

After the Revolution “The American Seduction of Machines and Artisans”

In the second week of November 1787, Phineas Bond, British consul in Philadelphia, received a visit from two English nationals. Thomas Edensor, a cotton merchant from Manchester, and Henry Royle, a calico printer from Chadrirk in Cheshire, were greatly distressed. They feared lynching at the hands of a mob led by the city's leading merchants and they looked to the envoy of His Britannic Majesty's government for shelter. Their story went as follows.

In 1783, concurrent with British recognition of American independence, an Englishman named Benjamin H. Phillips determined to establish a cotton manufactory in America. In spite of severe restrictions on the exportation of textile machinery and the emigration of skilled artisans, Phillips purchased a carding machine and three spinning machines in England, packed them disassembled into crates declared to British customs to contain Wedgwood china, and boarded the U.S. ship *Liberty* at Liverpool bound for Philadelphia. He had earlier sent his son to Philadelphia in anticipation of the machinery's arrival. The elder Phillips died before reaching America and his son received the crates, but lacking his father's knowledge of the machinery he could not reassemble the equipment. He then sold

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it to another Englishmen, Joseph Hague, who managed to assemble it but found he was unable to make it work properly. Having no capital and despairing of covering the operating expenses, in the spring of 1787 Hague sold the equipment to Royle, who in turn sold it to Edemson. Edemson once again disassembled the four machines and shipped them back to England. According to his testimony, he patriotically purchased and repatriated the equipment “to Check the Advancement of the Cotton Manufactory in America.”

In the meantime, a group of Philadelphia merchants, concerned with advancing the cause of U.S. economic independence from Britain to complement the nation’s newly found political independence, had formed the Pennsylvania Society for the Encouragement of Manufactures and the Useful Arts. The group had instigated a search for Hague’s cotton machinery and became infuriated upon learning of its repatriation by Royle and Edemson. The merchants’ wrath turned on the British culprits, who “in great dread of suffering from their Resentment” went into hiding for several weeks. Finally, the fugitives approached Bond for protection, and, in Royle’s case, for money to secure passage back to England. Shocked by the fanatic zeal of “the American Seduction of British Machines and Artisans” and convinced of the real danger of violence his compatriots faced from the leading men of Philadelphia in their quest to acquire “the industrial secrets of the Old World,” Bond paid the fare for Royle and his family out of his own pocket. When the society learned of Royle’s and Edemson’s escape, its leaders publicly rebuked and insulted the British consul.

Not intimidated, Bond set about investigating the incident. His inquiries led him to focus on the slippery character of Hague, who had left the city and was rumored to be back in England attempting to procure more equipment for illegal exportation to America. He notified the British Foreign Office that Hague might be found for arrest in Derbyshire, but by the time the magistrates arrived there Hague was

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gone. He reappeared in Philadelphia the following spring, having successfully smuggled over a new cotton-carding machine.¹ Adding insult to injury, the Pennsylvania legislature awarded him a prize of one hundred dollars on October 3, 1788, for having succeeded in his piracy. The Manufacturing Society trumpeted the achievement in the press and showed little concern for the subject of intellectual property. "It is with great pleasure we learn," it announced,

that the ingenious Artizan, who counterfeited the Carding and Spinning Machine, though not the original inventor (being only the introducer) is likely to receive a premium from the Manufacturing Society, besides a generous prize for his machines; and that it is highly probable our patriotic legislature will not let his merit pass unrewarded by them. Such liberality must have the happy effect of bringing into Pennsylvania other useful Artizans, Machines, and Manufacturing Secrets which will abundantly repay the little advance of the present moment.

The Society urged leading men in other towns to procure protected British textile machines, declaring that the development of home manufacturing was the way "the manufactures of the United States must succeed."²

This incident illustrates the volatility involved in the diffusion of technical knowledge across the Atlantic in the years immediately following the Revolution. In the battle over industrial skill and technology, agents of piracy in one incident would appear as protectors of patents in another. One of the protectors of British industrial secrets in the 1787 incident, Henry Royle, had offered his services to Franklin as part of the Stockport group earlier in the decade. Now Royle's life was in danger because he had participated in the return of Phillips's and Hague's machine to England. Royle's inconsistency, change of heart, or newfound loyalty to Britain demonstrates the fluidity of a situation in which ideas about national ownership of innovation depended on the geographical perspective of the beholder.

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The transfer of protected European technology was a prominent feature of the economic, political and diplomatic life of the North American confederation from its first moments as an independent political entity. In the decades before the Revolution, European commentators who wondered what could account for the phenomenal demographic, territorial, and economic boom in the colonies attributed it to the transfer of social and cultural capital, in the form of the European approach to the application of knowledge.³ The simultaneous timing of severing the political ties with Britain and the boom in British industrial innovation complicated the agendas of the revolutionaries bent on striking a new and independent course. Governments, companies, and individuals actively sponsored industrial espionage in hopes of using the lower costs of raw materials and the higher wages in the New World to propel the young republic into a prominent position in the emerging competitive industrial world market.

