capitalist investments are made without a predetermined return.

Contrary to the notions of Mauss and Levi-Strauss, the giving impulse in modern capitalism is no less prevalent and important—no less central to all creative and productive activity, no less crucial to the mutuality of culture and trust—than in a primitive tribe. The unending offerings of entrepreneurs, often over a period of profitless years, investing capital, creating products, building businesses, inventing jobs, accumulating inventories—all without any assurance that the enterprise will not fail—constitute a pattern of giving that dwarfs in extent and in essential generosity any primitive rite of exchange. Giving is the vital impulse and moral center of capitalism.

Capitalists are motivated not chiefly by their desire to consume wealth or indulge their appetites, but by the freedom and power to consummate their entrepreneurial ideas. Capitalists collectively save far more over their lifetime than they ever consume, as is shown by an increasing body of economic research. The life-cycle theory of savings—which sees the impulse of thrift as simply a desire for later consumption—is false. There is far more in the human psyche than a self-interested demand for goods and services, now or later.

Whether businessmen are piling up coconuts or designing new computers, they are movers and shakers, doers and givers, obsessed with positive visions of change and opportunity. They are men with an urge to understand and act, to master something and transform it, to work out a puzzle and profit from it, to figure out a part of nature and society and turn it to the common good. They are inventors and explorers, boosters and problem solvers; they take infinite pains and they strike fast.

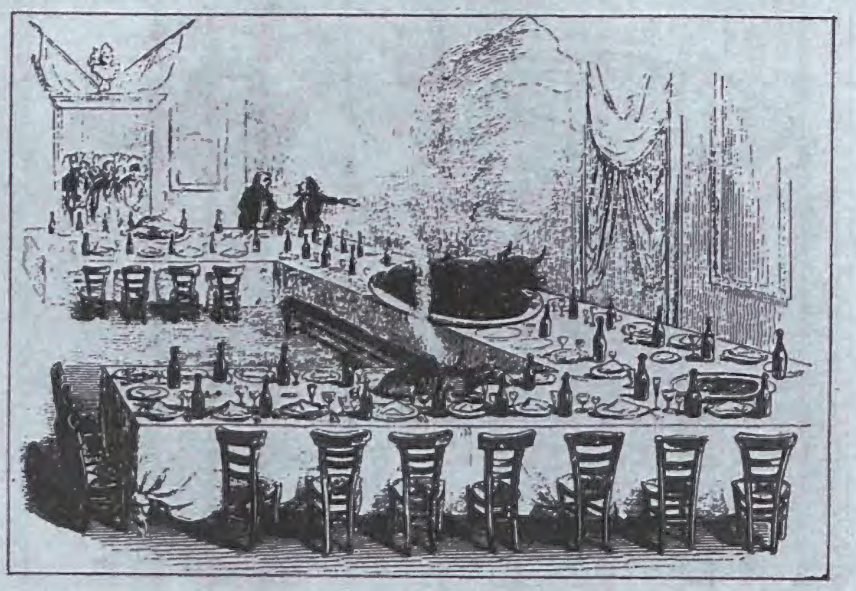
Are they greedier than doctors or writers or professors of sociology or assistant secretaries of energy or commissars of wheat? Yes, their goals seem more mercenary. But this is only because money is their very means of production. Just as the sociologist requires books and free time and the bureaucrat needs arbitrary power, the capitalist needs capital. It is no more sensible to begrudge the entrepreneur his profits—or ascribe them to overweening avarice—than to begrudge the writer or professor his free time and access to libraries and research aides, or the scientist his laboratory and assistants, or the doctor his power to prescribe medicines and perform surgery. Capitalists need capital to fulfill their role in launching and financing enterprise. Are they self-interested? Presumably. But the crucial fact about them is their deep interest and engagement in the world beyond themselves, impelled by their imagination, optimism, and faith.

The rewards of capitalists, however, do not simply constitute a tribute to virtue or an accommodation for a particular style of professional life. Entrepreneurs must be allowed to retain wealth for the practical reason that only they, collectively, can possibly know where it should go, to whom it should be given. Successful capitalism confronts the potential investor, public or private, with millions of small companies (nearly 16 million in the U.S.), scores of thousands of them lurching forth with growth rates of between 20 and 40 percent and more, and suffering from crises of expansion and cash flow. It offers a vast Babel of business plans and projects presented by every form of fast-shuffling charlatan, business school tyro, flimflam artist, sleek financier, computer shark, shaggy boffin, statistical booster, every imaginable combination of managerial, marketing, engineering, and huckstering skills, all inscrutably mixed in a teeming marketplace of "investment opportunities": over- and under-the-counter shares, Denver "penny stocks," Sub-Chapter-S corporations, limited partnerships, proprietorships, franchises, concessions, leveraged buyouts, leasebacks and carryforwards, spreads and deals of every description.

The investor must appraise a vast traveling bazaar of new products, the overflow of a million garages and laboratories, hobby shops and machinery "skunkworks," companies all on the edge of "new breakthroughs," takeoff trajectories, unique product niches in the "fast-moving high-tech semioptical bioconductor floppy tacos field," firms offering fame and fortune and tax shelters, businesses providing low-cost fuel, high-margin fast-food, automatic profits in mail-order marketing, forty-seven magazines the world needs now, the Photonic Chip!, the people's airline, fourteen plausible cures for asthma, the perfect coffee cup, the new Elvis, all demanding huge infusions of instant capital, all continually bursting beyond the ken even of banks and experts, let alone government planners, regulators, and subsidizers, no matter if they bear such promising titles as Small Business Administration or National Enterprise Board. Governments are entirely and inevitably unable to master the baffling specificity and elusiveness of economic opportunity.

The flood of protean growth can be comprehended and sustained only by millions of individuals with access to disposable savings and deep involvement in the companies themselves—that is, by investors who have money of their own and who can share in and pass on the profits as they gain new knowledge and investment skills. Although the desire to consume is ubiquitous and plays a significant role in motivating all men, far more important in capitalism is the purposeful drive to understand the world and to create things: to generate wealth (value defined by others) and reinvest it in the continuing drama of human invention and progress.

The fatal problem of a system without accumulations of personal income and the possibility of large profits is not the lack of incentives but the lack of dynamism and flexibility. In a low-income-low-profit



system, small businesses cannot swiftly rise up to exploit new ideas, overcome their crises of growth or respond to the kaleidic changes in knowledge and opportunity that continually transpire. Generous and creative men cannot command the resources to expand their influence and foster new projects. Under a system of forced redistribution, aggressive or ambitious men gain their inevitable advantages not by giving but by taking; they earn their money and power only at the expense of others, by pursuing the zero-sum maneuvers of excessive government, financial finagling, sclerotic bureaucracy, and legal pettifoggery, or by retreating into the invisible arms of an overgrown system of public sumps and subsidies. It is capitalism that best combines the desire and ability to do good and create value with the resources to accomplish these goals.

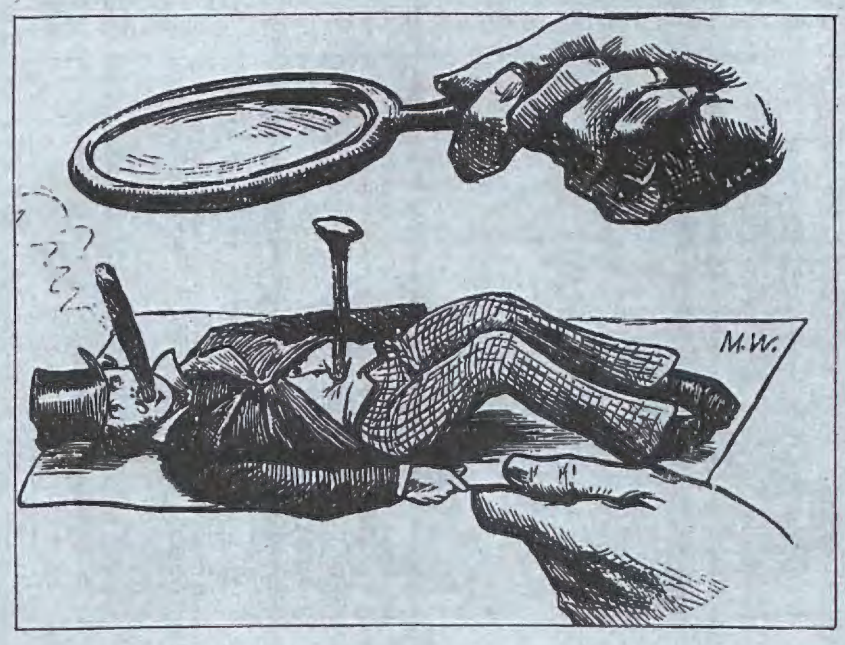
This process, however, is not well understood. For some the problem begins with a misreading of Scripture: confusing the creation and investing of wealth with the seizing and hoarding of it. For most, the problem is a misunderstanding of the nature and role of giving in human society.

The conventional wisdom, whether liberal or conservative, free market or socialist, regards charity or generosity as essentially simple—just giving things away without calculation or continuing concern with their uses. The best giver is the anonymous donor of money or valuable things, while the investor is seen in the image of a Shylock extorting usurious gains from lending money, or a Scrooge exploiting workers to make sure profits. By this measure, a welfare system of direct money grants financed by anonymous taxpayers through the choices of their elected representatives can be the epitome of compassion and charity.

This vision captures an important truth. Welfare can enhance the voluntarism at the root of free economies. The effort to force work, like all attempts to predetermine returns by coercion or exploitation, is inimical to the spirit of giving on which capitalist growth depends. The reciprocation must be voluntary to succeed. The grasping or hoarding rich man is the antithesis of capitalism, not its epitome, more a feudal figure than a bourgeois one.

The investor must give his money, offer his goods, freely, depending on the voluntary willingness of others to respond with creative efforts of their own. To the extent that the capitalist allies himself with the government or uses other modes of force in an effort to predetermine outcomes, he is just another kind of socialist, sometimes termed a fascist, rather than an investor who makes his contributions in the hopes that others will want them and willingly work to earn them. Similarly, a society without welfare of any kind—a system like the Soviet Union or China that forces people to work on pain of starvation—is as hostile to the spirit of giving as a society that forces them to work at the point of a gun. Sensible levels of benefits are indeed generous and capitalistic since they relieve people of coercion and thus permit them freely to join the system of giving.

Nonetheless, welfare beyond a minimal level becomes deeply problematic. The fact is that it is extremely difficult to transfer value to people in a way that actually helps them. Excessive welfare hurts its recipients, demoralizing them or reducing them to an addictive dependency that can ruin their lives. The anonymous private donation may be a good thing in itself. As an example for others, it may foster an outgoing and generous spirit in the community. But as a rule of society it is best if the givers are given unto, if the givers seek some form of voluntary reciprocation. Then the spirit of giving spreads, and wealth tends to gravitate toward those who are most likely to give it back, most capable of using it for the benefit of others, toward those whose gifts evoke the greatest returns. Even the most indigent families will do better under a system of free enterprise and investment than under an excessively "compassionate" dole which asks no return. The understanding of the law of reciprocity, that one must supply in order to demand, save in order to invest, consider others in order to serve oneself, is crucial to all life in society.



Indeed, it is the very genius of capitalism that it recognizes the difficulty of successful giving, understands the hard work and sacrifice entailed by the mandate to help one's fellow men, and offers a practical way of living a life of effective charity. True generosity is not soft or sentimental. It consists not of "give-aways" but of responsible giving. It has little to do with the often lazy "good works" of the gullible, all the protests and programs of "social change" and equality urged by the Left. Much of the world's most valuable, generous work comes from the labor and sacrifice of ordinary citizens, supporting their families, building small businesses, performing useful services, continually giving back their earnings in the practical cause of human betterment.

