Science and Statecraft: Thomas Jefferson's Hopes for American Higher Education, c. 1776-1806

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Introduction

Americans during the post-revolutionary era debated the proper relationship between science and the national state. Some believed that science, like schooling, should be left to local actors, perhaps supported by voluntary societies and subscriptions. Others argued that science, particularly applied science with broad economic benefits, should receive government aid. Yet, neither the Articles of Confederation nor the subsequent Constitution seemed to permit such aid (despite the Constitution's provision for patents and copyrights to protect intellectual property).

To examine the early roots of the relationship between science and the American state, this brief essay considers the question of state aid from the perspective of Thomas Jefferson, who, though committed to ideals of limited government, nonetheless sought throughout his political career to strengthen the state's role in support of science. Jefferson believed that science, with help from institutions of higher education, would propel the United States to great power and prosperity, as well as influence on the global stage.

Of course, in his pursuit of this agenda, Jefferson did not escape the cultural blinders of his time: he could not imagine women or nonwhites as university students, let alone scientists. Still, he saw how science could advance the development of an *opportunity* state if the state, in turn, advanced science. Even before he established the University of Virginia—an institution he placed with the Declaration of Independence on his tombstone's list of top accomplishments—he worked hard to build a strong relationship between science and the state.

This relationship was fraught with questions. If scientists received state aid, should the state determine the direction of scientific development? Should the prioritization of scientific activities be centralized or decentralized? How much aid to science was enough, and how much should be left to private or philanthropic support? In the pursuit of scientific discovery, should the United States cooperate with other countries, or compete with them? In general, should the products of scientific discovery be privately or publicly owned?

Jefferson did not have answers to all these questions, but over time each of them (and more) shaped his thoughts on the subject of state aid to science and higher education. By and large, he concluded that, while government should not seek to dictate the direction of scientific development, when possible more public aid was better, as was more collaboration with other countries. These views were not always welcomed by others, but Jefferson's vision for a closer relationship between science and the state proved to be historically prescient.

It helped that Jefferson hailed from Virginia in an era when the College of William and Mary and other institutions of (quasi-)higher education were relatively weak. To achieve his scientific aims, Jefferson *had* to look to new institutional forms. (Some have suggested that, if early national U.S. politics had rested with Harvardians like John Adams more than Virginians like Washington, Jefferson, Madison, and Monroe, then closer relations between science and the national state might have taken even longer to build as Harvard defended its own dominance.)

This short essay covers only a small part of Jefferson's long political career. Its ten brief episodes trace his ideas about science-state relations from the height of the revolutionary war until the start of his second presidential administration, roughly 1776 to 1806. Along the way, it follows his efforts to direct public aid toward scientific activities, whether in new (or reformed)

institutions of higher education or by other means. While these efforts did not always work out, they show the early roots from which a closer relationship between science and the state grew.

Episode I

In the summer of 1779, as the revolutionary war raged, Jefferson, then governor of Virginia, envisioned a revised scheme of education for his newly independent state. Outlined in his "Bill for the More General Diffusion of Knowledge" and his "Bill for Amending the Constitution of William and Mary," he called for a complete system of tax-supported district schools and regional academies topped by a university (a reformed William and Mary) that, each year, would enroll the state's best students at public expense.[1]

It was a grand vision, a result of years of planful anticipation. Calls to reform William and Mary had mounted for much of the prior decade, and readers of the *Virginia Gazette* encountered frequent columns on the need for educational improvement. In 1774, for example, a writer pen-named "Academicus" (probably Jefferson himself) had argued that William and Mary needed a new curriculum modeled after that of the College of New Jersey in Princeton . . . but a conservative faculty rejected this proposal, as it had many others.[2]

In 1776, however, with the rise of the revolutionary movement, calls for change gained steam. That spring, the college's twenty-seven-year-old professor of natural philosophy, James Madison (a relative of the future president), returned from a visit to London to find his fellow Virginians aligned with the patriot cause. He realized that national independence could release William and Mary from its original (English) corporation (and the king) and place it under a new (American) board of visitors (and the elected state legislature).[3]

Convinced that such a change would make the college more amenable to modern science, Madison (an avid astronomer) wrote to William Smith, provost of the College of Philadelphia, on the subject of higher-education reform. Two months later, a writer known only by the initials A.M. printed in the *Virginia Gazette* a plan for curricular revision. "[A.M.] wanted William and Mary to become the most extensive university in America," notes historian Robert Polk Thomson, "with professional programs in divinity, law, and medicine, [plus] a greatly expanded collegiate school."[4]

Within a year, the college's board of visitors had embraced the spirit of reform. In 1778 and 1779, they purged conservative loyalists from the faculty and placed Madison in charge as president. Then, guided by Jefferson's "Bill for Amending the Constitution of William and Mary," they cut the college's statutory ties with the Anglican Church and commanded its professors to pledge fidelity to Virginia's new revolutionary constitution. Their aim: to "republicanize"—and thus modernize—higher education in the state.

Jefferson, who as governor sat on the board of visitors, was pleased with these reforms but hoped they would go further, particularly with the implementation of new professorships in the natural sciences. Yet the challenges of the war meant his larger agenda had to be postponed, even as the war itself revealed an urgent need for scientific expertise. Jefferson, for example, coordinated a desperate search for lead mines to supply the state militia with bullets and cannonballs, a search that succeeded in 1780, just in time for the decisive Battle of Yorktown a year later.[5]

In the meantime, William and Mary suffered. A wartime fire destroyed much of the college, and Jefferson had to look elsewhere to advance his educational agenda. He looked west. Perhaps it was the perceived link between military success and mineral science that led him to sanction two legislative grants for thousands of acres in Kentucky to establish a new institution of higher education, chartered in 1783 as Transylvania Seminary. (The lead-rich land for this grant was expropriated mostly from the region's Shawnee tribes.)[6]

Jefferson saw in Transylvania a future site of science on the frontier. Particularly after the war, as Congress hoped to compensate veterans for their service via western land, Jefferson saw a need for institutions of higher education to prepare a new generation of scientifically minded leaders who could set a course for the nation's future. With the added imperative to secure the west's natural resources from the continued imperial encroachments of Britain, France, and Spain, he saw a need to connect *science* with *statecraft*.[7]

Episode II

The problem was that American institutions of higher education (roughly twelve in 1783) could not produce nearly enough graduates to meet this need. These institutions were tiny, often with just a few dozen matriculants in any given year, and their curricula were more likely to focus on classical literature than natural science. (Even required courses in mathematics were basic in comparison with similar courses in contemporary European universities.) For the United States to achieve Jefferson's developmental aims, it needed more, and better, colleges.