In the political vacuum created by the Revolution and its immediate aftermath, however, private voluntary initiatives by individuals and ad hoc organizations played an inordinately large role in this process. The impotence of governments to even feed and provide clothes for Washington's troops during the Revolution, and their helplessness in the face of the economic depression that followed, undermined public confidence in their ability to deliver services, let alone initiate complex policies to develop American manufactures.⁴ Hence it was private proponents of industrialization that undertook the project of importing forbidden European technology to the United States. In some sense, these Americans acted as if they subscribed to Franklin's rejection of politically bounded intellectual property. After all, their efforts to lure artisans and smuggle machines openly flouted rivals' efforts to block the diffusion of industrial knowledge across the Atlantic and challenged the intellectual property laws of other sovereign nations. Yet, these voluntary

activities had little to do with a universalist ideological commitment to the free dissemination of knowledge. The psychologies of the efforts to appropriate Europe's forbidden know-how in the post-revolutionary era were particularist, protectionist, and nationalist. They affirmed rather than challenged the confinement of ideas and innovations within political entities and foreshadowed the direction of American thinking about international intellectual property in the decades to come.

The Industrialists' Agenda

The events of November 1787 in Philadelphia reveal a fundamental aspect of the psychology of technology transfer in the aftermath of the American Revolution. The activities of Hague and the prominent citizens of the Pennsylvania Society for the Encouragement of Manufactures reflected their conviction that smuggling British technology to the United States was indispensable to American industrialization. The energetic response on the side of Bond reflects a similar attitude in England. But were these sentiments well founded? Could the young nation have developed its manufacturing independently? Was English technology indispensable? Most historians of the economy of the early republic have rejected the myth of North American technological inferiority vis-à-vis Great Britain. True, the young republic had neither the industrial economy nor the factories, experts, and sophisticated machinery of Britain. But in the American context the specialized skilled mechanic in charge of a specific stage in the production process was hampered by the labor shortage. Such a worker would have had difficulties finding the necessary skilled helpers. The specialized mechanic was in the American context less useful than the jack-of-all-trades.⁵

Indeed, some Americans believed that the new nation could carve its own path to industrialization and that the home manufac-

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turing already taking place in America in the postrevolutionary era answered most of the country's industrial needs. A Philadelphia man returning in 1789 after two years in Europe wrote an enthusiastic essay about the improvements in American manufactures during his absence. Given such immense progress in such a very short time, he argued, the need to emulate European technology had ceased to be urgent. The popular image of American workers in the early republic—excellent at performing multiple basic tasks yet far behind their European counterparts in expert innovations—is inaccurate. Many American artisans honed specialized skills and some developed technological breakthroughs that were hitherto unknown to Europeans. Nathan Sellers of Philadelphia, for example, developed in the 1780s a method of making wire screen molds needed by papermakers for turning their pulp into paper—a process that was to be emulated in England some ten years later. Oliver Evans of Newcastle, Delaware, developed a machine that dramatically improved wool carding. Whereas before each household spinner had to produce by hand the cards necessary to align the fibers of wool before spinning, Evans's device spared women this tedious labor, thereby making the "American age of homespun" possible. And newspapers occasionally published reports of industrial successes that eliminated the need to import goods from the Old World. The *New Haven Gazette* informed its readers in 1787 that "the manufacture of nails is brought to such perfection throughout the United States, as to stop the importation of that article." The paper predicted that America would soon rival "Great Britain in many other branches of manufacture."⁶

For all the impressive accomplishments of individual Americans, the Industrial Revolution was characterized by mechanization, the factory, and increased production, and in all three the English textile industry blazed the trail. Contemporaries surely saw it this way. Foreigners traveling through England were struck by the higher standard of living that ordinary women and men enjoyed in comparison

to those in the rest of Europe. They understood the causal relationship between technological development and a higher standard of living. Eighteenth-century economists explained that replacing human labor with machinery increased productivity and made for higher wages; that disposable income in the pockets of consumers increased demand for manufactured items; and that the rise in demand made for greater prosperity. American and European eighteenth-century political leaders and manufacturers clearly believed England was the technological leader of the Industrial Revolution. The extent of the foreign espionage effort in England decisively demonstrates the intense international desire for English technology. Contemporaries believed in the centrality of the new technology to successful industrialization and conceived of creative ways to snatch it away. The American press openly celebrated the successful appropriation of forbidden British textile technologies. Silas Deane, in trouble with the Continental Congress and somewhat disenchanted with the Patriot cause, wrote Robert Morris in June 1781 that even after the American victory, the superiority of British industry was so overwhelming that the young nation would "take at least three-fourth of all the European articles she wants from Great Britain." Deane explained that everyone "who has had an opportunity of comparing the manufactures of one nation in Europe with another, or observing the different modes and principles of transmitting business, will at once give England and her merchants the preference."⁷⁷ And American consumers expressed their appreciation and admiration of English manufactures. The end of the Revolutionary War ushered in frantic purchasing of English imports. In fact, simply knowing that an item had been manufactured in England was enough to make it desirable to the former colonists.