Capitalism transforms the gift impulse into a disciplined process of creative investment based on a continuing analysis of the needs of others. The investor cannot be fundamentally selfish. A truly self-centered capitalist will reject the very pattern of discipline and sacrifice, work and saving, that is indispensable to success. He will eschew the very initiatives—the risky but inspired ventures of innovation—that, being untested or unproven, depend most on an imaginative understanding of the world beyond himself and a generous and purposeful commitment to it.

All our recent history demonstrates that the so-called "me-generation" of egocentric men seek not the productive adventure of enterprise but the comfort and security of the welfare state, even if disguised in the form of protectionist tariffs, parity systems, or other invisible handouts. Libertarian authors of best-selling books on "looking out for number one" end up despairing for the future of the system, predicting depression and decline, and advocating withdrawal from productive investment. Rebelling against the perpetual dangers and uncertainties of engagement in capitalist enterprise, they urge purchases of art and collectibles, rural real estate and foreign retreats, guns and gold, in the always futile search for security in an inevitably insecure world. Even among exceptionally ambitious and committed men, self-love leads not to the giving of oneself and one's wealth to the realm of chance and fate, shaped by the decisions of

others in the market; rather, it leads to a quest for power over others, an effort to impose the fail-safe fantasies of radical politics.

Businessmen provide a continuing challenge both to men who refuse a practical engagement in the world, on the grounds that it is too dangerous or corrupt, and to men who demand power over others in the name of ideology or expertise, without first giving and risking their wealth. Capitalism offers nothing but frustrations and rebuffs to those who wish—because of claimed superiority of intelligence or birth, credentials or ideals—to get without giving, to take without risking, to profit without sacrifice, to be exalted without humbling themselves to meet the unruly demands of others, in an always perilous and unpredictable life.

It is not surprising, therefore, that the chief source of the incomprehension of capitalism is the intelligentsia, one of the many aristocracies which preen themselves on a contempt for bourgeois or "middle class" values and which refuse to acknowledge the paramount role of individual enterprise in the progress of the race. The disdain for businessmen is scarcely less common among thinkers on the Right than on the Left.

For socialists, however, this attitude poses no problem. They can feel free to denounce business and urge the dissolution of the business class. But this solution will not work for conservative, liberal, and libertarian theorists who understand the benefits of capitalism for the production of wealth and the promotion of freedom and democracy. Even though the conservative thinker often has little more respect for capitalists then the socialist does—variously regarding businessmen as vulgar, self-serving, stuffy, unrefined, unidealistic, amoral, and uninteresting compared with intellectuals—the conservative's ideology requires that he favor business. This conflict poses a genuine problem for conservative thought.

The dilemma was resolved, however, at the very beginning of the industrial revolution by the leading philosopher of classical liberal economics. Adam Smith was at once an intellectual who shared all the typical prejudices against the business class and a libertarian conservative who knew the value of freedom and enterprise. His solution was to locate the source of wealth not in the creative activities of businessmen but in the "invisible hand" of the market. Smith believed that capitalism worked not because of the virtues of capitalists but because of the "great machine" of exchange that converted their apparent greeds and vices into economic value.

Businessmen may be vulgar and avaricious, full of "childish vanities" and selfish indulgences, said Smith; "seldom do they gather but to conspire against the public." But it was their very "self-love," their avarice, their desire for self-indulgence that impelled the growth of economies. "Not from benevolence," wrote Smith in his most famous lines, "do we expect bread from the baker . . . but from his self-love." In *The Theory of Moral Sentiments* he wrote that it is from the "luxury and caprice" of the rich man that we gain "that share of the necessaries of life" which we "would in vain have expected from his humanity. . . . In spite of their natural selfishness and rapacity, though they mean only their own conveniency, though the sole end which they propose from the labours of all the thousands they employ, be the gratification of their own vain and unsatiable desires . . . they are led by an invisible hand . . . without intending it, without knowing it, to advance the interest of society."

In essence, Smith and his followers believe that the wealth of nations springs from a kind of Faustian pact: a deal with the devil through which humans gain wealth by giving in to greed and avarice. The selfish drive to better one's condition is seen as fueling what Smith describes as "a great, an immense machine" with "means adjusted with the nicest artifice to the ends which they are intended to produce": namely, the progress of human societies.

Such a vision, however, is unattractive to most religious or otherwise idealistic thinkers and simply unbelievable to the average man. It seems preposterous to most people to say that the way to create a good and bountiful society is to give maximum freedom to a group of predatory philistines. But to intellectuals this theory had the crucial advantage of praising capitalism without exalting capitalists. More important, it had a special appeal to many economists, attempting to reduce the productive behavior of men to a scientific system. Economists could find in Smith's theory of self-interest an apparently safe and orderly, even mechanically predictable, core of calculation as the source of economic growth.

Not inspired and unruly entrepreneurs or rambunctiously creative businessmen govern the Smith machine, but a crude form of *homo economicus*, a utility-maximizing agent, calculating gains and losses, and galvanized by incentives for self-aggrandizement. Capitalism works, according to Smith, because it offers an effective and predictable system of rational incentives, an invisible hand of expanding markets.

Smith's error was to found his theory on the mechanism of market exchanges themselves rather than on the business activity that makes them possible and impels their growth. In a capitalist system, the exchange itself is indeed governed by computations of what might be termed self-interest, as the participants negotiate a price agreeable to each. But this self-interest has nothing to do with avarice; it merely reflects a mutual transfer of information, allowing an appropriate allocation of resources. Smith brilliantly demonstrated the marvels of such markets in optimizing the distribution of goods and reconciling the competing concepts of value in any economy. As Smith showed, this market process, based on morally neutral computations of advantage, is indeed an indispensable instrument for the creation of wealth.

Smith's analysis fails, however, because he subordinates a higher and more complex level of activity—the creation of value—to a lower level, its measurement and exchange. In his desire to found a Newtonian science of political economy, he inflates the instrumental mechanism of trading into a complete economic universe, in which there is little or no room for the unpredictable activities of free business-

men. In *The Wealth of Nations* Smith implies that in some possibly mystical way the market process precedes and subsumes the process of production—that entrepreneurial creativity is determined in some way by "the extent of the market" and reflects the same kind of self-interested rationality that governs the market itself. Man, however, not mechanism, is at the heart of capitalist growth. Although a marketplace may work mechanically, an economy is in no sense a great machine. The market provides only the routine climax, the perfunctory denouement, of a tempestuous drama, dominated by the incalculable creativity of entrepreneurs, making purposeful gifts without predetermined returns, launching enterprise into the always unknown future. Capitalism begins not with exchange but with giving.

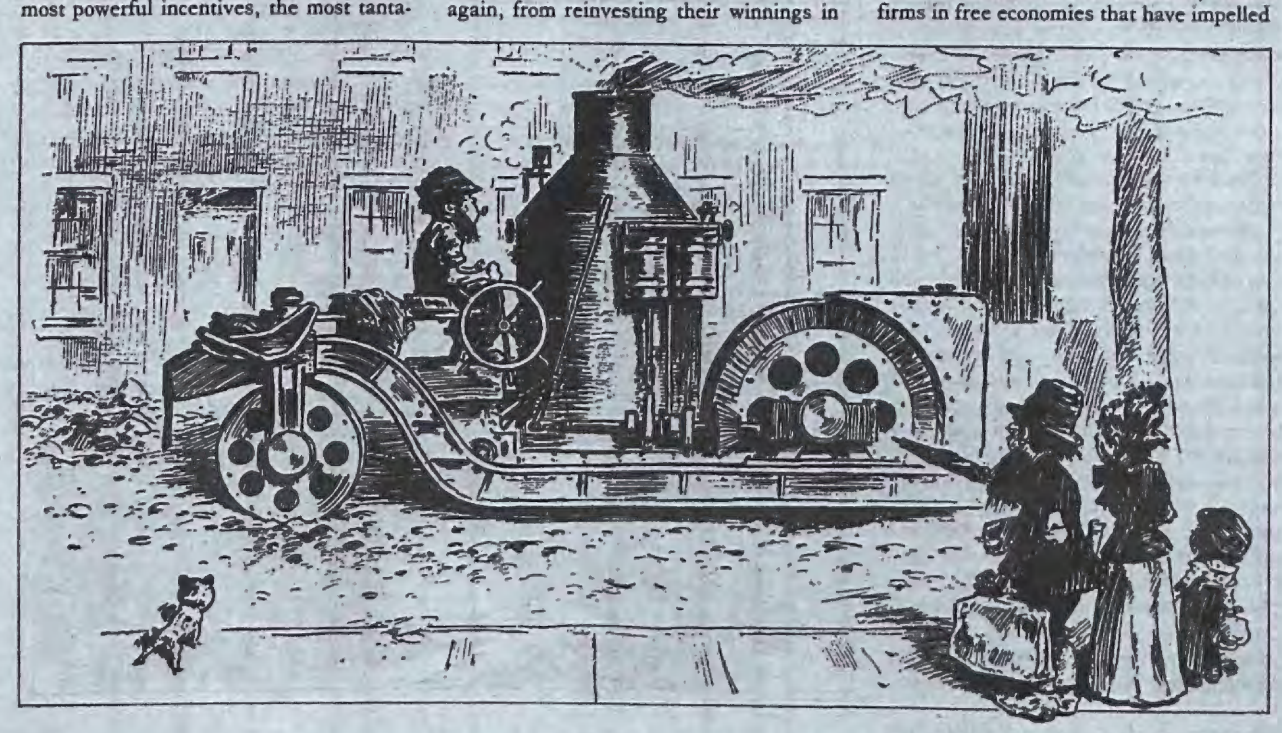
The gifts of capitalism generate economic progress chiefly because they comprise an epistemological system: a way of making discoveries and exploiting them. Accompanying every visible profit earned by enterprise is an invisible profit of expanded knowledge. Investments are in fact purposeful experiments, and whatever the outcome the results are informative. Even the failures in a sense succeed and the much remarked "waste" of the system is often redeemed by the accumulation of information and experience, a crucial form of intangible capital, held by both the entrepreneurs themselves and by the society at large.

Information alone, though, cannot make the system grow. The successful enterprise imparts to the entrepreneur financial resources as well as knowledge. Capitalism is the most effective way of expanding wealth not chiefly because it offers the most powerful incentives, the most tantalizing arrangement of carrots and sticks, but because it links knowledge with power. It gives control over resources and over the future flow of investment not to political bureaucracies of certified experts or to the most avidly self-loving pursuers of leisure and luxury, but to the particular businessmen who manage successful experiments of enterprise. It grants riches to those very individuals who have proven their ability to forgo immediate gratifications in pursuit of larger goals, who refuse to waste or hedonistically consume their wealth. It assigns further power to those very people, whoever they may be, how ever unorthodox or uncredentialed, who launch successful projects and commit to them their lives and savings. Under capitalism, economic power flows not to the intellectual, who manipulates ideas and basks in their light, but to the man who gives himself to his ideas and tests them with his own wealth and work.

