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Nationalism, Internationalism, and the Institutionalization of Research
in the Early American Republic: The Case of Plant Science, 1780-1815

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Note to Readers

This is a shortened version of a longer draft-chapter. For a more complete treatment of the ideas sketched in this paper, please see the draft-chapter (which has also been submitted for the ‘Realising the Global University’ conference).

Abstract:

Conventional histories of the American research university locate its origins in the late nineteenth century. This paper shifts the chronology of institutional development back to the late *eighteenth* century and places the rise of a new “research” enterprise in global context. Using the case of plant science—including both agricultural and botanical research—the paper explores the role that colleges, learned societies, state legislatures, and the federal government played in the early institutionalization of research in the United States. Drawing on a wide range of historical sources, the paper advances a three-pronged argument. First, it argues that American scholars in the late eighteenth and early nineteenth centuries won support for the institutionalization of research—in this case, plant research—by stressing its distinctly *national* economic and educational benefits. Second, it argues that institutional development in this period relied fundamentally on Americans’ participation in extensive *international* networks of scholarly exchange. Third, it argues that Americans in the early republic expected research institutions—particularly colleges—to secure both the “self-sufficiency” and the “superiority” of the United States in an increasingly competitive global marketplace. In various ways, the paper contends, the modern university has always been a global institution; it has always been enmeshed in the economic and political struggles of its time; and it has always had difficulty balancing the national(ist) and international(ist) dimensions of its research mission.

I. Introduction

The winter of 1779-1780 was bitterly cold, and it nearly brought the American revolutionary army to its knees. Freezing and hungry under the leadership of George Washington, soldiers buried in snow at Morristown, New Jersey, stole provisions from local farmers to avoid starvation. Mutiny seemed imminent. Yet, even in this dark hour, some remained optimistic. Speaking on March 16, 1780, from a podium at the newly reorganized University of the State of Pennsylvania, fifty-year-old Timothy Matlack, a leader of the “Fighting Quakers” who had joined Philadelphia’s committee of safety in the months before the war, addressed fellow patriots in the American Philosophical Society (of which he was a member). Setting recent military disappointments aside, he turned his attention to a different topic: agriculture.

Specifically, he addressed the need for agricultural research in a time of revolutionary struggle. Despite the depredations of war, he insisted, the university and the American Philosophical Society had an opportunity—perhaps even an obligation—to promote agricultural research in the interest of national development. “In our endeavors to promote the interest and happiness of our country,” Matlack declared, “let us apply to intelligent husbandmen in every part of the state and collect the real knowledge among us. Let us examine, digest, and arrange it into science . . . [for] that country whose citizens make its welfare not only the object of their business but [also] their pleasure cannot fail to become wise and happy and must rise to a height of riches, strength, and glory which the fondest imagination cannot readily conceive.”¹

Expressing his gratitude for the aid the United States had received from its ally France, not only in military assistance but also in scientific cooperation and collaboration, Matlack insisted that American universities must build their capacity to conduct their *own* research to serve their *own* national interests. “We must build upon experiments made in our own climate,” he asserted. “Indeed, our circumstances differ so widely from those of the European world that in some cases it is clearly right to pursue a conduct directly the reverse of theirs.” For example, he observed, “In old countries filled with people—overburdened with inhabitants—it is their interest to improve lands to the utmost possible perfection, [but] in new countries, where there is land in abundance but few people, we ought to make the most of our labor.”²

To “make the most” of American farm labor, Matlack called on the nation’s *colleges*, including the University of the State of Pennsylvania, to foster the development of modern agricultural research and education. “I feel a solid present joy in the certainty that agriculture, as a science, will ere long be taught within these walls,” he noted, adding that “under the auspices of a patriot legislature, science will give the last polish and brightest glow to a learned and useful education. . . . When husbandmen are liberally educated, agriculture and the state will flourish together, will rise to their utmost perfection, and this will soon come to pass. We have seen the representatives of the people liberally endowing that university in which the future husbandman, patriot, and statesman in one must receive his instructions in wisdom and virtue. May their descendants enjoy the benefits for ages to come.”³

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This paper advances a three-pronged argument concerning the institutionalization of scientific research in the early American republic. First, it argues that American scholars won support for the institutionalization of research—in this case, plant research—by emphasizing the distinctly *national* economic and educational benefits of their work. Second, it argues that advances in plant science in the early republic relied fundamentally on American scholars' participation in networks of *international* scientific exchange. Third, it argues that Americans in the late eighteenth and early nineteenth centuries expected new research institutions, particularly colleges, to secure both the economic “self-sufficiency” and the economic “superiority” of the United States in an increasingly competitive global marketplace.

The larger project from which this paper is drawn extends this argument to virtually all fields of scholarly research in the early republic. This paper, however, examines one field, plant science, the importance of which is hard to overemphasize. The United States in the late eighteenth and early nineteenth centuries saw itself as an agrarian republic, and the pursuit of “improvements” in agriculture was a national obsession. Farming, no longer the domain of mere gentleman amateurs, depended increasingly on experimentation and expertise. Every aspect of land management, from machinery to manures, came in for scientific investigation as farmers—the majority of the country's population—looked to research for ways to “make the most” of agricultural labor. Scientific research, they hoped, would boost the productivity (and, in turn, the profitability) of their land.

Therese O'Malley, an historian of American botany and botanic gardens, has examined the role of the plant sciences in the early republic. “In early American botanic gardens,” she explains, “scientific, agricultural, and ornamental interests were inextricably linked. But the naturalization and cultivation of useful plants taking place in these gardens were recognized in particular as essential to the national economy. These gardens were showcases of the natural raw material that was integral to the commercial success of the larger community. Agriculture, always foremost in the American economy, was no longer seen to be in opposition to manufacturing and industrial pursuits. . . . Now agriculture and industry could work together to bring the materials of nature into ultimate production. This utilitarian conception of nature appealed to the country's leaders, who were anxious to teach both self-sufficiency and superiority in terms of the international marketplace.”⁴

The pursuit of national self-sufficiency—as well as superiority in a global market—powerfully affected the institutionalization of plant science in the early republic. As commodity prices rose and fell with the vicissitudes of global trade, landowners sought crops that brought the highest prices, not only locally but also nationally and internationally. Looking to science for help, they compared the disease-resistance of different varieties of wheat, considered the advantages of imported peas over indigenous potatoes, calculated the value of sugar to be exported from native sugar maples, and experimented with numerous soil fertilizers to maximize production and profits. Recognizing that events around the world shaped their individual as well as their national destiny, they saw in research the key to commercial success.

In the quest for scientific innovations (and economic gains), Americans both cooperated and competed with their counterparts abroad. The greatest rewards were perhaps intangible, purely a matter of reputation, but the financial and political rewards could also

be significant. Support for plant science came from a wide range of sources, both public and private: from government, from learned societies, and even from the patronage of foreign powers. By the early decades of the nineteenth century, American *colleges*, staffed by scholars who had botanized around the world, emerged as key players in the institutionalization of plant science. The colleges (of which there were nine in 1780 and twenty-three in 1810) joined a growing number of learned societies to advance the cause of plant science for the sake of economic “self-sufficiency” and “superiority” in a global market.

II. Henry Muhlenberg’s Herbarium

Arguably the father of American botanical research was Henry Muhlenberg, first president of Franklin College in Lancaster, Pennsylvania. Muhlenberg came from a distinguished Pennsylvania family. One brother served as the speaker of the state legislature; another served as the state’s first “vice president” (when the “president” was Benjamin Franklin). All three Muhlenberg brothers had traveled abroad for advanced education at the University of Halle in Saxony, where Henry—whose given name was Gotthilf Heinrich Ernst Muhlenberg—studied theology. Returning in 1770 to assist his father (considered the founder of Lutheranism in America) with a large congregation in Philadelphia, the arrival of British troops in 1777 led him to Lancaster, the wartime capital of the revolutionary government. It was in Lancaster that Muhlenberg began to pursue an interest in botany, an interest he cultivated for the rest of his life.⁵

During the war, Muhlenberg collected plants in the region around Lancaster for his fast-growing herbarium. He shared many of his discoveries with another German botanist, Johann David Schöpf, the one-eyed surgeon-general of Hessian soldiers in occupied Philadelphia (evidently, botany superseded politics). When the war ended in 1783, Schöpf embarked on a two-year botanical tour of the eastern seaboard while Muhlenberg continued his collecting in Lancaster; two years later, Muhlenberg presented his findings—as well as several of Schöpf’s—in a paper delivered to members of the American Philosophical Society, which subsequently elected him to membership. Many of the plants Muhlenberg included in this early paper later appeared in his first published work, *Specimen Flora Lancastriensis*.⁶

Of course, Muhlenberg was not the first to collect or classify North American plants. As early as the mid-seventeenth century, John Tradescant, gardener to Charles I, had begun to gather specimens from the king’s American colonies, and Tradescant’s son (also named John Tradescant), had assembled hundreds of species from Virginia in his natural history museum—“Tradescant’s Ark”—in London. In the meantime, plants collected by David Banister in Virginia as well as David Krieg and William Vernon in Maryland in the late seventeenth century surfaced in the works of British scientists John Ray and Leonard Plunket. Later, in 1710, Cadwallader Colden, lieutenant governor of colonial New York, joined his daughter Jane in assembling a *Plantae Coldenhamiae*, a list of flora in the Hudson River valley.⁷

Along the same lines, botanist Mark Catesby published his *Natural History of Carolina, Florida, and the Bahama Islands* in 1731, and between 1739 and 1743 the Dutch botanist Johann Frederik Gronovius issued his *Flora Virginica* with plants collected by

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American botanist John Clayton and classified by the famed Swedish botanist Carl Linneaus, who had released the first edition of his *Systema Naturae* in 1735 and regularly augmented this work with new species from North America. (For instance, Peter Collinson, a fellow of the Royal Society and a leading patron of American science, forwarded to Linneaus a specimen of the venus flytrap, saying “only to him would I spare such a jewel. Linneaus will be in raptures at the sight of it!”) In this way, over the course of the eighteenth century, thousands of North American plants found their way into European herbaria.⁸

The methods of colonial science, with species traveling from “wilderness periphery” to “metropolitan core,” have been well documented. Few pursued the institutionalization of these methods more vigorously than Hans Sloane, who succeeded Isaac Newton as president of the Royal Society and built an unusually large and impressive herbarium with many species from American botanists. Among the botanists who contributed to Sloane’s collection was John Bartram of Philadelphia, whose son William Bartram famously spent the period from 1773 to 1777 on a two-thousand-mile pedestrian tour of botanically unexplored territories in Florida, Georgia, and the Carolinas. Hundreds of specimens collected on this journey were later published in Bartram’s eloquently written and vividly illustrated *Travels*.⁹

This work in the colonial era laid a foundation for Muhlenberg’s work after the revolution, when the great need was to build a national apparatus for plant research, including herbaria and botanic gardens. One of the first botanic gardens in North America took shape on Bartram’s estate near Philadelphia, and in 1773—the year William Bartram launched his southern tour—his father’s cousin, Humphry Marshall, established a garden near Marshalltown, Pennsylvania (half-way between Philadelphia and Lancaster). Marshall’s garden drew legions of visitors to see its vast collection of exotic trees, ornamental shrubs, and herbaceous borders. In 1785, Marshall wrote a taxonomy of North American trees, *Arbustrum Americanum, Or, the American Grove, an Alphabetical Catalogue of Forest Trees and Shrubs, Natives of the American United States*, a work that prompted his election to the American Philosophical Society.¹⁰

For men like Marshall, the economic benefits of botany were clear. As historian Whitfield Bell has noted, “In the preface to his *American Grove*, he justified the study of botany on the ground that the importation and cultivation of foreign plants or the discovery of native productions of general usefulness would relieve the United States of dependence on foreign nations. Tea might be grown in the southern states; rhubarb [native to North Asia] deserved to be cultivated; while the discovery of a plant as useful as tobacco or the potato or of a substitute for coffee or quinine would be of inestimable advantage.” In a paper read before the American Philosophical Society in 1786, Marshall acknowledged the medical applications of botanical science, “but,” he added, “its utility does not terminate in this alone.” Botany’s agricultural benefits were at least as great.¹¹

