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Giant Factories

Author(s): Joshua B. Freeman

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## PRESENTATION / PRÉSENTATION

# Giant Factories

**Joshua B. Freeman**

THE 2012 CONTROVERSY OVER the working conditions in the Foxconn Technology complex in Zhengzhou, China, where Apple electronic devices were being made, brought worldwide attention to the gigantic factories built in East Asia over the previous two decades. The scale of these industrial colossuses staggers the mind. The Foxconn factory in Chengdu, which poured out iPads to meet a seemingly insatiable consumer appetite, employed 120,000 workers. Seventy thousand workers lived in company dormitories. The Foxconn Zhengzhou plant employed a similar number of workers, while the company's two complexes in Shenzhen together had a workforce exceeding 400,000.<sup>1</sup> The Huafang Group, a leading textile producer, had one factory complex with over 100 buildings and 30,000 employees.<sup>2</sup> Yue Yuen/Pou Chen 6 Industrial Holdings, the world's leading producer of athletic and casual footwear, had a chain of factory behemoths in Southern China, including one, in Dongguan, which employed 110,000 workers.<sup>3</sup> Vietnam, too, had some very large footwear factories, including a plant belonging to a Yue Yuen/Pou Chen subsidiary where a reported 90,000 workers went on strike in 2011.<sup>4</sup>

1. Charles Duhigg and David Barboza, "The iEconomy; in China, the Human Costs that are Built into an iPad," *New York Times*, 26 January 2012; Kevin Drew, "Apple's Chief Visits iPhone Factory in China," *New York Times*, 29 March 2012; Paul Mozur, "Foxconn Workers: Keep Our Overtime," *Wall Street Journal*, 18 December 2012; James Fallows, "China Comes to America," *Atlantic*, December 2012, 54, 60–62.

2. David Barboza, "In Roaring China, Sweaters are West of Socks City," *New York Times*, 24 December 2004.

3. Nelson Lichtenstein, *The Retail Revolution: How Wal-Mart Created a Brave New World of Business* (New York 2009), 173.

4. International Trade Union Confederation, *2012 Annual Survey of Violations of Trade Union Rights – Vietnam*, 6 June 2012, <<http://www.refworld.org/docid/4fd889193.html>> (11 June 2013). See also Vu Tien Hong, "Workers Strike at Nike Contract Factory," *Huff Post Business*, 1 April 2008, <[www.huffingtonpost.com/2008/04/01/workers-strike-at-nike-co\\_n\\_94392](http://www.huffingtonpost.com/2008/04/01/workers-strike-at-nike-co_n_94392)>.

Newspaper, radio, television and theatrical depictions of these industrial complexes have generally focused on their low pay, dangerous conditions, and autocratic management, but their sheer size commands attention and wonder, too, like the three tons of pork and thirteen tons of rice used every day to feed workers at one Foxconn complex.<sup>5</sup>

The outsized factory has been a feature of industrial life for two centuries, an incandescent symbol of human ambition, achievement, and suffering. Journalists, novelists, social scientists, labour activists, political radicals, industrial engineers, investors, management theoreticians, photographers, filmmakers, and artists all have been drawn to these new things under the sun, grappling to understand their meaning and consequences. Often the giant factory has been associated with modernity, with rejecting old ways to create a new, more rational, and more bountiful world. But the meaning of modernity – as evident in visual imagery and reportage – has changed as the large factory as a distinct kind of physical structure and social organization migrated across space and time from England in the eighteenth century to the United States in the nineteenth century, the Soviet Union and its satellites in the twentieth century, and finally China and Vietnam in the twenty-first century. Over and over, the large factory has served as a measuring rod for attitudes toward work, consumption, and power, a physical embodiment of dreams and nightmares about the future.

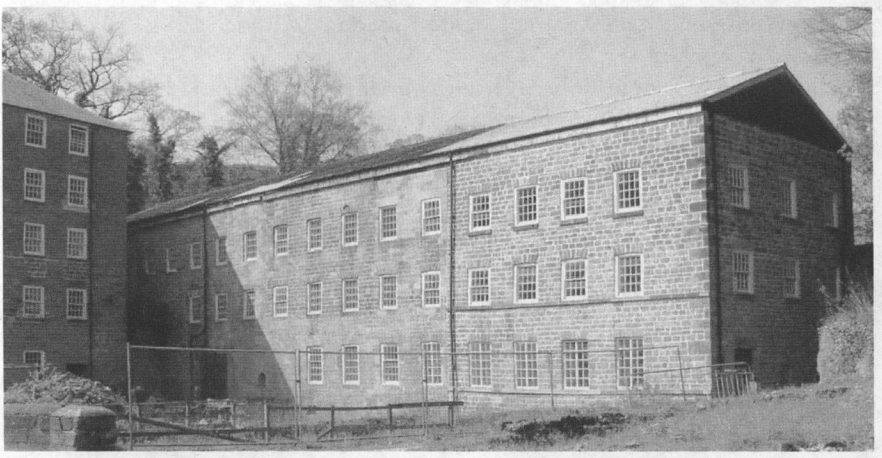
As far back as the ancient world, there were episodic large assemblages of workers to make war or build structures, such as pyramids, roads, canals, and aqueducts. These were largely state-sponsored projects of limited (if sometimes long) duration. By contrast, until the nineteenth century, manufacturing generally took place on a far more modest scale, engaged in by craftsmen and their helpers working alone or in small groups. As late as 1850, on average manufacturing establishments in the United States employed fewer than eight workers.<sup>6</sup>

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html> (April 25, 2012); Steven Greenhouse, "Nike Shoe Plant in Vietnam is Called Unsafe for Workers," *New York Times*, 8 November 1997; Mark Landler, "Making Nike Shoes in Vietnam; An Elusive U.S. Trade Pact Worries Workers and Bosses," *New York Times*, 28 April 2000; "10,000 strike at Vietnamese shoe factory," *USATODAY.com*, 29 November 2007, <[http://usatoday30.usatoday.com/news/world/2007-11-29-vietnam-shoe-strike\\_N.htm](http://usatoday30.usatoday.com/news/world/2007-11-29-vietnam-shoe-strike_N.htm)> (12 June 2013).

5. Charles Duhigg and Keith Bradsher, "How the U.S. Lost Out on iPhone Work," *New York Times*, 21 January 2012. Perhaps the best-known depiction of abuses at a giant Asian factory was an episode of the radio show *This American Life*, "Mr. Daisey and the Apple Factory," broadcast on 6 January 2012, later retracted because of fabricated material. <<http://www.thisamericanlife.org/radio-archives/episode/454/mr-daisey-and-the-apple-factory>> (12 June 2013).

6. Calculated from 1850 census data in United States Census Office, *Manufacturers of the United States in 1860* (Washington, D.C. 1865), 730. Of course, throughout history a great deal of manufacturing for domestic consumption occurred in homes, often by women.



**Cromford Mill, Derbyshire, England, the first water-powered cotton spinning mill, built 1771-1785, as seen in 2009 after partial reconstruction.**  
chevin

Factories – contained enterprises, designed for repeated cycles of production, with large numbers of workers under the same roof – first appeared in England in the late eighteenth century to produce cotton yarn and textiles. The invention of water and later steam-powered equipment for spinning cotton and weaving cloth transformed the economic and physical organization of the industry. Whereas once one worker or a few operated hand-powered spinning or weaving equipment in a home or small structure, power equipment made it more efficient to bring together in one building a large number of men and women operating many spinning jennies or mules and later looms, what Karl Marx called “the conglomeration in one place of similar and simultaneously acting machines.... receiving their impulse simultaneously ... from the pulsations of the common prime mover.”<sup>7</sup>

The factory system spread slowly; into the 1830s there were more handloom weavers in England than textile factory employees. But the factory quickly commanded a disproportionate amount of attention from journalists, parliamentarians, novelists, and social critics. The sheer novelty of the factory and the equipment it contained accounted for some of its mesmerization. After touring the manufacturing districts of Lancashire, Irish journalist William Cooke Taylor wrote in 1842, “The steam-engine had no precedent, the spinning-jenny is without ancestry, the mule and the power-loom entered

7. E.J. Hobsbawm, *The Age of Revolution 1789–1848* (New York and Toronto 1962), 54–56; Friedrich Engels, *The Condition of the Working Class in England*, trans. W.O. Henderson and W.H. Chaloner (1958; Stanford 1968), 12–17; Sydney J. Chapman, *The Lancashire Cotton Industry: A Study in Economic Development* (Manchester, Eng. 1904); Karl Marx, *Capital: A Critique of Political Economy*, Vol. 1 (1867; New York 1967), 379.

on no prepared heritage: they spring into sudden existence like Minerva from the brain of Jupiter.”<sup>8</sup>

Commentators, from Robert Owen to Freidrich Engels and Karl Marx, saw the factory as bringing into being a new stage of human history, marked not only by unprecedented productivity but also the creation of new social classes of industrial capitalists and proletarians. The clustering of legions of working-class families around the new factories was part of their novelty, the creation of a bustling landscape of massed humanity in mill towns and urban neighborhoods, where extremes of human behavior were on display. “Everywhere,” Engels wrote of the mushrooming cities of industrial England, “one finds on the one hand the most barbarous indifference and selfish egotism and on the other the most distressing scenes of misery and poverty.”<sup>9</sup> But it was not the revolutionary Engels nor his partner Marx who most lastingly captured the human and ecological degradation that came with the factory; four decades before they addressed the subject, William Blake had done that when he wrote of England’s “dark Satanic Mills” in a poem, later set to music under the title “Jerusalem,” still sung throughout the English-speaking world.<sup>10</sup>