In some ways, Jefferson's conception of the link between science and statecraft began with a specific scientific skill: the ability to conduct geographic surveys of the land itself. As early as 1783 the Confederation Congress noted a need for surveys to facilitate western settlement, and the next year, Jefferson spearheaded a plan to survey the land so it could be divided into territories and, ultimately, states. His plan required surveyors well-trained in astronomy, because every territorial boundary had to be verified by celestial observation.[8]

Congress named Jefferson to a subcommittee to oversee western land surveys. Though short on surveyors, he offered a clear strategy, with northern and southern boundaries separated by precisely two degrees of latitude and eastern and western boundaries longitudinally parallel and equidistant, so each new territory would form a perfect square. Even states already established along the Atlantic coast would have their western boundaries "chopped off straight on a meridian" so that Jefferson's squares could begin a westward march across the continent.[9]

Among the first boundaries to follow this pattern was the one that separated Virginia and Pennsylvania on their western frontiers. To conduct this survey, both states called on their colleges. Virginia was represented by president James Madison of William and Mary, and Pennsylvania was represented by professor David Rittenhouse of the University of the State of Pennsylvania (which temporarily replaced the College of Philadelphia), plus Andrew Ellicott—later known for his work alongside Black astronomer Benjamin Banneker to survey the District of Columbia.[10]

In 1785, after the Virginia-Pennsylvania boundary survey was complete, Madison wrote to Jefferson (then in Paris): "I believe few points on the globe are better ascertained." Jefferson,

meanwhile, saw how useful college-trained surveyor-astronomers could be—as did others who joined his push to establish new institutions of higher education in this era. In 1784, for instance, even as the boundary surveyors pursued their work, physician Benjamin Rush, a critic of the University of the State of Pennsylvania in Philadelphia, created a rival, Dickinson College, in Carlisle.[11]

Three years later, Rush founded another school, Franklin College, to serve Pennsylvania's large population of German immigrants. (He saw in this bilingual institution a way to facilitate German-American scientific collaboration. "It will enable us to understand all the discoveries in science that shall hereafter be made by one of the most learned nations abroad," he commented, aware that Franklin's inaugural president, Georg Heinrich Ernst Muhlenberg, was a botanist of transatlantic fame.)[12]

Rush, like Jefferson, hoped to create new institutions of higher education that gave due attention to science, and he was hardly alone. In 1787, the same year Franklin College opened, French impresario Alexandre-Marie Quesnay de Beaurepaire announced plans for a multi-state academy of science. Jefferson, intrigued by the idea of a school with branches in Virginia, Maryland, Pennsylvania, and New York, wondered if such a plan might be *too* ambitious for its time. "My countrymen may not be in a situation to support (effectively) so extensive an institution," he noted.[13]

In response, Beaurepaire sent a revised plan in which the academy's professors would be encouraged to pursue mechanical innovations, which in turn would seed joint-stock companies to fund the school. Jefferson—while supportive of plans to produce more scientists, and sympathetic to Beaurepaire's multistate structure (particularly given the federal system of government then under consideration at the Constitutional Convention)—remained skeptical. "I see in it, as yet, but a project in the air," he concluded. He was right: within two years, the plan collapsed.[14]

Episode III

Rather than a branch-campus design, Jefferson preferred another institutional structure, one that Rush had suggested—also in 1787—for a single "national" university "where the youth of all the states may be melted . . . together into one mass of citizens after they have acquired the first principles of knowledge in the colleges of their respective states." Fixed in the "federal city" and funded by Congress to prepare future leaders, Rush's national university promised its prospective students the highest level of "republican" education in letters and sciences.[15]

Rush elaborated on this proposal in 1788 in an editorial for the *American Museum* (whose subscribers included Thomas Jefferson, George Washington, and James Madison, among others), followed a year later by editorials for the *Pennsylvania Gazette* and *Massachusetts Centinel*. While some had argued that Congress should pay the nation's war debts (and even assume the states' debts) *before* it pursued a university, Rush held that postwar recovery required new institutions for the production and distribution of knowledge, not least knowledge of the natural sciences.[16]

Jefferson, though concerned that Rush's call for congressional aid to a university might be unconstitutional, nonetheless saw merit in his attempts to improve American higher education. Abroad since 1784, he knew the United States could not claim a place alongside France and other great powers unless it built a national infrastructure for science. Whether such an infrastructure would be funded by the central government or the states remained to be seen—but without it, Americans' economic and strategic future could not be assured.