Even the most patriotic Americans realized that habit and structural economic patterns originating in colonial relationships fostered dependence on European imports and hindered the young

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nation's technological development. Revolutionary calls for cutting off all connections to the Old World were contradicted by the recognition that for all the patriotic pride and talk of self-sufficiency, the United States had to emulate European discoveries. Just before he called for severing all ties with Europe, David Rittenhouse praised the value of scientific discoveries made "by our Philosophic brethren in Europe." Americans admitted that much of their knowledge of their geographical surroundings was acquired "at the great expence of the British Government." Deane toured British factories in the aftermath of the Revolutionary War to learn "their late, & new inventions, & machines of various kinds." The American Philosophical Society, a staunchly patriotic organization, asked clockmaker Owen Biddle in 1781 to give a "historical sketch on those capital inventions and discoveries, which have led to all the subsequent improvements in useful knowledge." Biddle complied with an oration that emphasized the international nature of the accumulation of technical knowledge. He argued that "discoveries have succeeded each other, by a flow and gradual advancement, and that one invention is linked in with and leads to many others, which are remote and unforeseen." The meaning of Biddle's words to the flagship of American intellectual life was clear. Political separation must not be followed by intellectual isolationism.⁸

The anti-British rhetoric of the postrevolutionary era went hand in hand with calls to industrialize. Patriots warned that if the new republic remained dependent on imports from the British empire, the political success of the Revolution would be rendered hollow. Writers bemoaned the "general prevalence of luxury and dissipation, and the decay of public virtue among us," and proposed to break America's dependency on English products by establishing home manufacturing. American addiction to British manufactures meant, wrote Hugh Williamson, that "we have expended more money since the peace, than we have gained." "Cease to import

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Goods from that imperious, insolent, debauched and intriguing Kingdom of *Great Britain*,” cried the *Boston Gazette*. “Abstain from British luxury, extravagance, and dissipation, or *you are an UNDONE PEOPLE.*” In this context, respect for Britain’s intellectual property laws was out of the question. “If we intended to maintain our independence we must try to counteract their machinations” to prevent the dissemination of industrial technology, and appropriate the necessary technology for American industrial development. The emerging consensus was best expressed by an anonymous writer who declared that political independence would not be truly secure until Americans could replace British imports with American manufactured goods.<sup>9</sup>

Independence was thus followed by calls for disseminating European industrial technology, the export of which was prohibited. Benjamin Rush openly celebrated the successful appropriation of a “machine lately brought into this city for lessening the expence of time and hands in spinning.” Robert Bell published in the midst of the Revolutionary War a collection of practical information drawn from European sources regarding various technical issues related to agriculture and manufacturing. Local newspapers followed suit, publishing technical information about British machinery. Philadelphia political economist Mathew Carey argued that these technical descriptions were being disseminated for patriotic reasons. Publishers hoped to “induce some patriotic persons to undertake a fine manufacture so likely to be of essential benefit to the country.” Ambivalence about the morality of appropriating the fruits of the intellectual efforts of foreigners was nowhere to be found. As the *Pennsylvania Gazette* declared, “Machines appear to be objects of immense consequence to this country.” It was thus the new republic’s right to “borrow of Europe their inventions.”<sup>10</sup>

James Watt’s improvement of the steam engine, in particular, fired up the American imagination. Audiences received their first

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full description of Watt's new engine in the July 1788 issue of the *Columbian Magazine*. The first steam engine, developed by Thomas Newcomen in 1705, was wasteful of energy and its main application in England, pumping water out of coal mines, was of little use in the colonies which did not rely on coal for energy. Watt's initial innovation, developed in 1768 and patented the following year, found a more efficient and more powerful way to address the problem of water in mines. After Watt successfully converted the energy from the steam engine to a rotary motion, Richard Arkwright and his assignees bought Boulton and Watt steam engines to run cotton spinning machinery in Manchester. The introduction of steam power sharply lowered the cost of spinning cotton into yarn and weaving yarn into fabric. The adaptation of the steam engine to other industries had the potential to dramatically increase the production capacity of North American industries, which were heavily dependent on human and animal energy. Deane reported that the new steam technology enabled English manufacturers to produce cheaper products despite the high cost of labor, and he offered, if given sufficient reward, to introduce the steam engine into the United States. James Rumsey and John Fitch set out in the second half of the 1780s to apply a steam engine to marine transportation. Fitch enlisted English immigrants to try and duplicate the Watt engine in America. Although several leading Americans lent their financial support to his cause, Fitch failed to produce an economically viable steamboat because he insisted on using American-made rather than British-made engines, while Rumsey spent several years in Britain and France consulting various engineers but never succeeded in building a boat.<sup>11</sup>