In the early decades of the nineteenth century, the factory system spread beyond “England’s green & pleasant Land” and the confines of the textile industry. In the United States, factories – which as in England appeared first in the cotton industry – initially were widely viewed not as Satanic provinces but as beacons of a bright future in a New World. The owners of the early New England textile mills, most famously in Lowell, Massachusetts, surrounded them with company towns and paternal institutions – boarding houses with chaperones, churches, parks, libraries, societies of various kinds, and literary magazines – to attract young women from the countryside. The neat-looking mill towns were praised by native observers and European travelers for providing opportunities for young female employees to have broadening experiences and some economic independence before settling down to marriage and homemaking. Rather than places of exploitation and misery, their owners and admirers promoted the mill towns as morally uplifting and culturally enlightening model communities, sites of progress and modernity as unalloyed goods. A comparison between Lowell and English manufacturing towns, wrote Charles Dickens, who spent a day in the New England city, “would be between the Good and Evil, the living light and deepest shadow.”<sup>11</sup>

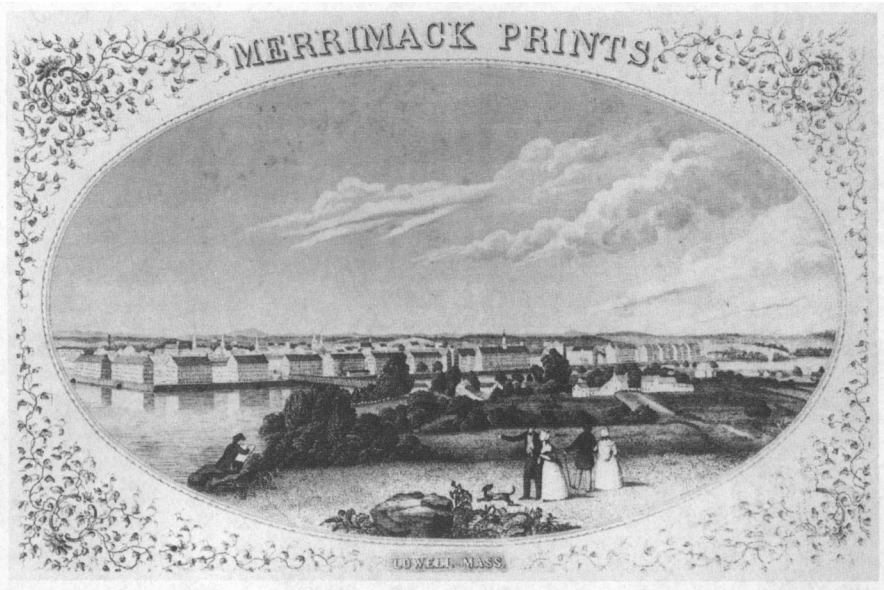
8. E.P. Thompson, *The Making of the English Working Class* (1963: Harmondsworth, England 1968), 207–212, including quote from Taylor on 208.

9. Robert Owen, *Observations on the Effect of the Manufacturing System....*, 2nd ed. (London 1817), 5–6; Engels, *Condition of the Working Class*, 31.

10. William Blake, *Collected Poems*, ed. W.B. Yeats (1905: London and New York 2002), 211–212. The original manuscript, with the punctuation used below, can be seen at <[http://en.wikipedia.org/wiki/File:Milton\\_preface.jpg](http://en.wikipedia.org/wiki/File:Milton_preface.jpg)> (14 June 2013).

11. Philip S. Foner, *History of the Labor Movement in the United States*, Vol. 1 (New York 1947),





Engraving of Lowell, Massachusetts, 1850s, from the cover of a fabric sample folder. Note the bucolic setting in the foreground.

American Textile History Museum, Lowell Massachusetts

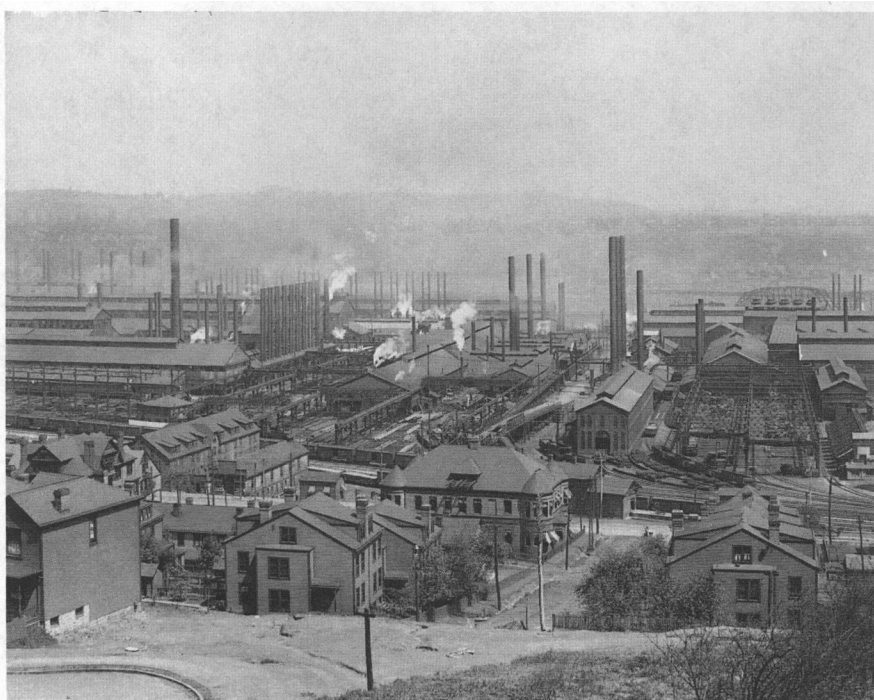
By the mid-nineteenth century, some textile mills in New England had grown very large by contemporary world standards, with one mill in Lowell employing over 2,000 workers and 6 others exceeding 1,000 hands. But apparently there was little further economy in housing ever more workers doing the same or similar tasks under one roof. While a few companies built still larger mills (most notably the massive Amoskeag Mills in Manchester, New Hampshire), many textile plants built after the initial rush were smaller in size than the biggest, pre-Civil War factories.<sup>12</sup>

The near-utopian characterization of New England factories proved short-lived. Deteriorating working conditions, complaints by young, female employees about long, hard, poorly-paid hours of work, some widely publicized walk-outs, and the turn by mill operators toward immigrant labour tarnished the image of the factory system. As the decades went by, a series of large, dramatic strikes rocked the New England textile industry, which suffered wide-spread criticism for its cruel exploitation of vulnerable workers,

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53–55; Michael J. Sandel, *Democracy's Discontent: America in Search of a Public Philosophy* (Cambridge, MA 1996), 151–52; Charles Dickens, *American Notes* (New York 1842), 27–29 (quote on p. 29).

12. Daniel Nelson, *Managers and Workers: The Origins of the New Factory System in the United States, 1880–1920* (Madison, Wisconsin 1975), 5–7.



**Carnegie Steel Plant, Homestead, Pennsylvania, early 20th century.**

Library of Congress, Washington, D.C., Prints and Photographs Division, Detroit Publishing Company Collection

especially children, women, and new immigrants. While some regions of the United States, especially in the South, continued to look to the cotton industry for economic salvation, the association of large textile factories with a more cultured, harmonious, liberatory future came to an end, at least in the United States, well before the turn of the twentieth century.<sup>13</sup>

By then, in Europe and the United States, iron and steel mills had displaced textile factories as the largest industrial facilities and, along with railroads, as prime carriers of ideas of modernity.<sup>14</sup> In 1880 the Cambria Iron Company works in Johnston, Pennsylvania employed 4,200 workers. Over the next two decades, plant size ballooned. In 1900, three of the four largest US factories,

13. Thomas Dublin, *Women at Work: The Transformation of Work and Community in Lowell, Massachusetts, 1826–1860* (New York, 1979); Ardis Cameron, *Radicals of the Worst Sort: Laboring Women in Lawrence, Massachusetts, 1860–1912* (Urbana, Illinois 1993).

14. On railroads and modernity, see Tony Judt, “The Glory of the Rails,” *New York Review of Books*, 23 December 2012; Matthew Beaumont and Michael J. Freeman, eds., *The Railway and Modernity: Time, Space and the Machine Ensemble* (Bern 2007); Richard White, *Railroaded: The Transcontinentals and the Making of Modern America* (New York 2012).

each with between 8,000 and 10,000 workers, were in the steel industry. (The other plant made locomotives.)<sup>15</sup>

Workers in iron and steel plants, to a greater extent than workers in the simpler textile mills, engaged in interrelated, sequential operations. A single worker operating a single machine could turn thread into fabric, but no one worker or one machine could produce an iron rail or steel bar. Rather, as in many of the emerging, technologically advanced manufacturing industries of the late nineteenth century, "[e]ach detail machine," as Marx put it in *Capital*, "supplies raw material to the machine next in order."<sup>16</sup> Far into the twentieth century, iron and steel were generally made through batch rather than continuous production.

Iron and steel plants grew large because of the nature of the production processes and the size of the products being made. Increasing the size of each batch of iron or steel saved time and money while necessitating larger blast furnaces, ladles, and the like. As steel girders, plates, and other products used to construct buildings, bridges, and machinery grew in size, so did the equipment and mill complexes needed to produce them. By the early 1890s, Andrew Carnegie's Homestead, Pennsylvania plant, the most technologically advanced steel mill in the United States, employed nearly 4,000 workers and produced molten metal in 50-ton batches.<sup>17</sup> Other industries in the late nineteenth and early twentieth centuries characterized by large factories – railroad car making, electrical equipment manufacturing, agricultural machinery production, sewing machine making, and meat packing – also tended to produce large products, require complex sequences of tasks involving the production and assembly of many separate parts (or in the case of meat packing disassembly into many separate parts), or both.<sup>18</sup>

As the industrial revolution leaped forward, the public in Europe and the United States developed a fascination with machinery and factories. Expositions and fairs, like the 1851 Crystal Palace Exhibition in London, the 1876 American Centennial Exhibition in Philadelphia, and the 1889 Universal Exposition in Paris (for which the Eiffel Tower was erected), often had as their centerpieces exhibits of the latest industrial machinery.<sup>19</sup> Giant factories

15. Three of the ten plants in the group of next largest factories, those with 6,000 to 8,000 workers, also were steel plants. Hobsbawm, *Age of Revolution*, 208–209; Nelson, *Managers and Workers*, 6–7.