Discovering useful plants depended first on the documentation of *existing* species, and herein lay the purpose of an herbarium. In 1786, Muhlenberg sent to the American Philosophical Society his *Specimen Florae Lancastriensis*, which he later supplemented in his *Index Florae Lancastriensis*. Introducing his *Index* to readers, Muhlenberg described his dogged search for plants. Since finishing his initial *Specimen*, he wrote, “I have had an opportunity of adding . . . such plants as I could find, after the strictest search, growing either wild or cultivated in, or near, Lancaster. The whole number is very near 1,100. All such plants as I never found growing wild,

but are imported from other countries, or even from other American states, I have marked with a †.” Using the system of Linnaeus, he referred unknown species to Johann Christian von Schreber of the University of Erlangen, editor of the *Genera Plantarum Linnaei*.¹²

Like others in this period, Muhlenberg had a wide network of international contacts. In addition to Schreber, he corresponded with Carl Ludwig Willdenow, the botanic curator at the Berlin Museum; Joseph Palisot, Baron de Beauvois, a student of French royal botanist Antoine Laurent de Jussieu who traveled extensively in North America (as well as West Africa and the Caribbean); Friedrich Wilhelm Weis, an expert on mosses at the University of Göttingen; Kurt Joachim Sprengel, a graduate of the University of Halle who made early microscopic studies of plant anatomy; Christian Hendrik Persoon, a Dutch botanist from South Africa remembered for his taxonomy of fungi; Erik Acharius of Sweden, a student of Linnaeus noted for his research on lichens; and James Edward Smith, who, upon Linnaeus’s death in 1784, bought all his works and established the influential Linnaean Society of London.¹³

III. Institutionalizing Plant Science

By the late 1780s, Muhlenberg had emerged as the elder statesman of American botany. Some even called him “The American Linnaeus.” His worldwide contacts enabled him to build an herbarium of more than 4,000 species, the largest in the United States and the foundation of subsequent research. Muhlenberg was not alone, however, in his pursuit of plant science. By the late 1780s, several learned societies had been founded specifically to fund research in this field. For example, the Philadelphia Society for the Promotion of Agriculture and Agricultural Reform, established in 1785, offered prizes “to promote the greater increase of the products of the land within the American states.” George Washington praised the society’s three hundred members for their work and lauded the “spirit of emulation . . . excited by the rewards offered to excellence in the several branches of rural economy.”¹⁴

Like similar organizations in New Jersey and South Carolina, the Philadelphia Society saw the nation’s *colleges* as its allies in the institutionalization of plant science. Not long after its creation, observes historian Benjamin Marshall Davis, the society appointed a committee to propose a “state society for the promotion of agriculture, connecting with it the education of youth in the knowledge of that most important art while they are acquiring other useful knowledge suitable for the agricultural citizens of the state.” The proposal called on the state legislature to fund new “professorships to be annexed to the University of Pennsylvania and the College of Carlisle [Dickinson College] and other seminaries of learning . . . for the purpose of teaching the chemical philosophy and elementary parts of the theory of agriculture.”¹⁵

When the legislature in Pennsylvania failed to act on this proposal, the University of Pennsylvania acted on its own. In 1789, the university hired a new professor of botany and natural history. In announcing this move, provost William Smith pledged that all “the philosophical parts of agriculture, as they regard a science particularly interesting to these United States, will be . . . attended to.” Plant science, he argued, had both educational and economic value. In his words, “The man who will discover a method of preventing the fly from destroying turnips, or who will point out a new and profitable article of agriculture or commerce, will deserve more from

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his fellow-citizens and from heaven than all the Latin and Greek scholars, or all the teachers of technical learning, that ever existed in any age or country.”¹⁶

To fill its new professorship, the university chose twenty-three-year-old Benjamin Smith Barton, an alumnus who had pursued medical studies at the University of Edinburgh, the great mecca of medical education. Barton was a superb choice for the job. Born in Lancaster, he was the son of a minister whose enthusiasm for natural history had led to an extended correspondence with Linnaeus; his mother, a sister of renowned astronomer David Rittenhouse, had encouraged his interest in plant science. At the age of sixteen, Barton had enrolled in the University of Pennsylvania, and following his graduation in 1785, he had joined his uncle on a major expedition to survey the western boundary of Pennsylvania and Virginia (for this survey, Pennsylvania sent Rittenhouse and Barton while Virginia sent astronomer James Madison, president of the College of William and Mary).¹⁷

While surveying the Pennsylvania frontier, Barton showed a keen interest in natural history, with a particular fascination for botany. “I spent the whole of the summer and autumn of that year examining the productions of the country through which I passed and making drawings of many of the rarer plants,” he noted. This interest he carried with him in 1786 to Edinburgh, where he wrote a prize-winning thesis on the botany of black henbane, especially its sedative effects. While attending lectures in materia medica, he met several famous botanists, including James Edward Smith, who had recently bought Linnaeus’ papers, and Joseph Banks, president of the prestigious Royal Society (who, fifteen years earlier, had served as chief botanist on Captain James Cook’s first voyage around the world).¹⁸

Completing his medical studies in 1789, Barton sailed home to join the faculty at the University of Pennsylvania as professor of botany and natural history. For this professorship he was both well-educated and well-equipped. While abroad, he had acquired the beginnings of a large herbarium—a collection that eventually surpassed even Muhlenberg’s, with specimens from all over the world. Barton’s herbarium, which he used regularly in his teaching, demonstrated the global reach of American botany in the late eighteenth century. As colonial empires stretched around the world, so did European-American networks of botanical exchange, and Barton took full advantage of these networks. The plants in his collection, each carefully labeled and pressed between large sheets of white paper, came from six continents. As a resource for teaching and research, this collection was unparalleled in the United States.¹⁹

Behind every species in Barton’s herbarium was a vast network of individuals and institutions that made botanical exchange possible in the late eighteenth century. Among his species were more than two dozen from Australia and New Zealand, given to him while he was in London by his friend James Edward Smith, who, in turn, acquired them from John White, surgeon-naturalist on the voyage that brought Australia its first convict-settlers. In 1788, eleven ships had reached Botany Bay (so named by Joseph Banks on his voyage with Captain Cook), and White had chosen to stay on as physician-in-residence at the Port Jackson colony (later Sydney). White routinely sent plants from Australia back to England for classification and cultivation, and some of these specimens found their way into Barton’s herbarium in Philadelphia.

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Barton's herbarium epitomized the "internationalism" of botanical science in this era. Besides plants from Australia, he also had plants from India, given to him by curators of the recently established British Royal Botanic Garden in Calcutta. In 1787, Robert Kyd of Britain's East India Company had established a garden to serve both scientific and economic purposes. As one historian of the garden observes: "The East India Company was still in 1787 a trading company, and a large part of [its] most profitable business was derived from the nutmegs and other spices exported from . . . settlements in Penang, Malacca, Amboina, Sumatra, and other islands of the Malayan Archipelago." Noting the commercial advantage of cultivating these spices in territory controlled by the company, Kyd sought permission to create a three-hundred-acre garden, which his successor, William Roxburgh, expanded considerably.²⁰

Barton's herbarium contained specimens not only from Calcutta and Sydney but also from Cape Town, where British collector Francis Masson arrived in the mid-1780s to collect plants for the royal botanic garden at Kew. Masson was eventually joined in South Africa by Swedish botanist Carl Peter Thunberg, who had been a student of Linneaus and had botanized his way through Japan, Java, and Sri Lanka before reaching the African subcontinent. Barton obtained South African plants from both Thunberg and Masson, and these plants joined others in his collection from South America and the Caribbean; historian Francis Pennell has found that Barton's herbarium included more than 100 species from Danish botanist Julius Philipp Benjamin von Rohr, who visited Barton in Philadelphia in 1791 after collecting thousands of plants along the South American coast from Surinam to Brazil.²¹

IV. Incentives for Agricultural Research

By the early 1790s, plant science had gained an institutional foothold in the United States; lectures in botany had been offered not only at the University of Pennsylvania but also at Harvard and the College of Rhode Island (later Brown), and colleges frequently joined forces with agricultural societies to promote botanical research. In 1791, for example, prominent citizens in New York founded the New York Society for the Promotion of Agriculture, Arts, and Manufactures, and the next year, this society persuaded the state to grant funds to Columbia College for a professorship in natural history, chemistry, and agriculture. The same year, Columbia raised its own resources to establish a professorship in botany. The botany professorship went to a recent Edinburgh graduate, Richard Kissam, but Kissam soon resigned, so both new professorships passed to Samuel Latham Mitchill, a successful farmer and state legislator.²²

The New York Society for the Promotion of Agriculture was not the only learned society in this period to advance the cause of agricultural research. The Massachusetts Society for Promoting Agriculture, established in Boston in 1792, offered cash premiums for "the cultivation of wheat and other grains; the improvement of land, including the reclamation of salt marshes; the raising of trees; the greatest stock maintained on the least land; the best vegetable food for wintering stock; the most and best wool from a given number of sheep; the best process for making cider, maple sugar, butter, cheese, flax, and salted provisions; and for the best farming journals, manures, tree plantations, advances in ploughs and ploughing techniques, and farms in general." The first two premiums the Society announced were \$50 for the best account of "the natural history of the canker-worm" and \$100 for the best way to eradicate this pest.²³

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Money for premiums came from both public and private sources. Among the Massachusetts Society's founding members were political leaders Samuel Adams, Charles Bullfinch, and Timothy Pickering; others who joined later were John Adams, John Hancock, and Josiah Quincy. Their stated mission was "to make experiments themselves and invite others thereto on the subject of agriculture . . . [and] to give handsome premiums to the men of enterprise who have, by their inquiries, made useful discoveries and communicated them to the public." In support of this mission, the society received generous financial assistance from the state; indeed, together with the American Academy of Arts and Sciences (also located in Boston), the Massachusetts Society for the Promotion of Agriculture was the state's principal benefactor of scientific research.²⁴

The idea of premiums to support agricultural research was not limited to learned societies. Such prizes were part of a broader strategy in this period to foster domestic improvement and grow the American economy. In 1791, Alexander Hamilton, then secretary of the treasury, issued his famous "Report on Manufactures," which argued that domestic improvements required "the incitement and patronage of government" to encourage American producers to enter internationally competitive markets. Pointing to "premiums and other artificial encouragements with which foreign nations second the exertions of their own citizens," Hamilton called on the federal government to do likewise. Some felt the newly ratified Constitution gave the federal government only limited powers, but Hamilton wanted the country to bolster scientific research with the same "gratuities and remunerations which other governments bestow."²⁵

The aim of Hamilton's "Report on Manufactures" was to suggest ways to spur economic growth and increase tax revenues so the federal government could pay down the national debt and meet a sudden rise in defense costs on the western frontier. While most of the suggestions in the "Report on Manufactures" were dismissed by Republicans in Congress who feared that Hamilton's approach favored industry over agriculture, one set of proposals—namely, higher tariffs on agricultural commodities—won bipartisan support. Republicans seeking to punish Britain for a series of protective trade policies that had been adopted following the revolutionary war joined the Federalist majority to increase tariffs—repeatedly—in the early 1790s. Higher tariffs on agricultural commodities, in turn, spurred agricultural research.²⁶

Among the commodities subject to higher tariffs in this period were sugar, tea, coffee, and tobacco. All of these commodities were considered luxuries and symbols of the United States' enduring and regrettable "dependence" on foreign imports. "They are all of them in reality luxuries; the greatest part of them foreign luxuries; some of them, in the excess in which they are used, pernicious luxuries," Hamilton wrote. Tariffs, of course, raised the price of these luxuries and gave domestic producers an incentive to enter the market. Shielded from international competition, American farmers sought ways to improve their production of crops that received tariff protection. As the average duty on imports more than doubled from 29 percent in 1790 to 66 percent in 1794, learned societies began to offer premiums for research targeted specifically at commodities that benefited from high tariffs.²⁷

Take, for example, sugar. In 1791, Benjamin Rush of the University of Pennsylvania read before the American Philosophical Society a detailed *Account of the Sugar Maple-Tree of the United States, and of the Methods of Obtaining Sugar from It, together with Observations Upon the Advantages Both Public and Private of This Sugar*. Written in the form of a letter to secretary of state Thomas

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Jefferson, this essay documented the number of sugar maples growing in American forests and the amount of raw sugar that could be produced from each tree. Rush's interest in the sugar maple was solely economic. Setting aside his lectures at the university, he listed the costs associated with harvesting and refining maple sugar and, based on estimates of domestic consumption, calculated the value of sugar that could be made available for export.²⁸