It is these capitalists, extending the division of labor by launching new goods and services, who expand the market, not the other way round. It is these often self-denying explorers beyond the bounds of the existing marketplace and its prevailing goods and services who extend the frontiers of human possibility, not some impersonal mechanism of exchange. The greatest damage inflicted by state systems of redistribution is not the "distortion of markets," the "misallocation of resources," or the "discoordination" of producers and consumers, but the deflation of capitalist energy, the repression of entrepreneurial ideas, and the stultification of wealth. Steeply "progressive" tax rates not only destroy incentives; more important, they destroy knowledge and subvert moral values. They take from the givers and thus prevent them from giving again, from reinvesting their winnings in the light of the new information generated by the original gift.

Economies run not only on light but also on heat and energy, not merely on information but also on courage and skill. The crucial capital of the system is not the physical accumulation of natural resources and machines, but the metaphysical capital of ingenuity and faith. The Pope is perfectly right in denouncing materialism. Materialist indulgence is the perennial enemy—and temptation—of capitalism, particularly when confiscatory taxes balk the crucial processes of reinvestment and growth. It is not Reagan, however, but the Pope's own socialist bishops seeking salvation through the redistribution of material wealth by the state who connive at the moral destruction of poor families in America in exchange for the pottage of an excessive dole. It is Catholic leaders proclaiming new "limits to growth" who betray the mandate of Providence and deny the infinite resources of mind. It is Church leaders condoning a mood of sexual hedonism, hostile to all familial continuities, who implicitly degrade the claims and rewards of the spirit.

The Pope is right in supporting a broad ownership of the multinational means of production, and he is right in denouncing the exploitation of the many by the few in a class society. But modern corporations, with their millions of free customers and shareholders—many of them workers with pension funds—diffuse the control and benefits of production more widely and concretely than any bureaucracy of socialism or UN agency. Most free systems now assign some 85 percent of income to labor, and comprise millions upon millions of small businesses. It is relatively small firms in free economies that have impelled



the vast increase in human wealth, and destroyed the class society, while class war persists virulently between bureaucrats and proletarians in every socialist state. If the Church is truly concerned with the material problem of world hunger and poverty, it should maintain a becoming modesty about its own mostly feckless efforts at distributing food (any multinational agribusiness, after all, far excels the Church in the physical nourishment of its sheep); and bishops should stop teaching the poor the absurd and disabling myth that their problem is the wealth of capitalists—and that the solution is stealing it from them (i.e., socialism). Instead, the Church should devote itself to its own spiritual and religious cause, upholding the laws of morality and faith, and thus redeem the most crucial conditions of capitalist giving and entrepreneurship.

The Pope, if he looked carefully, could see that the worldly society of his dreams is—in fact—capitalism. Although many capitalists fail to fulfill the essential values of the system, the problem of free economies is not the nature of their economics, but its corruption by a secular humanist and amoral culture. Capitalism is suffering from the increasing betrayal of its moral, spiritual, and religious foundations by churches and schools, priests and politicians, conservatives and liberals, who believe that the paramount laws of giving and faith are irrelevant to the great dreams of human creativity and production, science and art. business too.

Yet, entrepreneurial activity is usually necessary to all practical compassion and charity, just as understanding and good will toward others is necessary to most entrepreneurial success. It is the capitalist who renounces the zero-sum imagery of socialist planning—and the disguised egotism of "revolutionary" leadership—and asserts the golden rule that the good fortune of others is also one's own, that the expansion of trade always depends on the success, the trust, and the understanding of others.

Our problem, therefore, is a crisis not of economics but of religion and culture. All too many clerics have renounced the claims of the spirit in favor of inept ventures of materialism and social politics, thus depriving capitalism of its indispensable moral rules and roots, and spreading famine and poverty in the name of social justice. It is the Pontiff's own increasingly socialist flock—particularly its new contingent on the *New Republic*—that most needs to heed his warnings against materialism and unbelief. □

John Nollson

AIX-EN-PEKING

As everyone knows, almost everything useful—from noodles to gunpowder—was invented in China. The most valuable recent addition, however, is a new system for the spelling of English. This is the second time the Chinese have devised a way of doing it. Years ago, they had, in their ingenuity and sageliness, taken to spelling Joe as Chou and Dung as Teng although, for some strange reason, China [illegible] the bandwagon. Three months ago, the report of the White House Conference on Spelling was submitted to the President and, just three days ago, a well-connected Washington journalist filched a copy of a press release that is scheduled for release at the end of the month, its provisions to become effective on January 1, 1982:

The Huait Hauc

Pureisiduhnt Reigun ahnaunsed tudai thas [illegible]

has already begun to prepare legislation which will empower the Administration to issue the necessary rules and regulations.

Given the historical dimensions of the President's decision, public reaction has been mixed, ranging from only mild skepticism to enthusiastic support; it all depends upon the direct effect on local

A fading Ralph Nader rewrites his strategy

The consumer movement that has kept U. S. corporations on the defensive for most of the last decade is losing ground in just about every power center in Washington. With the defeat last year of a bill to create a federal agency for consumer protection, congressmen flaunting the banner of budget austerity have been more willing than ever to say no to the demands of consumer leaders. And consumerists are finding little solace at the White House, where President Carter's just-announced plan to overhaul the regulatory process is seen as thwarting future consumer initiatives within the various agencies.

Against this backdrop, Ralph Nader, who raised the consumer movement to its prominence, is moving with uncharacteristic quiet to get things back on track. His strategy, he says, is to turn away from Washington, taking his cause to cities across the U. S. in an effort to translate what pollsters tell him is an immense popularity into clout he can exert in Congress. His lieutenants, meanwhile, are fighting on the federal level to keep intact many of the programs they have gained in the past. "It's a dark time for progressive activists," admits Mark Green, director of Congress Watch, the main lobbying arm of Nader's Public Citizen network.

Nuisance ruling. Nader's new grass-roots strategy has him for the first time establishing branches of his organization at the local level, in an effort to put more pressure on the lawmakers from their districts back home. Initially, the backbone of this network will be 36 so-called Congress Watch locals that will follow the voting records of individual congressmen and lobby members.

Nader says that his new priority for the coming decade will be to attack the way many major corporations conduct their business. Issues include greater shareholder rights, worker ownership, broader economic and social disclosure, and the responsibilities of a corporation when it quits a community.

But if Nader is to be effective, he is going to have to convince many members of the Washington establishment that he can use his broad constituency against them. Says one business lobbyist: "A lot of members of Congress are finding out that the walls don't fall in when they stand up against Ralph." Nader is often criticized in Congress for using rhetoric to win support and for refusing to compromise. Detractors also believe that some of the research done by his younger staffers is sloppy.

A recent decision by U. S. District Court Judge John J. Sirica, moreover, could hamper Nader's litigation efforts, a key tool in his overall program. Sirica held that groups such as Nader's that are supported by contributions rather than dues-paying members have no standing to bring class-action suits on behalf of the public.

Nader says that Sirica's ruling is nothing more than a nuisance and that

He still wants to take on business, but now seeks support at the grass roots

in the future he will sue on behalf of qualified litigants who can allege specific injury. To the charge that his influence has declined, Nader says that it is a myth predicated on his refusal to continue to plead before a Congress that has changed its priorities under intensive pressure from big business. "I'd deserve criticism if I continued to butt my head against the same walls," Nader says. "But I'm not doing that." He says his new tactics—organizing and working at the grass roots—are a response to this changing mood in Washington.

Nader's clout in the grass roots was evident recently in Cleveland where he entered the fray to help embattled Mayor Dennis J. Kucinich retain control over Muny Light, the city-owned electric power system. Before Nader participated in an advertising and media blitz, polls showed that 70% of the voters were in favor of selling the utility to private operators. In the referendum vote, however, they supported keeping the system by a 64% majority. Says a Kucinich aide: "Nader quite clearly had a major impact."

Paul S. Conklin

Nader: Capitalizing on his popularity to continue his pressure on Congress.

Businessmen still feel Nader's sting as well and are far from counting him out. Says David S. Potter, a General Motors Corp. vice-president: "He is a force wherever he chooses to be a force." Adds Edgar G. Davis, vice-president for corporate affairs for Eli Lilly & Co.: "There is still an intensity of issue-raising that has remained."

But Davis raises a concern common among the businessmen who are singled out for barbs by consumerists: the right of Nader to represent the public in anything. Nader and his groups, says Davis, "are not really reflecting the vast experience and concerns of the public in any broad, cross-segmented way." Nader's Health Research Group has been pushing to curtail the use of Lilly's pain drug, Darvon, one of the company's big profitmakers. But Davis says that the company has received many positive letters and phone calls on Darvon from consumers. "They say, 'Hey, this group doesn't speak for me,'" Davis says.

Producing the 'troops.' Nevertheless, public opinion polls usually put Nader at the top of the list of those trusted by citizens. The most recent consumer poll by Harris & Associates Inc. gave Nader a 55% positive rating for protecting the consumer, against a 71% negative rating for the White House and a 62% negative rating for private industry. That public support shows up in the estimated $1.5 million Nader raises each year through donations and public appearances. "If he has influence, it's because he is saying things that people believe in and support him on," says Congress Watch's Green.

David Schoenfeld, a consumer advocate at J. C. Penney Co., believes that Nader has a tough job ahead of him. "He has to relate the big generic issues to things that can be understood by individuals in cities and towns," he says. But Schoenfeld predicts that the new focus on the grass roots "will produce what the consumer movement has needed for a long time—troops, the establishment of a constituency." ■

The moral crisis in American capitalism

Robert Wuthnow

Headline-catching economic difficulties have emboldened the opponents of market capitalism to question its appropriateness to the American way of life. With its promise of abundance badly tarnished, they ask, does the market still have a useful role to play in shaping the values or legitimizing the institutions of American society? And if it does, just how is the market–that abstraction of classical economic thought–to exert its influence on the present-day world of fact and event?

These questions are, of course, not new, but they do have a new urgency. The author of this article seeks to answer them in an original way by showing both how the market creates opportunities for morally satisfying action for those who participate in it and how the assumptions on which the market system is based help support the exercise of individual freedom. New developments in technology, however, have put many of these old assumptions at risk, and the author gives an important place in his discussion of the market to the realities of technological change.