Machine importation, however, was problematic. Americans could not build European machinery from manuals since most inventions were kept secret. Even those published in magazines were not translatable into actual machines because descriptions and

drawings generally lacked specificity and clarity.<sup>12</sup> In theory, the public in the London patent office could access patented English inventions during the term of the patent, but the knowledge required to conduct an effective search rendered copying specifications all but impossible. In fact, Arkwright intentionally registered his 1782 patents in an incoherent manner to “guard against foreigners.” Seventeenth- and eighteenth-century technical improvements originated in individuals’ responses to specific situations that involved thinking about a mechanical problem in a nonverbal manner. Manufacturing processes were connected to those that preceded them and those that followed, and all links in the manufacturing chain were closely dependent on local sources of energy and raw materials. Moreover, once a machine arrived in the New World, only those who had worked on a similar one in Britain could put it together and operate it. The various subsidized iron factories of the Revolution faltered because of the lack of skilled laborers. The carding machines Bond had acquired and sent to England sat idle in Philadelphia for more than three years because no one knew how to assemble them and put them to work. Successful acquisition of prohibited English industrial knowledge depended on the emigration of skilled operators and managers of English factories.<sup>13</sup>

As soon as American entrepreneurs began to establish factories in the 1780s they realized that the absence of skilled operators, for a water frame in New England or a spinning mule in Philadelphia, hindered their efforts. Samuel Wetherill, patron of the failed United Company of Philadelphia which tried to establish textile manufacturing from 1775 to 1778, reflected years later that the biggest hurdle “which occurs in so arduous an undertaking, as attempting to establish manufactures in a country not much acquainted with them,” was “finding artists and making machines without models.” For the nascent American industries of the 1780s, labor shortages created two problems. First, the shortage of skilled workers hindered successful

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emulation of British manufactures. Second, the scarcity of skilled workers allowed the few capable artisans to demand and receive high wages that undermined the price competitiveness of American manufacturing. A New Haven newspaper published "Hints to Manufacturers" that warned potential industrialists that the cost of "labour is from about twelve to twenty percent higher in Connecticut, than in England." And William Barton explained in a widely read treatise that the high cost of labor in America "would be a considerable obstruction to the establishment of domestic manufactures." The new nation was not naturally inclined toward manufacturing, declared an anonymous writer, "because nature has not formed us artists and mechanics, and given us from our birth all the wisdom and experience of old countries and taught us the mystery of being industrious and working cheap."<sup>14</sup>

Champions of industry turned their attention to recruiting skilled artisans and machine operators. The first issue of Mathew Carey's *American Museum* ran a letter that elaborated on the connection between national interest, industrialization, and the promotion of emigration. "As it is the wisdom of America to discourage the importation from Europe of those things she is able to make—so it is equally her wisdom to encourage emigrations from Europe." The emigrants America needed were "the industrious poor" who were "chiefly bred to trades and mechanical business." Another essayist emphasized the importance of attracting to America artisans who would continue to practice their trades in the United States, thereby contributing to the economic development of the nation.<sup>15</sup>

Successful recruitment depended on the construction of a local industrial base where these workers could be employed and ensuring that the wages and working conditions in American factories were sufficiently lucrative to discourage industrial immigrants from abandoning their trades for agriculture. Some suggested offering eight to ten acres of land to prospective industrial immigrants. The

"small quantity of Land" appropriated to each would prevent them from turning to Agriculture and "be sufficient for all the purposes of manufacturing." Artisans who came to America, wrote a proponent of manufacturing, "are turning their attention to other occupations." Unless American manufacturers acted quickly, "collected" them in urban settings, and created employment opportunities for the "many artisans and tradesmen now among us," their precious industrial skills would be forever lost to the manufacturing sector. Benjamin Rush wrote that by establishing "woolen, cotton and linen manufactories in this country, we shall invite manufacturers from every part of Europe, particularly from Britain and Ireland, to come and settle among us." The goal was to attract skilled artisans who in turn would improve American capacity for industrial production: "we stretch forth a hand from the ark to invite the timid manufacturers to come in." At the same time, industrial development, by the employment it would offer, promised to "encourage thousands to come and settle in America." Twelve years later Rush's idea was endorsed by another champion of American manufacturing who argued in the *American Museum* that if industrial emigrants could "be assured of employment and encouragement in coming to America, I am persuaded that some thousands would soon visit these shores. We should soon have a competent number of workmen to carry on most kinds of manufactures. There would, in a short time, be no necessity to import a single article" of manufactures.<sup>16</sup>

In order to attract skilled workers, then, industrialists needed to establish factories. Yet, these factories could not be established without specific instruction from those who had worked in them in the Old World. Many Americans did not want to wait for the arrival of workers with the necessary knowledge and experience and argued for taking active measures to induce immigration. The most popular suggestion was to sponsor the cost of the Atlantic voyages of skilled workers. Others suggested providing "ample provisions" to "me-

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chanics and artizans migrating hither from Europe.”<sup>17</sup> Some sent recruiting agents and others hoped that the popular press and word of mouth would spread the news of the opening of industrial opportunities in America.