According to Rush, "There are in the states of New York and Pennsylvania alone at least ten millions of acres of land which produce the sugar maple tree, in the proportion of thirty trees to one acre. Now suppose all the persons capable of labor in a family to consist of three, and each person to attend 150 trees, and each tree to yield 50 pounds of sugar in a season, the product of the labor of 60,000 families would be 135,000,000 pounds of sugar, and allowing the inhabitants of the United States to compose 600,000 families each of which consumed 200 pounds of sugar in a year, the whole consumption would be 120,000,000 pounds in a year, which would leave a balance of 15,000,000 pounds for export. Valuing the sugar at 6/90 of a dollar per pound, the sum saved to the United States would be 8,000,000 dollars by home consumption, and the sum gained by exportation would be 1,000,000 dollars."²⁹

Rush ended his essay with a word of praise for Thomas Jefferson, who, as secretary of state, reportedly used "no other sugar in his family than that which is obtained from the sugar maple. He has lately planted an orchard of maple trees on his farm in Virginia." Hoping that others would follow Jefferson's lead, Rush encouraged farmers to gather sugar maple seedlings in local forests and plant them in nurseries, where they could be profitably cultivated. "I shall conclude this letter," he wrote to Jefferson, "by wishing that the patronage which you have afforded to the maple sugar, as well as the maple tree, by your example may produce an influence in our country as extensive as your reputation for useful science and genuine patriotism." Indeed, for professor Rush, botanical science was inherently "patriotic."³⁰

V. André Michaux's Western Expedition

As it happened, Jefferson's enthusiasm for botany was a driving factor behind a major botanical expedition that set out from Philadelphia in 1793. This mission, funded by the American Philosophical Society with Jefferson's support, was important for three reasons. First, it showed the grand scale of botanical research in the United States in the late eighteenth century and the ways in which this research was imagined to contribute to national prosperity, power, and prestige. Second, it showed the extent to which botanical research in this period relied on international cooperation and collaboration, in this case between the United States and France. Third, it showed the ways in which international cooperation in science, so important to national development, could occasionally succumb to national rivalry, diplomatic controversy, and political intrigue.³¹

At the center of this fascinating story was the eminent French botanist André Michaux, whom Jefferson, acting on behalf of the American Philosophical Society, commissioned in 1793 "to explore the interior country of North America, from the Mississippi along the Missouri and westwardly to the Pacific Ocean." Anticipating the project that Meriwether Lewis and William Clark would pursue a

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decade later, Michaux was recruited to gather information on “the geography of the said country, its inhabitants, soil, climate, animals, vegetables, minerals, and other circumstances of note.” Jefferson, who had become acquainted with Michaux in Paris while serving as the United States’ ambassador to France, hoped Michaux’s expedition would yield new and valuable discoveries in all fields of natural history. (He also hoped it would lead to the discovery of a northwest passage across the North American continent.)³²

André Michaux, the botanist leading the expedition, had arrived in the United States eight years earlier with instructions from Louis XVI to study American trees. His aim was to identify fast-growing hardwoods that could replenish the royal forests, which had been rapidly depleted as a result of massive shipbuilding during France’s seemingly endless wars of the eighteenth century. Michaux was the right person for this job. The son of a farmer, he grew up on the grounds of Versailles and studied botany under Bernard and Antoine Laurent de Jussieu, the father and son who oversaw the Jardins du Roi. In addition to regular botanical journeys to the Alps and Pyrenees, he spent the early 1780s on a plant-hunting expedition to Persia, traveling from Baghdad to Basra to Bushire in search of commercially beneficial fruits—especially date palms and olive trees—for the king’s collections.³³

France’s desire for knowledge of American trees led Michaux’s colleague André Thouin of the Royal Society of Agriculture to address the issue in his research. Thouin noted that France had only thirty-seven species of trees that reached heights of thirty feet, while North America had at least ninety that reached heights over forty feet. Moreover, of the thirty-seven species in France, nineteen were rare, thirteen would not grow in rocky soil, two grew only in the southernmost part of the country, and only seven were suitable for naval construction. In the United States, by contrast, seventy-six species grew in both northern and southern locales, forty grew in sandy or rocky soil (five more in wetlands), and fifty-one were suitable for naval construction. Given this information, the advantages of importing American trees to France seemed obvious.³⁴

And so, in the fall of 1785, Michaux came to America to study forest trees. Upon his arrival, he bought two large properties—one in South Carolina, the other in New Jersey—to use as holding gardens. Altogether, he sent 90 boxes of seeds and 60,000 seedlings to France (with many plants acquired on visits to American botanic gardens, including William Bartram’s garden outside Philadelphia and William Hamilton’s garden, The Woodlands, nearby). In 1788, he made an epic four-year botanic trek from the Gulf of Mexico to Hudson Bay in search of new trees, but shortly after this journey began, the outbreak of the French Revolution cast doubt on his royal commission. The revolutionary Assembly in Paris refused to cover his expenses, and it was at this point that he told Thomas Jefferson (via Benjamin Smith Barton) of his idea for a western botanical expedition funded by the American Philosophical Society.³⁵

The society embraced the idea, but Michaux’s loyalties, it seems, were divided. In accepting his commission, he emphasized above all his continuing obligations to France. “Bound by all manner of considerations to my country, I owe to her my services, and the primary objective of my researches on natural history is to fulfill my obligations in this regard,” he wrote. Nonetheless, he added, “The friendship which united France and the United States led the old regime to authorize me to share with the United States all the productions of the botanical gardens of Europe, and it is on this principle that I have introduced into Carolina many trees and plants

from Europe, from Asia, and from the southern isles. Maintained [now] in my mission by the French Republic, . . . I am dedicated by duty and by inclination to the reciprocal benefit of the two nations and will be happy to fulfill this purpose to the best of my ability.”³⁶

It was not entirely clear that Michaux could serve two nations at once, particularly in 1793, when relations between the United States and France were becoming increasingly strained. That year, the revolutionary Assembly in Paris dispatched a new ambassador to the United States with instructions that complicated Michaux’s work considerably. Edmond Charles “Citizen” Genet carried with him a plan for a military alliance to oust Spain from land west of the Mississippi. “Such an alliance,” the French government asserted behind-the-scenes, “would not only pave the way for the liberation of Spanish America but also open the Mississippi to the inhabitants of Kentucky, deliver our brothers in Louisiana from the tyrannical yoke of Spain, and perhaps add the glorious sites of Canada to the American constellation.” Genet’s secret agent in this plot was André Michaux.³⁷

It was a bold proposal (to say the least), and when it was revealed, president George Washington was furious. In the summer of 1793, he issued a Proclamation of Neutrality, but Genet paid no heed. He armed settlers in Kentucky and maneuvered French ships in New Orleans for war. Meanwhile, describing his agent Michaux as “circumspect, loyal, and dedicated to the glory of his country,” he noted that, since Michaux was “accustomed to travel in the hinterlands of America, his departure can be suspicious to no one.” In fact, Michaux *was* “dedicated to the glory of his country.” He celebrated the victories of French armies in Europe in 1793 and 1794 and expressed his enthusiasm for the Jacobin cause. “The city of Lyons has been stormed by the Republicans,” he cheered, “and ten thousand Aristocrats put to the sword.”³⁸

In the end, Genet’s scheme on the frontier did not succeed. His defiance of American neutrality led Washington to demand his removal from his diplomatic post. Once deprived of Genet’s military support, the rebels in Kentucky abandoned their efforts against the Spanish, and Michaux—having traveled no further than Louisville—returned to Philadelphia to deliver a summary report on his scientific journey (shortly thereafter, Genet’s replacement, Jean Fauchet, issued a proclamation “canceling all commissions conferred by the previous minister and instructing all French citizens to abide by the dictates of American neutrality”). Thus ended an important episode in what might be called the geopolitics of eighteenth-century science—an episode that revealed the potential for covert action under the cloak of neutral research.³⁹

VI. Students and Botanical Research

In 1798, four years after Michaux’s western journey, Benjamin Smith Barton published his landmark *Collections for an Essay Towards a Materia Medica of the United States*, which asserted that it was time for *Americans* to document their country’s botanical riches. “From this school,” he told his students at the University of Pennsylvania, “you are to spread yourselves over the happiest and one of the fairest portions of the world. In whatever part of this vast continent you may be placed, you will find an abundant field of new and interesting objects to reap in. The volume of nature lies before you: it has hardly yet been opened: it has never been perused.

But by your assistance, the knowledge of the natural productions of our country may be greatly extended, and travelers shall then no longer upbraid us with an utter ignorance of the treasures which an all-benevolent Providence has so largely bestowed upon us.”⁴⁰

Barton’s students got the message. They wrote thesis after thesis on the agricultural, medical, and commercial advantages of native American plants. Grafton Duvall of Maryland, for example, submitted *An Experimental Botanico-Medical Essay on the Melia Azerdarach of Linneaus*. The *Melia Azerdarach*, otherwise known as the “China Tree” or “Pride of India,” was indigenous to Asia but had been naturalized in the southern United States. According to Duvall, the fruit of this tree had limitless economic potential. “We do not know but that the oil of the fruit of the *Azerdarach* may be of great and extensive application in medicine,” he asserted. “Who can say but that its use may supersede that of the equally highly priced as highly valued castor oil? Who can tell but that it may in practice be of more value than the oil of olives?”⁴¹

Ever the scientist-salesman, Duvall anticipated “immense and certain profit” from his botanic discovery. “In process of time,” he claimed, “as our lands become cleared and cultivated; . . . as our forests are hewn down and fertile plains formed where there were wet morasses; . . . as our country becomes thickly inhabited and our citizens shall stand in need of every convenience; . . . as our arts and sciences shall flourish and we shall be disposed to profit by every advantage which is opened to our view; . . . as we become more and more a commercial nation, our manufactures shall be improved and their number increased.” To prepare for this future, he noted, “we shall, I think, find it extremely to our interest in every point of view to cultivate, with all assiduity, a tree which certainly bids fair to be of boundless value, it being one of the most prolific known.”⁴²

Duvall’s enthusiasm for economic botany was typical of his generation; most of Barton’s students were just like him. In 1803, for example, young John Mitchell of Pennsylvania wrote *An Essay on the Arbutus Uva Ursi and Pyrola Umbellata and Maculata of Linnaeus*. Just as Barton found a native *Laurus* to substitute for imported allspice, Mitchell found that, “During the revolutionary war, when it frequently became necessary to substitute some of our own productions for almost every article of the materia medica that we had become accustomed to receive from foreign countries, the pyrola was used with considerable effect as a substitute for [Peruvian] bark.” This was no minor claim. In 1803, finding a substitute for Peruvian bark—the source of quinine to treat malaria—was the holy grail of botanic research. In a global plantation economy, the potential cost-savings of a bark substitute could be enormous.⁴³

Owing to the singular value of Peruvian bark in treating malaria and the difficulty of cultivating the *cinchona* tree outside its native habitat in the Andes Mountains, the search for substitutes had become an international obsession. It was therefore unsurprising that another Barton student, William Nelson of Virginia, submitted a thesis titled *Observations on the Management of Peruvian Bark*. Nelson sought to codify the doses of Peruvian bark for various tropical diseases. Chief among these diseases was “intermittent fever,” an often fatal condition of unknown cause that afflicted slaves and sailors in large numbers. Nelson maintained that, with a disease as deadly as “intermittent fever” and an imported drug as costly as Peruvian bark, it was imperative for American physicians to manage doses as parsimoniously as possible.⁴⁴

Nelson was not, however, the only Barton student to address this subject. In 1805, another Barton student, William Baldwin, surgeon-naturalist on a voyage to China, collected plants for Barton and kept notes for a medical dissertation titled *A Short Practical Narrative of the Diseases Which Prevailed Among the American Seamen at Wampoa in China, in the Year 1805*. Baldwin questioned the efficacy of Peruvian bark as a treatment for “intermittent fever.” In particular, he challenged the practice of British physician John Clark, whose *Observations on the Diseases in Long Voyages to Hot Countries, and Particularly on Those Which Prevail in the East Indies* (1773) recommended heavy doses of bark as the first line of defense against tropical diseases—though Clark had no idea what caused such diseases, and many of his patients died.⁴⁵

Convinced that his own “Brunonian” method (bloodletting to release the inner “excitement” of fever) was superior to Clark’s, Baldwin called for better-trained physicians on the vessels that had become so important to the United States’ global trade. “I cannot conclude,” he wrote, “without observing how much it is to be regretted that the merchant ships are not more generally furnished with physicians, especially when it is considered how extensive the trade has become and how profitable East India voyages are. If the lives of our seamen are considered to be of any importance, either in a moral or a commercial point of view, some regard ought surely to be extended to the preservation of their lives in those climates where diseases are rapid in their progress and too generally fatal in their termination.” According to Baldwin, medicine—and medical botany in particular—was essential to American commercial success.⁴⁶