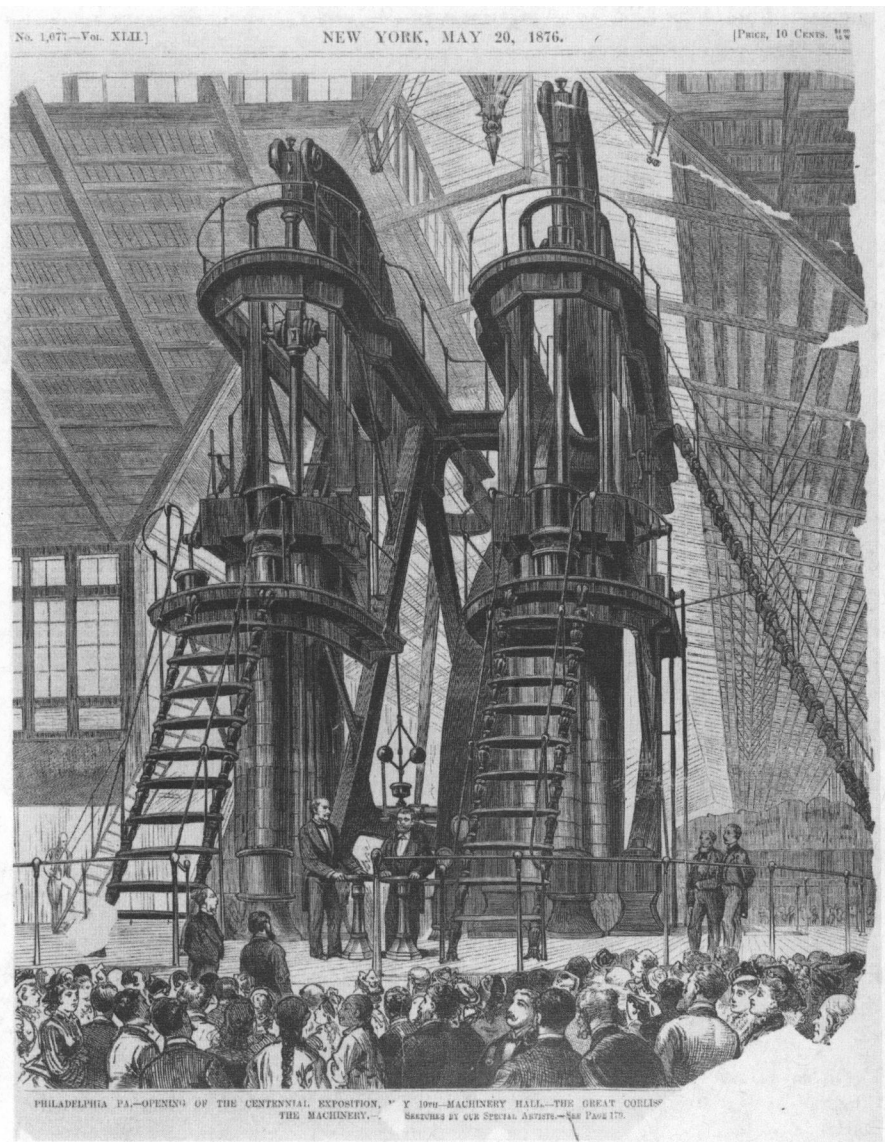
16. Marx, *Capital*, Vol. 1, 380.

17. David Nasaw, *Andrew Carnegie* (New York 2006), 405; Harry B. Latton, "Steel Wonders," *The Pittsburg Times*, 1 June 1892, reprinted in David P. Demarest, Jr., ed., "*The River Ran Red*": *Homestead 1892* (Pittsburgh 1992), 13–15.

18. Nelson, *Managers and Workers*, 7–9.

19. Jeffrey A. Auerbach, *The Great Exhibition of 1851: A Nation on Display* (New Haven 1999); Linda P. Gross and Theresa R. Snyder, *Philadelphia's 1876 Centennial Exhibition* (Charleston, SC 2005); Jill Jonnes, *Eiffel's Tower: And the World's Fair Where Buffalo Bill Beguiled Paris, the*





**United States President Ulysses S. Grant and Brazilian Emperor Dom Pedro II start the Corliss Engine that powered the equipment in the Machinery Hall at the 1876 Philadelphia Centennial Exposition.**

*Frank Leslie's Illustrated Newspaper*, May 20, 1876 – American Social History Project, City University of New York

became subjects of intense interest to journalists, photographers, and the public, especially iron and steel mills, in which fundamental forces of nature were unleashed to create objects unprecedented in size and strength. Such plants were often portrayed as testaments to human achievement and national greatness. Because they produced components that made possible transcontinental railroads, great new bridges, ever-taller cityscapes, and blooming industrial infrastructure, they were more directly associated with the advance of society as a whole than factories making goods for individual consumption. In 1876 George Thurston described the then-new Edgar Thomson steel mill in Braddock, Pennsylvania as “a striking illustration of ... the progress of civilization.” “No grander monument to the growth of the nation ... or the triumph of American manufactures and of American mechanics, could well be built, than this complete and comprehensive steel works.”<sup>20</sup> But for some, the massive complexes in which metal was refined, purified, alloyed, and shaped, were not so benign. Early in the twentieth century, the manager of an iron and steel mill in Pueblo, Colorado, echoing Blake, said “The steam, the fire, the fluid metal, the slag and the whirl of the machine all ma[d]e it look like it was the Devil’s Workshop.”<sup>21</sup>

Iron and steel plants were not the only large factories at which visitors and journalists marveled. There was, for example, the Singer Manufacturing Company’s sewing machine factory in Elizabethport, New Jersey, according to an 1880 account “believed to be the largest establishment in the world devoted to the manufacture of a single article.” In an extreme example of the tendency in many industrial sectors toward concentration of production, by the end of the 1880s Singer was producing close to three-quarters of the world’s sewing machines in just two factories, Elizabethport and another near Glasgow, Scotland.<sup>22</sup> But steelmaking continued to be the paramount symbol of the new industrial age – and of a dazzling industrial future – well into the twentieth century.

Labour strife brought the iron and steel industry some of its prominence. The 1892 lockout and strike at Carnegie’s Homestead plant received massive press coverage. A quarter-century later, the 1919 steel strike, which crippled production in much of the United States, again put the giant steel complexes at which it was fought at the center of the national narrative.<sup>23</sup> But the process

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*Artists Quarreled, and Thomas Edison Became a Count* (New York 2009).

20. Nasaw, *Andrew Carnegie*, 164.

21. Thomas G. Andrews, *Killing for Coal: America’s Deadliest Labor War* (Cambridge, MA 2008), 62.

22. David Hounshell, *From the American System to Mass Production, 1800–1932: The Development of Manufacturing Technology in the United States* (Baltimore 1985), 109; Alfred D. Chandler, Jr., *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge, Mass. 1990), 196.

23. Russell W. Gibbons, “Dateline Homestead” and Randolph Harris, “Photographers at

of steelmaking itself – and the giant facilities where it occurred – captured the attention of well-known chroniclers separate from the lives and plight of the men who made metal. Writer Mary Heaton Vorse, who volunteered as a publicist for the strikers in 1919 (and was a model for one of John Dos Passos' characters in his account of the clash in *U.S.A.*), proclaimed "I would rather see steel poured than hear a great symphony."<sup>24</sup>

Vorse was not unique. Margaret Bourke-White, who as a photographer for *Fortune* and *Life* magazines did more than anyone to bring images of large-scale industry to the public in the decades before World War II, said in 1937 "I worship factories." In her autobiography she captioned a photograph of an electric generating facility that she took in 1927 "Dynamos were more beautiful to me than pearls" (quite a statement for a woman devoted to expensive clothes and a stylish look).<sup>25</sup>

Large factories fascinated visual artists long before Bourke-White. American painters and photographers, including Alfred Stieglitz, Paul Strand, Charles Sheeler, Charles Dumuth, and Louis Lozowick, embraced a machine aesthetic, portraying machinery and industrial landscapes, often in a highly abstracted manner.<sup>26</sup> In Europe, too, visual artists – constructivists in the Soviet Union, Purists in France, Futurists in Italy, Bauhaus affiliates and *Neue Sachlichkeit* photographers in Germany – adopted visual ideas and symbols from industry, even if they did not directly represent factory production.<sup>27</sup>

But Bourke-White reached a far larger audience with her images of modern industry than other, less frankly commercial, visual artists. The daughter of an inventor and industrial engineer, who took her as a child into factories, she began her career taking architectural photographs, but soon found her calling in the Cleveland Flats, the smoke clogged site, in the middle of the city,