Entrepreneurs recognized, however, the need to ensure that even after industrial immigrants set foot on American shores they did not opt for nonindustrial employment. After all, labor scarcity plagued all sectors of the postrevolutionary United States. If the states were to industrialize, then, more workers, skilled and unskilled, had to turn to manufactures. However, the dominant economic sector in North America—agriculture—was also thirsting for laborers. Promoters of American industry understood that the agricultural interests would oppose national sponsorship of competing employment in manufactures. Indeed, prominent politicians envisioned the new nation without manufacturing altogether. John Dickinson announced in his widely circulated *Letters from a Farmer in Pennsylvania* that “this continent is a country of planters, farmers, and fishermen; not of manufacturers.” This view persisted; former physician in chief of the Continental Army John Morgan wrote as late as 1789 that manufacturing was suited to a country “fully stocked with inhabitants.” But the labor shortage meant that industrialization would have to come at the expense of agriculture, the real source of national wealth.<sup>18</sup> To make industrialization politically possible its proponents had to persuade the agriculturalists that the labor pool available to them would not be depleted by the introduction of manufacturing. Societies for the development of American technology often paid more attention to mechanical innovations in agriculture than to those in manufacturing. Agricultural societies were equally interested in emulating European innovations. Proponents of American industrial developments were careful to position manufacturing and agriculture as complementary rather than competing sectors.<sup>19</sup> One popular suggestion was that at least at the unskilled stages, manufacturers

employ women and children, who commanded much lower wages. But this approach would have done little to ameliorate America's technological disadvantages. The workers who could industrialize the United States would come from Europe. As one South Carolinian writer explained in 1786, developing manufacturing was necessary to stop the drain of specie that had followed peace and the resumption of purchasing of English products. After proposing the traditional mercantilist measures to develop manufacturing, tariffs and bounties, he went on to assure readers that American industrialization would not compete with agriculture for the limited supply of American laborers. "I only wish to encourage," he wrote, "European tradesmen to come and reside here; their numbers will add strength to us, and enable the planters, without danger, to keep a greater number of hands in the field."<sup>20</sup>

Champions of industrialization succeeded in making overcoming American technological backwardness a national priority. Sponsorship of manufacturing skill, declared the *Pennsylvania Gazette*, by either the private or the public sectors, was the "duty of every friend to America, at home and abroad." At stake was not only the economic well-being of the residents of the newly independent states, but the entire republican experiment. Rush, who like many of his contemporaries believed that the interests of the United States and the cause of human freedom were one and the same, explained that he favored encouraging industrial workers to cross the Atlantic not only as a way to develop American manufactures, but also as a humanitarian gesture by the messenger of republicanism, reaching out with a helping hand to the suffering masses of Europe. "By bringing manufacturers into this land of liberty and plenty," he declared, "we recover them from the torpid state in which they existed in their own country and place them in circumstances which enable them to become husbands and fathers, and thus we add to the general tide of human happiness."<sup>21</sup> In the eyes of patriots, the

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particularist interests of American manufactures merged with the universal language of the Revolution in a manner that took little account of the rules and regulations of others.

### Voluntary Associations for Acquiring Technology

Proponents of American development emerged from the Revolution with heightened awareness of the nation's technological backwardness. The zeal for developing American manufactures was organized and expressed by voluntary industrial associations. The Continental Congress, spurred on by John Adams, called on the legislatures of the various states in March 1776 to establish societies "for the improvement of agriculture, arts, manufactures, and commerce." It encouraged these societies to communicate their developments to each other to make sure that the "rich and numerous natural advantages of this country, for supporting its inhabitants, may not be neglected," and specifically urged them to consider "ways and means of introducing the manufactures of duck and sail cloth, and steel."<sup>22</sup>

The period from the mid 1780s to the early 1790s saw the formation of societies for promoting American manufactures in towns from Burlington to Wilmington. "Every well-wisher of his country," declared one enthusiast, "ought to rejoice, when he is informed, that not only great men, but great associations also, do their utmost, to favour and assist the establishment and progress, of the Manufactures of their country."<sup>23</sup> Some associations actively participated in establishing factories in America and in recruiting European artisans to migrate to the United States. Most required their members to pledge publicly to wear only American-made clothes. Upgrading American industrial technology was at the top of their priorities.

The American associations were modeled after London's Society

of Arts, established in 1754, which sponsored fine arts as well as improved techniques in industry and agriculture. The London society was interested exclusively in knowledge that could be applied to practical uses. Its principal method of sponsorship was awarding premiums to individual innovators who improved output. Prior to the Revolution, the London society offered premiums to American innovation, dispensing money to various colonial agricultural products from Massachusetts to Georgia. The Connecticut physician Benjamin Gale, for example, received a gold medal from the society in January 1770 for inventing a drill plow.<sup>24</sup>

