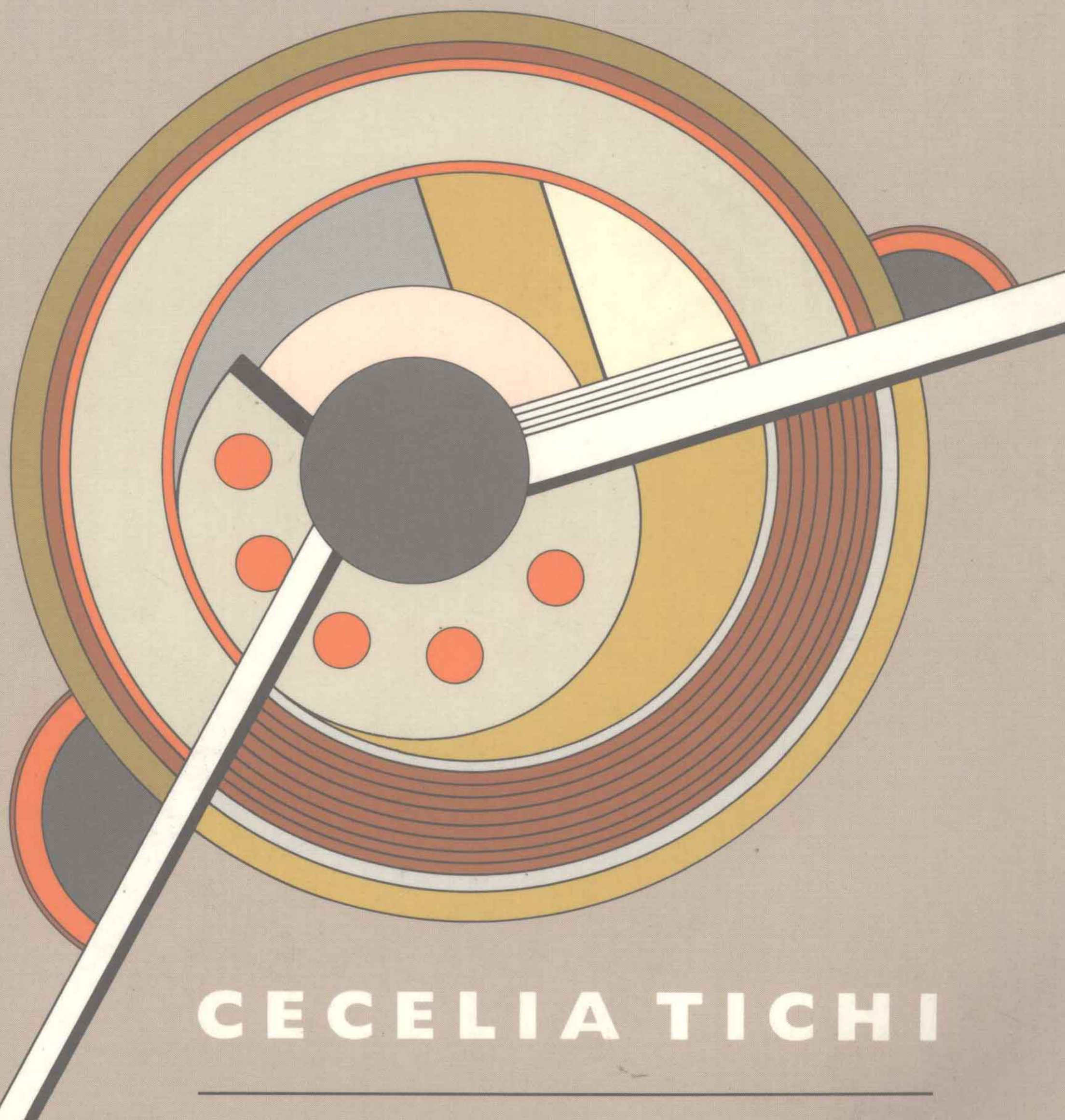
SHIFTING GEARS

TECHNOLOGY, LITERATURE, CULTURE IN MODERNIST AMERICA



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SHIFTING GEARS

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Machinery will tend to lose its sensational glamour . . . for . . . the wonderment experienced in watching [airplane] nose dives is of less immediate creative promise to poetry than the familiar gesture of a motorist in the modest act of shifting gears.