As it happened, the grand scope of Jefferson's scientific vision was evident in 1787 when he met in Paris with Joseph Ledyard, a decorated explorer who had accompanied Captain James Cook on his last voyage around the world. Two years earlier, Jefferson has asked Ledyard whether he might consider a commission to seek a northwest passage across the American continent; now, he promised diplomatic clearance from Catherine the Great to cross Russia and survey the Pacific Rim all the way from Alaska to California in search of waterways connected with the Atlantic.[17]

Ledyard accepted, but when Jefferson was unable to secure a passport as promised, he took a risk. He made it as far east as Irkutsk but, without documents, was arrested on suspicion of

scientific espionage. While he said he traveled simply for "geographic knowledge," he was sent back to St. Petersburg, where he wrote to Jefferson about his capture and warned that, while he was away, French captain Jean-Francois de Galaup, comte de Laperouse, had launched a round-the-world expedition to culminate in a new agricultural settlement in the American northwest.[18]

Laperouse's expedition failed—he sank off the Solomon Islands—but his plans showed the vast scope of expeditionary science in an era of imperial competition. Indeed, to understand Jefferson's hopes for the development of American higher education in this era, one must place his view of science for statecraft in this context of science for *geostrategy*. When he envisioned new institutions of science for the United States, he saw the role they could play in the nation's pursuit of power and prosperity on a continental—and ultimately global—scale.

This broader context was evident in 1787 not only in his correspondence with figures like Beaurepaire and Ledyard but also in his *own* scientific activities. Take, for example, his agricultural research while he was stationed overseas. Aware of the awful effects of the so-called Hessian fly on contemporary wheat production, he took it upon himself to investigate alternate cereal grains. Although seed theft in Europe could be punishable by death, he made a secret trip from Paris to Pavia, Italy, to examine several varieties of rice for possible naturalization in the United States.[19]

He also considered different kinds of rice from Africa and Asia, which he shared with his friends in Virginia and other states. Later, in an essay, "Services to My Country," written after his return in 1789, he reported his success with the African strain. "The greatest service which can be rendered to [any] country is to add a useful plant to its culture, especially a bread grain," he wrote. (Those enslaved on his Monticello and Shadwell estates may have recognized the "heavy upland rice" he obtained from the Niger river delta via intercolonial networks of exchange.)[20]

Episode IV

Jefferson was not alone in his sense of the strategic value of scientific knowledge. When president George Washington, his fellow Virginian, read his first message to Congress in January 1790, he too called for aid to higher education. "Knowledge is, in every country, the surest basis

of public happiness," he argued. "There is nothing which can better deserve your patronage than the promotion of science and literature." Congress applauded Washington's message, but even as it chartered the District of Columbia that year, it declined to fund a ("national") university.[21]

Despite this disappointment, Congress did not ignore science altogether. On the contrary, shortly after Washington's message, Jefferson collaborated with colleagues from the American Philosophical Society to meet a congressional request for a *Report on Weights and Measures* (1790), part of an effort to standardize that nation's metrology. On this project, he worked alongside professor Rittenhouse at the University of the State of Pennsylvania (soon to merge with the restored College of Philadelphia into a newly formed "University of Pennsylvania").[22]

Then, a year later, in 1791, he brought James Madison on a botanical tour of the northern states, in part to study the region's sugar maples as possible substitutes for sugar cane—a topic of great concern after that summer's Haitian slave revolt. In this project, he followed in the footsteps of Benjamin Rush, who also studied the sugar maple, and in Vermont he met with former Harvard professor Samuel Williams, another sugar-maple enthusiast who saw the economic and strategic value of cane substitutes.[23]

In a newly independent country that had only just started to rely on itself for scientific improvements, the range of questions that demanded attention—not to mention increasingly specialized expertise—seemed endless. Jefferson, while grateful for the assistance of scattered colleges and learned societies, felt keenly the need for a larger cadre of educated individuals to aid in this work: first, scholars who could teach advanced science, and second, their students, who could disseminate themselves across the country in service to national development.

Others also felt this need. In the fall of 1791, when George Washington delivered his next message to Congress, he repeated his call for a national university. Congress again ignored this appeal, but the president's cabinet discussed a different strategy: a *military academy* to produce officers trained in science. Alexander Hamilton, as secretary of the treasury, supported this idea, but Jefferson, as secretary of state, opposed it—ostensibly from concerns about its constitutionality but also from concerns about Hamilton's partisan influence.[24]

Jefferson's objections to a military academy later faded, but in the early 1790s he looked to other institutions—to more local colleges and learned societies—to advance the nation's scientific interests. For example, in 1793, with his colleagues in the American Philosophical Society, he enlisted a French botanist, Andre Michaux, to conduct a survey of natural resources from the Mississippi to the Pacific (an earlier four-year trek from the Gulf of Mexico to Hudson Bay had suggested that Michaux was the right man for this job).[25]

Jefferson was eager to see what Michaux might discover, but his mission was complicated by contemporary geopolitics when, in addition to scientific duties, he became a secret agent for the French ambassador Edmond Genet, used for reconnaissance on the frontier and the recruitment of troops for a possible insurrection on the western border. Jefferson's awareness of this arrangement was ambiguous—his friend Aaron Burr and other associates of dubious loyalty were involved—but, for some, it simply highlighted the *risks* of international scientific cooperation.[26]

The case of Michaux's expedition revealed the difficulties that faced American science in the early republic. On the one hand, the United States had too few "men of science" to meet its own needs. On the other hand, its reliance on foreign networks, partnerships, and collaborations posed dilemmas of its own—particularly in an era of ascendant nationalism in American culture and politics. To supply itself with scientists, the United States needed more, and better, institutions of scientific education . . . though, as Jefferson knew, extant colleges often resisted this prospect.