Initial colonial efforts to form manufacturing societies did not get very far. As early as 1727 Franklin proposed to establish an American Society for the Promotion of Useful Knowledge. He gathered a small group of Philadelphians around him and tried to launch the organization. But the idea failed to take root. In 1743, together with naturalist William Bartram, he drew up a plan for establishing an Academy for Promoting Useful Knowledge among the British Plantations in America, but after initial successes the attempt folded. In 1750 Franklin assembled around him in Philadelphia a group of twelve men committed to the promotion of the pursuit of science and technology in America, but their sporadic meetings ceased altogether by 1762. Then, in 1768, the American Society for Promoting and Propagating Useful Knowledge was established to promote "the Advancement of useful Knowledge and improvement of our Country." It encouraged the introduction "from Abroad, new Species of Plants, Trees, Fruits, Grain &c., suitable to our own Soil and Climate." Aware of the possible negative reaction to its founding among the British manufacturing and mercantile elite, it announced that "Such Discoveries will not only be a Benefit to ourselves, but they will render us more useful to our Mother Country. They will give full Scope to our Industry, without exciting her Jealousy, or interfering

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ing in the least with her Manufactures.”<sup>25</sup> In 1769 the society merged with the American Philosophical Society, a union dominated by the Philosophical Society’s emphasis on theoretical learning. Those interested in practical applications of science to industry formed separate groups, like the Silk Society (1770), and the United Company of Philadelphia for Promoting American Manufactures (1775).

The imperial crisis and the separation from England infused the American technological efforts with cultural nationalism and turned American leaders against the intellectual internationalism of the prerevolutionary era. Virginia’s Arthur Lee, for example, resigned from the Royal Society because membership in it was incompatible with his American patriotism. The general sentiment was, as the constitution of the Delaware Society for the Encouragement and Promotion of Manufactories of America declared, that in order “to complete the great fabric, the progress of which has already astonished the world—it becomes the duty of the sons of America to promote the arts and sciences” and that “the attainment of these objects requires various and extended exertions, beyond the power of a few individuals.” American voluntary associations for the promotion of manufactures, free from the constraints of the Empire, pursued a nationalist agenda.<sup>26</sup>

The American societies attracted the social and political elite—leaders who saw an intimate connection between industrialization and political independence. New York’s Society for Promoting Useful Knowledge, launched in 1784, was led by Samuel Bard, an Edinburgh-trained physician, and included prominent politicians like New York State’s governor, George Clinton, New York City’s mayor, James Duane, and the Confederation’s secretary for foreign affairs, John Jay. The Virginia Society for Promoting Useful Knowledge was composed of slave-owning planters. The leadership of the Pennsylvania Society for the Encouragement of Manufactures and the Useful Arts, the

most prominent of these organizations, included Benjamin Franklin, George Clymer, Tench Coxe, Mathew Carey, Samuel Miles, Benjamin Rush, and Samuel Wetherill.<sup>27</sup>

Patriotic rhetoric abounded in the proceedings of the Pennsylvania Society. In announcing its formation in 1787 the board explained that developing manufactures was the premier national task because Americans must now take charge of “promoting and establishing manufactures among ourselves.” Wetherill bemoaned “our late dependence on foreign nations for many of the most useful articles in life,” and called for “great exertions of virtue and industry” to lift America out of its current “disadvantageous situation.” The commercial crisis of the mid 1780s, triggered by the closure of the markets of the slave colonies of the West Indies to American agricultural imports, necessitated the development of home manufacturing. “We feel an hourly diminution of our wealth; and the support of our artificers and labourers is become precarious and difficult,” explained the officials of the society. Should America fail to develop its manufacturing, they warned, “our population will be diminished; our strength as a nation destroyed; and our country reduced to poverty, insignificance and contempt.”<sup>28</sup>

The society openly declared its intention to appropriate forbidden technology from Europe. Indeed, technology piracy occupied a central role in its program to develop American industry. And the nationalist rhetoric used to persuade Americans of its value justified the violation of the British intellectual property laws. The manufacturing committee of the society devoted much of its effort to acquiring English machines and attracting the skilled artisans who could build and operate them. The “want of proper bleach yards and the difficulty of procuring persons well skilled in bleaching,” for example, undermined American ability to manufacture sufficient quantities of linen.<sup>29</sup> It was therefore essential to find a way to bring such knowledge to America.

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The society underwrote the establishment of a textile factory in Philadelphia.<sup>30</sup> Its officials declared that in the context of the high cost of labor in America "the acquisition of machines must be a capital advantage."<sup>31</sup> Technological piracy was the chosen route "to obtain some of those machines, which, by a substitution for manual labour, enable the most agricultural countries to manufacture to very great advantage." Two years after the society's founding a writer in the *American Museum* praised it for fostering "the spirit of emulation" and credited it with the successful birth of American manufacturing.<sup>32</sup> And the society was quite energetic in its efforts. Within a year of its founding it operated a large cotton factory. To be sure, the factory relied for the most part on the labor of two to three hundred women who used hand spinners and jennies to produce linen and yarn. The men, however, used smuggled British machinery, acquired through the efforts of Tench Coxe and his agents, to make British-model carding engines and spinning machines. The first year was declared an economic success and at the parade celebrating the adoption of the new federal constitution members and workers proudly wore their American-made clothing. That the entire operation rested on pirated technology seemed to have mattered to no one.