As these remarks indicate, Baldwin was not the only American serving as a surgeon-naturalist in East Asia in this period. By the early nineteenth century, scores of American students were sailing the world, gaining hands-on experience that supplemented their formal education. Baldwin’s classmate William Darlington, for example, was surgeon-naturalist on a commercial voyage to Calcutta, where he met regularly with William Roxburgh, who gave him plants for American botanic gardens: “Darlington . . . has again called on me for what I might have ready for America,” wrote Roxburgh to Barton as he decided which plants to send. “I take this favorable opportunity to send you the accompanying parcel of seeds, some of which I hope will produce ornamental plants.” Darlington brought seeds from Calcutta not only to Barton in Philadelphia but also to professor David Hosack of Columbia College in New York.⁴⁷

In addition to Baldwin in China and Darlington in India, another Barton student, Thomas Horsfield, signed up to be a surgeon-naturalist on a merchant voyage to Java. Eager to pursue a thorough study of Javanese botany, Horsfield returned briefly to America to assemble “books and instruments for field and laboratory,” then made his way back to Java, where he remained for three decades. As historian Joseph Ewan notes, “The beauty of Java’s rain forests and the drug plants he saw being used by the natives fascinated him.” Perhaps the leading botanist of Southeast Asia in the early nineteenth century, Horsfield worked first at the Buitenzorg Gardens owned by the Dutch; then, after the British seized Java from the Dutch in the Napoleonic Wars, he aligned himself with British administrator Thomas Stamford Raffles, a stern colonialist who shared his enthusiasm for natural history.⁴⁸

VII. Botany for National Development

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Even as these students botanized their way around the world, others continued the push for improvements in botanic education at home. In this push, the nation's learned societies played a key role. In 1800, for example, Frederick Muhlenberg, the eldest brother of Henry Muhlenberg, founded the Lancaster County Society for Promoting Agriculture, Manufactures, and Useful Arts. Comprised of Republicans who identified with Jefferson's appeal to agrarian values—a prominent theme in his presidential campaign that year—the Lancaster County Society offered financial premiums for research that would “procure from the fertile soil of Pennsylvania every production it is capable of affording; and, from the labor and ingenuity of independent citizens, every article of manufacture and the useful arts necessary to render our country happy, prosperous, and truly independent.”⁴⁹

The rhetoric of “economic independence” framed the project of scientific research in this period. “Upon the emancipation of our country from the political yoke of Great Britain,” read the constitution of the Lancaster County Society, “we deemed and called ourselves a free and independent commonwealth. But there are means of inferior and indirect subjugation from which our country is not yet emancipated. We are dependent on Great Britain for almost every article of clothing we wear, for a great part of the furniture of our houses, for the instruments of our amusements, and for the means of our defense.” To promote the economic independence of the United States, the society gave a gold medal to the farmer who raised the most high-quality flax per acre of land; then, echoing the isolationist message of George Washington's recent “Farewell Address,” it urged its members to buy only home-spun clothes.⁵⁰

In the early republic, economic self-sufficiency was a national goal. In 1800, for example, the Western Society of Middlesex Husbandmen in Massachusetts featured a patriotic oration by the Reverend Edmund Foster, who told his rural audience that, once the nation's valleys were “covered with corn” and its orchards “yielding all their various fruits in plenty,” the United States would become the envy of the world. “Our individual and national importance will then be felt at home and must be recognized abroad,” he declared. “Our young country will become rich in articles of first necessity while the old manufacturing nations of Europe will be encumbered with those of convenience and fancy. The elder then must bow to and serve the younger. They will all studiously endeavor to obtain a share of our profitable commerce.”⁵¹

Orations of this sort were common in the early republic, but support for agricultural development in the United States came not only from nationalist boosters; it also came from abroad. In 1801, André Michaux's son, François André Michaux, arrived in America to continue his father's work. Upon his return to France, he published his comprehensive *North American Sylva, Or A Description of the Forest Trees of the United States, Canada, and Nova Scotia: Considered Particularly With Respect To Their Use in the Arts and Their Introduction Into Commerce*. In gratitude for the assistance he received in the United States while preparing this work, Michaux donated \$12,000 for the study of agriculture (and silviculture) to the American Philosophical Society and \$8,000 to the Massachusetts Society for Promoting Agriculture. This latter gift, in turn, indirectly aided the cause of botanical education at Harvard.

In the field of botanical education, Columbia College and the University of Pennsylvania had taken an early lead, but Harvard was not far behind. In 1805, the board of visitors at Harvard began to seek contributions for a new professorship in natural history. “It has frequently been remarked,” the board noted in one publicity statement, “that in the extensive regions of the United States, there are

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boundless fields of inquiry, hitherto almost untrodden; that our forests, our plains, our rivers, and our shores contain multiple treasures from which we have been but partially benefited, and that there are so many of our native productions of which we know not the *use*, and scarcely even the *names*.” To advance the cause of botanical education and research, Harvard’s board solicited contributions from the members of the Massachusetts Society for the Promotion of Agriculture.⁵²

In asking the Massachusetts Society (and, in turn, the state) for aid, Harvard pointed to recent European gains in plant science made possible by university botanic gardens. “The European world has long experienced the multiplied benefits of such institutions,” the board asserted. “Establishments, which are there fostered by the care and bounty of government, cannot in this country be created and maintained without the liberal contributions of public spirited individuals.” Pledging to create a botanic garden in connection with its new professorship, Harvard insisted that, by 1805, the advantages of botanic research were indisputable. “To those intelligent men whose contributions are invited,” the board asserted, it was “unnecessary to state how *commerce, agriculture, medicine, and the arts* would be aided and promoted by a zealous, well-directed, and extensive cultivation of those branches of science.”⁵³

The appeal worked. With contributions totaling \$31,333 from the Massachusetts Society, the college established the so-called Massachusetts Professorship in Natural History. The first to fill this new position was Harvard alumnus William Dandridge Peck, who immediately sailed for Europe to collect plants, seeds, and books. Historian Jeannette Graustein notes that “a long illness held him in Stockholm during four months of the first winter; from there he went to Denmark, Germany, the Netherlands, and Belgium; he spent a year in Paris and about ten months in England,” where he met Joseph Banks and James Edward Smith, among others. In 1808, Peck returned to Massachusetts with a gardener from Yorkshire, and for the next twelve years, he and his assistant worked to build a seven-acre botanic garden suitable for both teaching and research.⁵⁴

Not long after Peck’s appointment, Benjamin Smith Barton surveyed the nation’s progress in the field of plant science. He found much to commend but also much to criticize. Plant science, he argued, had not been sufficiently institutionalized. Only three American colleges had established botanic gardens, and opportunities for publishing botanical discoveries were still scarce (although Barton had managed to publish his textbook, *Elements of Botany*, in 1803). Without an infrastructure to promote scientific research and education, he lamented, the glory of identifying new species—particularly indigenous species—too often went to foreigners. It was time, he repeated, for *American* scholars to establish their own institutions of plant science and, in this way, to secure a place in the international community of botanists. Heeding his own advice, Barton did his part to hasten this process.⁵⁵

In 1806, Barton was elected the founding president of the American Botanical Society in Philadelphia, which soon changed its name to the American Linnaean Society to mark its connection with its London counterpart. The next year, he delivered *A Discourse on Some of the Principal Desiderata in Natural History, and on the Best Means of Promoting the Study of this Science, in the United States*. In this address, he outlined a new research institution “devoted to the cultivation of the different branches of natural history: an institution similar to those which have been founded, and have flourished, in most of the countries of Europe.” Such an institution, he

said, would give “a new and very impressive direction to the minds of a number of young men from whose talents and industry and zeal, in union with better opportunities than have yet been afforded to them, much important information may be expected.”⁵⁶

VIII. Frederick Pursh

Barton saw the American Linnaean Society in both national and international terms. He wrote: “When we consider the great extent of the United States, even excluding the country beyond the Mississippi, I presume it may be stated, at a moderate calculation, that, at least, one eighth part of our native vegetables is entirely unknown; *certainly to the botanists of Europe*, and with respect to the regions between the Mississippi and the ocean, the botany is still more imperfect. . . . But this vast region will, unquestionably, afford much for the gratification of the botanist. In its higher latitudes, we may expect to find many of the vegetables of the north and east of Asia; as we have already found, in those latitudes, many of the animals of Asia; and in the lower latitudes we shall, in all probability, meet with many of the plants of China, and Japan, and Cochin-China, Hindoostan, and other regions of the old world.”⁵⁷

The implication here was clear: the United States might well possess within its borders untold botanical riches—plants with agricultural, industrial, or medicinal value that would otherwise have to be imported from abroad. If such plants were found growing inside the nation’s borders, any investment in botanical exploration would be repaid many times over. “We are the inhabitants of a country peculiarly blessed by the all-wise and benevolent Creator of the universe,” Barton wrote. “He has given us an abundance of valuable esculent herbs, and roots, and fruits, of various kinds: and our soil and climate are admirably adapted to the growth of many others, which are not indigenous. . . .” As far as Barton was concerned, western lands might well serve as nurseries for commercially propagated foreign plants—thereby contributing to the nation’s self-sufficiency and superiority in a global marketplace.⁵⁸

By the early nineteenth century, the idea that Americans must claim the glory of botanical discovery in their own country had become commonplace. Perhaps the clearest expression of this idea was the national pride associated with the famous Lewis and Clark expedition. The first botanical specimens from this expedition reached Philadelphia on November 16, 1805, and Thomas Jefferson, as president, put Benjamin Smith Barton in charge of their classification. Barton, in turn, recruited a Prussian botanist, Frederick Pursh, to assist in this work (evidently, none of Barton’s students were trained for this job). In between shipments from the west, Barton sent Pursh on a series of botanical jaunts through New York, Vermont, Massachusetts, Connecticut, New Jersey, Pennsylvania, Maryland, Virginia, and North Carolina in hopes of assembling a comprehensive *Flora Americana*.⁵⁹

Pursh was a very able botanist. Born in Grossenhain and educated in Dresden, he studied with Prussian court gardener Johann Heinrich Seidel. From an early age, his brother (a member of the king’s civil service) noted, Pursh showed a “preference for the study of the natural sciences and particularly for botany, in which, partly through the use of the royal library [and] partly through association and various excursions undertaken with several authorities of this science, in a short time he made considerable progress.” Pursh was particularly intrigued by the dilemmas of deforestation and read Humphry Marshall’s *American Grove* shortly after its translation into

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German in the early 1790s. Like his contemporary Frederic Adam Julius von Wangenheim, who published a survey of American trees in 1787, Pursh believed that fast-growing American hardwoods might offer a solution to Prussia's timber shortages.⁶⁰

Pursh came to Philadelphia in 1799 to pursue his botanical interests. He worked briefly in Baltimore, then shifted to Humphry Marshall's botanic garden on the Schuylkill; four years later, in 1803, he joined William Hamilton across the river at The Woodlands, where he met Henry Muhlenberg and William Bartram as well as Benjamin Smith Barton. All were impressed with Pursh's advanced botanical training. In 1805, Barton asked Pursh to help in the classification of the Lewis and Clark specimens, and, for the next several years, they worked side-by-side to identify and catalog the plants that poured in from the expedition. Using the herbarium that Barton had so carefully assembled, they checked the identity of every plant and chose a type-specimen for each one that was new to science. In 1808, a third botanist-gardener, Bernard M'Mahon, joined the project to speed its progress toward publication.⁶¹

Pursh spent most of the year 1808 "drawing and describing" Lewis and Clark's plants. Repeated delays, however, made him impatient. He wanted Lewis and Clark's discoveries published quickly so botanists around the world could study the new specimens. "This man, who is completely adequate to the task, is becoming very uneasy," M'Mahon confided in a letter to Jefferson, "and I wish him not to leave the neighborhood until the arrival of Mr. Lewis, by whose particular instructions only, he can finish the drawings of some very important but imperfect specimens." Lewis died, however, before he could give Pursh the instructions needed to finish the remaining classifications. Pursh therefore decided to leave Philadelphia and go to work for David Hosack at Columbia College in New York; when he left, Pursh took all his drawings and descriptions of the Lewis and Clark specimens with him.⁶²