Episode V

Extant colleges' resistance to competition was just another part of the puzzle Jefferson faced in his effort to expand the nation's scientific capacity. In 1794, for example, he received a request to relocate the entire faculty of the Academy of Geneva from Switzerland to Virginia or somewhere in the vicinity. This proposal come from Genevan exile Francois-Henri D'Ivernois after Jacobin forces captured his city during the French Revolution and called the academy's professors "counter-revolutionary" elites. D'Ivernois hoped Jefferson could find a home for them.[27]

Jefferson tried, but Virginia's legislators balked. They said a "transplanted" academy would steal William and Mary's students or, worse, sneak in unwanted foreign ideas (George Washington shared this concern). They prioritized scientists' *nationality* over their *ability* . . . so much so that Jefferson withdrew his plan. "I would have seen with peculiar satisfaction the establishment of such a mass of science in my country," he wrote disappointedly to D'Ivernois in 1795, "and [w]ould have been tempted to attach myself to it by procuring a residence in its neighborhood."[28]

Jefferson wrote similarly to Genevan chemist Marc Auguste Pictet, who, in anticipation of a move to Virginia, had looked forward to "mineralogical and geological excursions in a world entirely new to me." Jefferson, acutely conscious of the United States' need for expertise in earth sciences, responded: "Our geology is untouched and would have been a precious mine for you, as your views of it would have been precious to us." But it was not to be. Jefferson's (nativist) opponents insisted scientific institutions should not be "imported."[29]

Significantly, the same concerns that sank D'Ivernois's plan also shaped the reception of another plan to bring European science to American shores. In 1794, the famed chemist Joseph Priestley had immigrated from Birmingham, England, to Northumberland, Pennsylvania, with his library and laboratory and plans to establish a college. Priestley's sympathy with the ideals of the French Revolution, however, caused local residents to question his ideological motives. Within a year, promises of public support for his college disappeared.[30]

One person whose support for Priestley did *not* disappear was Thomas Jefferson, who saw in him a valuable scientific asset. In fact, it may have been the disintegration of Priestley's college plan that motivated Jefferson and his colleagues in the American Philosophical Society to hold a prize contest in 1795 for essays on a comprehensive system of public education, including higher education, "adapted to the genius of the government and best calculated to promote the general welfare of the United States."[31]

The competition remained open to submissions for two years, and in 1797 the panel of judges met in Philadelphia under Jefferson's leadership to pick the winners. Among those who attended the deliberations were Priestley and several professors from the University of Pennsylvania (all politically aligned with Jefferson's Democratic-Republican Party). They

selected two essayists, Samuel Knox and Samuel Harrison Smith, each of whom proposed a bold new system of education topped by a central university—just the sort of structure Jefferson hoped to see.

Knox, for his part, suggested a university in suburban Washington, D.C., distant enough to avoid the lures of urban life but governed by a "federal" board comprised of a member from each state. "It might be of advantage," he commented, "to be contiguous to the seat of government in order that [students], having an opportunity of occasionally seeing the grand council of the nation [i.e., Congress], should be animated by that patriotism which they, in turn, might, on some future day, be called upon to exercise for their country."[32]

Smith's plan likewise featured a postbaccalaureate university, with 10 percent of graduates from every college in the country eligible to enroll at public expense. Its curriculum encompassed mathematics, manufactures, medicine, and natural philosophy; agriculture, geography, history, government, law, and moral philosophy; classical and modern languages, literature and criticism, music, architecture, gardening, drawing, and the "elements of taste"; plus military tactics (in response to renewed trade conflicts with Europe . . . and in lieu of a military academy).[33]

Episode VI

Even as the American Philosophical Society reviewed Knox and Smith's essays, with their clear links between science and statecraft, others weighed in on the subject of higher-education reform. In 1798, for example, Jefferson's friend Joel Barlow in France contacted Ira Allen, president of the University of Vermont, with a series of suggestions based on his study of Parisian institu-tions. He called for a national university capable of "teaching all the useful sciences as far as they are hitherto carried and encouraging those researches which push them toward perfection."[34]

Shortly after Barlow wrote to Allen, he sent a similar list of suggestions to Jefferson in a letter prompted by news of George Washington's death and his gift of 50 shares in the Potomac River Navigation Company to fund a national university. Eager to seize the moment, Barlow outlined a vast institution of science that was part research society, part expeditionary agency, part

normal school, and part extension service—all equipped with a botanical garden, chemical laboratory, mineral cabinet, mechanical apparatus, and industrial museum.[35]

He called his French-inspired university a "Polysophic Society" (to capture its enormous scope) and pledged to send Jefferson a curriculum if he could find resources to fund it. He also contacted his brother-in-law Abraham Baldwin, a recently elected U.S. senator from Georgia, to ask to become president of this venture—should it win support. "If you will put me at the head of the institution, . . . you cannot imagine what a garden it would make of the United States," he promised. "I believe you think me crazy, but I am not."[36]

Baldwin's reaction to Barlow's request is unknown, but Jefferson's was positive, not least because he was then engaged in a presidential campaign with plans for higher-education reform. Indeed, as early as January 1800, with the nearly finished White House in view, he asked Joseph Priestley for recommendations for "a university" in Virginia "on a plan so broad and liberal and modern as to be worth patronizing with public support, and to be a temptation to youth from other states to come and drink the cup of knowledge and fraternize with us."[37]

Jefferson went on to describe the scientifically oriented university he envisioned, with professorships in botany, chemistry, zoology, anatomy, surgery, medicine, natural philosophy, agriculture, mathematics, astronomy, geology, geography, politics, commerce, history, ethics, law, and fine arts (he did not mention classical or modern languages). He said he intended to staff his university with European scholars—recruited with high salaries and free houses—and even suggested that Priestley might like to lead the institution as president.[38]

Flattered by Jefferson's request, Priestley happily complied, though he reminded Jefferson that his own efforts to create a college in Pennsylvania "on the most liberal principles" had failed just a few years earlier. (As for the presidency, the sixty-seven-year-old politely declined. "Were I a few years younger and more movable, I should take interest for some appointment," he replied, "but . . . a move is absolutely impossible unless you [a]re possessed of Aladdin's Lamp and could transport my house, library, and laboratory to Virginia without trouble or expense.")[39]

Priestley's sketch, titled *Hints Concerning Public Education*, arrived in May 1800. It called for a university in two parts: one for "professional" education in medicine, law, and

divinity; the other for liberal, or "general," education in classical languages, belles lettres (including grammar, oratory, criticism, and bibliography), moral philosophy, and theology; mathematics, natural his-tory, natural philosophy, chemistry (including agriculture), and human anatomy; as well as history, geography, law, and "general policy."[40]