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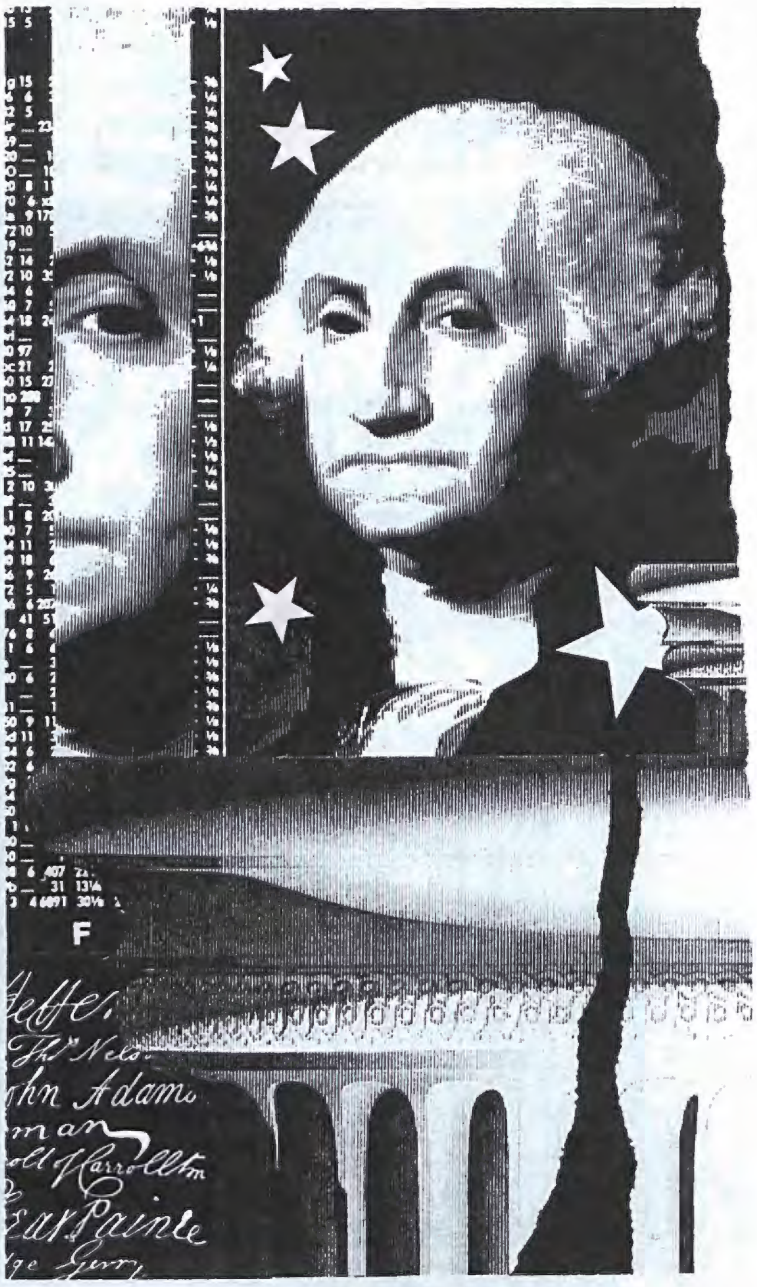
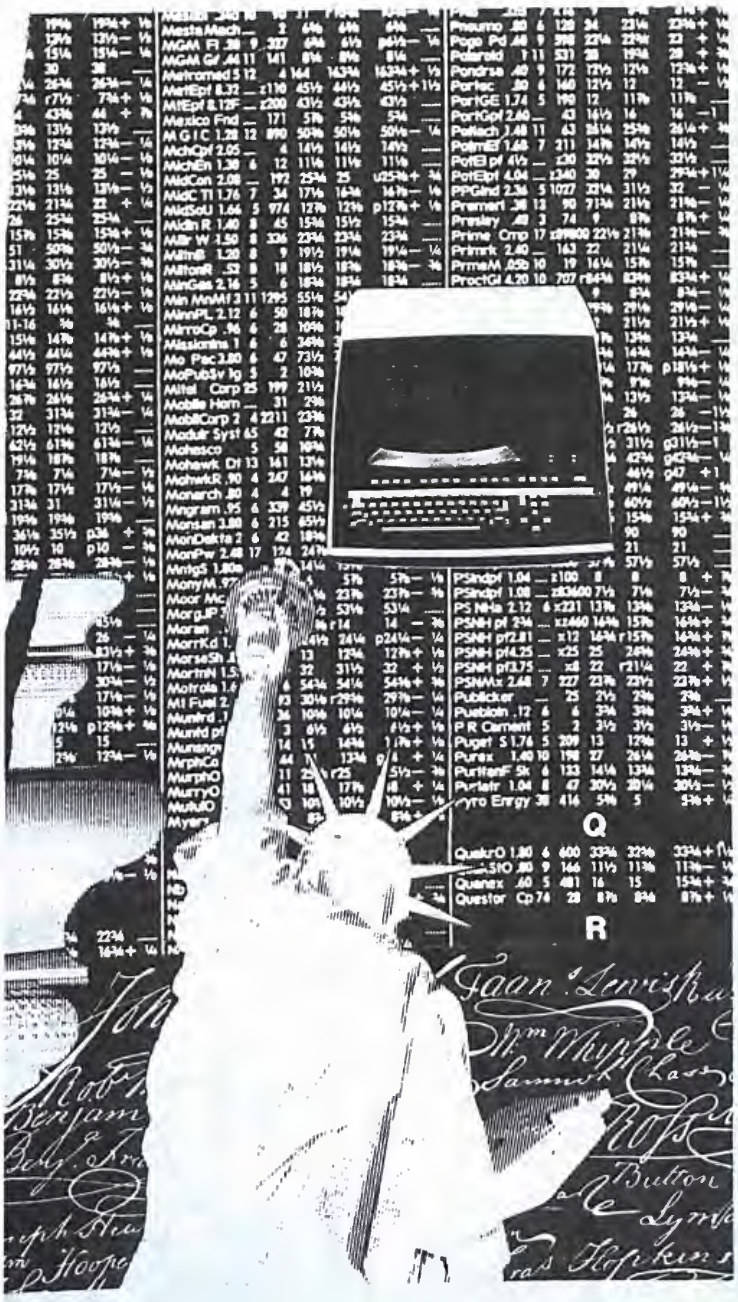


Illustration by Karen Watson.

Do the assumptions on which its market economy rests still have meaning for American society?



Periods of economic uncertainty inevitably provoke questions about the vitality of America's economic system. Today, of course, inflation, unemployment, and lagging productivity inspire debate about the efficiency of the market system itself. But for Americans, at least, a market-based economy means something more than just the exchange of goods and services at prices determined by levels of supply and demand. True, the market system as Americans understand it differs from economies dependent on barter or central planning, but this is the market in just its narrow economic sense. In American culture, the market carries additional significance.

Whether we acknowledge it consciously or not, the market influences our basic values, helps shape our suppositions about reality, and figures centrally in our tacit assumptions about daily life. We invest the market with moral importance and associate it with many of our most deeply held beliefs.

In fact, the market system is so inextricably woven into our view of the world that any threat to the market endangers not only our standard of living but, more important, the very fabric of our society.

Some observers argue that such a period of danger is already upon us. In a speech delivered at Harvard University shortly after his arrival in the United States, Aleksandr Solzhenitsyn, widely known for his revealing criticisms of Soviet society, claimed that the American system indeed suffers from a pervasive sickness—a sickness that even extends to a fundamental uncertainty about the institutions of capitalism.[1] Noting the lack of public commitment, responsibility, and loyalty to the absolute values on which America was founded, Solzhenitsyn challenged us to renew our sense of moral obligation.

1 Aleksandr I. Solzhenitsyn, *A World Split Apart* (New York: Harper & Row, 1978).

Pollsters regularly identify rising skepticism about the ethics and values of public leaders and public institutions. Some cultural critics speak of a serious "disjuncture" between the economic realm and the values that once gave it legitimacy; others point to an alarming shift in what was once a civic-minded population toward a narcissistic concern for the self.[2]

But if in America the market system is intimately linked to personal values and commitments, what are the moral assumptions on which that system is based? What are its implications for industrial behavior and individual conscience?

The morality of the marketplace

Textbook economics holds that the marketplace is nothing more than a means for transacting business. This view is wrong. The marketplace provides one of the few arenas in modern society in which people have an opportunity to participate directly in public life. Indeed, with the possible exception of voting, market activities constitute the major form of such participation. Buying and selling, working and consuming link individuals to one another and to the collective goals of their society. In the market, therefore, one can discharge—or avoid—his or her moral responsibilities to society.

A historical view

The founders of modern economic theory clearly recognized the moral character of the marketplace. Adam Smith, the great eighteenth-century spokesman for laissez-faire economics, was as interested in moral philosophy as in economic theory. To Smith, the freely functioning market was an instrument of human betterment, for as buyers and sellers pursued their private interests, an "invisible hand" guaranteed that prosperity would accrue to them all.

What was good for the pin maker was, in Smith's view, good for England. After all, the pin maker contributed to the good of society by making pins. If he withdrew from the market, hoarded his pins, or took an extended vacation, he not only damaged his personal interests as a businessman but failed to keep the public trust as well. His moral obligation, therefore, was to participate in the market.

The eighteenth century also thought the marketplace a buttress to moral virtues in that it placed a check on the individual's most dangerous passions. By rationally pursuing one's own economic interest, one channeled unruly natural passions into socially desirable activities. Outside the market, these passions readily led to avarice, lust, fanaticism, and caprice; within it, they led to discipline and virtue. As Montesquieu once observed, "Commerce . . . polishes and softens barbarian ways."

Arguments like these also had political connotations. In the turbulent context of the eighteenth century, men of property and principle believed a strong market economy offered the best protection against the designs of the powerful, for by making social relations more predictable, it promoted both domestic and international peace. Yet the market was delicate, like a fine clock, and had to be treated with respect and devotion. By acting responsibly in the marketplace, a citizen discharged a moral duty.

How much these philosophical arguments actually swayed the merchants and industrialists of the time remains, of course, a matter for conjecture. At a minimum, historical evidence suggests that they were not the arguments of academicians alone. As Albert O. Hirschman has shown, eighteenth-century publications—and even eighteenth-century laws—were filled with debate about the moral quality of the market and about its responsibility for individual and social well-being.[3]

By the nineteenth century, the market system had come to be such a familiar feature of social organization that it scarcely required an explicit moral defense. It was simply a fact of life.

In the United States, for example, the market system was widely regarded as a source of individual freedom and dignity. The famous McGuffey readers, on which more than 150 million Americans were reared, extolled the virtues of the marketplace as a means of building moral character. Similarly, in the popular rags-to-riches stories of the period, only by struggling in the marketplace did the individual discover his talents and contribute to the good of his fellow man. To the readers of Horatio Alger, the market never appeared to be a strictly economic device; it was, first and foremost, an engine for shaping moral character.

The modern scene

These arguments may no longer carry the weight or conviction they once did, but neither have they altogether disappeared. Older notions of character and virtue may have given way to modern concepts of the self; yet people still need to think of themselves as moral individuals, and the market remains a primary arena in which to demonstrate moral responsibility.

Contemporary best-seller lists include moralistic defenses of the market system as the only way of protecting the free world and the affluent life. Public voices regularly call on consumers to conserve energy, buy American goods, regulate spending habits, and avoid hoarding and speculation. Even presidents and their advisers present economic policy in moral terms—often as the moral equivalent of a war against the enemies of the free market.

In all these ways and more, behavior in the marketplace takes on moral significance today. Because individuals' actions can affect the very well-being of society, they represent more than strict economic calculation; they are a way of discharging both civic and social responsibility.

Moral crusades

A society's moral sense also expresses itself in the kinds of "moral crusades" in which it engages. In the United States these crusades have ranged from the abolition and temperance movements to various nativistic campaigns against Jews and Catholics and to the more recent struggle for civil rights. At present, the profamily and antiabortion campaigns sponsored by such groups as the Moral Majority and the Conservative Caucus seek to impute a moral meaning to specific dimensions of public life.

Of late, however, a growing number of these crusades have had as their focus not the family or race or religion or personal conduct but the marketplace. The consumer protection, environmental, antismoking, and antinuclear movements, for example—no less than the drives for equal employment, fair housing, accurate advertising, and cleaned-up television—share the assumption that the marketplace is an important focus for moral behavior. Whether to smoke cigarettes, recycle beer cans, and install solar collectors have become decisions of moral as well as economic importance.

Individual commitment

How do these various moral claims help legitimize the market system? Let us assume for the moment that people prefer to think of themselves as decent, morally upright individuals and not as purely calculating utilitarians. If this is a reasonable assumption, as I believe it is, then responsible behavior in the marketplace can work to maintain a person's sense of self-worth. Not surprisingly, activities that promote a feeling of well-being tend to evoke strong individual commitment and thus to appear legitimate.[4]

In the past, the obligations of military service, kinship, religion, and philanthropy provided the most common ways of demonstrating one's moral stature. Today, however, the marketplace has surpassed them in making such opportunities available. Commitment to the market, therefore, stems only in part from strict economic necessity or from convictions about the market as a rational economic system. Its legitimacy and stability rest instead on the feeling of self-worth it affords to individuals who fulfill their moral responsibilities to society.