Pursh's next move shocked his American colleagues. He first sailed to the Caribbean (allegedly to restore his impaired health), then proceeded to England, where he made plans to publish Lewis and Clark's specimens himself. With access to various gardens and herbaria containing North American plants, he was able to compare his sketches of Lewis and Clark's plants with previously identified species. This process took several years, but eventually, in 1814, with financial backing from wealthy English botanist Aylmer Bourke Lambert as well as James Edward Smith and Joseph Banks, he published a catalog of the Lewis and Clark specimens. Pursh's catalog provoked bitter outcries from American botanists who accused Pursh, "a foreigner," of absconding with top-secret drawings of the United States' most valuable botanical treasures.⁶³

Henry Muhlenberg, distancing himself from his fellow German, registered an early opinion on Pursh's decision to publish his catalog. "Pursh is printing at London a *Prodromus flora Americanae*," Muhlenberg wrote to Stephen Elliott, a South Carolina botanist. "John Bull is fat and pays well, [and] they intend to make the best of their collections. Let it then be so. I find it extremely difficult to get even a small Catalogue printed [here]." Muhlenberg had in fact managed to publish a *Catalogue of North American* plants a year earlier, but his work paled in comparison with Pursh's triumph. Muhlenberg, however, was not the only American to condemn Pursh's actions. Samuel Latham Mitchill at Columbia wrote that "Mr. Pursh, who has for several years cultivated botany in New York, is now engaged in diffusing the fruits of his discoveries, in London, to the Europeans."⁶⁴

The appearance of Pursh's work, *Flora Americae Septentrionalis*, in 1814—and its timing amid the War of 1812—unleashed a wave of lamentations from American botanists. Jacob Green, a professor at the College of New Jersey (later Princeton), asserted that Americans were paying a dear price for neglecting the institutionalization of botanical science. “While Americans have neglected the botanical examination of this country,” he declared, “foreigners have immortalized themselves by doing it. From England we have had . . . Catesby . . . ; from Sweden, professor Kalm . . . ; from Germany, . . . Pursh; France has sent us Michaux . . . , and Prussia, Baron Humboldt. . . .” Among such illustrious names, professor Green cried, “there is not one of our countrymen—no one who has received our patronage or encouragement.”⁶⁵

IX. Conclusion

What made Pursh's action so galling was undoubtedly the historical context in which it occurred. The process of collecting and classifying the Lewis and Clark specimens unfolded amid the events that led to the War of 1812. In 1807, as plants flowed in from the western frontier, tensions between United States and Britain nearly erupted in war. The catalyst here was the *Chesapeake* affair, which occurred when a British warship, the *Leopard*, captured the American vessel, the *Chesapeake*, off the coast of Virginia and demanded the return of four British deserters. When the *Chesapeake* refused, the *Leopard* fired, killing three Americans and wounding eighteen. This episode—part of a wider contest for control of Atlantic trade during the Napoleonic Wars—provoked widespread demonstrations in the United States as patriotic orators called for an immediate end to commerce with European belligerents.

Responding to the clamor, president Jefferson imposed an embargo on all European trade. Jefferson believed that Americans could survive without European “luxuries” far longer than Europeans could survive without American food—but he was wrong. The embargo had a crippling effect on the United States' global trade and, subsequently, on the whole national economy. Exports, which had more than quintupled in value from \$19 million in 1791 to \$108 million in 1807, came to a sudden halt. The loss of trade hurt not only merchants but also manufacturers and farmers. So great was the resentment over Jefferson's policy that, in the election of 1808, Republicans abandoned him and chose as their candidate James Madison, who promised to end the embargo as soon as he arrived in office.⁶⁶

With the end of the embargo, trade flourished as merchants resumed shipments to Europe and its colonies. In 1810, Congress removed all restrictions on trade with Britain and France in exchange for open commerce with both nations. Despite its ongoing wars, France agreed to abide by this arrangement. Britain, however, refused, which placed the United States in a diplomatic bind and led, in 1812, to war. The War of 1812 divided Congress and the American public. Some cast “Federalist merchants” as key opponents of the war and “Republican agrarians” as key supporters, but the war exposed a more fundamental divide between those who felt the nation's strength and security hinged on economic isolation (and “self-sufficiency”) and those who felt American strength and security hinged on international trade and commercial superiority.

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In many ways, this debate between economic isolationists and internationalists mirrored contemporary debates over scientific research. Some believed the institutionalization of scientific research would make the United States economically self-sufficient and “independent.” As one botanist asserted in a proposal for a botanic garden in the nation’s capital in 1808 (the year the embargo crisis hit rock bottom): “To render us independent we must raise and naturalize those plants, the products of which are by custom rendered necessary to our comfort and convenience.” Others, however, stressed that greater investment in scientific institutions would make the United States more competitive in a global market. These views were not, of course, mutually exclusive; most felt the United States could (and should) pursue *both* national self-sufficiency *and* international superiority at the same time.⁶⁷

Whether one emphasized isolationism or internationalism as the reason to institutionalize scientific research, it was clear that research itself, so closely associated with economic growth, was not immune to politics. Indeed, the political significance of scientific research in this period meant that even Thomas Jefferson, as president, had to watch his step. In 1808, when Jefferson arranged to ship “two parcels” of cotton seed to André Thouin at the Agricultural Society in Paris (in exchange for a steel plough Thouin had sent), his shipping agents balked at what they considered a brazen violation of the president’s own trade embargo. “Their first object,” Jefferson noted in a confidential letter to a friend, “was to make a show of my letter as something very criminal and to carry the subject into the newspapers.”

Jefferson was outraged that politics had disrupted “science,” but he should not have been. Cotton seeds were not the “neutral” material he made them out to be. Plants and politics went hand in hand, and repeated experience—with Michaux, Pursh, and others—had reinforced this point again and again. And yet, Jefferson insisted that science could transcend politics. “It is really painful . . . to be obliged to note these things which are known to everyone who knows anything,” he lamented, “but we have a faction to whose hostile passions the torture, even of right into wrong, is a delicious mortification; their malice I have long learned to disregard, their censure to deem praise, but I observe that some republicans are not satisfied (even while we are receiving [scientific assistance] liberally from others) that this small return should be made. They will think more justly at another day. . . .”

Jefferson was convinced that international science could rise above national rivalries. He noted, for example, that, before the embargo (but after Congress passed the Non-Importation Act, which barred Americans from buying goods from Britain), he shipped “two or three barrels” of “genuine May wheat” to the English Board of Agriculture, which in turn sent “the seed of the famous turnips of Sweden.” These exchanges, he believed, showed “the nature of the correspondence which is carried on between societies instituted for the benevolent purpose of communicating to all parts of the world whatever useful is discovered by any of them. These societies are always in peace, however their nations may be at war. Like the republic of letters, they form a great fraternity spreading over the whole earth, and their correspondence is never interrupted by any civilized nation.”

This image of a great republic of letters, “never interrupted by any civilized nation,” was common in the late eighteenth and early nineteenth centuries, but this Enlightenment ideal did not reflect the reality of contemporary efforts to institutionalize scientific research. In a global race for profits and power, the institutionalization of research was inextricable from international economic and

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political struggles. Certainly, in the field of plant science, both Americans and Europeans won support for their work by stressing its distinctly national economic benefits, *even* as they depended on international networks of scholarly exchange. What the scientists of this era all shared was an inescapable sense of their own nationality, a belief that national identity shaped their work in crucial ways, and a conviction that national service was every scholar's foremost duty.

Both directly and indirectly, these scholars linked the institutionalization of research with a "project" of national development; they associated scholarship with nation-building. At the same time, they realized that such a project relied on cross-national scholarly cooperation. Nationalism and internationalism thus went hand in hand. In this regard, the institutions of the late eighteenth and early nineteenth century resemble those of the early twenty-first century. Then, as now, the university was a global institution enmeshed in the economic and political struggles of its time. Then, as now, the university had tremendous difficulty balancing the national(ist) and international(ist) dimensions of its mission. The enduring question, it seems, is whether the university, in serving its own nation, could also serve humanity in general. Many in the early American republic assured themselves that, on balance, it could.

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NOTES

¹ Timothy Matlack, *An Oration, Delivered March 16, 1780, Before the Patron, Vice-Presidents and Members of the American Philosophical Society, Held at Philadelphia, for Promoting Useful Knowledge* (Philadelphia: Styner and Cist, 1780), 25.

² Matlack, 13.

³ Matlack, 26.

⁴ Therese O'Malley “‘Your Garden Must be a Museum to You’: Early American Botanic Gardens,” *The Huntington Library Quarterly* 59:2/3 (1996), 212.

⁵ See Paul A.W. Wallace, “Henry Ernst Muhlenberg,” *Proceedings of the American Philosophical Society* 92:2 (May 5, 1948), 107-110.

⁶ James A. Mears, “Some Sources of the Herbarium of Henry Muhlenberg (1753-1815),” *Proceedings of the American Philosophical Society* 122:3 (June 9, 1978), 168. See also Wolf-Dieter Muller-Jahncke, “Johann David Schoepf (1752-1800): A German Physician As a Botanist and Zoologist in North America,” *Pharmacy in History* 20:2 (1978), 43-64.

⁷ See William Martin Smallwood, *Natural History and the American Mind* (New York: Columbia University Press, 1941). For a comprehensive early summary of well over a hundred botanical studies of North and South American plants to 1800, see Samuel Latham Mitchill, “A Discourse Delivered Before the New York Historical Society at Their Anniversary Meeting, 6th December 1813, Embracing a Concise and Comprehensive Account of the Writings Which Illustrate the Botanical History of North and South America,” *Collections of the New York Historical Society II* (New York: Van Winkle and Wiley, 1814), 149-215. See also Michael Krau, *The Eighteenth-Century Origins of the Atlantic Civilization* (Ithaca: Cornell University Press, 1949), 163-175; U.P. Hedrick, *A History of Horticulture in America to 1860* (New York: New York University Press, 1950); James L. Reveal, *Gentle Conquest: The Botanical Discovery of North America with Illustrations from the Library of Congress* (Washington: Starwood, 1992); and Arthur W. Hill, “The History and Functions of Botanic Gardens,” *Annals of the Missouri Botanical Garden* 2:1/2 (February-April 1915), 197.

⁸ See Frederick Brendel, “Historical Sketch of the Science of Botany in North America from 1635 to 1840,” *The American Naturalist* 13:12 (December 1879), 754-771. See also John C. Greene, “American Science Comes of Age, 1780-1820,” *Journal of American History* 55:1 (June 1968), 22-41; and Jon Kukla, “A Naturalist in Colonial Virginia: ‘Mr. Clayton The Great Botanist of America,’” *Virginia Cavalcade* 40:4 (1990), 184-190. See also Benjamin Smith Barton, “Memorandums of the Life and Writings of Mr. John Clatyon, the celebrated Botanist of Virginia” (1805), “Some Account of Mr. John Banister, the Naturalist” (1806) and “Memorandums of the Lives and Literary Labours of Mr. William Vernon and Dr. David Krieg” (1806). Another important contribution to North American natural history in this period was the work of Swedish botanist Peter Kalm, who published his *Travels in North America* in 1748.

⁹ William Bartram *Travels through North and South Carolina, Georgia, East and West Florida, the Cherokee Country, The Extensive Territories of the Muscogulges, or Creek Confederacy, and the Country of the Choctaws; Containing an Account of the Soil and Natural Productions of Those Regions, Together*

With Observations on the Manners of the Indians, Embellished with Coppert Plates (Philadelphia: James and Johnson, 1791). See Jean Jacquot, “Hans Sloane and the French Men of Science,” *Notes and Records of the Royal Society of London* 10:2 (April 1953). See also Gilbert Chinard, “André and François-André Michaux and Their Predecessors: An Essay on Early Botanical Exchanges Between America and France,” *Proceedings of the American Philosophical Society* 101:4 (August 16, 1957), 348-349.

¹⁰ Humphry Marshall, *Arbustrum Americanum: The American Grove, or, An Alphabetical Catalogue of Forest Trees and Shrubs, Natives of the American United States, Arranged According to the Linnaean System, Containing, the Particular Distinguishing Characters of Each Genus With Plain, Simple and Familiar Descriptions of the Manner of growth, Appearance, &c. of Their Several Species and Varieties. Also, Some Hints of Their Uses in Medicine, Dyes, and Domestic Economy. Compiled from Actual Knowledge and Observation, and the Assistance of Botanical Authors* (Philadelphia: Joseph Crukshank, 1785). See also William Darlington, *Memorials of John Bartram and Humphry Marshall* (Philadelphia, 1849). For a brief sketch of early American botanic gardens, see Smallwood, *Natural History and the American Mind*, 150-155.