Jefferson, now a recognized candidate for president, was thrilled with Priestley's detailed proposals. "They came up perfectly to what I had wished from you, and if they are not turned to useful account for posterity it will be from the insensibility of others to the importance of a good education," he wrote, persuaded that Priestley's vision of a modern university was precisely what Virginia (and the United States) needed to link science to statecraft. "As soon as we can ripen the public disposition," he added, "we shall bring forward our propositions."[41]

Episode VII

Even as Jefferson solicited Priestley's advice, he also sought input from others, notably his friend Pierre Samuel du Pont de Nemours, who recently had immigrated from Paris with his family. Jefferson had known du Pont ever since his diplomatic stay in France and had long admired his (physiocratic) views on the relationship between higher education and national development. A decade earlier, du Pont had been asked to reorganize the schools of Poland and Lithuania, and in France he served as president of the National Assembly during the early days of the revolution.

After the rise of Robespierre, however, du Pont had paid a high price for his ties with the relatively moderate Girondist faction. A printer, he was "twice imprisoned, close to the guillotine on one occasion, and almost deported to a penal colony on Cayenne on another," his biographer writes. In 1798, during the relative stability of the Directory, he proposed a scientific colony in the United States, but this plan was blocked when president Adams decided he might have nefarious intentions. ("We have . . . too many French philosophers already," wrote Adams.)[42]

Given the president's objections, it was unclear how du Pont made it to America, but in 1799 he left what he dubbed "the rotten side that is . . . Europe" and reached Newport, Rhode Island, on January 1, 1800, whereafter he visited Jefferson in Virginia to discuss, among other topics, his friend's hope for a "reformed" institution of higher education in his native state. After

he left, Jefferson asked him for a plan of a university to expand on the one Priestley had provided, but with "as few professorships as possible, because of the narrowness of our resources."[43]

Du Pont worked quickly. At the end of the summer, Jefferson received his design. If he expected a modest institution accommodated to Virginia's "narrow" resources, then he must have been disappointed, but if he wanted a bold plan for a truly "modern" university, then he must have been thrilled. Du Pont sketched a magnificent *University of North America*, located not in Virginia but in Washington, D.C., complete with a school of law, a school of medicine, a school of engineering, and a school of mines.

A "palace of science," du Pont's university was intended to show the world "that youth can be as well taught in America as in Europe." Indeed, he said his university, open to students from every nation, would be the greatest ever to exist. "Washington City," he promised, would become "the Bokhara, the Benares, the Byblas, the Cariath-Sepher, the City of Knowledge; men of the highest reputations will be assembled there as professors . . . , [and] perhaps Europeans will not be considered properly educated unless they have studied in its schools."[44]

He looked forward to a day when the United States—and particularly its capital—would become a Mecca of Mind, a true metropolis in the global marketplace of ideas. To obtain such a place, he argued, Washington needed only "to secure the most illustrious scholars of Göttingen, Edinburgh, and other scholastic cities, promising them a brilliant future that can be attained only by the perfection of their knowledge." For du Pont, the era of American educational preeminence was not far off.[45]

If his University of North America were founded with public funds, du Pont anticipated, then domestic youth would no longer need to study abroad. Instead, the world's scholars would study in the United States; the center of intellectual gravity would shift; the direction of scholarly exchange would turn. At that point, Europe's academic hegemony would end, and the United States—finally and truly "independent"—would control the immense power that derives from the production and distribution of modern knowledge.

Jefferson was awestruck. He thanked du Pont for his "much-desired and much-valued piece on education," which he said he read with "great pleasure" before he passed it to James

Madison for review. Determined to put du Pont's plan into practice as soon as possible, he made this promise on December 12, 1800—just nine days after polls closed in that year's presidential contest. He did not know that it would take three dozen ballots in the House of Representatives for the election's results to be finalized.[46]

Episode VIII

When they were, Jefferson emerged victorious, and he quickly turned his attention to higher-education reform. He directed his first efforts at the sole institution of scientific instruction under federal supervision, namely, the military's corps of artillerists and engineers at West Point. (As early as September 1776, in the early days of the revolution, John Adams had suggested the formation of a military academy; a year later, George Washington had called for a corps of engineers at West Point, informed by plans from various French and Prussian officers.)[47]

By 1800, the experience of the United States' "quasi-war" against France had revived calls for a military academy. Secretary of war James McHenry had submitted to Congress a plan from major Anne Louis de Tousard, while Alexander Hamilton had offered a plan from Louis Lebegue Duportail, both veterans of the revolutionary war. Each plan was considered by Congress, but Jefferson, while vice president, had continued to express concerns about their constitutionality (as well as their susceptibility to partisan influence).[48]

As president, he changed his tune. A month after his inauguration, he announced plans to reorganize the corps of engineers into a "modern" school of applied science. He purged the corps' Federalist officers and replaced them with Republican loyalists, then appointed fifty-one-year-old Jonathan Williams (a relative of Benjamin Franklin) to serve as superintendent of the "U.S. Military Academy at West Point," which opened in 1802 and was joined a year later by a Military-Philosophical Society to support applied-science research projects among the cadets.[49]

West Point was not the only institution of education to receive Jefferson's attention. The same year, the Mississippi Territory chartered Jefferson College, a school intended to spread the spirit of science to youth on the southwest frontier. Jefferson urged his friend William Dunbar in Natchez to appoint Pierre Samuel du Pont de Nemours to direct this school, but du Pont demur-

red on grounds that he was busy with a new gunpowder business. (Indeed, he was. His company, now Du Pont de Nemours, Inc., became a global colossus in the modern chemical industry.)[50]

While it took more than a decade for Jefferson College to open to students, its namesake pursued a series of projects to bring science into closer relationship with the national state. He started with a series of western expeditions. Framed alternately in scientific and economic terms, these expeditions, initially led by Meriwether Lewis and William Clark in the northwest and William Dunbar and George Hunter in the southwest, illustrated not only the link between science and statecraft but also—once again—the United States' need for well-educated scientists.[51]

Lewis in particular spent nearly two months at the University of Pennsylvania in preparation for his journey. He studied astronomy, botany, zoology, geology, and mineralogy—at least enough to make himself useful in the calibration of geographic coordinates and the classification of plant, animal, and rock collections. (The university's faculty also recommended which books and instruments to pack.) Clark, meanwhile, had few scientific credentials, as was typical of the military personnel who supported these initial expeditions.