Hart Crane, "Modern Poetry," 1930

PREFACE

"Bessemer" was a good name, smelt of money and mighty rolling mills and great executives stepping out of limousines. . . . "Bessemer."

John Dos Passos, *The 42nd Parallel*, 1930

An American born before, say, 1960 can probably recall the personal incident that crystallized his or her knowledge of the current technological revolution. Mine occurred on a 1985 visit to Pittsburgh's Station Square, a recycled riverfront railroad station with restaurants and shops. On a fine spring day the crowd gathered at a crafts fair set up near a hulking structure that had been moved to the riverfront site from a shut-down steel mill. I approached and stood before it, a towering, 1930 Bessemer converter bearing the brass plaque of a historical commission.

You stare hard at that plaque if you are a native Pittsburgher born during World War II, your earliest memories those of the wartime night sky blazing from the steel mills. You stare because you realize that the Bessemer converter has now become an official symbol of your past and America's as well. The steel retort essential to steelmaking from the 1890s through the better part of this century has now become the focus of tourist curiosity and nostalgia. Economically, of course, it represents a bygone industrial era, one grimly echoed in the abandoned steelworks up and down the Monongahela Valley.

But the industrial relic signifies something else as well. Mounted for exhibition in the era of the digital computer, the Bessemer converter represents a superseded technology. It is the technology we associate with eighteenth- and nineteenth-century inventions like boilers and gear wheels, ball bearings, pistons, and the like. It is the technology of interconnected component parts, many of them visible to the naked eye in traditional machines and structures. In operation, this technology became familiar in the last century in steam locomotives whose rods and wheels pushed and rotated before the eyes of bystanders on railroad station platforms. It is a technology still with us in the automobile engine and in steel-frame building construction. It is the technology of girders and gears.

It is no longer, however, the dominant or defining technology. That position belongs to the computer. Even popular slang underscores the change. An eccentric or crazy individual formerly had a "screw loose"; he or she now has a "bad chip." Mental effort is now the work of a "computer mind"; no longer do the "wheels go around." These images mark the transition from one dominant technology to another. The change involves much more than the adaptation of language to new material conditions. Behind the shift of images are new, technological definitions of the human relation to the world.

Twentieth-century science, of course, is also reconceiving the material world. In quantum mechanics it is a statistically probable set of circumstances at any given moment, in nuclear physics fluctuating energy levels. The functioning of higher organisms, biochemists argue, may depend upon chemical information systems far more sophisticated than the computer's binary model allows. Within technology, however, it is the computer which provides the powerful new metaphor for the human mind and brain. The classicist and student of the computer, J. David Bolter, explains this power on a historical basis. In any given era, he argues, there exists a technology which defines or redefines man's role in relation to nature. Currently, Bolter argues, the computer is giving us a new definition of man as an "information processor" and of nature as "information to be processed" (13). Accordingly, a contemporary magazine cover portrays the human brain as a mass of digital microcircuitry.

The now-eclipsed technology of gears and girders defined human beings and their relation to nature differently. Its central conception was that of an energy-transforming machine. True, some of its machine terms are still in use. "Systems" and "components," for instance, continue from the Bessemer era into the computer age, where they are newly defined in a context of information processing. But when used in the era of gear-and-girder technology, these terms meant something very different. In fact, they referred to a different world view. The gear-and-girder era, powerful through the late nineteenth century and well into the twentieth, fostered a conception of the human being as a machine for the consumption and production of energy. And it defined nature similarly as a congeries of machines and stuctures comprised of interworking component parts, meaning structural and mechanical members (gears, crankshafts, sprocket arms, armatures, belts, etc.). According to this technological outlook, each machine or combination structure-machine produced energy with greater or lesser efficiency, depending upon its design.