¹¹ Whitfield J. Bell, Jr., “The Scientific Environment of Philadelphia, 1775-1790,” *Proceedings of the American Philosophical Society* 92:1 (March, 1948), 11. Botanic gardens in the United States generally followed European models. See Hill, 192n1: Recounting the establishment of a botanic garden at the monastery at St. Gaul in the ninth century Hill notes that botanic gardens were founded at Pisa in 1544, Padua in 1545, Bologna (1547), Zurich (1560), Leiden (1577), Leipzig (1579), Paris (1597), Montpellier (1598), Heidelberg before 1600, Giessen (1605), Strasburg (1620), Oxford (1621), Jena (1629), Upsala (1657), Chelsea (1673), Berlin (1679), Edinburgh (1680), Amsterdam (1682), St. Petersburg (1713), Vienna (1754), Cambridge (1762), etc. Some of these gardens expanded rapidly. “In the botanic garden at Paris, for example, in the year 1636, there were about 1,800 species under cultivation, and the number had risen in 1640 to 2,360, and in 1665 to as many as 4,000 species.” See also Raymond Frank Paskvan, “The Jardin du Roi: The Growth of Its Plant Collection, 1715-1750” (Unpublished Ph.D. dissertation, University of Minnesota, 1971); and Smallwood, *Natural History and the American Mind*, 61-76.

¹² Henry Muhlenberg, “Index Florae Lancastriensis,” *Transactions of the American Philosophical Society* 3 (1793), 157. Contributors to Muhlenberg’s herbarium included Christian Denke, William Hamilton, Matthias Kinn, Samuel Gottlieb Kramsch, Johann Christopher Muller, William Baldwin, Stephen Elliott, Benjamin Smith Barton, William Paul Crillon Barton, William Bartram, Jacob Bigelow, Peter Billy, John Brickell, Zaccheus Collins, Manasseh Culter, Gustavus Heinrich Dallman, Caspar Wistar Eddy, Aloysius Enslin, Anna Rosina Kleist Gambold, Erik Acharius, James Dickson, Johann Hedwig, Jacob Green, Isaac Hiester, John Jackson, Frederick Kampmann, Bernard M’Mahon, John Lyon, James Mease, Augustus Gottlieb Oemler, William Dandridge Peck, Frederick Pursh, Constantine Samuel Rafinesque-Schmaltz, Joseph van der Schott, Johann David Schopf, Lewis David von Schweinitz, Jacob van Vleck, Charles Whitlow, Ambroise Marie François Joseph Palisot de Beauvois, Christiaan Hendrik Persoon, Albrecht Wilhelm Roth, Heinrich Adolph Schrader, Johann Christian Daniel von Schreber, Christian Freidrich Schwagrighen, Olaf Peter Swartz, Kurt Polycarp Joachim Sprengel, Dawson Turner, Carl Ludwig Willdenow, Georg Franz Hoffmann, and perhaps also Humphry Marshall, Adam Kuhn, François-André Michaux, David Greenway, and Samuel Latham Mitchill.

¹³ Mears, “Some Sources of the Herbarium of Henry Muhlenberg (1753-1815),” 155-174. For more on German botanic gardens in this period, see, for example, Fritz Kümmel, *300 Jahre Botanischer Garten der Martin-Luther Universität Halle-Wittenberg* (Halle-Wittenberg: Martin-Luther Universität, 1998); Eva-Maria Stahmer, Bilkis Heneka, and Susanne Traut, *Botanischer Garten der Universität Freiburg, 1620-1995* (Freiburg: Universitätsbibliothek, 1996); Friedrich Karl Timler and Bernhard Zepernick, *Der Berliner Botanische Garten: Seine 300jährige Geschichte vom Hof- und Küchengarten des Grossen Kurfürsten zur*

wissenschaftlichen Forschungsstätte (Berlin: Presse- und Informationsamt des Landes Berlin, 1978). See also Andréw T. Gage, *A History of the Linnaean Society of London* (London: Linnaean Society, 1938).

¹⁴ M. L. Wilson, "Survey of Scientific Agriculture," *Proceedings of the American Philosophical Society* 86:1 (September 25, 1942), 53; Lucius F. Ellsworth, "The Philadelphia Society for the Promotion of Agriculture and Agricultural Reform, 1785-1793," *Agricultural History* 42:3 (July 1968), 189. See also Chester McArthur Destler, "The Gentleman Farmer and the New Agriculture: Jeremiah Wadsworth," *Agricultural History* 46:1 (1972), 135-153. In 1784, a year before the establishment of the Philadelphia Society for the Promotion of Agriculture, the United States' first seed distribution company, David LAndréth and Sons, was founded in Philadelphia. For more on this company, see the first chapter of Leslie R. Hawthorne and Leonard H. Pollard, *Vegetable and Flower Seed Production* (New York: Blackiston, 1954).

¹⁵ Benjamin Marshall Davis, "Agricultural Education: Agricultural Societies," *The Elementary School Teacher* 11:5 (January 1911), 267.

¹⁶ Bell, "The Scientific Environment of Philadelphia, 1775-1790," 11.

¹⁷ See Francis W. Pennell, "Benjamin Smith Barton as Naturalist," *Proceedings of the American Philosophical Society* 86:1 (September 25, 1942), 108. Barton's father was a close friend of University of Pennsylvania provost William Smith. In fact, Pennell notes, his "friendship was so keen for Provost William Smith of the College of Philadelphia as to insert a Smith in his son Benjamin's name." Barton succeeded the University of Pennsylvania's first teacher of botany, Adam Kuhn of the medical faculty. See also Christine Chapman Robbins, "David Hosack's Herbarium and Its Linnaean Specimens," *Proceedings of the American Philosophical Society* 104:3 (June 15, 1960), 293-294: "The Professor of Botany and Materia Medica of the Medical Faculty at the University of Pennsylvania, Dr. Adam Kuhn, had received his M.D. from the University of Edinburgh in 1768. Previously, he had spent two years, 1762-1764, as a student of botany at the University of Upsala, Sweden, under Professor Carl Linnaeus, a friend of his father."

¹⁸ Joseph Ewan, "From Calcutta and New Orleans, or, Tales from Barton's Greenhouse," *Proceedings of the American Philosophical Society* 127:3 (June 1983), 125. Barton won the Harveian Prize for his thesis; see Pennell, "Benjamin Smith Barton as Naturalist," 110. See also Benjamin Smith Barton to Benjamin Rush (January 24, 1787) quoted in Christine Chapman Robbins, *David Hosack: Citizen of New York* (Philadelphia: American Philosophical Society, 1964), 26n20. See also David Mackay, *In the Wake of Cook: Exploration, Science, and Empire, 1780-1801* (London: Croom Helm, 1985).

¹⁹ Pennell, "Benjamin Smith Barton as Naturalist," 110. See also Mears, "Some Sources of the Herbarium of Henry Muhlenberg (1753-1815)," 159: "William Paul Crillon Barton (1786-1856), a nephew of Benjamin Smith Barton, contributed at least 137 specimens to Muhlenberg's herbarium."

²⁰ "A Sketch of the History of Indian Botany," accessed on June 23, 2006, at <http://wgabis.ces.iisc.ernet.in/biodiversity/documents/botanical.htm>. See also Lucile H. Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New York: Academic Press, 1979); and F. Nigel Hepper, *Royal Botanic Gardens, Kew: Gardens for Science and Pleasure* (London: Her Majesty's Stationery Office, 1982). For more on economic botany in Asia, see R. A. Donkin, *Between East and West: The Moluccas and the Traffic in Spices Up to the Arrival of Europeans* (Philadelphia: American Philosophical Society, 2003); Giles Milton, *Nathaniel's Nutmeg, Or, The True and Incredible Adventures of the Spice Trader Who Changed The Course of History* (New York: Farrar, Straus, and Giroux, 1999); and Penny LeCouteur, *Napoleon's Buttons: How 17 Molecules Changed History* (New York: Putnam, 2003).

²¹ Francis W. Pennell, "Historic Botanical Collections of the American Philosophical Society and the Academy of Natural Sciences of Philadelphia," *Proceedings of the American Philosophical Society* 94:2 (April 21, 1950), 150, 140-141. See also F. N. Hepper, *The West African Herbaria of Isert and Thonning: A Taxonomic Revision and an Index to the IDC Microfiche* (Kew: Bentham-Moxon Trust, 1976). Perhaps the most famous botanical expedition to South America in this period was that of Hipólito Ruiz Lopez and Jose Antonio Pavón Jiménez, who spent eleven years botanizing in Peru, Chile, and Ecuador between 1777 and 1788. Pavon later corresponded with Alexander von Humboldt in advance of his own voyage.

²² See Courtney Robert Hall, *A Scientist in the Early Republic; Samuel Latham Mitchill, 1764-1831* (New York: Columbia University Press, 1934; reprinted 1967). Mitchill belonged to a wide range of learned societies. See Hall, 129-130. He belonged to the American Philosophical Society (1791); the Society for Promoting Agriculture, Arts, and Manufactures of New York (1791); the Royal Society of Arts and Sciences at Cape Francois, Haiti (1792, associate); the Royal Society of Edinburgh (1793, fellow); the Massachusetts Historical Society (1798, corresponding member); the American Mineralogical Society (1799); the Philadelphia Academy of Medicine (1799, corresponding member); the Agricultural Society of the Bahama Islands (1801, honorary member); the Society of Antiquarians of Scotland (1802, corresponding member); the Culpeper Agricultural Society of Virginia (1802); the London Medical Society (1802; associate); the Lancaster County Agricultural Society in Pennsylvania (1803); the South Carolina Medical Society (1805; honorary member); the United States Military Philosophical Society (1805); the Academy of Arts and Sciences, Belles Lettres, and Commerce of Marseilles (1807, corresponding member); the New York County Medical Society (1807); the Academy of Arts and Sciences of Leghorn, Italy (1808, corresponding member); the Orange County Medical Society in New York (1808, honorary member); the Medical Lyceum of Philadelphia (1808); the New Hampshire Medical Society (1808, honorary fellow); the Society for Promoting the Physical and Natural Sciences of Paris (1808, corresponding member); the Philo-Medical Society of New York (1810), the Society for the Promotion of the Useful Arts of New York (1810); the New York State Medical Society (1811, honorary member); the Wernerian Natural History Society of Edinburgh (1811, fellow); the Literary and Philosophical Society of Preston, England (1811), the Royal Society for the Better Advancement of Medicine of Madrid (1812); the Academy of Natural Sciences of Philadelphia (1814, corresponding member); the Philadelphia Society for Promoting Agriculture (1814, corresponding member); the American Antiquarian Society (1814); the New York Lyceum of Natural History (1817); the Literary and Philosophical Society of New York (1815); the Linnaean Society of New England (1815, honorary member); the Berkshire Society for Promoting Agriculture and Manufactures (1815, honorary member); the Vermont Medical Society (1816); the Royal Medical Society of Copenhagen (1816); the Medical Society of New Orleans (1818, corresponding member); the Accademia dei Georgofili of Florence (1818, corresponding member); the Newtonian Society of Maryland (1818, honorary member); the Caesarean Academy of Naturae Curiosorum of Moscow (1819); the Agricultural Society of North Carolina (1819, honorary member); the Western Museum Society (1819, honorary member); the Medical Society of the District of Columbia (1819, honorary member); the American Geological Society (1819); the Physico-Medical Society of New Orleans (1820, corresponding member); the Tennessee Antiquarian Society (1820, honorary member); the New York County Agricultural Society (1820); and the New York Nautical Institution (1820).

²³ "Massachusetts Society for Promoting Agriculture Records, 1764-1963: Guide to the Collection," accessed on-line August 8, 2007, at <http://www.masshist.org/findingaids/doc.cfm?fa=fa0245>

²⁴ Marti, "Early Agricultural Societies in New York," 314.

²⁵ Alexander Hamilton, *Report on Manufactures* (Philadelphia, 1791), quoted in Douglas A. Irwin, “The Aftermath of Hamilton’s ‘Report on Manufactures,’” *Journal of Economic History* 64:3 (September 2004), 803.

²⁶ Douglas A. Irwin, “New Estimates of the Average Tariff of the United States, 1790-1820,” *Journal of Economic History* 63:2 (June 2003), 512. See also Charles R. Ritcheson, *Aftermath of Revolution: British Policy Toward the United States, 1783-1795* (Dallas: Southern Methodist University Press, 1969).