William Dunbar and George Hunter, meanwhile, had been trained abroad. Dunbar was a graduate of the University of Aberdeen, while Hunter, a fellow Scot, had attended the University of Edinburgh, where he studied chemistry. Dunbar often complained to Jefferson—and secretary of war Henry Dearborn, who staffed the expeditions—that he could not find men widely trained in natural history or natural philosophy. Of individuals "properly qualified from the seats of science," he grumbled, "there is a great dearth." (Low pay did not help.)[52]

Dunbar was hardly alone in his assessment. In 1802, a recent Yale graduate, Eli Ives, had given a Phi Beta Kappa address "On Chemistry and Botany" in which he charged that botany was "more neglected by our citizens than any other of the whole circle of the sciences." He added: "In many parts of science America is not inferior to the most enlightened countries of Europe. . . . Yet, however degrading it may be to our national pride, it is a fact undeniable that we are dependent on Europeans for [a] knowledge of the plants of our own country." It was a common refrain.[53]

Even when Lewis and Clark shipped plants back to Philadelphia for classification, they had to rely on Friedrich Pursh, a botanist from Prussia who had been employed by professor David Hosack at Columbia and Benjamin Smith Barton at the University of Pennsylvania (whose own students apparently lacked the knowledge to complete this crucial task). Pursh later published Lewis and Clark's specimens in London under his own name—a source of consternation to Jeffer-son, who felt the nation had been deprived of the glory of his expedition's scientific discoveries.[54]

Episode IX

Only slowly did American colleges begin to produce more graduates trained in science. Yet, after Lewis and Clark's triumph (and the excitement that spread in the wake of Jefferson's negotiation of the Louisiana Purchase), the academic integration of the natural sciences picked up pace, often with state aid. Government expeditions and geographic surveys conducted under the authority of the U.S. Army were supplemented by steady growth in the number of scientific organizations and, gradually, an increased number of colleges: about thirty by 1804.[55]

As the relations between science and statecraft deepened, Jefferson began to consider the long-term institutionalization of this connection. How could it be supported? How could it be *sustained*? In early 1804, he likely contemplated these and other related questions as he penned a letter to French theorist Jean Baptiste Say, whose recently published *Traite d'economie politique* (1803) had argued that all modern enlightened states understood the need to fund institutions of science for the sake of continuous national development.

In book 1, chapter 6, of his treatise, Say had challenged Adam Smith's infamous claim that scholarship was "unproductive" labor. He cited the case of an iron door lock to illustrate his point. "A lock could never have been constructed without previous knowledge of the properties of iron, the method of extracting it from a mine and refining the ore as well as mollifying and fashioning the metal," he noted. Science, in short, made the manufacture of the lock possible. The question for political economists was how to *institutionalize* this valuable labor for the good of the state.[56]

Say, in his chapter "Of the Profits of the Man of Science," identified the problem. "The philosopher—the man who makes it his study to direct the laws of nature to the greatest possible benefit of mankind—receives a very small proportion of the products of the industry that [leads to] such prodigious advantage from the knowledge of which he is both the creator and the depository." In fact, most scholars made nothing from their labor, because they simply gave it away via the academic papers they published *gratis*.[57]

States got rich off the products of scholarly labor but often left scholars themselves in poverty. Inasmuch as they *wanted* scholars to share their ideas free-of-charge, they had to find ways to remunerate them for their work. According to Say, the wisest states paid them directly. In his words, "Every nation sufficiently enlightened to conceive the immense benefit of scientific pursuits has endeavored, by special favors and flattering distinctions, to indemnify the man of science for the very trifling profit derivable from his professional occupation."[58]

Say went further. He called for aid not only to scientists but also to *institutions of scientific education*. "In every country that can at all appreciate the benefits to be derived from the enlargement of human faculties," he observed, "it has been deemed by no means a piece of extravagance to support academies and learned institutions, and a limited number of very superior schools intended not as mere repositories of science and the most approved mode of instruction but as the means of its still further extension."[59]

Such institutions *had* to be supported by government, because they were otherwise "so much less favored in the natural course of things, and so little stimulated by the competition of demand, as to require the aid of that authority which is created purposely to watch over the public interest." Without state aid, institutions for the most advanced scientific education might not survive. "These are the kinds of instruction most calculated to promote national wealth," Say maintained, "and most likely to retrograde if not in some measure supported by the public."[60]

Aware that scientific investment was sometimes politically unpopular—particularly in modern republics—Say nonetheless warned that scientific *disinvestment* was disastrous for a state's long-term prospects. "The loss occasioned by [scientists'] disappearance is neither immediate nor perceptible," he noted. "A flourishing empire might retrograde until it reached the

confines of barbarism before individuals observed the operating cause of its decline." By then, however, it would be too late for a state to regain its scientific edge.[61]

According to Say, public aid to science implied public aid to *scientific education*, most of all, "higher" education in the importance of science itself—and its contributions to enlightened statecraft. "Two questions have been raised in political economy," he concluded: "1. Whether the public be interested in the cultivation of science in all its branches?" and "2. Whether it be necessary that the public should be at the expense of teaching those branches it has an interest in cultivating?" Say's answer to both questions was unequivocally *yes*.[62]

Episode X

When he read Say's treatise in 1804, Jefferson was still reluctant to apply his appeal for "public" aid to science at the *federal* level, but he did not hesitate to apply it at the *state* level. After the polls closed in that year's presidential contest (which he won in a landslide), he got a letter from his friend Littleton Tazewell, who told him that Virginia might have a way to fund a new public university. Specifically, he thought a portion of the legislature's stock in the recently chartered Bank of Virginia could be made available for such a venture.