Tench Coxe became the society's most prominent spokesman. Philadelphia emerged in the last quarter of the eighteenth century as the center of the American efforts to catch up with British technology. The city developed into a magnet for thousands of British skilled artisans who brought with them not only the know-how but also the new capitalist industrial psychology that had developed in English manufacturing towns. Coxe, who became the society's secretary, saw the connection between the arrival of new technologies and the rise of his city. He dabbled in technological piracy as early as 1775 when he was one of the patrons of the failed United Company of Philadelphia. In the early days of the Revolution Coxe entertained

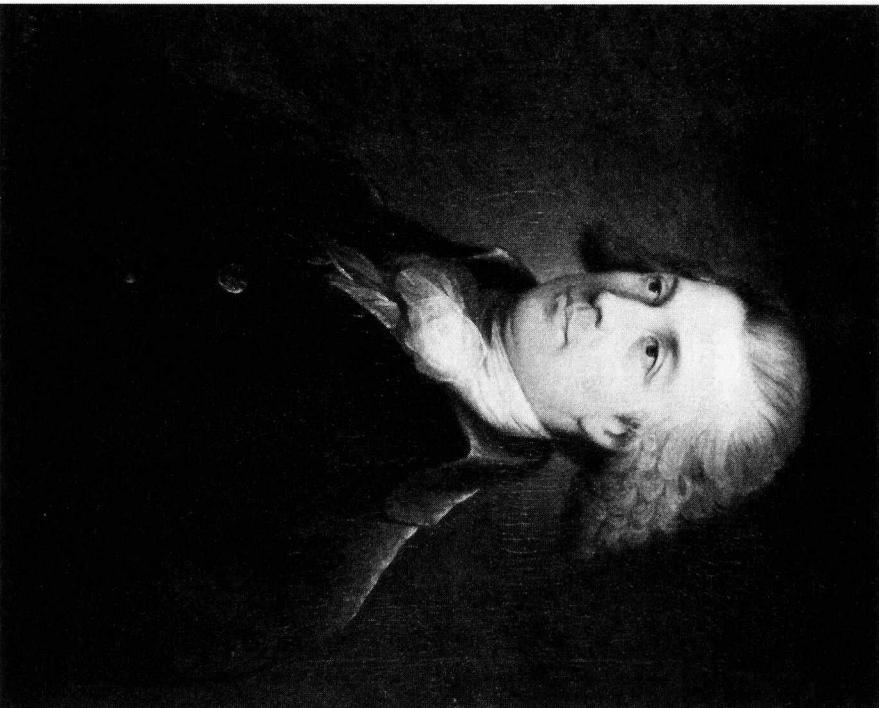


FIGURE 4. Tench Coxe (1755–1824). Portrait by Jeremiah Paul, 1795. Coxe was the leading advocate of industrialization in the young republic through the illicit appropriation of foreign technology. Courtesy of The Historical Society Collection, Atwater Kent Museum of Philadelphia.

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some loyalist sympathies. His dubious patriotic credentials, however, did not hinder his postrevolutionary ascent in Philadelphia's social, political and economic elite. By the late 1780s Coxe was widely recognized as the most prominent and active advocate of American manufactures.<sup>33</sup>

Coxe believed that European manufactures were technologically superior and argued that imported machinery "will give us immense assistance" in launching an independent industrial economy.<sup>34</sup> In the second half of the decade Coxe campaigned in behalf of state and federal support of industrial piracy. He made sure that America's technological backwardness was on the minds of the men who convened in Philadelphia to form the new constitution in the summer of 1787. On May 11, three days before the delegates to the Philadelphia convention were scheduled to begin their deliberations, Coxe addressed the need for government-sponsored industrialization in a passionate talk at the home of Benjamin Franklin. Then, on August 9, while the convention was in session, he explicitly called for importing technology in his inaugural address to the society at the University of Pennsylvania.

The new national government, he told the men gathered at Franklin's house, must support industrialization efforts to provide employment for the many who "will probably emigrate from Europe, who will chuse to continue their trades."<sup>35</sup> Artisans would cross the Atlantic because tyranny, unemployment, low wages, and civil wars in Europe, contrasted with freedom and opportunity in America, "will bring many manufacturers to this asylum for mankind. Ours will be their industry, and what is of still more consequence ours will be their skill." Many of the society's leaders speculated that among the men already arriving in the United States each month there were skilled artisans who could lift the level of American industrial technology. "Is it not, then, a melancholy consideration," asked one member, "that many tradesmen of these descriptions,

after coming to America, are obliged through want of work, to return home again—while many of those who stay, must commence labours to produce a morsel of bread?" Coxe proposed that a committee of the society "visit every ship arriving with passengers from any foreign country, in order to enquire what persons they may have on board capable of contributing useful machines, qualified to carry on manufactures, or coming among us with a view to that kind of employment."<sup>36</sup>