The human role in such a world was to formulate new designs. It was to engineer the structures and machines able to function with maximal efficiency and minimal waste. Under the aegis of this technology human beings intellectually understood the material world as dynamic, integrated assemblies of component parts. Studied analytically, the parts and the wholes could be reconceived in new relations to each other. They could be improved upon by redesign, making the systems stronger and more efficient. New, better designs were possible with redesigned, reconstituted components. The emphasis was always upon the component parts and the human role in design.[1]

1. The reader will notice that throughout this study writers and other nontechnical commentators mix up technical terminology, some of it more appropriate to machinery with

This machine world of the gear-and-girder technology had vast implications for all of American culture during the late nineteenth and earlier twentieth centuries. Until recently we have been simply too involved in it to see it, too much a part of its assumptions to gain the necessary analytical perspective. Now its decline in importance in the computer age opens up that perspective. The assumptions of the gear-and-girder technology can emerge clearly as just that—a set of assumptions. These can be seen as formulations of reality and not as reality itself. When we study these assumptions, therefore, we essentially study an era's perception. We investigate an outlook on the world and recognize that certain imaginative forms are necessarily cognate with it. In this instance I will approach that once-definitive technology of gears and girders in order to see how its assumptions affected diverse areas of American culture, from skyscrapers and autos to popular media and the arts of the written word.

We must bear in mind, all the while, that the gear-and-girder technology pushed aside certain cherished assumptions about the material world in its own day. Its ascendance brought about new conceptions of art because it posed a radical challenge to the existing order. Specifically, the machine world of gears and girders displaced the dominant Romantic view of a holistic, spiritual world of vegetative and bodily being. When the twentieth-century poet, William Carlos Williams, called the poem a machine made of words, he presumed a very different world from that of Henry David Thoreau, who wrote in the *Dial* that "poetry . . . is a natural fruit" and that "man bears a poem . . . as naturally as the oak bears an acorn and the vine a gourd" (4:290–91). This nineteenth-century belief that nature, the human imagination, and art were unitary, fertile, maternal, and co-generative changed radically under the the gear-and-girder assumptions of the twentieth.

Even Edgar Allan Poe, the Romantic writer fascinated by the machinery of works of art, repudiated a machine-based aesthetic of visible component parts and design. "To see distinctly the machinery—the wheels and pinions—of any work of Art is, unquestionably, of itself, a pleasure," he began. But in the next breath Poe made it clear that to emphasize the artist's design is to deform the work of art. To reveal the anatomy of form is to destroy aesthetics (1464). In a holistic and spiritually unitary world, the mechanisms and structures of the poem, like those of the