By its charter, the Bank of Virginia was obliged to capitalize projects that advanced "the public interest." While some wanted it to support joint-stock companies to build canals along the Appomattox, James, and Potomac rivers, Tazewell, a resident of Williamsburg and graduate of William and Mary, proposed an institution of scientific education. He suggested that a permanent endowment funded with bank stock could place a future center of science (the key to Virginia's economic development) "beyond the reach of legislative caprice."[63]

Jefferson, who had spent the past quarter-century devoted to higher-education reform, penned an enthusiastic reply. "No one can be more rejoiced at the information that the legislat[ors] of Virginia are likely at length to institute a university on a liberal plan," he wrote, though he cautioned against the use of bank stock to fund it. Stocks, backed only by paper notes, were prone to depreciation or, worse, liquidation, he warned. Much better to found a university on an endowment of land, which rose in value with improvements such as farms.[64]

Jefferson was right to worry, for shares in the Bank of Virginia quickly lost value. In 1805, a Republican majority in the legislature politicized the bank's governance when it required the state to put "a complete preponderance of persons of sound Republican principles" on its board of directors. That summer, the share price dropped because of fears the new board would make bad investments for partisan reasons (for example, in Republican-owned canals that lost money, or in Virginia's weak private colleges, which sought a share of the state's aid).[65]

As the bank's shares collapsed, Jefferson again had to look for other sources of "public support" for higher education. In particular, he turned back to plans for a national university in Washington, D.C., an idea that resurfaced in January 1806 when his friend Joel Barlow issued a *Prospectus for a National Institution to Be Established in the United States*, an updated description of his "Polysophic Society," now synchronized with a university bill in Congress, sponsored by Republican senator George Logan of Pennsylvania.[66]

Logan joined his colleagues Samuel Latham Mitchill (formerly on the faculty at Columbia) and John Quincy Adams (who held faculty posts at Harvard and Brown) on a subcommittee that reported favorably on his bill. The full Senate, however, voiced old Republican concerns about constitutionality before it voted to strike the work *National* from the institution's name, which left it with no source of funds. Jefferson, mindful of Say's caution about populist anti-intellectual-ism, groused that legislators did not understand the role of science for statecraft.[67]

In his annual speech to Congress in December 1806, he suggested a constitutional amendment to allow federal aid to "a national establishment for education," but this effort also failed. He therefore proposed that, if *direct* aid was not (yet) allowed, perhaps *indirect* aid in the form of western land grants might be. In his words, "if Congress, approving [such an establishment], shall think it more eligible to found it on a donation of lands, they have it now in their power to endow it with those which are likely be among the earliest to produce the necessary income."[68]

Jefferson's pitch was not without precedent. Already, out west, Congress had granted tens of thousands of acres to Transylvania University and Ohio University, as well as Davidson College in Tennessee (led by Joseph Priestley's son James and renamed Cumberland College after

federal aid was granted for the Cumberland Road on March 29, 1806). None of these grants had required a constitutional amendment. All were made under the Enabling Act of 1802, which had outlined educational requirements for statehood.

And if the federal government could grant lands to colleges in the west, then why not to a national university in the capital? What better institution to coordinate the activities of all the others and connect the distant parts of the country in a common enterprise of scientific advancement? "This territory presents . . . such a variety of productions, . . . such a diversity of . . . manners, . . . as will create a strong tendency to diverge and separate the views of those who shall inhabit the different regions within our limits," Barlow wrote. A national university could hold it all together.[69]

Conclusion

The idea of congressional land grants to colleges resurfaced several times over the next half-century, but it was not until the Morrill Act of 1862, at the start of the Civil War, that federal aid linked science to statecraft on a national scale (or at least a sectional level, as land grants were limited to northern states until the end of the century). By then, a profusion of public and private colleges and universities had arisen, particularly in the west, as legislatures zealously chartered, and sometimes funded, institutions for the advancement of letters and science.

The decades after the revolution had seen active debates over the relationship between higher education and national development—between science and statecraft. For a long time it was unclear whether the United States' constitutional structure would allow federal support for education or science, a situation that spurred other institutions, such as learned societies funded with private subscriptions, to advance this work. Unlike most of the great powers of continental Europe, which, in the eighteenth century, funded science directly, the United States had to wait.

Yet few if any political leaders in this era spoke out *against* the importance of scientific investments; they merely disagreed about the *source* of those investments: public or private, the individual states or the federal government. All seemed to agree that science benefited society, that it drove a benevolent process of social modernization. Immersed in "republican" ideology,

they even agreed that scientific work should be led by experts, distinguished not by social class but rather by educational merit. (They rarely acknowledged biases of race or gender.)

What stood out was their faith, born of the Enlightenment, that science—and scientific education—drove progress. It fostered territorial security and technological innovation, which, in turn, facilitated economic growth. It produced citizens able to apprehend the common good and the requirements of self-government. And, ultimately, as Jefferson held, when promulgated through schools, colleges, and universities, along with other governmental and nongovernmental institutions for the production and distribution of knowledge, it helped society flourish.

Of course, this enlightened faith in science for statecraft was not (perhaps never could be) fully realized. It ebbed and flowed with the political tides of time, not unlike the ebb and flow of federal aid to institutions of higher education. While often elevated by the exigencies of war—not only the Civil War but also World War I, World War II, the Korean War, the Vietnam War, the Gulf War, and the War on Terror—federal support for science and education has always been fragile.