Coxe sang the glories of his homeland and predicted that Europeans would see things similarly and vote with their feet. But he was not content to let the virtues of the United States gradually cause the desired population movement. He implored his listeners and the men devising a new form of government in the summer of 1787 to "Carefully examine the conduct of Other countries in order to possess ourselves of their methods of encouraging manufactures." He made two specific proposals: (1) Grant federally protected exclusive rights over inventions to introducers of technology; (2) Award land grants to skilled Europeans who introduced European machinery to the United States. America's industrial virginity would work in its favor for, if Europeans continued to improve their machinery, "their people must be driven to us for want of employment, and if on the other hand, they should return to manual labor, we shall under work them by these invaluable engines." It is time for the young nation, he declared, to "borrow some of their inventions."<sup>37</sup>

A year later, in the pages of the *American Museum*, Coxe was even blunter. American industrialists had recognized long ago that the "want of workmen, and the high rate of labour" had delayed the development of American manufactures. They resolved to obtain "machines which were said to be in use in foreign countries" since the new machinery required fewer workers to produce greater quantities. This was particularly appropriate in a country like the United States, which suffered chronically from labor shortages. Thus far, "notwith-

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standing the impediments which the natural jealousy and self-interest of mankind have thrown in our way, acquisitions of the utmost consequence have been made." We are not ashamed of our efforts to acquire Europe's industrial secrets, Coxe declared. Americans "heartily rejoice in the early success of our endeavors to obtain them."<sup>38</sup>

Emigration of skilled workers from Europe, Coxe argued, was the optimal solution to America's labor problems. Agriculture, Coxe insisted, would remain the primary sector in the nation's economy. The farming interests need not worry that industrialization would come at the expense of agricultural labor: "there is another grand source from which supplies of manufactures may be obtained—Emigration from foreign Countries. To this end our laws must be made to countenance, assist and protect them." Coxe hoped that the adoption of the new federal constitution would calm those who feared the disorder of the years of the Confederation. He declared: "the door is opened wide, and the call is made in a loud and friendly voice, upon the whole body of European manufacturers, to come out, and sit down among us. The present circumstances of this country, and the universal disposition of the people of the united states, must strongly persuade and encourage them; and we can have no doubt, that very many of this new and valuable class of emigrants will every year repair to America, and make it their home."<sup>39</sup>

When Coxe was writing of technological rivalry, he had only Great Britain in mind. During the colonial period "it was the unvaried policy of Great Britain to discourage manufactures," and after the separation it continued to suffocate the westward flow of technology. When the United States was but a colonial outpost of the British Empire "our progress was very slow, and indeed the necessity of attention to manufacture was not so urgent, as it has become since our assuming an independent station." He believed that Britain was determined to suffocate American manufacturing attempts just as it blocked the development of manufactures in Ireland.<sup>40</sup>

Coxe saw in the involvement of Phineas Bond in the return of the carding and spinning machines that had been smuggled out of Britain an indication that Britain was determined to keep America technology-deficient. Unlike the enraged citizens of Philadelphia who surrounded Bond's home, Coxe saw the events as a natural extension of the international competition over technology. While he bemoaned the loss of machines that could save "the labour of no less than 120 workmen, daily," he understood that Bond had "acted in perfect confidence with the dictates of national and commercial rivalship." In Virginia, British agents bought and burned stocks of cottonseed "to avert the injurious effects, which the extension of the cotton manufactures in America, must produce on the importation of Manchester goods." Such actions, Coxe hoped, should wake American industrialists to the realities of the worldwide all-out competition for technology, and he urged other states to adopt a "prudential spirit of jealousy and circumspection" and follow the example of Pennsylvania that had enacted legislation "to prevent exportation of machines and enticing away artizans."<sup>41</sup>

Coxe did not confine himself to words. In the summer of 1787, he recruited Andrew Mitchell to return to England and pirate English textile technology. Mitchell was to go to England, buy models of machinery, and transport them to France through a French middleman who was to ship them to Philadelphia. The scheme was exposed, British officials seized the trunk containing the illegally obtained models, and Mitchell was forced to escape to a safe haven at Copenhagen.<sup>42</sup> In the same year Coxe entered into a partnership with a Philadelphia clockmaker, Robert Leslie, who was known as a collector of "every model, drawing or description" of European machinery. In 1788 Coxe, together with John Kaighan, reported that the process of coloring leather, while attempted in America, "has not yet been obtained here." They published the process "as communicated by Mr. Philippo, a native of Armenia, who received from the society

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for the encouragement of arts in London, one hundred pounds sterling, and also the gold medal of the society, as a reward for discovering this secret."<sup>43</sup>

Coxe embodied the new American attitude. In the aftermath of independence the United States and Great Britain became political and economic adversaries. American political independence was founded on economic self-sufficiency, which in turn depended on the ability of the young nation to reduce its vast consumption of English imports and manufacture industrial goods at home. The new mood, heightened by wartime demands for military and industrial goods and the postwar desire to prove the compatibility of republican government and a high standard of living, viewed technology as the premier tool to industrial development. The weakness of the national government left the initiative for American industrialization in the hands of voluntary associations like the Philadelphia society and aggressive individuals like Coxe who, capriciously, and without considering the wider implications of their actions, cast a wide net in their effort to lure artisans and technology to the new nation. The intellectual internationalism of the Enlightenment gave way to an exclusive technological nationalism.