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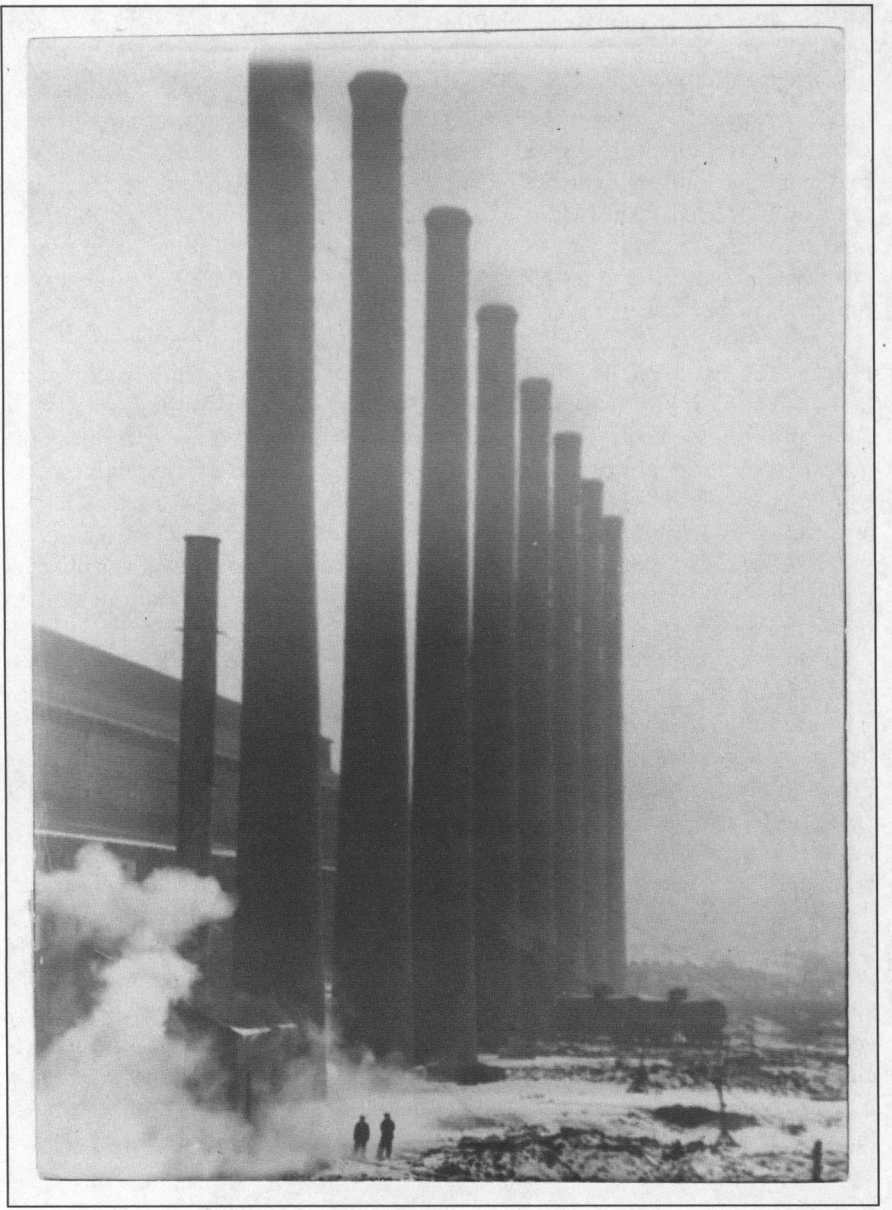
Homestead in 1892," in Demarest, Jr., ed., *"The River Ran Red,"* 158–161; Paul Krause, *The Battle for Homestead, 1880–1892: Politics, Culture, and Steel* (Pittsburgh 1982); David Brody, *Labor in Crisis: The Steel Strike of 1919* (Philadelphia 1965).

24. Dee Garrison, ed., *Rebel Pen: The Writings of Mary Heaton Vorse* (New York 1985), 21, 55. The character Mary French, based on Vorse, appears in the last two volumes of *U.S.A.*: John Dos Passos, 1919 (New York 1932) and *The Big Money* (New York 1936).

25. Margaret Bourke-White, *Portrait of Myself* (New York 1963), 40.

26. Vicki Goldberg, *Margaret Bourke-White: A Biography* (New York 1986), 81–82; Richard Guy Wilson, Dianne H. Pilgrim, and Dickran Tashjian, *The Machine Age in America 1918–1941* (New York 1986). Illustrator Joseph Pennell's book of drawings of work and industry, *Joseph Pennell's Pictures of the Wonders of Work* (Philadelphia 1916), though lacking the artistic influence of later painters and photographers, was highly popular. For a fine discussion of the portrayal of workers – as opposed to factories – by U.S. artists and filmmakers in the interwar years, see Max Fraser, "Hands off the Machine: Workers' Hands and Revolutionary Symbolism in the Visual Culture of 1930s America," *American Art*, 27 (Summer 2013), 94–117.

27. Kim Sichel, *From Icon to Irony: German and American Industrial Photography* (Seattle 1995); Leah Bendavid-Val, *Propaganda and Dreams: Photographing the 1930s in the U. S. S. R. and U. S. A.* (Zurich 1999).



**Margaret Bourke-White, Otis Steel Company, 1928, photograph, Special Collections Research Center, Syracuse University**  
© Estate of Margaret Bourke-White/Licensed by VAGA, New York, NY



of numerous heavy industrial facilities. "To me," she later wrote, "fresh from college with my camera over my shoulder, the Flats were a photographic paradise." Her breakthrough came when she convinced the head of Otis Steel to allow her into the company's Cleveland plant. After prolonged experimentation, she overcame the technical difficulties, in an era of slow film, big cameras, and primitive lighting devices, to capture the beauty and drama of steel being made and poured. She was not particularly interested in the workers in the factories she photographed – often they are completely absent – nor in how their products transformed society. Rather, she wrote in 1930, the "beauty of industry lies in its truth and simplicity."<sup>28</sup>

Bourke-White's photographs first won a following through their publication in business journals. They gained a national audience when Henry Luce hired her to work for his new magazine, *Fortune*, and then for his enormously successful photoweekly, *Life*. Bourke-White photographed other types of big industrial facilities besides steel mills. Her photograph of the Fork Peck dam in Montana, the world's largest earth-filled dam, a masterpiece of formal, nearly abstract composition and human-dwarfing scale, graced the cover of the very first issue of *Life*.<sup>29</sup> But only the automobile factory, in Bourke-White's photography and more generally, challenged the steel mill as the paramount symbol of the modern industrial age.

In the early twentieth century, the complexities of automobile production – with hundreds of parts that needed to be produced and assembled – and an explosive growth of sales led to a rapid increase in plant size. In 1910 – even before cars stopped being luxury goods and became mass ownership objects – a Buick factory employed 4,000 workers and a Packard factory 4,640. But Ford soon surpassed both, as it developed mass production techniques to pour out millions of inexpensive Model T's and later Model A's. The Ford plant in Highland Park had 13,000 workers in 1914, soon after the company introduced assembly line production, and was producing 200,000 automobiles a year. Ten years later, it had 42,000 workers. Soon thereafter Ford left Highland Park behind as its flagship plant when it built the River Rouge complex on a 2,000-acre tract in nearby Dearborn, an integrated facility where the company generated its own power; made its own steel, glass, and tires from raw materials unloaded at its deep water harbor or from its own railroad; cast, forged, and machined myriad metal parts; and produced finished vehicles on a sprawling set of interconnected assembly lines. The 68,000-strong River Rouge

28. Bourke-White, *Portrait of Myself*, 11–152 (first quote on 33); Goldberg, *Margaret Bourke-White*, 7–112, 172–195 (second quote on 89). Workers likewise rarely appeared in images of industry by Precisionist painters like Sheeler, Dumuth, and Lozowick, as noted by Fraser in "Hands off the Machine" and Sharon Corwin in "Picturing Efficiency: Precisionism, Scientific Management, and the Effacement of Labor," *Representations*, 84 (November 2003), 139–165.

29. *Life*, 23 November 1936.



workforce was the largest at any industrial facility in the United States (and quite possibly in the world).<sup>30</sup>

The massive scale of the Ford and other automobile plants took advantage of innovations in construction techniques. The replacement of wood, stone, and brick by reinforced concrete and steel made possible huge spaces with large windows and few interior supports. Albert Kahn, a young, Detroit-based architect, took the lead in designing large, low, sprawling factories for the automobile and other metal-working industries, often using a system of reinforced concrete developed by his brother Julius. His design for Ford's Highland Park Plant, which incorporated a long interior, glass-roofed railway siding and craneway, garnered world-wide attention. His buildings at River Rouge dwarfed his earlier efforts, starting with "Building B," a one-story, steel structure with glass walls a half-mile long.<sup>31</sup>

The assembly line system of mass production was recognized by many observers as the beginning of a new age of low-priced, standardized products which could be consumed by and upgrade the lives of ordinary people, including those making such goods. "Fordism," as mass production was first known, thickened the link between giant factories and a revolution in consumption, prefigured by the textile, sewing machine, and meatpacking plants of the nineteenth century.<sup>32</sup>

Assembly line factories, though, had a special allure besides their social implications. The actual production facilities – their grand scale, geometric lines, and intense interior activity – proved fascinating in their own right. The tight coordination of the activity of thousands upon thousands of workers by machines they themselves did not control was visually arresting while seeming to announce a new stage in the relationship between man and his mechanical creations. Even today the allure remains: an advertisement for the cable television series "Megafactories," shown in the United States and Canada, proclaims "For many of us, theres [sic] nothing quite as cool as a factory – the deafening whirl of huge machines, the mechanized march of thousands of parts on conveyor belts, the spinning, grabbing, twisting, bending and turning that magically convert raw materials and parts into today's coolest products."<sup>33</sup>

Charles Sheeler photographed River Rouge in 1927, commissioned by the Ford Motor Company as part of an advertising campaign to launch the Model A, being built at the factory complex. His 32 finished prints capture the enormous

30. Nelson, *Managers and Workers*, 9; Hounshell, *From the American System*, 228, 267–68.

31. Nelson, *Managers and Workers*, 16–17; Federico Bucci, *Albert Kahn: Architect of Ford* (New York 1993), 31–58; W. Hawkins Ferry, *The Legacy of Albert Kahn* (Detroit 1987), 10–13, 23–26. Building B was first used for assembly line production of boats during World War I and then, after the war, to produce automobile bodies on a massive scale.

32. See, for example, Edward A. Filene, *The Way Out: A Forecast of Coming Changes in American Business and Industry* (Garden City, N.Y. 1925), esp. chapter 10.