²⁷ For more on economic development in this period, see Michael Lind, ed. *Hamilton’s Republic: Readings in the American Democratic Nationalist Tradition* (Free Press, 1997). See also A. Glenn Crothers, “Banks and Economic Development in Post-Revolutionary Northern Virginia, 1790-1812,” *Business History Review* 73:1 (Spring 1999), 1-39; and Jacob E. Cooke, “Tench Coxe, Alexander Hamilton, and the Encouragement of American Manufactures,” *The William and Mary Quarterly*, 3rd. Series, 32:3 (July 1975), 369-392.

²⁸ Benjamin Rush, *An Account of the Sugar Maple-Tree of the United States, and of the Methods of Obtaining Sugar from It, together with Observations Upon the Advantages Both Public and Private of This Sugar. In a Letter to Thomas Jefferson, Esq., Secretary of the United States, and One of the Vice-Presidents of the American Philosophical Society, Read in the American Philosophical Society, on the 19th of August, 1791* (Philadelphia, R. Aitken and Son, 1792; reprinted in the *Transactions of the American Philosophical Society*, 1793). Rush’s study was not the first on the subject of the sugar maple. For others published as early as 1699, see Samuel Latham Mitchill, “A Discourse Delivered Before the New York Historical Society at Their Anniversary Meeting, 6th December 1813, Embracing a Concise and Comprehensive Account of the Writings Which Illustrate the Botanical History of North and South America,” 174, 179, 180, 190, etc.

²⁹ Rush, *An Account of the Sugar Maple-Tree of the United States*, 10. Rush noted that, while an estimate of 60,000 families engaged in maple sugar production might seem high, twice as many were “employed every year, in making cider, the trouble, risks, and expenses of which are all much greater than those of making maple sugar.”

³⁰ Rush, *An Account of the Sugar Maple-Tree of the United States*, 14.

³¹ For more on Jefferson, science, and science policy, see Silvio A. Bedini, *Jefferson and Science* (Charlottesville, Va.: Thomas Jefferson Foundation, 2002).

³² Subscription List for Michaux Expedition (1793), American Philosophical Society Archives, 1980, 1654 MS, quoted in Henry Savage, Jr., and Elizabeth J. Savage, André and François-André Michaux (Charlottesville: University Press of Virginia, 1986), 127-128. For more on Michaux, see Margaret Mills Seaborn, ed., *André Michaux’s Journeys in Oconee County, South Carolina, in 1787 and 1788* (Columbia, S.C. : R. L. Bryan Co, 1976).

³³ Savage and Savage, 3-15. See also J. R. Schramm, “The Memorial to François-André Michaux at the Morris Arboretum, University of Pennsylvania,” *Proceedings of the American Philosophical Society* 100:2 (April 23, 1956), 145.

³⁴ Savage and Savage, 275-276. For more on forestry in the context of colonialism, particularly since the mid-nineteenth century, see K. Sivaramakrishnan, “Colonialism and Forestry in India: Imagining the Past in Present Politics,” *Comparative Studies in Society and History* 37:7 (January 1995), 3-40; and M. Buchy, *Teak and Arecanut: Colonial State, Forest, and People in the Western Ghats, South India, 1800-1947* (Pondichery: Institut francais de Pondichery,

1996). France was not the only European country to investigate American forest trees in this period. In 1787, Frederic Adam Julius von Wangenheim, who accompanied the Hessian troops during the revolutionary war, published a work on this topic in Göttingen. See Mitchell, “A Discourse Delivered Before the New York Historical Society at Their Anniversary Meeting, 6th December 1813, Embracing a Concise and Comprehensive Account of the Writings Which Illustrate the Botanical History of North and South America,” 199: “This ample work was printed at Göttingen and embellished with numerous large and distinct figures of the plants described. The object of this labored and extensive work seems to have been the improvement of the forests and gardens of Prussia by transplanting into them the trees and shrubs of North America. Under this impression, Wangenheim considers his subject in four points of view: 1st, such timber trees growing in North America, between the thirty-ninth and forty-fifth degrees of north latitude, as may be propagated in Germany, with improvement of the forests and with advantage to all persons concerning therein; 2nd, such trees and shrubs, growing in North America between thirty-nine and forty-five degrees as may perhaps be profitable for the German estates, but on which further trials ought to be made before a correct judgment can be formed; 3rd, such North American trees and flowering shrubs growing between the thirty-ninth and forty-second degrees of latitude as well bear transplanting and grow in the open air in Germany and are at the same time worthy of cultivation for their taste and ornament; 4th, such as, though growing between the thirty-ninth and forty-fifth are not of importance enough to be transplanted from North America to Germany as articles of substantial profit or improvement. All the plants are arranged according to the sexual system. The pains bestowed upon them evinces in the strongest manner the interest which the richness of our forests excited in the author and his royal patron. It is a pity this work is not extant in our language, on account of the fund of instruction it contains.”

³⁵ Chinard, “André and Francoi-André Michaux and Their Predecessors,” 352; Savage and Savage, 42-63. See also William J. Robbins and Mary Christine Howson, “André Michaux’s New Jersey Garden and Pierre Paul Saunier, Journeyman Gardener,” *Proceedings of the American Philosophical Society* 102:4 (August 1958), 355: “The decision to establish a garden in New Jersey was undoubtedly influenced by J. Hector St. John de Crevecoeur, French Consul to New York, New Jersey, and Connecticut. Two years prior to André Michaux’s arrival, Crevecoeur, on behalf of the French Minister in Charge of Nurseries and Botanical Gardens in France, had written a letter to Governor Livingston in which he proposed that a botanical garden be established in New Jersey ‘for the cultivation of the useful and curious productions in America’ and promised that, if such a botanical garden were established, his Royal Majesty, King Louis XVI of France, out of his deep respect for the United States, would send ‘at His Majesty’s expense from his Royal Gardens every species of seed and Plants that the Director of the Botanical Gardens in New Jersey may wish to have.’ New Jersey was ideally suited for the founding of such a garden, according to Crevecoeur, because of its admirable climate and situation and the civic-mindedness of its people. The legislature of New Jersey voted to thank Crevecoeur for his gracious letter, but made no move to appropriate funds for the garden.” Apparently, the same royal offer was also made to Yale; see Smallwood, *Natural History and the American Mind*, 151: “The American Philosophical Society passed an order on June 19, 1784, that a botanic garden be planted in Philadelphia. Another garden was started in the same year at New Haven and obtained French patronage through the active interest of MM. Mich-Guillaume and St. Jean de Crevecoeur.” See Clifton F. Lord, Jr., and Martha Jane K. Zachert, “The Botanical Garden of André Michaux Near Charleston, 1786-1802,” *American Pharmaceutical Association Convention* (Las Vegas, March 27, 1962); H.H. Torrey, “Michaux’s New Jersey Botanical Garden,” *Torrey Botanical Club Bulletin* 11 (1884); W.C. Coker, “The Garden of André Michaux,” *Journal of the Elisha Mitchell Scientific Society* (July 1911). Michaux was not the only foreign botanist to acquire holding gardens on behalf of foreign powers; see Marcus. B. Simpson, Jr., Stephan Moran, and Sallie W. Simpson, “Biographical Notes on John Fraser (1750-1811): Plant Nurseryman, Explorer, and Royal Botanical Collector to the Czar of Russia,” *Archives of Natural History* 24:1 (1997), 1-18. See also Walter Kingsley Taylor and Elaine M. Norman, *André Michaux in Florida: An Eighteenth-Century Botanical Journey* (Gainesville, Fl.: University Press of Florida, 2002); Reuben Gold Thwaites, ed., “Journal of André Michaux, 1793-1796,” in *Early Western Travels, 1748-1846*, vol. 3 (1889), 27-306; and Susan Delano McKelvey, *Botanical Explorations of the Trans-Mississippi West, 1790-1850* (Eugene, Ore.: Oregon State University Press, 1991).

³⁶ André Michaux, “Exposition of the Basis upon which I have resolved to undertake the journey to the West of the Mississippi” (April 29, 1793) Michaux Papers, American Philosophical Society, translated and quoted in Savage and Savage, 131.

³⁷ “Memoir to serve as instructions to Citizen Genet,” in Frederick Jackson Turner, *Correspondence of the French Ministers to the United States, 1791-1797*, vol. 1 (New York: De Capo Press, 1972), 201-211, quoted in Savage and Savage, 132.

³⁸ Edmond Genet to Minister of Foreign Affairs, Philadelphia (May 18, 1793), quoted in Turner, ed, *Correspondence of the French Ministers to the United States, 1791-1797*, 1:214, quoted in Savage and Savage, 135. C.S. Sargent, ed., *Journal of André Michaux* (“Journal de mon Voyage”), 90, quoted in Savage and Savage, 145-146. Even as Michaux cheered the victories of the French army in 1794, these same victories precipitated François D’Invernois’ request to Thomas Jefferson and George Washington to relocate the faculty of the University of Geneva to the United States.

³⁹ See Paul M. Spurlin, “The World of the Founding Fathers and France,” *The French Review* 49:6 (May 1976), 922. See also Cushing Strout, *The American Image of the Old World* (1963), 42: “when Citizen Genet, minister of the new Republic to the United States, arrived in the spring of that year [1793], seeking American aid, he was greeted with elaborate enthusiasm, and his journey from Charleston was so studded with fetes and ovations that it took him twenty-eight dahys to reach Philadelphia.” For the fruits of Michaux’s work, see André Michaux, *Histoire des chênes de l’Amérique : ou, Descriptions et figures de toutes les espèces et variétés de chênes de l’Amérique Septentrionale, considérées sous les rapports de la botanique, de leur culture et de leur usage* (Paris, 1801); and André Michaux, *Flora boreali-americana : sistens caracteres plantarum quas in America septentrionali collegit et detexit* (Paris 1803).

⁴⁰ Barton, *Collections for an Essay Towards a Materia Medica of the United States*, 44-45. Benjamin Smith Barton, *Collections for an Essay Towards a Materia Medica of the United States, Read Before the Philadelphia Medical Society, on the Twenty-First of February, 1798* (Philadelphia: Way and Groff, 1798), iii-iv.

⁴¹ Grafton Duvall, *An Experimental Botanico-Medical Essay on the Melia Azerdarach of Linnaeus* (Philadelphia: Hugh Maxwell, 1802), 22.

⁴² Duvall, *An Experimental Botanico-Medical Essay on the Melia Azerdarach of Linnaeus*, 22.

⁴³ Robert Holmes, *An Investigation of the Properties of the Bignonia Catalia of Linnaeus* (Philadelphia: Hugh Maxwell, 1803); William Downey, *An Investigation of the Properties of the Sanguinaria Canadensis, or Puccoon* (Philadelphia: Eaken and Mecum, 1803); John Mitchell *An Essay on the Arbutus Uva Ursi and Pyrola Umbellata and Maculata of Linnaeus* (Philadelphia: Eaken and Mecum, 1803). See also Thomas Massie *An Experimental Enquiry into the Properties of the Polygala Senega* (Philadelphia: Eaken and Mecum, 1803). Massie wrote: “America may be compared to a mine of treasures as yet imperfectly explored. To the ingenuity and talents of a few individuals, the scientific world is much indebted; but in a field so spacious much remains to be done, and a great variety of subjects present themselves to arrest the attention of the Botanist, Naturalist, and Physician. To the latter our country has furnished some of the most valuable articles of the Materia Medica, which are employed in opposing the ravages of disease. With the qualities of all of them we are by no means perfectly acquainted. The following essay is an attempt to explain more fully the properties of some of them, viz., of the Polygala Senega, which, from its abundance in the United States, and its efficacy in the treatment of Cynanche Trabealis (a very frequent and often fatal disease) is entitled to our attention, even had it no other good qualities.”

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⁴⁴ William Nelson, *Observations on the Management of Peruvian Bark* (Philadelphia: John Geyer, 1802).

⁴⁵ James A. Mears, "Some Sources of the Herbarium of Henry Muhlenberg (1753-1815)," *Proceedings of the American Philosophical Society* 122:3 (June 9, 1978), 158. "Indefatigable William Baldwin (1779-1819) contributed more than 1,550 specimens to Muhlenberg between 1811 and 1815." William Baldwin, *A Short Practical Narrative of the Diseases Which Prevailed Among the American Seamen at Wampoa in China, in the Year 1805, With Some Account of the Diseases Which Appeared Among the Crew of the Ship New Jersey on the Passage from Thence to Philadelphia* (Philadelphia: Thomas T. Stiles, 1807).

⁴⁶ Baldwin, *A Short Practical Narrative of the Diseases Which Prevailed Among the American Seamen at Wampoa in China*, 22.