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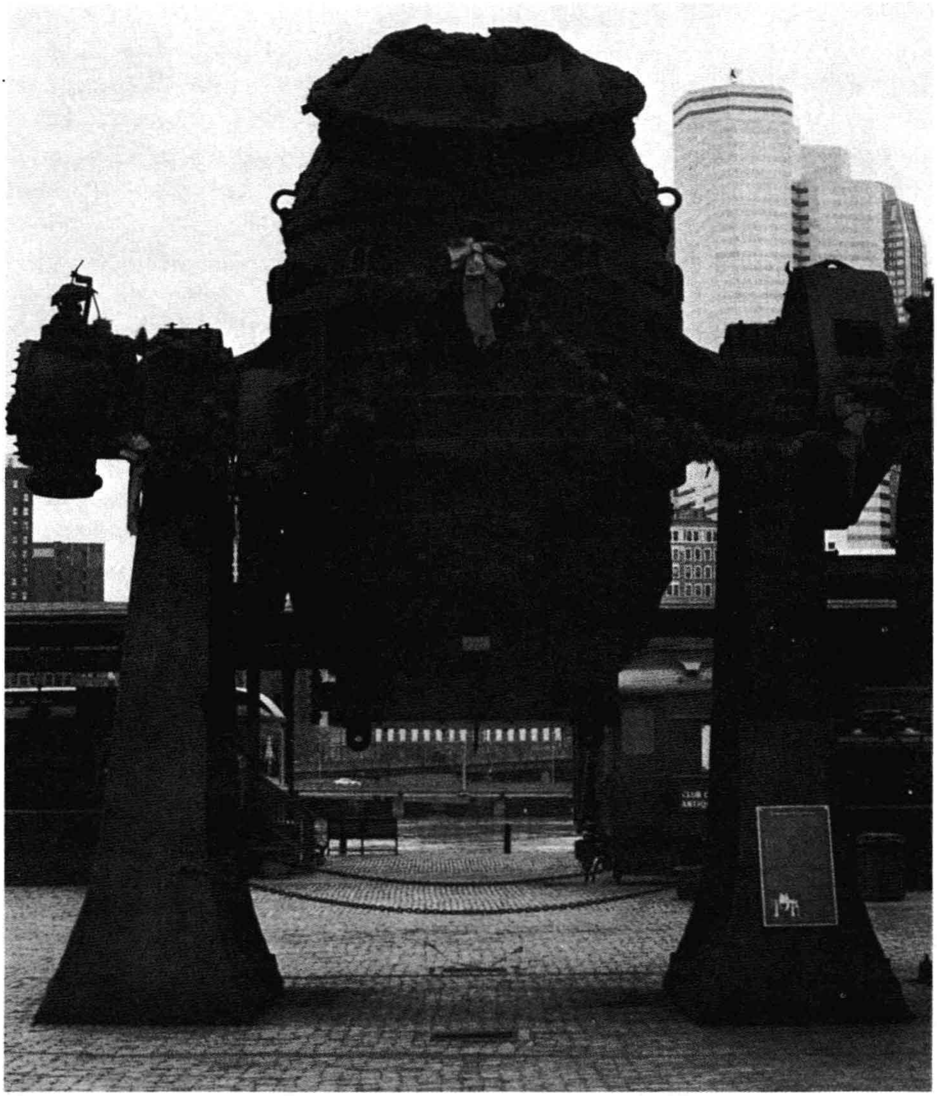
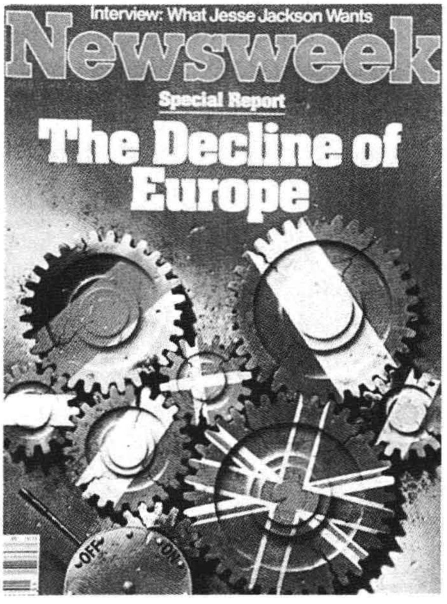
moving parts and the rest better suited to static structures like bridges and buildings. The sometimes-confusing mingling of terms is evidently a problem extending to professional engineers. As Dr. David Billington, a civil engineer concerned about engineering aesthetics, remarks in a letter concerning this study, "A major part of the problem lies in the ambiguous use of such language even within the engineering community [and] is another example of how engineering differs from natural science; in the latter terms are more carefully used."

Clarifying the distinction between the function of gears and girders, Dr. Billington remarks, "In mechanical engineering a gear is certainly part of a mechanism but in civil engineering a girder becomes a mechanism only when it fails (as when girders freely spanning between two walks are loaded so greatly that a hinge forms at midspan). The gear does transmit energy although the engineer speaks of transmitting motions (kinetics) or transmitting power (which signifies force times distance per unit of time). Energy is usually the term used for fuel capacity (14,000 British Thermal Units in one pound of coal, for example)."