33. Megafactories Episode Guide, < <http://natgeotv.com/ca/megafactories/about> > (6 July 2013).

scale and power of the Rouge, including his iconic image “Criss-Crossed Conveyors – Ford Plant.”<sup>34</sup> Three years later, Bourke-White photographed the plant as well.<sup>35</sup> Two years after that, yet another leading artist became entranced by the giant Ford factory, Mexican painter and muralist Diego Rivera. Commissioned by a group of wealthy Detroit patrons, including Edsel Ford (Henry’s son) and Albert Kahn, to produce two frescos for the Garden Court of the Detroit Institute of Art, Rivera, after spending a month studying the Rouge, renegotiated his arrangement to include fourteen panels fully decorating the courtyard, depicting, in a highly stylized fashion, the production processes at the Ford complex. Rather than the simple celebration of the geometric lines and massive scale of industry that characterized Sheeler’s and Bourke-White’s work, Rivera showed the toil and wear of assembly line production on the workers making cars. Yet the strength of muscle and machine and the Promethean audacity of the whole enterprise set the tone for his great assemblage as much as the oppression of workers by machines and their masters.<sup>36</sup>

If Rivera’s murals provided a critique of giant industry and the assembly line, along with a portrayal of its dynamism and power, Charlie Chaplin more radically rejected the way of life based on mass production in *Modern Times*, one of the landmarks in the history of cinema (and enormously popular in its time), released three years after Rivera painted his Detroit murals. Before filming *Modern Times*, Chaplin toured the Highland Park plant escorted by Henry and Edsel Ford. For Chaplin, or at least for the Tramp he portrayed, the only solution to the mind and body ruining pace and monotony of assembly line production, the unequal distribution of wealth and power in the larger society, and the general heartlessness of authority was to literally turn away from “Modern Times,” with the movie ending with its hero and heroine walking away from the industrial city and modernity toward an unknown future.<sup>37</sup>

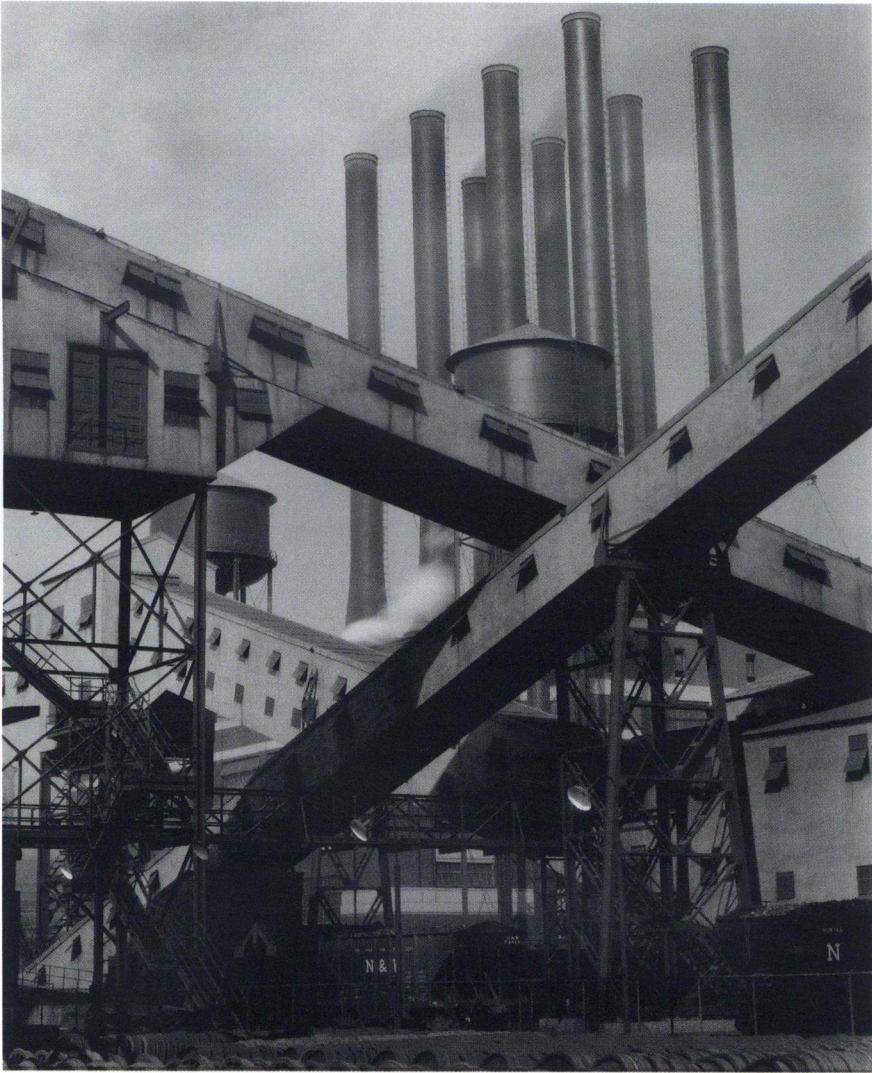
Just as in the nineteenth century the United States displaced England as the site of the world’s largest factories and the fusing of industrial giantism with notions of progress, so in the 1930s the Soviet Union came to at least rival the United States in the equation of modernity and progress with huge industrial facilities. It had long been Marxist orthodoxy that a socialist society would harness the productive capacities developed under capitalism, expanding them by eliminating contradictions that limited growth, such as the booms and busts that came from the uncoordinated activity of myriad firms. But soon

34. John Stomberg, “‘The United States of the World’: Industry and Photography Between the Wars,” in Sichel, *From Icon to Irony*, 21.

35. Goldberg, *Margaret Bourke-White*, 87–88.

36. Hounshell, *From the American System*, 323–27.

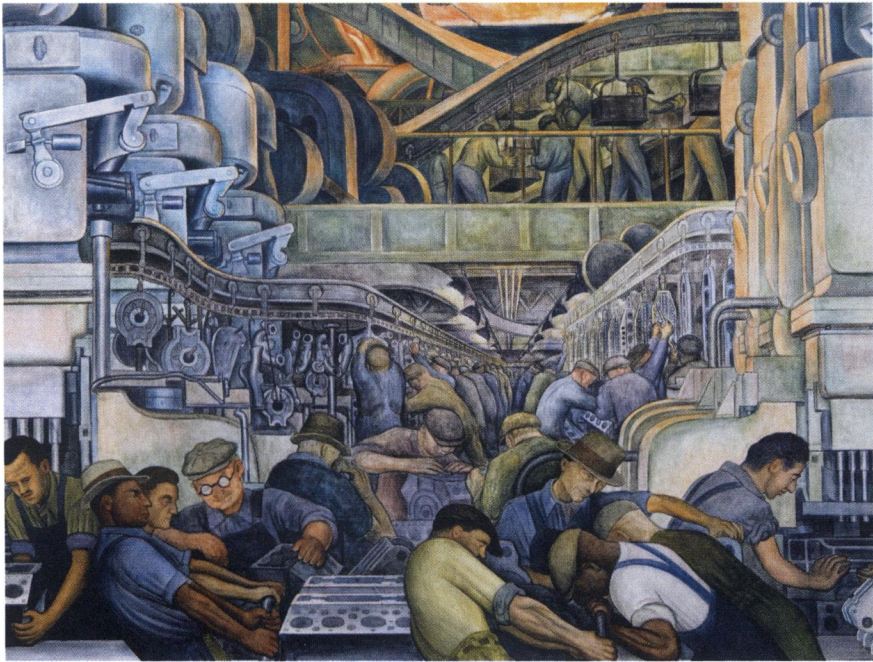
37. Charles Chaplin, *Modern Times* (United Artists 1936); Hounshell, *From the American System*, 318–20.



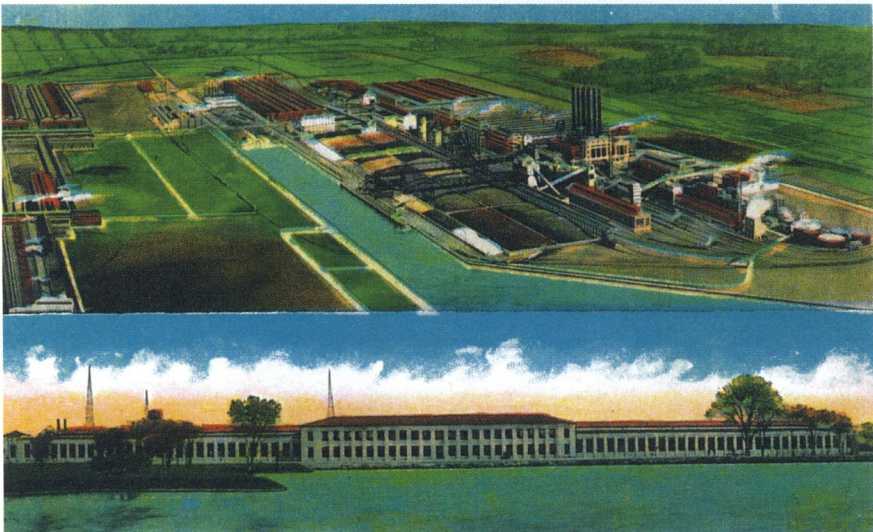
**Charles Sheeler, "Criss-Crossed Conveyors – Ford Plant"**

© The Lane Collection. Photograph courtesy Museum of Fine Arts, Boston





**Detroit Industry, north wall (detail), Diego Rivera, 1932-33, fresco, Detroit Institute of Arts**



**"River Rouge Plant and Administration Building, Ford Motor Company, Detroit, Michigan," National News Company, Detroit, Michigan**

after the Russian Revolution, a debate broke out within and around the Soviet Communist Party about to what extent capitalist approaches to production – particularly the system of scientific management associated with Fredrick Winslow Taylor – should be adopted or if a different model of production that reflected socialist values and the needs of the newly empowered working class could be developed. The debate continued into the mid-1920s, when the advocates of adopting Western methods, including the assembly line, carried the day.<sup>38</sup>

The toll of the civil war, including the loss of skilled workers and the enormous challenge of economic reconstruction, bolstered the case among Bolshevik leaders for adopting methods developed under capitalism. Leon Trotsky put it sharply in 1926, not long before his banishment from power: “The fundamental, main, and most important task is to abolish poverty. It is necessary that human labor shall produce the maximum possible quantity of goods.... A high productivity of labor cannot be achieved without mechanization and automation, the finished expression of which is the conveyor [assembly line].... A voyage in a boat propelled by oars demands great personal creativity. A voyage in a steamboat is more ‘monotonous’ but more comfortable and more certain. Moreover, you can’t cross the ocean in a rowboat. And we have to cross an ocean of human need.”<sup>39</sup>

Ironically, it was Trotsky’s rival (and eventual murderer), Joseph Stalin, who co-opted this hard-headed belief (which Lenin had shared) in the need to adopt Western-style industrialization to build socialism, equating mechanization, mass production, and giant factories with progress, civilization, and modernity. Under Stalin’s leadership, the Soviet Union launched in its first Five-Year Plan a crash program to industrialize, to leap into the future through the construction of giant, integrated production facilities, as many and as quickly as possible.