⁴⁷ Ewan, "From Calcutta and New Orleans, or, Tales from Barton's Greenhouse," 129. See also Benjamin Smith Barton to William Roxburgh (May 1, 1807), quoted in Ewan, "From Calcutta and New Orleans, Or, Tales from Barton's Greenhouse," 132: "I ought long since to have acknowledged the receipt of your kind note, together with the present of seeds by Dr. Darlington. Since the return of Dr. D[arlington], I have erected upon my own grounds, a pretty extensive greenhouse, as we call it, into which I am extremely anxious to receive a number of your vegetable countrymen, especially the hardy ones. Will you, my dear sir, endeavor to assist me in this business? You have only to say what I shall send you."

⁴⁸ Joseph Ewan, "Five Pupils of Benjamin Smith Barton: The Men and Their Minds," *Transactions and Studies of the Colleges of Physicians of Philadelphia* 5:5 (1983), 319. For more on Horsfield's first voyage to Java, see Thomas Horsfield, "An Account of a Voyage to Batavia, in the Year 1800," *Philadelphia Medical Museum* 1 (1805), 75-82. Dutch botanists initiated several gardens in Asia; see Hill, 213-214: "At Penang the Hon. East India Company decided to start spice gardens with a view of breaking down the Dutch monopoly. Living plants of nutmegs and cloves were collected in the Moluccas in 1796, and the first nutmegs were produced in Penang in 1801. The Gardens, however, were destroyed in 1805, and refounded in 1822 at the instance of Sir Stamford Raffles. . . . The first botanic garden established in Ceylon was created by the Dutch on Slave Island, near Colombo, but this was neglected with the island passed into the possession of Britain, and it was not until 1810, when Sir Joseph Banks suggested a site, that a new garden was established, also on Slave Island at a place still known as Kew." The British also established a botanic garden at Sydney, Australia, in 1788, and later at Brisbane, Melbourne, Adelaide, Hobart, and Tasmania, as well as Wellington, Dunedin, Napier, and Christchurch in New Zealand.

⁴⁹ Quoted in William Frederic Worner, "The Lancaster County Society for Promoting Agriculture, Manufactures, and the Useful Arts," *Journal of the Lancaster County Historical Society* 100:4 (1998), 347.

⁵⁰ Worner, "The Lancaster County Society for Promoting Agriculture, Manufactures, and the Useful Arts," 347.

⁵¹ Foster, *Husbandry: An Ancient, Honorable, and Useful Employment*, 14.

⁵² Harvard University, *The Foundation of the Massachusetts Professorship of Natural History at Harvard College in Cambridge, with Documents, relative to its Establishment* (Boston: Russell and Culter, 1805), 19. See also Jeannette E. Graustein, "Harvard's Only Massachusetts Professor of Natural History: Establishing Harvard's Botanic Garden and Equipping It With a Director," *Harvard Alumni Bulletin* (December 13, 1958), 242-243, 257-258; and Judith Warnement, "Botanical Libraries and Herbaria in North America. 3. Harvards' Botanists and Their Libraries," *Taxon* 46 (November 1997). Harvard asked the state legislature

for support but received no funds. About the same time, in 1805, the medical faculty at the University of Pennsylvania asked the Pennsylvania state legislature for resources to create a botanic garden. See Ewan, "From Calcutta and New Orleans, Or, Tales from Barton's Greenhouse," 126: "The next year [1806], \$3,000 was granted to the University of Pennsylvania 'for the purpose of enabling them to establish a garden.' But after 1807 there was no further support for the operating expenses of the university botanic garden."

⁵³ Harvard University, *The Foundation of the Massachusetts Professorship of Natural History*, 19. The plan to solicit donations for a professorship apparently originated in 1802. See Graustein, 242: "John Lowell, 'the Old Judge' (1744-1802), a member of the Corporation [of Harvard College] and President of the Massachusetts Society for Promoting Agriculture, 'formed the design of raising a fund' for creating a professorship of Natural History at Harvard and in conjunction with it a garden. Very soon after his death his two eldest sons, John and Rebel (1769-1840), and Francis Cabot Lowell, took the lead in carrying out his plan. The latter, in charge of the subscription list, had accumulated pledges for \$31,333 from about 150 donors by early 1805. . . . The Legislature of the Commonwealth of Massachusetts voted a township of wild land in Maine (part of Massachusetts until 1820) to the Trustees of the Massachusetts Society for Promoting Agriculture for the benefit of the new Professorship, and it subsequently was named the Massachusetts Professorship of Natural History." See also Benjamin Waterhouse, *The Botanist* (1811), vii-viii.

⁵⁴ Graustein, 243. "On the side of his mother (Hannah Jackson) as well as his father, he was related to several of the donors; in fact the professorship had been established with Peck in mind as its first incumbent. His father, John Peck, had been a Boston merchant and a very clever naval architect whose ships were famous for their ease and speed, among them the Revolutionary ships-of-war *Hazard*, *Belisarius*, and *Rattlesnake*, and later the *Empress of China*, the first American ship in the China trade. She took a shipment of ginseng and other western products to a market so profitable that fortunes in New England rapidly blossomed into great capital resources that financed much of the technical development of the fast-growing nation." Of the Harvard botanic garden, Graustein writes, "The grounds were enclosed by a high, close fence and carefully laid out on two levels 'with the formal lines of smaller London establishments used as a model.' In the lower part, a pool for aquatic plants formed the center of a series of concentric beds. A great variety of trees and shrubs, native and exotic, were promptly planted. In the southwest corner, around a cool spring, native herbs were established . . . To the east an old cottage accommodated the gardener. On the higher ground a conservatory, placed in line with the pool below, was linked to it by a wide gravel walk and wooden (later granite) steps. To the northeast, concealed by a fine hedge of European beech, was a working area of seed-plots, cold frames, and hotbeds. The Garden was primarily for instruction, but it was open to visitors at an admission charge of twenty-five cents (or at a yearly rate) and it also sold flowers and plants." See also Graustein, 257. "Peck did not start his teaching activities until many months after his return from Europe [in 1808] because Dr. Benjamin Waterhouse of the Harvard Medical School, who had been giving a course in Natural History annually at the College since 1788, was very loath to hand over the work and the fees to anyone else. He had bitterly opposed the establishment of the Massachusetts Professorship, the first incumbent of which was to be elected by the subscribers: in a long Memorial he begged the Corporation not to allow the proposed professorship to deprive him of vested interests rooted in the pioneer work of starting a new subject and building up interest in it under difficulties and discouragements through seventeen years. When Peck arrived in Cambridge from Europe in the spring of 1808 he was too occupied by other business to assume the course in Natural History, and in the spring of 1809 Waterhouse proceeded to meet the class as usual. The Corporation voted to permit him to finish the course but rescinded his rights for the future." For more on Peck, including excerpts from his inaugural lecture at Harvard, see Smallwood, *Natural History and the American Mind*, 302-303. For his lectures on botany, Peck noted: "As a proper foundation for all knowledge of plants I shall first consider the structure of the solid portion of vegetables and then their fluids; after this the use of the various organs, from root to the leaves and flowers. The various modes of flowering; the explanation of technical terms; and finally, that of the Linnaean System, which has been found of all others the most easily applied to plants, and this will include the description of all that appertains to the exterior of vegetable bodies." Peck was among the first American botanists to

collect alpine plants. See Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 615: “It is known that Professor Peck, and a party including Rev. Manasseh Culter, and Dr. Nathaniel Bowditch, made an ascent of the White Mountains in 1804, reaching the summit on July 28. This was evidently Peck’s first trip to the alpine summit of the White Mountains but the Reverend Cutler had previously visited the heights in 1784, when he was in fact the first person to record botanical observations of any sort upon alpine vegetation on the North American continent.”

⁵⁵ See, for example, Greene, “American Science Comes of Age, 1780-1820,” 22-41. See also Benjamin Smith Barton, *Elements of Botany, Or, Outlines of the Natural History of Vegetables* (1803; second edition 1812-1814). See Pennell, “Benjamin Smith Barton as Naturalist,” 114.

⁵⁶ Barton, *A Discourse on Some of the Principal Desiderata in Natural History*, 2.

⁵⁷ Barton, *A Discourse on Some of the Principal Desiderata in Natural History*, 41.

⁵⁸ Barton, *A Discourse on Some of the Principal Desiderata in Natural History*, 45.

⁵⁹ Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 606. Pursh may have come first to Baltimore, though it remains unclear where he might have worked there. See Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 602.

⁶⁰ Joseph Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” *Proceedings of the American Philosophical Society* 96:5 (October 1952), 601.

⁶¹ Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 606. Pursh may have come first to Baltimore, though it remains unclear where he might have worked there. See Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 602.

⁶² Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 610, 612-613. M’Mahon was the author of *The American Gardener’s Calendar* (1806), which went through eleven editions and which Ewan calls “the first really serviceable book for all branches of horticulture published in America” (citing Ulysses Prentiss Hedrick, *A History of Horticulture in America to 1860* (New York: Oxford University Press, 1950), 474. Ewan adds, “I am inclined to think Barton intended to write the account of the Lew and Clark collections himself, and subsidized Pursh to collect the Atlantic states’ species for inclusion in his projected flora. Did Pursh, then, aware of the need of a comprehensive flora for North America and the unlikelihood of Barton’s ever writing such an account, decide to quit Barton? In any event, it was only a matter of days after Pursh’s precipitous return from Rutland [Vermont], discouraged, ill, and penniless, that he took up lodging with the Philadelphia nurseryman Bernard M’Mahon to work on the Lewis and Clark collections. This phase of Pursh’s life has been generally overlooked by his biographers.”

⁶³ Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 614. “According to his own account Pursh made the trip to the West Indies in the winter of 1810-1811 for his impaired health. He visited five islands, namely, Barbados, Martinique, Guadeloupe, Dominica, and St. Bartholomews. . . . It is quite possible that Pursh visited Baron de Schack, correspondent of Dr. Hosack, when he stopped at Martinique, and Dr. Alexander Anderson, . . . another correspondent of Hosack’s, on either Barbados or Martinique, but we lack confirmation of these suggestions. The naturalist Johann Eric Forström, 1775-1824, lived on St. Bartholemews between 1803 and 1815 and, again, it is probable that Pursh sought out Forström as a kindred spirit if when he visited the island he

found Forström there. Pursh returned to the United States in the fall of 1811” See also Thomas Meehan, “The Plants of Lewis and Clark’s Expedition across the Continents, 1804-1806,” *Proceedings of the Academy of Natural Science of Philadelphia* 50 (1898), 12-49. Apparently, Thomas Jefferson was unaware of Pursh’s desire to publish the Lewis and Clark specimens. See Thomas Jefferson to Henry Muhlenberg (March 16, 1814), quoted in Wallace, “Henry Ernest Muhlenberg,” 110: “I thank you for your catalogue of North American plants. It is indeed very copious, and at the same time compendious in its form. . . . The discoveries of Governor Lewis may perhaps furnish matter of value, if ever they can be brought forward. The mere journal of the voyage may be soon expected; but in what forwardness are the volumes of the botany, natural history, geography, and meteorology of the journey, I am uninformed. . . . With my wishes for the continuance and success of your useful labors I embrace with pleasure this first occasion of assuring you that I have had long and much gratification in observing the distinguished part you have borne in making known to the literary world the treasures of our own country and I tender to you the sentiments of my high respect and esteem.” Apparently, before he sailed for England, Pursh visited William Dandridge Peck at Harvard; see Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 615.

⁶⁴ Quoted in Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 617, 618. The Lewis and Clark specimens were eventually returned to the United States when Amherst College botany professor Edward Tuckerman purchased the Lambert herbarium at auction in London in 1842. See Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 624-626.

⁶⁵ Quoted in Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 617-618. See also John Torry to Amos Eaton (May 15, 1818), quoted in Ewan, “Frederick Pursh, 1774-1820, and His Botanical Associates,” 624: “Upon the whole I am sorry that his [Pursh’s] work was ever published. He had, to be sure, great opportunities to consult herbaria, etc., but he is such a notorious liar and plagiarist that we can put no confidence in his assertions. His localities are very imperfect, and many of his synonyms are frequently erroneous.”

⁶⁶ Timothy Pitkin, *A Statistical View of the Commerce of the United States of America*, 2nd ed. (New York, 1817), 36, quoted in David Maldwyn Ellis, “Rise of the Empire State, 1790-1820,” *New York History* 56:1 (1975), 5-27.

⁶⁷ Quoted in O’Malley, “‘Your Garden Must be a Museum to You’: Early American Botanic Gardens,” 216.