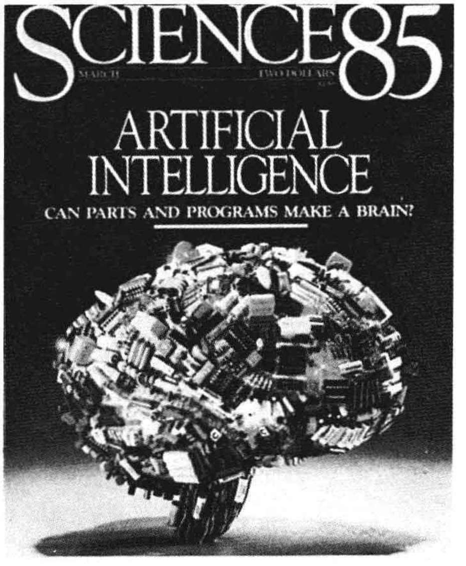


Bessemer converter decorated for holiday season at Station Square, Pittsburgh

acorn or gourd, must remain concealed. Artifice must suit the world to which it refers. Even Walt Whitman, who sometimes carpentered the poem ("jointing, squaring, sawing, mortising, / The hoist-up of beams, the push of them in their places, laying / Them regular") was responding to a hand-crafts tradition and referred solely to static forms, not to energy-producing machines. He sings to a locomotive, but essentially to compel that "fierce-throated beauty" to "merge" into the organically holistic song-poem (186, 472).



Cracked, worn-out gear wheels illustrate a magazine cover story in the 1980s (Copyright 1984, by Newsweek, Inc. All rights reserved. Reprinted by permission.)



Human brain modeled as electronic microcircuitry (Courtesy Science 85)

Approaching the world of gears and girders, therefore, we enter into a world very different from that of the Romantics. It is a world whose sociopolitical difficulties have been addressed by numerous scholars and critics of culture. In this century its premises have precipitated a crisis of the liberal imagination by repudiating the Romantic concept of organic wholeness which gave the individual and society their integrity. Modernist thought lent itself to contemporary crises ranging from spiritual anomie to social fragmentation and even the political atrocities of fascism. In imaginative literature and criticism its presumptions have conceptually dislocated the word and the text in a crisis continuing from the late Victorians to the deconstructionists. The modernist world view, in addition, has left us disturbing paradoxes. It is ironic, for instance, that William Carlos Williams, a man of deeply liberal social sympathies, would nonetheless define the poem impersonally as a machine made of words.

Yet Williams and others could not sustain the terms of an older world. They saw signs of its exhaustion in sentimental, fey, and precious literature, and they rejected it. This study, then, is not a reiteration of the spiritual and political crises of twentieth-century modernism, but the story of American writers' efforts to reinvigorate imaginative literature in accordance with the terms of a new world. Materially, that world appeared to them to be a system of component parts, and human beings its designers. It is the world of Archimedes come to fulfillment, and one likely to remain with us in life and art insofar as it legitimately represents the visual and the kinetic. Now it is time to see how the principles of that technology emerged in the forms of language, art, and popular culture from the 1890s through the 1920s.

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Long-term projects inevitably become a part of personal life. On the home front, therefore, I want to thank Bill Tichi, to whom this book is oral history.

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SHIFTING GEARS

INTRODUCTION

"I wanted to design."