Lacking engineers, architects, and managers to carry out the heroic task the Communist Party set for the nation, the Soviets turned to the West, especially the United States, admired for its technical advancement and dynamism, if not for its class relations.<sup>40</sup> Albert Kahn’s firm was among the first the Soviets

38. Kenneth E. Bailes, “Alexei Gastev and the Soviet Controversy over Taylorism, 1918–24,” *Soviet Studies*, 29 (July 1977), 373–394; Judith A. Merkle, *Management and Ideology: The Legacy of the International Scientific Management Movement* (Berkeley 1980), 103–135; Daniel A. Wren and Arthur G. Bedeian, “The Taylorization of Lenin: rhetoric or reality?,” *International Journal of Social Economics*, 31 (2004), 287–299.

39. Steve Fraser, “The ‘New Unionism’ and the ‘New Economic Policy,’” in James E. Cronin and Carmen Sirianni, eds., *Work, Community, and Power: The Experience of Labor in Europe and America, 1900–1925* (Philadelphia 1983), 183–84; Leon Trotsky, “Culture and Socialism,” *Krasnaya Nov*, 6 (3 February 1926), translated by Brian Pearce, in Trotsky, *Problems of Everyday Life and Other Writings on Culture and Science* (New York 1973), 244.

40. Stephen Kotchin, *Magnetic Mountain: Stalinism as a Civilization* (Berkeley 1995), 32, 43, 69–70. As early as 1920, Lenin declared “We are willing to pay out to foreign capital hundreds



hired, in 1929 commissioning it to design and oversee the construction of a factory complex in Stalingrad. Pleased with the first plant to be finished – to make tractors – in 1930 the Soviet government engaged the company to design other industrial complexes and train Soviet engineers and architects. Albert's brother Moritz ran a substantial company branch in Moscow, helping in the design of over 500 Soviet factories. Other US firms, too, took on work in the USSR, sending teams of experts and hiring locally in crash efforts to build large, sophisticated plants incorporating advanced Western technology and production principles. In some instances, they also designed and help build whole cities to accommodate the workers staffing the new plants.<sup>41</sup>

Some Soviet factories directly mimicked US plants. In 1929 the Ford Motor Company helped the Soviets establish the Gorky Auto Works in Niznij Novgorod, modeled on the Rouge, with Albert Kahn reprising his architectural role. Like its template, the plant was huge, employing 32,000 workers.<sup>42</sup> The idea for the gigantic Magnitorgorsk Metallurgical Complex, built near a massive iron deposit in the southern Ural Mountains, and the city of 200,000 erected alongside it, by some accounts came from Stalin after he learned of the US Steel complex in Gary, Indiana. American firms, including Kahn's, were heavily involved in design work for it.<sup>43</sup>

The belief that only crash industrialization could ensure Soviet survival, along with the adoption of the American pattern, helps explain the scale of Soviet plants. But another factor, specific to the Soviet political economy, also came into play. A poorly-functioning centralized planning system often left industrial enterprises short of needed materials and their managers facing the consequences of either failing to meet production targets or of improvising their own shadowy supply networks. In response, industrial and regional leaders sought to build very large urban-industrial complexes which would be maximally self-sufficient, buffering them from the effects of missed targets up the supply chain.<sup>44</sup>

Giant factories had long been symbols of capitalist prowess and sites for its contestation by workers. But the headlong Soviet rush to build giant factories of its own, using Western models and experts, at least implicitly framed methods

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of millions or even billions of dollars in order to get them to develop Russia economically for us." Fraser, "New Unionism," 178.

41. "Great Kahn," *Time*, 13 (20 May 1929), 59; "Austin's Austingrad," *Time* 14 (16 September 1929), 31; "Architects to Russia," *Time*, 15 (20 January 1930), 20; "Industry's Architect," *Time*, 40 (29 June 1942), 42; Bucci, *Albert Kahn*, 46, 90–96.

42. Bucci, *Albert Kahn*, 95–96; Nelson Lichtenstein, *The Most Dangerous Man in Detroit: Walter Reuther and the Fate of American Labor* (New York 1995), 37–45; Victor G. Reuther, *The Brothers Reuther and the Story of the UAW* (Boston 1976), 88–103.

43. Kotchin, *Magnetic Mountain*, 1, 42–43, 47, 363; Bucci, *Albert Kahn*, 92.

44. Patrick Flaherty, "Stalinism in Transition, 1932–1937," *Radical History Review*, 37 (Winter 1987), 48–49.

of production as a technical, not political issue. One journalist, describing the giant auto plant Kahn designed in Stalingrad, said the assembly line was “no longer an issue of disagreement between capitalists and socialists.”<sup>45</sup> Though Henry Ford bitterly opposed unions and radicals at home, he had no compunctions about selling factory equipment to the Soviets, not only to make money but also out of his desire – reflecting his lingering pacifism – to raise living standards and productive capacity in developing nations, thereby forestalling conflicts with more developed ones.<sup>46</sup>

Marshall Berman long ago pointed out the embrace by both capitalist leaders and socialist states of what he called the “‘Faustian model’ of development”: giant, integrated energy and infrastructure projects which would achieve rapid social advancement through sheer willpower.<sup>47</sup> The chroniclers of Faustian development made little distinction between socialist and capitalist projects, both of which were seen as reflecting the same underlying Promethean spirit, the bold grab for modernity. In 1930 Margaret Bourke-White made the first of three visits to the Soviet Union. She claimed to know and care little about Soviet politics. Instead she was drawn by the giant industrialization effort and its effect on the peasantry being pulled into the working class. On her first trip she photographed the dam being built at Dnieprostroi, a collective farm, a cement factory, and the Albert Kahn-designed tractor plant in Stalingrad. On her second trip, at the invitation of the Soviet government, she documented the construction of the Magnitorgorsk complex. Though Bourke-White was developing a greater interest in workers as well as their work sites, the way she photographed Soviet industry did not differ from her approach to American subjects. Like many other Western intellectuals and artists, Bourke-White shared the “machine worship” she reported finding everywhere in the Soviet Union.<sup>48</sup>

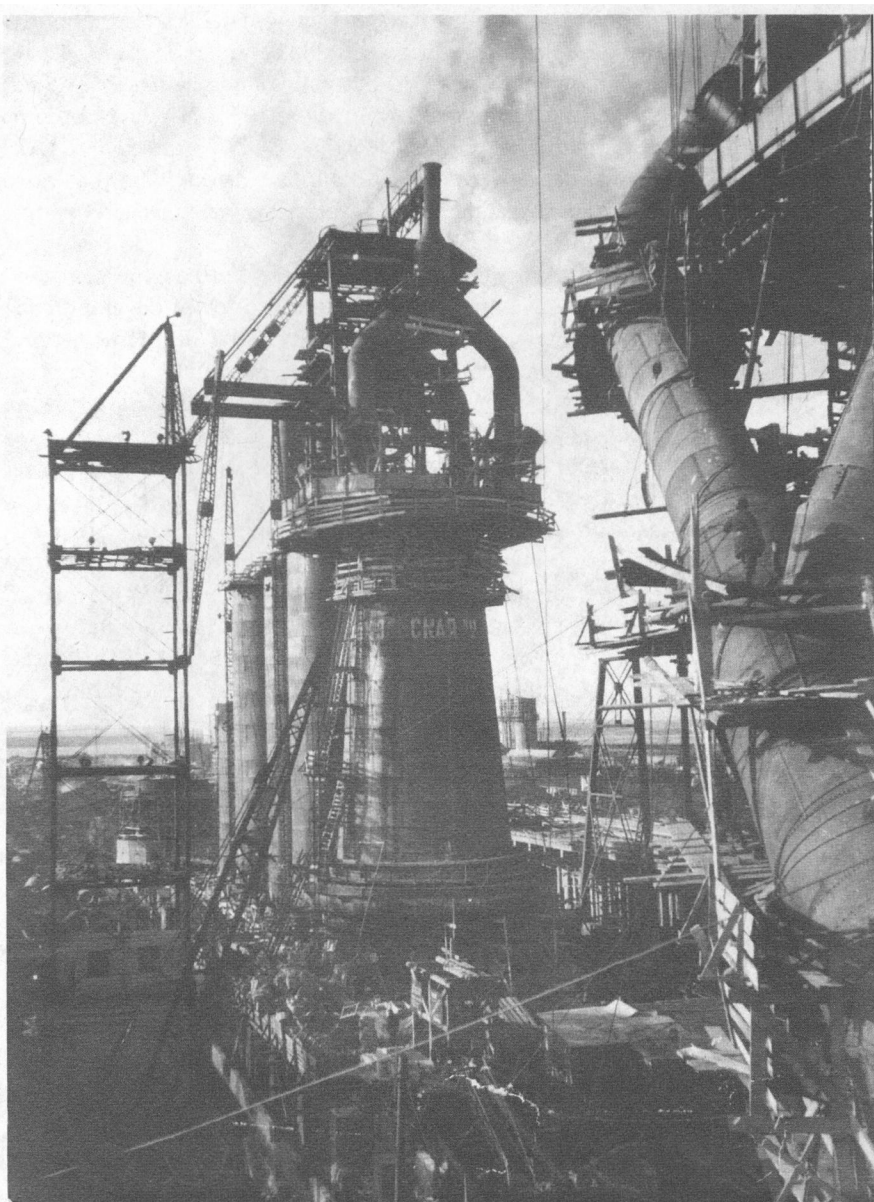
After World War II, the fate of the giant factory diverged in the capitalist and communist blocs. In the United States, large manufacturing companies accelerated a trend that had begun before the war toward decentralizing operations from a few giant complexes to multiple mid-sized plants. Labour militancy

45. Bucci, *Albert Kahn*, 92.

46. Bucci, *Albert Kahn*, 95; Reuther, *Brothers Reuther*, 91. During and after World War II, theories of convergence between communist and capitalist countries proliferated, resting in part on the similarity of their large-scale, bureaucratized, productive systems. See, for example, James Burnham, *The Managerial Revolution; What is Happening in the World* (New York 1941) and C.L.R. James, *State Capitalism and World Revolution* (1950; Chicago 1986).