This argument assumes, of course, that the market actually does provide opportunities to fulfill moral obligations. This is the catch. If these occasions are not present even in symbolic form, it becomes difficult to maintain a sense of personal worth and thus to feel loyalty to the market. But whether the market is genuinely rich in such opportunities remains an important question.

Capitalism & freedom

The dynamics of self-esteem, therefore, provide one set of assumptions on which the legitimacy of American capitalism rests; the relation between capitalism and freedom constitutes a second. Linking an institution to the highest values of a society is an obvious way of legitimating that institution. No wonder, then, that some apologists for the free market have exploited the notion of freedom in order to oppose government intervention in the economy and to extol the virtues of private enterprise. Others go further. According to Milton Friedman, for example, the free market provides the only sure protection for freedom of speech, freedom of religion, and freedom of thought.[5]

But asserting a relation between capitalism and freedom is of little value unless that relation is thoroughly understood. Freedom assists in the day-to-day legitimation of the market system not so much by linking economic activity with abstract political phi-

2 See Daniel Bell, *The Cultural Contradictions of Capitalism* (New York: Basic Books, 1976) and Christopher Lasch, *The Culture of Narcissism: American Life in an Age of Diminishing Expectations* (New York: Norton, 1978).

3 Albert O. Hirschman, *The Passions and the Interests* (Princeton: Princeton University Press, 1977).

4 For a discussion of legitimacy, see Peter L. Berger's article "New Attack on the Legitimacy of Business," HBR September-October 1981, p. 82.

5 Milton Friedman, *Capitalism and Freedom* (Chicago: University of Chicago Press, 1962).

losophy as by reinforcing the sense of moral worth that individuals derive from the marketplace. This understanding of freedom is a recent development.

The early idea of freedom

In societies lacking a fully developed market economy, freedom has generally been thought an attribute of groups. In traditional India, for example, the individual believed himself free insofar as he occupied a clearly defined rank within the hierarchical structure of the caste system. According to Louis Dumont, a French anthropologist who has devoted many years to the study of Indian culture, the Western concept of freedom as individual autonomy was virtually unknown in India until recent times. Even in societies where trade was well developed–among the Polynesian Islanders, for example, or in the Greek city-states–freedom was not associated with the individual merchant or trader but with the people collectively.

To the American colonists, freedom still lacked a focus on the individual. What they valued most was freedom from external political domination–in effect, the freedom to worship as they chose, to create fitting standards of government, and to build institutions appropriate to the New World. But these were all collective enterprises. The Puritan settlers of the seventeenth and eighteenth centuries were not the Protestant individualists of the nineteenth century. To the Puritans, freedom from external constraint meant not license but conformity to internal restraint.

Freedom in a market society

As the market economy grew to prominence during the nineteenth century, the idea of freedom became increasingly associated with individuals, not collective institutions. For Americans it was the rugged individualist on the frontier–the heroic woodsman, the pioneer, and the self-sufficient farmer–who then best symbolized freedom. And it was the market, not communal groups, that provided these newly autonomous individuals with an outlet for their produce and with the materials they needed for survival.

But self-sufficiency and autonomy, as definitions of freedom, were by themselves inadequate before the growing social complexity that accompanied the rise of large-scale industry. Contrary to what many observers have said, the growth of complex industrial bureaucracies did not erode the concept of freedom so much as give it a different meaning. No longer were free individuals able to think of themselves as purely separate creatures, like grains of sand on the seashore. Instead, freedom came to mean knowing one's place in the organization of society–that is, knowing what one's function was in relation to other individuals and groups.

The British anthropologist Mary Douglas likens this modern idea of freedom to a grid in which each cell is occupied by an individual who stands in specific, formal relation to the other occupants of the grid.[6] In his study of prisons, factories, and military units, the French historian Michel Foucault takes this concept one step further by arguing that the similarity between cells and the modern view of the individual is more than just analogy. According to Foucault, the market economy actually created cells–cubicles, offices, places on assembly lines–that in turn shaped a notion of the person based not on self-sufficiency but on functional responsibility to some large organization or system.[7]

True, in highly regimented settings like military units and assembly lines, the individual's functions are closely prescribed. As a market economy evolves, however, the opportunities for individual discretion increase, and it is in these acts of discretion that individual freedom is most vividly manifest. In setting priorities, in choosing among possible courses of action, in selecting jobs or career paths, and in making decisions as consumers, individuals dramatize their freedom.

The right to choose

In the contemporary marketplace, therefore, freedom means essentially the right to choose. But why is this type of freedom valued? To be sure, the freedom to explore personal talents and desires expresses fundamental beliefs about the value and dignity of the individual. But this is only part of the story–and perhaps not even the most important part, since many people readily sacrifice their individuality in favor of conformity to collective norms.

What the right to choose does, even if that right is often relinquished, is to make it possible for individuals to be held responsible for their actions. Responsibility for an action can, after all, be imputed to an individual only if he or she could have chosen to do otherwise. If a sergeant orders me to march, for

6 Mary Douglas, *Natural Symbols: Explorations in Cosmology* (New York: Vintage Books, 1973).

7 Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Vintage Books, 1979).

8 Karl Polanyi, *The Livelihood of Man*, Harry Pearson, ed. (New York: Academic Press, 1977).

example, I can take little credit for my "decision" to march. But if I voluntarily purchase and maintain a home, the responsibility for that decision is mine alone.

Now, if the market works to sustain my loyalty by nurturing an image of myself as a good and decent person, it must not only provide me with opportunities to discharge moral obligations, it must also demonstrate to me that I am free to discharge them and can therefore be held responsible for them. The legitimacy of the market system depends heavily on its capacity to provide this sense of freedom.

Because the modern concept of freedom is largely subjective, it is difficult to determine in any absolute sense whether the market system actually reinforces freedom. No standard, easily measurable criteria like GNP or disposable income are available. The only relevant evidence is the feeling involved in making choices among the various products, services, and opportunities provided by the market.

But this kind of evidence is sufficient. As individuals make choices in their jobs and as consumers, they are likely to experience their freedom more vividly than in any Fourth of July celebration. This dramatically "experienced" freedom is real enough that it easily pushes into the background abstract questions about the freedom of those who cannot or who choose not to participate in the marketplace. Such questions are, of course, important, but their theoretical concern does not—and cannot—in practice disprove the mutual legitimation of marketplace and personal freedom.

Economic laws

A third set of assumptions also links capitalism with freedom and moral responsibility. We assume that economic forces exist over which we have no more control than over the laws of nature. Whenever our most conscientious choices lead to unexpected and undesired outcomes, these economic laws receive the blame. We believe these laws to be objectively real, to be beyond human control or manipulation, to operate according to principles of their own, and to function in ways only partly comprehensible to economic theorists. They provide us an excuse, so that we do not have to blame ourselves or question our moral responsibility—even when evil results from our well-intentioned activities.

All moral codes include assumptions that permit their adherents to excuse themselves from the consequences of some of their actions. Although moral codes are often thought a source of guilt, just the opposite is actually the case. Moral codes are generally constructed in such a way that guilt can be absolved and that individuals can be left with the sense that they are good and decent. In the world's great religions, for example, some notion of evil spirits, fate, original sin, or inherent contradiction has always been present to absolve individuals of full responsibility for their actions. Were these escape clauses not present, guilt and frustration would build up to such intolerable levels that the moral codes would probably fall apart.

So too with capitalism. It imputes moral meaning to the marketplace and holds individuals responsible for their economic choices, but it also absolves them of overwhelming guilt and frustration by providing a scapegoat for the failings of the system.

Just as fate and the demonic are objectified in other moral systems, so popular discourse objectifies the market economy as an ominous, willful, living creature. The economy gets "sick," suffers "blows," sustains "shocks," "recovers," "falls into a slump," "straightens itself out," "awakens," experiences "spurts," and "revives." Like earthly beings, interest rates "climb," inflation "soars," and productivity "staggers." Even the caretakers of the economy, much like wise physicians caring for an ailing patient, are said to seek "remedies" in their attempt to "heal" the economy and maintain its "health."

This talk livens up the newspapers, but it also plays an important role in sustaining commitment to the market system. Characterizing the economy as something "out there" for which individuals cannot be held morally accountable is, as all propagandists know, perhaps the most effective way of legitimating it. A mere idea can be questioned: Is it right? Could it have been otherwise? An objective fact, in contrast, simply exists. Standing outside the realm of choice, it appears natural and inevitable. Things could not be otherwise. When something goes wrong, therefore, no one need take the blame. Such problems, after all, result from the operation of the economy's natural laws.

Since the early part of the nineteenth century, Western culture has increasingly viewed the market system as a part of reality itself and has thus fallen prey to what Karl Polanyi, the late economist and historian, termed the "economist fallacy." This fallacy consists of the assumption that the market works according to economic laws that apply to all societies. It is true, of course, that all societies have had economies, but the market system is only one form of economic organization. It may seem a fact of nature, but the market system is as much a humanly constructed institution as are democracy, communism, and the mass media. There is nothing inevitable about it.[8]

Nevertheless, the temptation is to think of the market as an inevitable fact of nature because doing so limits the realm of moral responsibil-

ity. In a sense, people find it useful to have restrictions on their freedom so that they cannot be held accountable for everything that happens. Consumers can excuse themselves for not saving more of their income. Large corporations can excuse themselves for not making a profit. Even presidents of the United States can excuse their inability to perform economic miracles. Given our belief in economic laws to which we are all subject, we need think no less of ourselves for not doing better.

Is there a crisis?

The legitimacy of the American economic system rests, therefore, on more than its productive capacity. It derives support from three sets of largely unrecognized assumptions that, in combination, sustain the belief of those who participate in the market in their own goodness and decency. These assumptions do not require adherence to any formal creed, doctrine, or philosophical outlook. They are built into the fabric of American society itself.

The market system provides an arena in which some of the moral obligations incurred by members of society can be fulfilled. This is so because the capacity to make choices in the marketplace reveals a deep relation between capitalism and personal freedom. A belief in objective economic laws, then, limits this freedom and thereby defines realistically those areas to which moral responsibility applies. Together these assumptions provide individuals with a measure of security against doubt – doubt that what they are doing is right and doubt that the system as a whole is worthwhile.

Historians suggest that the market system gradually acquired these meanings during the eighteenth and nineteenth centuries. As the market economy incorporated ever more of the adult population into the production of goods and services for commercial exchange, it came to be an important determinant of how individuals felt about themselves. Indeed, some historians – Polanyi, for example – argue that by the end of the nineteenth century the market had become the single most important institution in the life of industrialized societies.

The implications of technology

Many observers now, however, believe that the market system is undergoing a crisis in legitimacy and commitment. To put the question bluntly: Are the sets of assumptions we have discussed being eroded today by major events in the world?

I am convinced that the answer to this question is yes. The growing dependence of American society – and, in fact, of the world at large – on technology threatens to undermine each of the basic tenets of the market system's moral code. Although it is too soon to predict the final outcome of so fundamental a cultural transition, it is likely that, over the long haul, the market's legitimating assumptions will become reoriented around technology. If so, technology will take on an increasingly important role in determining how people think and act. Just as the market dominated the nineteenth century, so technology may well come to dominate not only the economic life but also the social and intellectual life of the modern world.