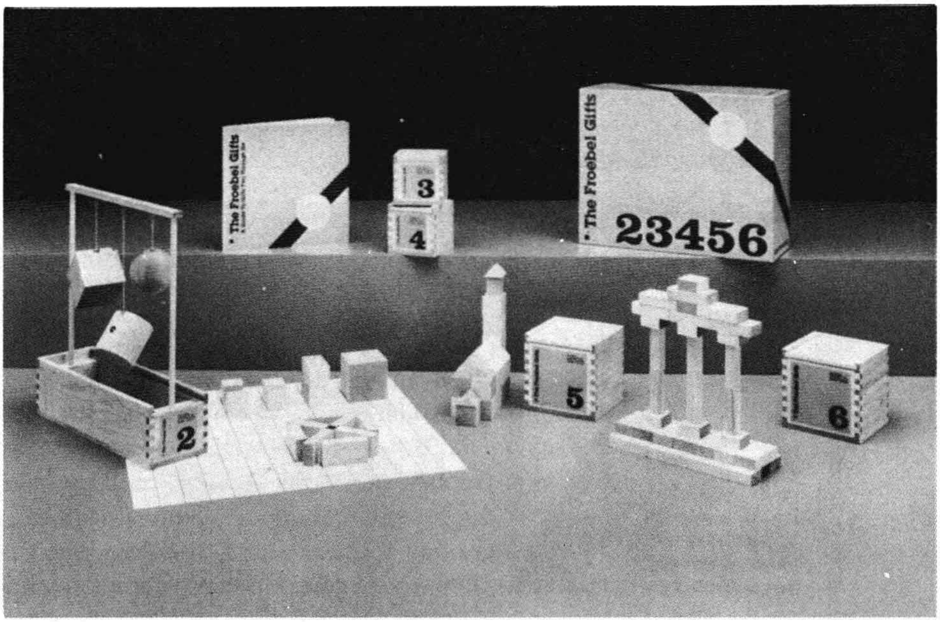
Frank Lloyd Wright, *A Testament*, 1957

At the United States Centennial Exposition in Philadelphia in 1876, the mother of a five-year-old boy paused before an exhibition of educational blocks. Designed in 1830 by the German educator, Friedrich Froebal, the "Froebal Gifts," as they were called, consisted of smooth cardboard and maplewood cubes, cylinders, triangles, spheres. They were intended for programmed play. This mother determined that her son must have a set.

Whether Frank Lloyd Wright's mother knew it or not, her decision to educate young Wright with the Froebal blocks fit with the industrial age into which the boy was born. Post–Civil War America increasingly presented a landscape of machines and structures whose component parts were visible to the naked eye. The era of handicrafts was rapidly giving way to an age of manufacture from prefabricated component parts. The parts were integrated into the total design. Gear-and-girder technology was in ascendance, and prefabricated parts were the order of the day. Wright's mother somehow recognized that the multiform blocks were appropriate to that order.

For the blocks, factory milled, were components of design. Each smooth shape, an abstract solid, was nonetheless a prefabricated part to be integrated into a larger design system of the child's invention. Programmed play with the wood components perfectly suited the new industrial age. Wright recalled, "I sat at the little kindergarten table top and played with the cube, the sphere and the triangle. . . . I soon became susceptible to constructive pattern evolving in everything I saw. I learned to see this way, and when I did, I did not care to draw casual incidentals of nature. I wanted to design" (*Testament* 19–20).

The American industrial-age passion for component-part design continued. Few children had the opportunity to experience the esoteric Froebal blocks, but the vernacular version reached millions in the form of the Erector Set. By the early 1910s American boys were hard at work designing structures and machines with the steel components of the phenomenally successful Erector. Its component parts of stamped-out steel could be assembled into numerous designs. The Erector rewarded boys' ingenuity by awarding dazzling prizes for original models. Operating manuals otherwise guided boys in the component-part construction of a range



The Froebal blocks, Frank Lloyd Wright's toys
(Courtesy Korver/Thorpe Ltd., Boulder, Colorado)

of designs from bridges to skyscrapers and Ferris wheels. Powered by small electric motors, the girders and gears became moving parts of machines.

The toys and the industrial culture mirrored each other. Steel-girder bridges and buildings were rising on the landscape by the late nineteenth century, and electric motors and internal combustion engines soon powered a variety of machines. Americans found themselves living in a gear-and-girder world. The New Yorkers walking the concourses of Penn Station experienced much the same environment as the San Franciscans who swam at the steel-girdered indoor pools of the Sutro baths. The railway passengers routed over bridges routinely saw the same girdered trusses which World's Fair visitors to Chicago or St. Louis marveled at as they rode the steam-powered, original Ferris wheel. People found themselves in an "Erector" world.

That world was remarkable for visual accessibility. To scan photographs of the machines and structures between the 1890s and the 1920s—or to look, really look, at them and at their counterparts today—is to be visually involved. An onlooker has immediate access to the construction, to the design decisions of the engineers and architects. Open to view, so obviously *designed*, the world of girders and gears invites the onlooker to see its internal workings, its component parts. It insists upon the recognition that it is, in fact, an assembly. It demands that the viewer notice the design in and of itself and acknowledge its constructed