47. Marshall Berman, *All that is Solid Melts into Air: The Experience of Modernity* (New York 1982), 74–78.

48. By the mid-1930s, Bourke-White's visits to the Soviet Union and the impact of the Great Depression at home led her to a greater interest in politics and an embrace – from something of a distance – of the American left. Bourke-White, *Portrait of Myself*, 90–93, 99; Goldberg, *Margaret Bourke-White*, 128–132; Jonathan Silverman, *For the World to See: The Life of Margaret Bourke-White* (New York 1983), 28–57, 74–81.



**Margaret Bourke-White, Magnitogorsk, USSR, 1931, photograph, Special Collections  
Research Center, Syracuse University**  
© Estate of Margaret Bourke-White/Licensed by VAGA, New York, NY

was a major factor in the widespread industrial reorganization. The automobile and rubber industry strikes that began in 1935 and continued through the war demonstrated the vulnerability of highly centralized production systems, as the interruption of operations at key large factories, such as the Goodyear Rubber complex in Akron, Ohio, the General Motors plants in Flint, Michigan, and the Ford River Rouge plant, brought the entire production of their parent companies to a virtual halt. The post-World War II strike wave, the largest in United States history, further highlighted the danger for employers of the concentration of large numbers of employees in dense urban centers, where working-class solidarity could develop in neighborhoods, churches, bars, and other social venues, as well as within plant gates. Many companies sought to avoid a rerun of these displays of worker power by dispersing production facilities to smaller plants in suburbs or to less-industrialized parts of the country than the Northeast-Midwestern manufacturing belt, where most giant factories were located. Dispersion also moved production closer to markets in the rapidly developing West and the underserved South. Government policy facilitated the movement in multiple ways, from the sale of large surplus wartime government facilities to private companies (like the war plant in Louisville, Kentucky which became General Electric's Appliance Park) to the construction of improved highways making rural plant locations more practical.<sup>49</sup>

The shrinking of plant size could be dramatic. In Schenectady, New York, where during World War II General Electric had 40,000 workers, employment at the factory that made heavy-current products fell from 20,000 in 1954 to 8,500 in 1965, as manufacturing was dispersed to factories in Virginia, Maryland, Indiana, Vermont, California, and elsewhere in upstate New York. Almost all production by the electronics giant RCA in the mid-1930s occurred at its Camden, New Jersey complex, with nearly 10,000 workers. By 1953, only 700 jobs remained, the rest spread among plants in California, Virginia, Pennsylvania, Michigan, and Indiana. River Rouge went from employing 85,000 workers in 1945 to 54,000 workers in 1954 and 30,000 in 1960 (which still made it among the largest factories in the country). Whatever efficiencies of scale companies once felt they could obtain by concentrating production in a few massive factories were outweighed in their thinking by the resulting vulnerability to company-wide paralysis at the hands of a militant labour movement and the advantages of being closer to consumer markets being reshaped by massive demographic shifts.<sup>50</sup>

49. Irving Bernstein, *Turbulent Years: A History of the American Worker 1933–1941* (Boston 1969), 98–99, 519–551, 589–602, 734–751; Jack Metzgar, “The 1945–1946 Strike Wave,” in Aaron Brenner, Benjamin Day, Immanuel Ness, eds., *The Encyclopedia of Strikes in American History* (Armonk, NY 2009), 216–225; Ronald W. Schatz, *The Electrical Workers: A History of Labor at General Electric and Westinghouse, 1923–1960* (Urbana 1983), 233.

50. Schatz, *Electrical Workers*, 233–35; Jefferson Cowie, *Capital Moves: RCA's 70-Year Quest for Cheap Labor* (Ithaca 1999), 17, 33–34; Thomas J. Sugrue *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit* (Princeton 1998), 125–138; Kim Phillips-Fein,

By contrast, leaders in the socialist bloc, vastly enlarged by the Soviet Union's postwar occupation of Eastern Europe and the communist victory in China, retained a belief in the efficacy of gigantic industrial projects as symbols of national prowess and social progress and a means for rapid economic growth. Nowa Huta – “New Steelworks” – on the outskirts of Cracow embodied the spirit of late Stalinist giantism. The Lenin Steelworks, which at its peak employed 43,000 workers, and the surrounding town, designed to house 100,000 people but by 1985 accommodating 223,000, was among the most important projects in the 1950 Polish Six-Year Plan. The building of Nowa Huta, largely by young workers, drawn from poor, rural parts of the country, was presented by communist leaders as a metaphor for building a new socialist man.

Apparently Polish authorities, unlike American corporate executives, did not worry about concentrating large numbers of workers in one locale, expecting that the very act of creating the new factory city would give its residents a sense of social ownership and responsibility and with that loyalty to the socialist state. But they were wrong. Almost from the start, the new city was plagued by unruly behavior by young workers new from the countryside. Initially much of the trouble was drunkenness, squatting, and other acts of individual misbehavior. But it also included efforts to create Catholic markers and worship sites in a city designed without a single church. In the 1980s, Nowa Huta became a major center for the Solidarity union (as was, more famously, the giant shipbuilding yard in Gdansk). Pressure on Poland's government from a 1988 strike at the steel works contributed to the convening of the Round Table talks, which in turn led to free elections in 1989, an important step toward the unraveling of Eastern European socialism and an end to its vision of utopia resting on massive industrial enterprises.<sup>51</sup>

But the story of giant factories is not over. In recent decades, factories that dwarf even the industrial behemoths of the past have been springing up in China and Southeast Asia. Two factors underlay the latest chapter of factory giantism. First was the opening up, starting in the 1980s, of China and then Vietnam to private and foreign capital, part of massive national efforts to boost living standards and embrace a modernity increasingly measured by global, largely capitalist, standards. Second was the revolution in retailing in the United States and Western Europe, as in many product lines merchants, rather than manufacturers, became the key players in design, marketing, and

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*Invisible Hands: The Making of the Conservative Movement from the New Deal to Reagan* (New York 2009), 87–111.

51. Alison Stenning, “Placing (Post-)Socialism: The Making and Remaking of Nowa Huta, Poland,” *European Urban and Regional Studies*, 7 (April 2000), 99–118; Katherine Lebow, “‘We Are Building a Common Home’: The Moral Economy of Citizenship in Postwar Poland,” in Frank Biess and Robert G. Moeller, eds. *Histories of the Aftermath: The Legacies of the Second World War in Europe* (New York 2010). Andrzej Wajda's great film, *Man of Marble* (Człowiek z Marmuru 1977) is set in Nowa Huta during its construction and subsequent history.



logistics. First in China's Shenzhen Special Enterprise Zone near Hong Kong and then elsewhere in the country and in Vietnam, foreign companies, in many cases based in Hong Kong or Taiwan, were permitted to construct industrial facilities to manufacture parts and assemble products for global merchants and their supply chains. In just a few decades, the result was a second wave of Chinese and Vietnamese industrialization, a rapid increase in the national standards of living, and the construction of the largest factories in human history.<sup>52</sup>

Why are the Asian factories so large? For the most part, it is not as a result of the technical requirements of production. In many cases, workers in these plants work at individual stations assembling sneakers or electric coffee pots or work on relatively short assembly lines. Masses of workers may be under the same roof, but for the most part their labour is individual or in small groups, doing work identical to other individuals or groups nearby, without interacting with them. In this respect, these plants are less like River Rouge or Magnitogorsk and more like the early English textile mills, where weavers or spinners sat side by side doing individual tasks.<sup>53</sup>

It is not clear what if any efficiencies in production come from having 1 plant with 100,000 workers as opposed to, say, 5 plants with 20,000 workers or 20 plants with 5,000 workers. In his classic 1990 study, *Scale and Scope*, Alfred D. Chandler, Jr., after noting that at one point close to a quarter of the world's production of kerosene came from just three Standard Oil refineries, wrote "Imagine the *diseconomies* of scale that would result from placing close to one-fourth of the world's production of shoes, textiles or lumber into three factories or mills! In those instances the administrative coordination of the operation of miles and miles of machines and the huge concentration of labor needed to operate those machines would make neither economic nor social sense."<sup>54</sup> Yet just that has happened in the production of iPhones, other electronic gadgets, and some types of footwear.

52. During China's opening up to private enterprise, two phrases commonly used to characterize the historic switch were "search for modernity" and "quest for globability." Ironically, the sprouting of giant Asian factories occurred just as many Western scholars were declaring the age of Fordism over. Pun Ngai, *Made in China: Women Factory Workers in a Global Workplace* (Durham, NC 2005), 4; Nelson Lichtenstein, "Wal-Mart's Tale of Two Cities: From Bentonville to Shenzhen," *New Labor Forum*, 15 (Summer 2006) 8–19; Richard P. Applebaum, "Giant Transnational Contractors in East Asia: Emergent Trends in Global Supply Chains," *Competition & Change*, 12 (March 2008), 69–87; Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York 1984).

53. Ngai, *Made in China*, 81. The work of Toronto photographer Ed Burtynsky captures the individual or small group character of production in many of the giant Asian factories. See the mistitled "Endless Assembly Lines and Giant Cafeterias; Inside China's Vast Factories," <[http://www.wired.com/science/planetearth/multimedia/2007/06/gallery\\_burtynsky\\_china](http://www.wired.com/science/planetearth/multimedia/2007/06/gallery_burtynsky_china)> (8 July 2013) or Jennifer Baichwal's film about Burtynsky in China, *Manufactured Landscapes* (Foundry Films and National Film Board of Canada 2006).