I do not mean that technology threatens to unravel the social fabric, as many have suggested, by provoking environmental catastrophe or accelerating the pace of social change. True, both of these may occur. But I think the more serious implications of current technology lie in the subtle and as yet largely imperceptible shifts it is causing in the assumptions undergirding the individual's sense of moral worth.

A moral code in flux

Signs of this process of change are already evident. The growing complexity of the marketplace makes it increasingly difficult to believe that participation contributes in any significant way to the public good or represents any genuine discharge of one's moral obligations to society. As a result, the activities that lead to moral gratification are more and more restricted to the "private" realms of family, leisure, and voluntary associations, where individual effort still makes a discernible difference.

To some extent, this tendency has been slowed by a professionalization of the work force that redefines work as a career from which personal fulfillment can and should be expected. But even here a serious decline in loyalty and commitment exists. A study of work values conducted a few years ago in the Detroit area, for example, found that over a 13-year period commitment to the work ethic among professionals had dropped precipitously.[9]

Though the meaning of these changes is not yet clear, the indications are that technology is

9 Larry Blackwood, "Social Change and Commitment to the Work Ethic," in Robert Wuthnow, ed., *The Religious Dimension* (New York: Academic Press, 1979), p. 241.

now taking on the kind of moral force once associated with the marketplace. Consider the accomplishments in which society takes pride: the moon landing, the space shuttle, sophisticated defense systems, improvements in transportation and communication, breakthroughs in laser technology, the latest generation of high-speed computers.

Or consider what it is that now leads to a sense of personal accomplishment: contributing to these technological feats; being knowledgeable enough to discuss them intelligently with co-workers, family, and neighbors; reaping the benefits of technology as consumers of home computers, microwave ovens, videodiscs, and the like.

Further, today's moral crusades still focus to some extent on the marketplace, but their emphasis is shifting toward technology. A small but growing number of individuals attribute the highest moral importance to opposing what they see as the worst dangers of technology—the threat of nuclear annihilation, the risk associated with nuclear energy, the invention of drugs that make euthanasia and abortion easy, and the use of communications technology for the dissemination of values potentially harmful to the moral fabric of society. It is no accident that the Moral Majority and similar groups have seized on these issues.

Then, too, the idea of freedom, so vital to the traditional legitimation of the market system, has been similarly affected by the rising prominence of technology. Contemporary discussions of freedom center on questions of technology, not the market, for no longer is it the market that provides the clearest dramatization of freedom.

Society has become sophisticated enough to realize that the production, consumption, and pricing of goods represents far more than the simple act of autonomous individuals freely expressing their personal preferences. It is the underlying technology to which society looks to expand its range of choices—and which society fears as the greatest potential threat to its right to choose.

As a result, technology now provides the key symbolism in discussions of freedom. On one issue after another ("the pill," abortion, genetic screening, sex selection, solar energy, fusion research, labor-saving consumer products, information processing), technology symbolizes what promises most to enhance, or threatens most to diminish, personal freedom.

Finally, the notion of objective economic laws, which have long been taken for granted as part of reality, is also undergoing a subtle process of revision. The growing use of fiscal planning by government agencies and the private sector alike undercuts the belief that economic realities are simply "there" in the nature of things. As planning agencies assume responsibility for the economy, society will increasingly hold them—and not some neutral law—morally accountable for the failings of the system.

This phenomenon has already played a significant role in recent elections, but it is really nothing new. It was, history tells us, not so much the stark hunger and economic destitution that led the peasantry to revolt in Old Regime France. That much they were used to. It was, rather, the growing belief that representatives of the regime could have forestalled the periodic misery that afflicted the masses.

Toward a new code

As the moral code underlying the market system falls open to challenge, a new technology-based code has begun to take its place as a guarantor—within limits—of personal freedom. Just as the idea of objective economic laws at one time justified the failure of morally respectable intentions, so the notion of finite "technical capacity" does so today. Because the technical capacity of society is still limited, oil and electricity cost as much as they do, nuclear power is necessary but risky, and space exploration is of uncertain benefit to life on earth. Or so runs the new rationale. What under other circumstances might appear the failure of managers, breadwinners, and consumers can now be attributed to the limited "state of the art."

Society may have lost its former confidence in the market as a reflection of immutable laws of nature, but it has no doubt that technology rests on proven evidence about the world itself. Individuals can thus be held responsible for what current technology allows; what falls outside its limitations, however, is beyond human responsibility as well. Technology, then, promises society not only economic value but also a new legitimating moral code. Technology, in turn, acquires legitimacy because it promotes economic progress and—more important—because it supports the self-worth of individuals.

A look to the future

What do these developments portend? The market economy is, after all, already heavily reliant on scientific technology. R&D figures centrally in projections for corporate profits and productivity. Government plays an increasing role in organizing and funding large-scale technical projects. Much of the labor force is associated, directly or indirectly, with the production and distribution of technical knowledge.

To say that technology will become increasingly important, therefore, is to suggest only a continuation of society's dependence on technology.

Strengthening the linkages between the individual's concept of self and technology, however, represents a qualitative deepening and broadening of that dependence. When, for example, personal gratification comes less from making choices in the marketplace than from making contributions to technological projects, society may have to restructure the organization of work itself.

Major technological projects require vast sums of capital, the application of expert knowledge, and the cooperation of corporations, universities, national labs, and government agencies. These "technical systems," to give them a name, represent as dramatically new a form of social organization as the modern corporation did in the late eighteenth century. They already exist in knowledge-intensive areas such as nuclear waste disposal, solar photovoltaic applications, millimeter wave technology, and the gene-splicing industry, and they are likely to become even more prominent.

The new moral code linking self-worth with participation in the production of technology should, of course, contribute to the legitimacy of these technical systems and their capacity to elicit personal commitment. To the extent that the marketplace continues to be an arena for the discharge of moral obligations, however, some conflict will inevitably arise between the market and emerging technical systems. The two do overlap in that the market distributes the tangible products of technology, but at heart they are quite different in both organization and legitimating assumptions.

Technical systems require communication networks, collective planning, and a degree of centralized administration that is out of place in the traditional view of the market. They also put a value on innovation and scientific calculation that was only implicit, if present at all, in the legitimating assumptions of the market.

For the present, then, these two systems for conferring legitimacy on American society and the American economy will exist in uneasy balance. We have weathered periods of uncertainty in the past, perhaps most notably during the Great Depression, but we have never felt so direct a challenge to our deepest legitimating assumptions. As a new moral code slowly takes shape, a delicate balance must again be struck between the moral demands we as Americans perceive in our work and our ability to fulfill them – that is, between the freedom undergirding moral responsibility and our perception of unchangeable forces in the external world. Getting this balance right is as vital to the functioning of the economy as the economy is to the society itself.

INTELSAT AT MIDDLE AGE

Taking The High Ground

by Scott Chase

The picture that emerges of Intelsat as it enters the '90s is of an organization restored to a confidence and stature it once took for granted.

Intelsat today appears poised to make its mark in a competitive global telecommunications arena without undue reliance on regulatory mechanisms and a monopoly that even its top officers openly concede may be archaic at best, and, at worst, directly impeding the organization's ability to get on with business.

THE DEMISE OF ARTICLE XIV(d)

Nowhere is the new competitive Intelsat more evident than in its approach to Article XIV(d) of the Intelsat Agreement. This is the provision which requires operators of so-called separate satellite systems, such as PanAmSat and the planned Orion satellite system, to enter "consultations" with the global network to avoid causing Intelsat direct and significant economic harm and to coordinate their spacecraft to avoid possible interference from adjacent satellites.

"Article XIV(d), whatever its original intent, has turned out in practice, by and large, to just be a bureaucratic mess," says Intelsat Director General Dean Burch. While pointing out that the technical coordination of satellite systems is still a good idea, the economic harm protections of the Intelsat Agreement largely are a thing of the past: "We're trying to move toward something that simply says that 99.9 percent of the [coordination] cases aren't worth the paperwork and we're just going to punt." Adds Burch hopefully, "That should satisfy most people who give this matter five seconds worth of thought."

Communications Satellite Corp. (Comsat) executive Bruce Crockett, who serves as president of Comsat World Systems Division and is as well Chairman of the Intelsat Board of Governors, is even more acerbic. "It's become apparent to us—to Comsat and, over time, to many of the other knowledgeable owners [Signatories] and ultimately to Intelsat—that the negative perception the separate systems advocates were able to build around XIV(d) and our inability to come to grips with what 'cumulative economic harm' meant effectively obsoleted the Article. It got to the point that it was doing us more harm than good; it was being used by our detractors to beat us over the head and, at least as far as I was concerned, I was ready to chuck the whole thing."

Intelsat Director General Dean Burch

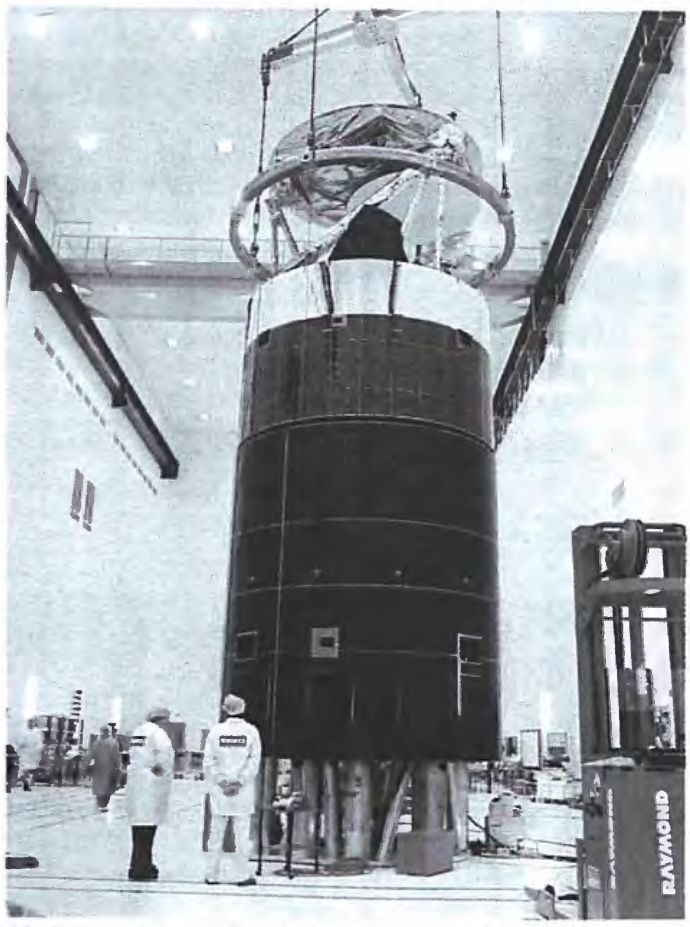
Of course, Crockett concedes, "It's difficult to potentially chuck it because it means

[going to the Board and the governments]. I suspect that what's going to happen is that, for any service other than switched voice, a way will be found to make the Article XIV(d) consultative process neutralized. And I think that's positive. I don't think in the world today Intelsat can expect to have those kinds of protections and it doesn't need them. I think we can compete very effectively."

Asked late last year to review the status of XIV(d), key Signatories reached an untortured consensus that, in all but a few cases involving very high capacity satellite systems, Article XIV(d) is a relic of the past. The United States, in a March 2, 1990, Intelsat internal document, said, "We believe Intelsat's focus on maintaining a competitive posture is ultimately more important to the future of the organization than Article XIV(d)." Intelsat's long-term competitiveness and prosperity, the United States continued, "will be based on swift responses to market conditions and not on Article XIV(d)."

Competition is the one word that sums up all that Intelsat must face in the future.

The Australians were more direct: "Australia recommends that the Board of Governors decide that the current approach to fulfilling members' obligations under Article XIV(d) . . . is no longer appropriate given Intelsat's new competitive perspective and strategic plan."



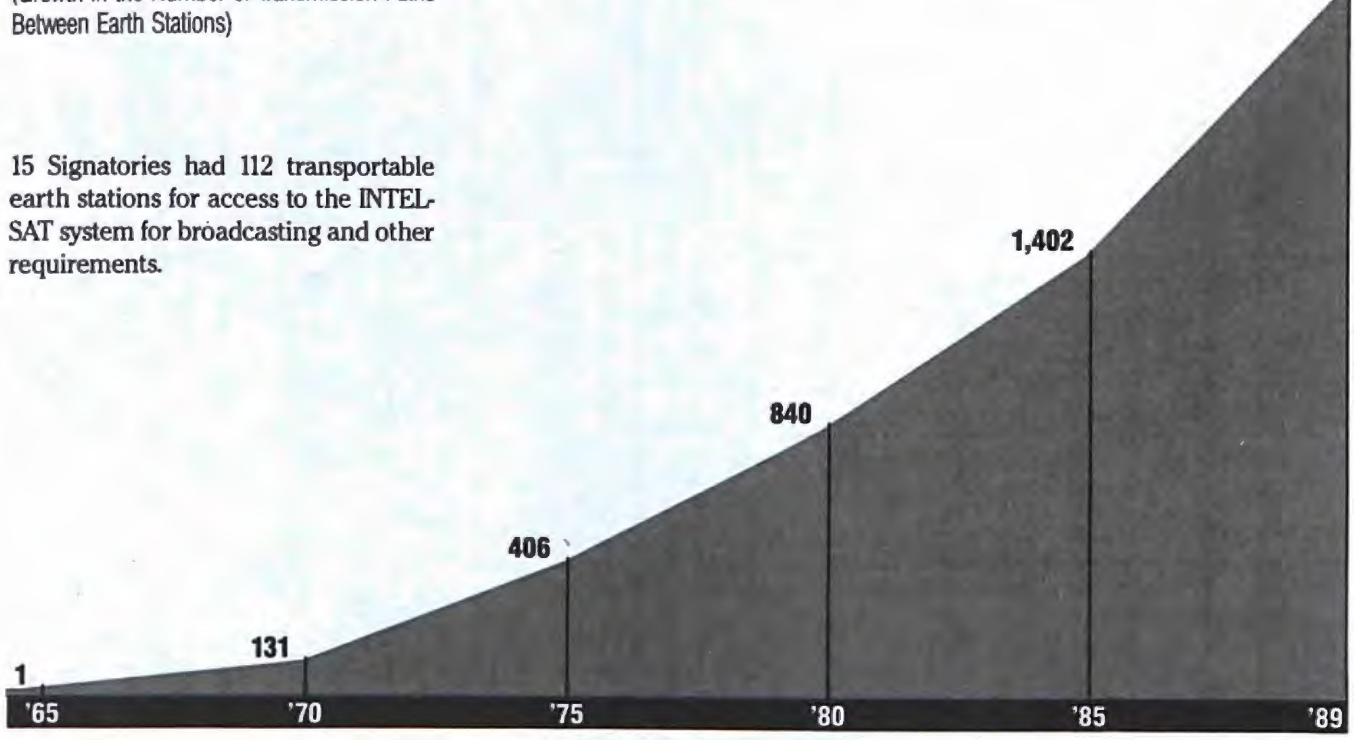
The Intelsat 6 spacecraft is the largest commercial communications satcllite ever built.

INTELSAT

Connectivity

(Growth in the Number of Transmission Paths Between Earth Stations)

15 Signatories had 112 transportable earth stations for access to the INTELSAT system for broadcasting and other requirements.



Full-Time Satellite Use By Region
(Channels)

	Atlantic	Pacific	Indian	Total
1965	150	–	–	150
1970	2,632	1,312	314	4,258
1975	8,862	1,926	2,580	13,368
1980	27,530	4,676	8,409	40,615
1985	49,707	12,025	19,298	81,030
1986	53,666	14,659	21,422	89,747
1987	56,468	18,164	21,442	96,074
1988	68,468	22,280	24,204	114,952
1989	69,758	22,733	26,394	118,885

Television Highlights

Occasional Use	67,387 channel hours
Long-Term Leases	34
Short-Term Leases	19
Record Number of Occasional Use Television In One Month	6,464 channel hours
Record Number of Transmissions In A Single Day	217

The Signatory of Canada offered a series of recommendations that would reduce reliance on XIV(d) while instructing the organization to reach a "better definition of the type of Intelsat system that . . . Signatories are committed to protect in today's changing telecommunications environment." In this approach, Canada was joined by Japan, which said, "In estimating the amount of economic harm [a satellite system seeking Article XIV(d) consultation might cause], it has to be made sure that the Intelsat system is rationally and efficiently operated."

The United Kingdom, target and partner of the Orion network, not to be outdone, said, "The Article XIV(d) process is inherently discriminatory. It is a protective device which can be deployed against separate satellite networks but not against fibre optic systems, private or otherwise." The United Kingdom set out "three general principles"—objectivity, transparency and cost effectiveness—which, it said, should guide the increasingly limited application of Article XIV(d) prior to its outright abandonment.

While noting that the government feels that Intelsat "needs to be much more competitive," Randolph Earnest, director of the Office of Cable and Satellite Policy in the Bureau of International Communications and Information Policy, U.S. Department of State, says that Intelsat may face a "tough problem convincing members that the game has changed as it relates to international satellites." Acknowledging that the smaller members of Intelsat are the ones chiefly threatened by the removal of traditional protections such as those embodied in Article XIV, Earnest adds that separate systems, ironically, "could in the end create new markets for Intelsat." Indeed, he says, "the lesser developed countries already are benefiting from increased competition in the form of capacity lease reductions [and] improved services." Finally, in those areas where Intelsat "hasn't or can't" provide a full range of service, "there may be room for separate systems," he opines.

Intelsat's concern with the role of Article XIV(d) has provided a convenient foil for an internal discussion of topics that, just a few years ago, would have been considered heretical in the organization's executive suites. One such topic revolves around an examination of the possible "downsizing" of the international satellite system as a competitive response to pressures from the expected increase of applicants for and operators of separate systems. While the discussion at this

time may be purely intellectual, the point is that, contrary to its detractors, Intelsat is far from mired in pleasant memories of when it was the only game in town.

THE BATTLE OF THE ATLANTIC

Intelsat came under fire last year with its abrupt acquisition of an off-the-shelf satellite, GE Astro-Space's Satcom K4—renamed Intelsat K—to provide interim high-power Ku-band capacity over the North Atlantic. The naysayers pouted that Intelsat acted solely to lock up customers identified by others, particularly Orion, prior to the introduction of new separate system services in the region.

Nowhere is the new competitive Intelsat more evident than in its approach to Article XIV(d) of the Intelsat Agreement.

Nonsense, says Intelsat's Burch. "Like everyone who reads the trade press I've seen all the suggestions that what we're doing is trying to steal someone else's thunder," he chuckles. "First of all, it seems to me that we're in the business of stealing thunder and, secondly, it didn't come as any surprise to us that people needed Ku-band capacity. We have a lot of information in that area, and the question was how to supply it. The decision was to go out and buy an existing satellite. And that's exactly what we did. As of today, the satellite is essentially sold out, which is some evidence that the forecasting was right on it. If I have the opportunity to do things like that in the future, I intend to do them any time I can."

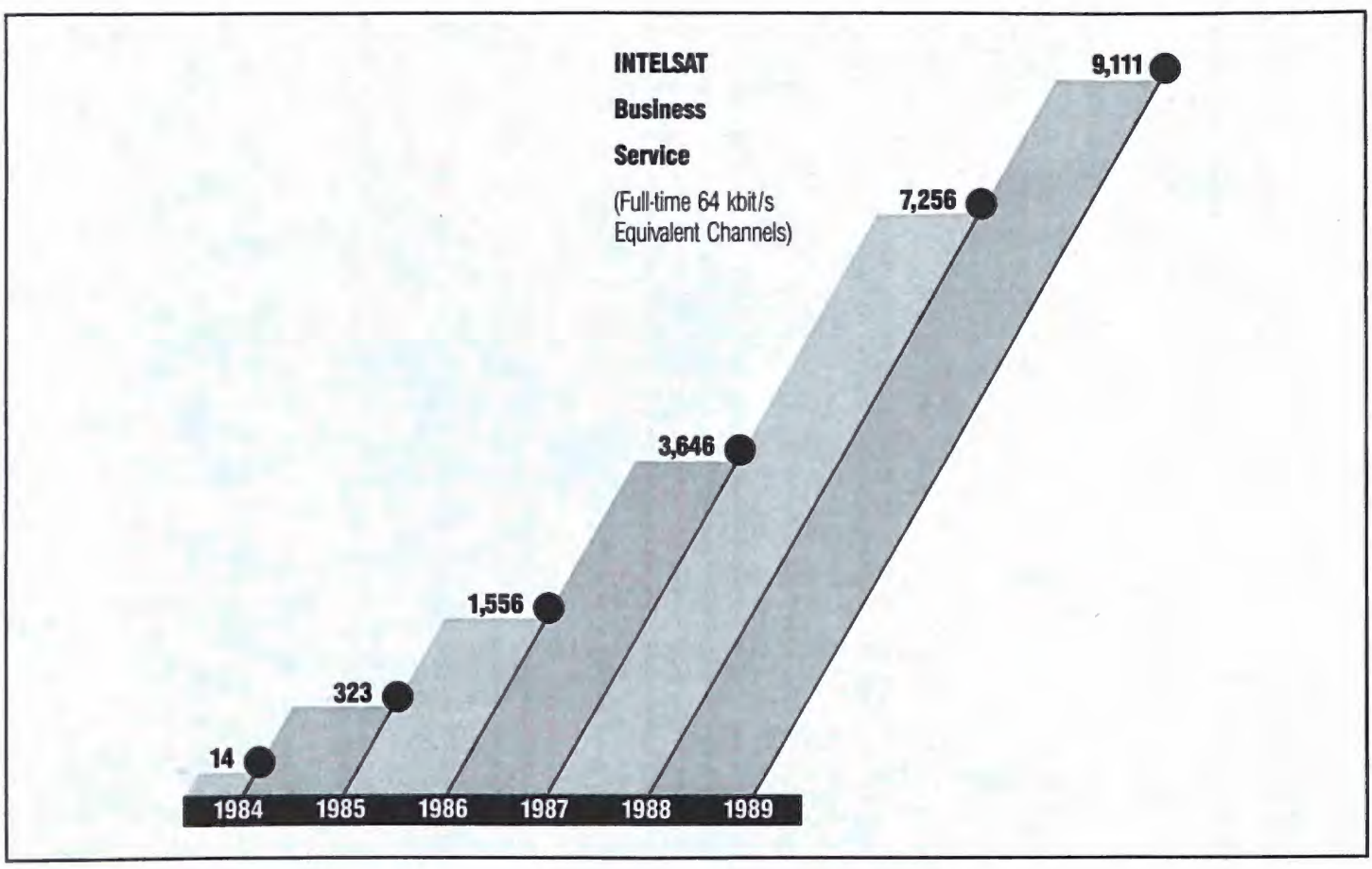
Comsat's Crockett chimes in: "When [Intelsat] goes out and does something pro-active and competitive, it's called discriminatory and monopolistic and every other bad word you can think about. When a separate systems does it, it's all in the name of competition. If you're going to have competition, and there is for non-switched services, we have to be able to do the same things that they do."