54. Chandler, Jr., *Scale and Scope*, 25.

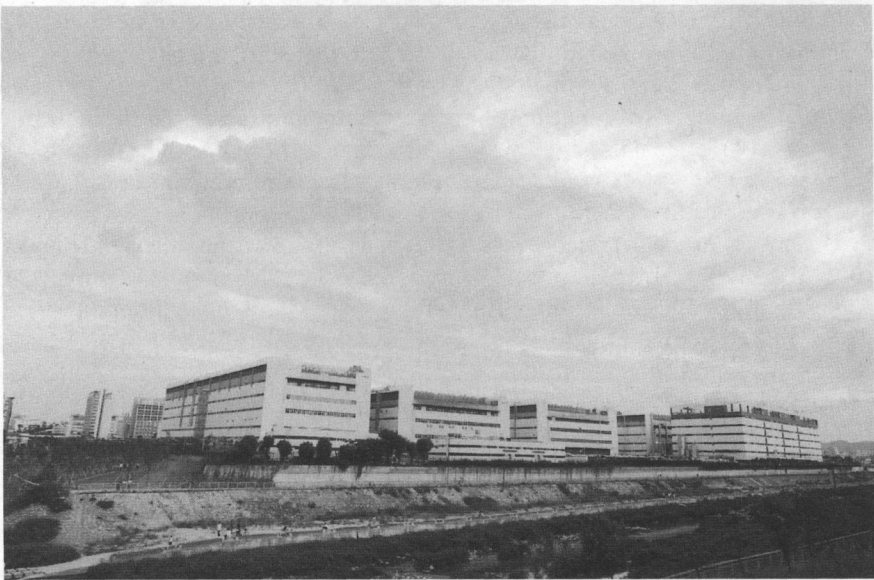


**Workers making Reebok shoes in a factory in Ho Chi City, Vietnam, 1977**  
 Peter Charlesworth/Getty Images

Measured simply by unit cost, there may not be economies of scale – or very significant ones, anyway – in the latest turn to giantism. But giant factories are well-suited to the needs of the giant retailers which now dominate world supply chains. It is to their advantage to be able to go to a single factory or just a few to quickly fulfill a massive order for this or that product. Housing a large percentage of their work forces in nearby dormitories and disregarding overtime regulations enhances the ability of these plants to rapidly respond to the needs of their customers. In 2007 Apple redesigned the screen of the iPhone just weeks before it was due to go on sale. When near midnight the new screens arrived at a Chinese factory, 8,000 workers in dormitories were woken up and almost immediately put to work on a 12-hour shift installing them.<sup>55</sup>

What is the significance of the newest industrial behemoths? In some ways they represent continuity with the early days of the industrial revolution, at least in the United States. Like the Lowell textile mills, the large Chinese and Vietnamese factories have been heavily dependent on young women, coming from the countryside for work intervals before marriage. Being a “dagong-mei” – a migrant worker – has been embraced by millions of Chinese women as a way to help their families with cash remittances, save money, and see

55. Applebaum, “Giant Transnational Contractors,” 71; Lichtenstein, “Wal-Mart’s Tale of Two Cities,” 11; Duhigg and Bradsher, “How the U.S. Lost Out on iPhone Work.”



**Foxconn factory, Shenzhen, Guangdong, China, 2010**  
Yu Lian/China Foto Press

something of urban life before settling down back in their birthplaces, where they know they will be spending most of their lives as a result of the residency permit system, which blocks them from moving permanently to urban areas.<sup>56</sup>

For many of these temporary workers, the factory represents modernity and even emancipation, just as previous iterations of the giant factory once did. Most of the outsized Asian plants are new and, unlike many of the smaller productive facilities across the continent, modern looking, neat, air-conditioned, and well lit. Some have associated cultural facilities, like libraries or discos, echoing amenities provided in Lowell and the Soviet industrial complexes in previous eras.<sup>57</sup>

But in other ways, the current giant factories differ from their predecessors. For one thing, it is hard to hold them up as sources of national pride, as steel mills in Braddock, Pennsylvania or Nowa Huta once had been, since they are largely foreign owned, run by foreign managers, and make goods largely for consumption out of the country. Furthermore, they seem devoid of the heroic overtones that were associated with earlier, large scale industrial projects or with modern infrastructure projects in China, like dams and high-speed rail lines.

56. Ngai, *Made in China*, 40–75; Hong, “Workers Strike at Nike Contract Factory.”

57. Ngai, *Made in China*, 32, 109–32; Lichtenstein, “Wal-Mart’s Tale of Two Cities,” 15–16.

In part, this is an issue of gender; modern apparel and electronic plants are heavily staffed by women, unlike steel and auto factories and big construction sites, where men have dominated the work force, and largely still do. Female-dominated industries sometimes have been associated with utopian dreams, like the early New England textile mills, but Promethean daring generally has been associated with brawny, male workers, workers resembling the common portrayal of Prometheus himself.<sup>58</sup>

The nature of the products made in the new giant factories also contributes to their banality. The twenty-first century factories with the most employees typically churn out small things, like coffee pots, sneakers, or cellphones, which could fit into a small box or the palm of a hand, not the large, awe-inspiring beams, rails, and vehicles produced by the largest nineteenth and twentieth-century factories.<sup>59</sup> Images of Chinese factories do not celebrate machines or man's mastery of nature, but rather either document bland, generic structures or portray repetitiveness, size as endless replication.<sup>60</sup> Billions of people, worldwide, may want iPhones or Nike sneakers and see them as symbols of modernity, but they lack the world-historic aura of the products that came out of the giant steel mills and auto plants of yore. Modernity, Foxxcon style, may be associated with higher living standards and innovative technology but not with a new phase of human history, as giant factories once were, whether it be the coming of a new type of class society in England and the United States or a new type of classless society in the Soviet Union and Poland.

58. For example, compare two collections of images by the pioneer American photographer Lewis W. Hine: Hine, *Men at Work: Photographic Studies of Modern Men and Machines* (1932; New York 1977) and Jonathan L. Doherty, ed., *Women at Work: 153 Photographs by Lewis W. Hine* (New York 1981).

59. Airplane factories do not neatly fit into this typology; they are physically huge (the Boeing plant in Everett, Washington is the largest building in the world), produce large products, and command considerable public interest, with both Boeing and Airbus offering popular tours of their main facilities. But these plants employ fewer workers than the giant, Asian consumer product factories. "History of Boeing and the Everett site," Boeing corporate website, <<http://www.boeing.com/boeing/commercial/facilities/index.page?>> (1 July 2013); Steve Wilhelm, "Boeing's worker head count will start falling next year," *Puget Sound Business Journal*, 3 May 2012, <<http://www.bizjournals.com/seattle/news/2012/05/03/boeings-worker-head-count-will-start.html?page=all>> (1 July 2013); "Plant Tours of Key Airbus Facilities," Airbus corporate website, <<http://www.airbus.com/company/aircraft-manufacture/how-is-an-aircraft-built/>> (1 July 2013).

60. Countless examples can be seen by doing a Google search for images of Chinese factories. See, for example, <[www.google.com/search?q=chinese+factories&source=lnms&tbn=isch&sa=X&ei=WdjeUcHNNvTi4AP3yoHIDQ&ved=0CAcQ\\_AUoAQ&biw=1280&bih=923#facrc=\\_&imgdii=\\_&imgsrc=MxnIaTFoWNSTzM%3A%3Bn5KAAw8AC90aTM%3Bhttp%253A%252F%252Fwww.wired.com%252Fimages%252Fslideshow%252F2007%252F06%252Fgallery\\_%252520burtynsky\\_china%252FCHNA\\_MAN\\_16\\_05.jpg%3Bhttp%253A%252F%252Fwww.wired.com%252Fscience%252Fplanetearth%252Fmultimedia%252F2007%252F06%252Fgallery\\_burtynsky\\_china%3B580%3B444](http://www.google.com/search?q=chinese+factories&source=lnms&tbn=isch&sa=X&ei=WdjeUcHNNvTi4AP3yoHIDQ&ved=0CAcQ_AUoAQ&biw=1280&bih=923#facrc=_&imgdii=_&imgsrc=MxnIaTFoWNSTzM%3A%3Bn5KAAw8AC90aTM%3Bhttp%253A%252F%252Fwww.wired.com%252Fimages%252Fslideshow%252F2007%252F06%252Fgallery_%252520burtynsky_china%252FCHNA_MAN_16_05.jpg%3Bhttp%253A%252F%252Fwww.wired.com%252Fscience%252Fplanetearth%252Fmultimedia%252F2007%252F06%252Fgallery_burtynsky_china%3B580%3B444)> (11 July 2013).

Today we may be seeing the historic apogee of the giant factory. In China, as labour supply problems grow and working-class unrest spreads, massive assemblages of workers may come to be seen by employers as too risky, just like they came to be seen in the mid-twentieth-century US. In poorer countries to which production is being shifted from China, like Bangladesh, the giant factory has not emerged as a dominant form.<sup>61</sup> So perhaps the heyday of the giant factory will soon be over. But the questions raised by the huge industrial facilities of the past and present no doubt will remain with us, at least into the near future: What are the benefits and costs of associating modernity and progress with productivity and ever-growing material output? How ecologically sustainable can it be? Do the methods of large-scale industry inherently reinforce hierarchy and serve the interests of corporate owners and state managers or can they be used to erect a different social system offering workers democratic rights at their place of work and full compensation for their labour? Do we need to “question not the fruits of toil but the toil itself?”<sup>62</sup> For ultimately, it is up to us to decide what kind of future comes next, more than two centuries after big factories began to change our green and pleasant lands (and some not so pleasant ones) forever.

*Steve Fraser, with whom I co-authored a short article on giant factories in New Labor Forum, provided insightful comments on an earlier version of this article. So did other colleagues at the Joseph S. Murphy Institute for Worker Education and Labor Studies at the City University of New York, where I gave a talk incorporating some of this material at a Brown Bag Lunch. Dave Gillespie and Josh Brown helped me locate factory images. Queens College and the Murphy Institute provided assistance in securing reproduction rights.*

*This article is dedicated to the late Marshall Berman, who made me realize how much I do not know.*

61. Ross Perlin, “Chinese Workers Foxconned,” *Dissent*, 60 (Spring 2013), 46–52.

62. James, *State Capitalism and World Revolution*, 114.