Former Intelsat senior staffer and industry pioneer Dr. Joseph Pelton says that Intelsat began working up traffic projections for Ku-band requirements in the Atlantic Ocean region nearly a decade ago. He terms the Intelsat K buy "a shrewd strategic move."

THE SIGNATORIES: DEALING WITH COMPETITION

Competition is the one word that sums up all that Intelsat must face in the future. With it comes the realization that the organization must change in fundamental ways that, during two decades of technological hammerlock, were not actively considered.

"I think the biggest issue that faces us is the same issue that faces everyone in the telecommunications business; namely, the world is changing so quickly," Burch explains. "The patterns that were accepted for 50 years are no longer there. An organization like this simply can't continue to point to the Communications Satellite Act [of 1962] and



say, 'That's it! That's the way it was set up and that's the way it will always be.' Our Signatories are changing, their roles are changing within their particular countries and we have to be in a position to assist them in meeting these changes."

But these changes don't necessarily translate into a change in the way Intelsat does business with its 119 customers, the Signatory owners that control the organization: "We were set up in a way to deal with Signatories and I find that we can do that and still provide the service that is ultimately given to the end user in a very acceptable fashion."

Indeed, echoes Crockett, it is the Signatories that are on the front lines of competition; they're the ones that meet the fibre optic cables and the separate systems head-on in the marketplace. But these days, he adds, the owners of Intelsat have put petty squabbles behind them and are focused on the challenges of running the global satellite system.

Intelsat today appears poised to make its mark in a competitive global telecommunications arena without undue reliance on regulatory mechanisms.

Burch explains what is perhaps the newest wrinkle in inter-Signatory relations: The Signatories have become much more competitive with each other. "For example, one of the concerns is that a certain Signatory may have a pricing advantage over another because of being better able to utilize the tariff system, and that's a valid concern," Burch says. As in all forms of communications, it takes two to tango, and the struggle for customers on either end of the link has become intense.

"Inevitably, any organization of this nature is bound to have some strains between, let's say, North-South, East-West, Big-Small, Rich-Poor. The great thing about this organization is that we discuss these problems honestly, and what we don't do is toss in a lot of ethnic background and geopolitical concerns," Burch declares.

THE FUTURE OF TELEVISION AND TARIFFING

"The only thing that seems to be predictable about television is that the demand seems to be inexhaustible for it," the Intelsat DG says. "Every year our demand figures rise." Burch is hoping that "some sort of compression technique which is acceptable" to broadcasters will make an appearance and cites research progress in this area. But, he adds, it's inevitable that Intelsat will require more capacity.

"The other thing that is fairly predictable is that, by and large, broadcasters will want higher power for the television services so that they can use smaller and smaller dishes," Burch says. But there are a few problems to be resolved. "The television business is a peculiar business in that, if you look at the figures, we have so many peaks where we're using practically 100 percent of our capacity and then we look at other times when it's almost none. It just lies there fallow.

"So, our job, it seems to me, in cooperation with the broadcasters, is to try to figure out some way to spread that load around so that, first of all, we can make the services less expensive for using off-peak, and we can simply offer more services."

Hooking back to Intelsat K, Crockett outlines a future of heavy demand in the television arena: "Intelsat K is particularly well suited [to handle video requirements] because it is higher powered. It turns out also [that the] Ku-band power levels on the Intelsat VII are roughly equivalent, so it isn't really a 'one-of' satellite." When "the K" reaches its normal end of life, Crockett says, it will be followed by VIIs.

The picture that emerges of Intelsat as it enters the '90s is of an organization restored to a confidence and stature it once took for granted.

"In a sense it's an early entry into what we believe is the tremendous video market that will take place," he predicts. Intelsat has about 34 full-time video leases; 22 of them are Comsat deals. There are about 80 dedicated video channels worldwide, counting domestic satellites, Eutelsat, and others. "By the year 2000, there will be between 250 and 300 video channels being beamed around the world," Crockett foresees. "We will be a significant player there."

Crockett expects prices for video service to come down. Television, relative to some of the other services Intelsat offers, he says, "is a great bargain."

ALL THINGS TO ALL PEOPLE

No one denies that Intelsat has served a critical role in global economic development, in the emerging Information Revolution and in the bringing about of a true Global Village. But it can't really be all things to all people. Its critics like to wonder, usually on soapboxes with international reach, just why Intelsat can be so uncooperative at times.

"Why should Intelsat cooperate," asks a well-placed industry analyst in Washington, D.C. "After all, they traditionally have held the monopoly position and, in terms of the marketplace, there's nowhere to go but down."

Dean Burch would contest that, and vigorously. Pointing to the organization's active pursuit of new capacity in recent negotiations with Arabsat, NASA and AsiaSat, Intelsat, he claims, "is not a slow moving bureaucracy but a dynamic organization that can and has successfully reacted to rapidly changing market conditions." Cooperation, he'll be happy to tell you, is handed out on an equal basis to his customers, who just happen to be the Signatories.

"The two biggest strengths of Intelsat are its universality and its connectivity," says Comsat's Bruce Crockett. "On the universality issue," he continues, "that's why we're so anxious to see the Soviet Union and other Eastern non-members become members. There's nothing stronger than an Intelsat with 170 members, with every country in the world. In terms of global connectivity, that's an advantage Intelsat has vis-a-vis separate systems, at least right now principally because we have satellites that cover the world. It will be quite some time before anybody has the global breadth that we have."

cc: FL
10/16/90

Cabinet Approves Thai Phone Project

By Helen E. White
Staff Reporter

BANGKOK – The Thai cabinet, suspending hostilities after recent political squabbling, gave a big boost to private-sector involvement in developing the country's infrastructure by allowing a private company to build and operate a massive extension of Thailand's telephone grid.

The cabinet's go-ahead for agribusiness giant Charoen Pokphand group to install three million new telephone lines under a 25-year concession apparently marked a truce between warring political factions within Prime Minister Chatichai Choonhavan's seven-party coalition government. Fierce political infighting, much of it centered in recent weeks around the massive telephone project, had threatened to splinter the administration and force its disintegration, some analysts believed. But such strife wasn't apparent at Tuesday's meeting.

Much of the cabinet's lengthy debate on the plan, the largest single infrastructure project ever awarded to a private company in Thailand, centered on whether the entire project was legal. Under Thai law, only the Telephone Organization of Thailand, a state enterprise, is responsible for the country's domestic telephone grid, which currently consists of 1.5 million lines.

But under the project approved Tuesday, telephone operations would be privatized in most regards except ownership. Charoen Pokphand would invest an estimated 150 billion baht ($5.94 billion) to install two million lines in Bangkok and one million lines outside the capital; installation of the lines would be scheduled to coincide with the country's Seventh Five-Year Development Plan, which will begin in October 1991.

Though the Telephone Organization of Thailand, or TOT, would own the equipment from the moment of installation, Charoen Pokphand would be responsible for almost all aspects of operation and maintenance of the new lines. In return for the 25-year concession to operate the new lines, Charoen Pokphand agreed to give TOT 16% of total revenues from Bangkok, and 22% of revenues outside the capital. Charoen Pokphand's chief adviser in the project is British Telecommunications PLC.

Though the total contract's value is difficult to estimate, Transport and Communications Minister Montree Pongpanit told reporters last week that TOT expected to receive a total of 170 billion baht from revenue-sharing of the Bangkok lines during the entire concession period, and 161 billion baht from the provincial lines. Under the revenue-sharing formula, that would indicate that Charoen Pokphand stands to collect 1.47 trillion baht as its portion of the project's revenues.

Some ministers questioned whether such ad hoc pseudo-privatization would be in the country's best interest.

"This is a first pilot project" of such large scale semi-privatization, said Government Spokesman Suvit Yodmani. The cabinet therefore has instructed the Ministry of Finance, the National Economic and Social Development Board, and the Juridical Council to "draw up regulations so there will be no doubts any more" about the legality of similar projects in the future, he said.

The regulations should serve to enunciate government policies toward privatization. In the past, attempts at privatizing various services – such as port operations and electricity generation – have met fierce resistance from labor unions.

But labor unions were much less a problem to the TOT's move toward privatization than was the state enterprise's own legal charter, which significantly circumscribes private-sector involvement.

"I think the feeling among a lot of technocrats is that they really need to get things done," and allowing the private sector greater leeway is the fastest means of tackling Thailand's infrastructure shortages, a securities analyst said. "But it's easier to work within the constraints of the legal system than to try to change it," and hence semi-privatizations, like the Charoen Pokphand project, may be the most effective way of confronting bottlenecks, he said.

The cabinet authorized the Ministry of Transport and Communications, which had proposed the project, to draw up a contract with Charoen Pokphand. After the contract receives approval from the Finance Ministry and the Public Prosecutor's Department, the contract will again be presented to cabinet for final authorization.

[illegible]val Expected

CANADIAN-SOVIET SATELLITE VENTURE SAYS [illegible]

New Canadian-Soviet satellite [illegible] venture [illegible] networks (PSN), satellite service area [illegible] Satellite Communications [illegible] Tues. that it had signed formal agreement with Soviets [illegible] system [illegible] Oct 31 p11. [illegible] Cancom Vp Larry Steinman [illegible]

Cancom is [illegible] of [illegible] access to PSN. [illegible] venture "won't [illegible] illegal [illegible] with Soviets [illegible] to seek domestic and international approval [illegible] they have very good logic [illegible] to argue for regulatory approval from [illegible] system "that will enable [illegible] the world to maintain the sovereignty [illegible]

Intersputnik, Soviet equivalent to [illegible] would use satellite to provide services to its members, which include Cuba, Yemen and other count[illegible] Steinman said [illegible] member countries represent 400 million people [illegible] demand for international communications.

Project schedule: Cancom would [illegible] and market studies by end of [illegible] by end of Oct. 1991 company hopes to have regulatory approvals. Then venture will begin construction and launch process. He said cost of first satellite would be about $100 million. Venture expects to procure 2 more birds, after which further capacity may [illegible] would provide launch, probably with Proton rocket.

[illegible] all the [illegible] Steinman said, including sensitive issue of [illegible] [illegible] Canada has been selected to supp[illegible] which may fall under COCOM restric[illegible] is a living, changing thing [illegible] because the pol[illegible] changed [illegible] he said advice [illegible] "from a knowledgeable person [illegible] we are doing this, [illegible] COCOM approval."

Steinman, who [illegible] in Moscow, said he's preparing to return to [illegible] because Cancom and Soviets [illegible] to bring players together. He said company [illegible] spoken with U.S. [illegible] There was no use walk[illegible] and wasting their time without a working [illegible]ment in hand.

3. Bel [illegible] T [illegible] ering [illegible] Cooperative Activities (BEL NR) *

[illegible] had signed [illegible] with the Korean [illegible] Authority earl[illegible] Director Gen[illegible] mmented that a strong relation[illegible] with a company like Bell Atlantic will en[illegible] DGT's ability to develop and provide high quality, diversified telecommunications services. DGT [illegible] over 7 million access lines in the Republic of China and reported [illegible] assets of [illegible]