Today, as in the early national period, some ask what role the state, as patron, should play in the direction of scientific development, whether the prioritization of scientific activity should be more centralized or decentralized, how much aid to science is enough and how much should be left to private or philanthropic interests. Some ask whether the products of scientific discovery should be privately or publicly owned, and whether, in pursuit of discovery, the United States benefits more from international competition or collaboration.

As past experience shows, answers to such questions rarely take either-or, all-or-nothing forms. The challenge of modern scientific governance is to find the best possible balance among diverse institutional and ideological approaches, not only to promote the power and prosperity of the national state but also of humanity (as well as the non-human world) in general. Herein lies the broadest conception of the relationship between science and statecraft—even broader, perhaps, than Jefferson foresaw.

The question today is how, or whether, the relationship between science and statecraft might change in the future. No one knows for certain, but history offers clues. Thomas Jefferson

and his generation were not only *creative* but also *courageous* in their efforts to construct new institutions of science and education to advance their cause. They also were persistent, even as they saw how difficult it could be to build support for higher education and science in a pluralist democracy. Their successes, as well as their failures, remain instructive today.

NOTES

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[2] "Academicus to A. B.," *Virginia Gazette* (July 7, 1774); see also Francis L. Broderick, "Pulpit, Physics, and Politics: The Curriculum of the College of New Jersey, 1746 1794," *William and Mary Quarterly*, 3rd ser., 6 (1949), 42-68.

[3] Robert Polk Thomson, "The Reform of the College of William and Mary, 1763-1780," *Proceedings of the American Philosophical Society*, vol. 115, no. 3 (June 17, 1971), 187-213.

[4] James Madison to William Smith (25 September 1776) in H. W. Smith, ed., *The Life and Correspondence of the Rev. Wm. Smith, D.D.*, 2 volumes (Philadelphia, 1880), 1:566-7; Thomson, 206.

[5] Arthur Hecht, "Lead Production in Virginia during the Seventeenth and Eighteenth Centuries," *West Virginina* History, vol.25, no. 3 (1964), 173-83.

[6] See, for example, James Cousins, *Horace Holley: Transylvania University and the Making of Liberal Education in the Early American Republic* (Lexington: University Press of Kentucky, 2016); John D. Wright, Jr., *Transylvania: Tutor to the West* (Lexington: University Press of

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[8] See, for example, Silvio Bedini, *Thomas Jefferson: Statesman of Science* (United Kingdom: Macmillan, 1990), 120-21.

[9] Andro Linklater, *Measuring America: How an Untamed Wilderness Shaped the United States and Fulfilled the Promise of Democracy* (New York: Penguin, 2003), 70.

[10] See, for example, Bedini, 114-116.

[11] James Madison to Thomas Jefferson (April 10, 1785), *Founders Online,* National Archives, https://founders.archives.gov/documents/Jefferson/01-08-02-0046 (original source: *The Papers of Thomas Jefferson*, vol. 8, *25 February–31 October 1785*, ed. Julian P. Boyd. Princeton: Princeton University Press, 1953, pp. 73–75); see also Thomas Jefferson, *Notes on the State of Virginia* (London: John Stockdale, 1787).

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[13] Thomas Jefferson to Chevalier Alexandre Quesnay de Beaurepaire (January 6, 1788), *Founders Online*, National Archives, http://founders.archives.gov/documents/Jefferson/01-12-02-0519; see also Chevalier Alexandre Quesnay de Beaurepaire, *Mémoire, Statuts et Prospectus concernant l'Académie des Sciences et Beaux-Arts des Etats-Unis de l'Amérique, établie è Richmond, Capitale de la Virginie* (Paris, 1788); a copy exists in the library of the University of

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[14] Thomas Jefferson to Chevalier Alexandre Quesnay de Beaurepaire (January 6, 1788),

[15] Benjamin Rush to Richard Price (May 25, 1786), in Butterfield, *Letters of Benjamin Rush*, 1:388.

[16] Benjamin Rush, "Address to the People of the United States," *American Museum; or, Repository of Ancient and Modern Fugitive Pieces &c. Prose and Poetical* 1, no. 1 (January 1787), 8; Benjamin Rush to Friends of the Federal Government, "A Plan of a Federal University" (October 29, 1788), in Butterfield, *Letters of Benjamin Rush*, 1:491–92; Benjamin Rush, "Plan of a Federal University," *American Museum; or, Repository of Ancient and Modern Fugitive Pieces &c. Prose and Poetical*, no. 4, issue 5 (November 1788), 442–44; John Fenno, "Importance of a Proper System of Education—Establishment of a Federal University Recommended," *American Museum; or, Universal Magazine, Containing Essays on Agriculture, Commerce, Manufactures, Politics, Morals, and Manners; Sketches of National Characters, Natural and Civil History, and Biography; Law Information, Public Papers, Intelligence; Moral Tales, Ancient and Modern Poetry* (Philadelphia), vol. 6, no. 4 (October 1789), 290–92. See also Albert Castel, "The Founding Fathers and the Vision of a National University," *History of Education Quarterly* 4, no. 4 (December 1964), 280–302; and David Madsen, *The National University: Enduring Dream of the USA* (Detroit: Wayne State University Press, 1966).

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[18] See, for example, John Ledyard to Thomas Jefferson (19 March 1787), *Founders Online,* National Archives, https://founders.archives.gov/documents/Jefferson/01-11-02-0226 (original source: *The Papers of Thomas Jefferson*, vol. 11, *1 January–6 August 1787*, ed. Julian P. Boyd. Princeton: Princeton University Press, 1955, pp. 216–218); Alan Frost, "Science for Political Purposes: European Explorations of the Pacific Ocean, 1764-1806," in *Nature in Its Greatest Extent: Western Science in the Pacific*, eds. Roy MacLeod and Philip F Rehbock (Honolulu: University of Hawaii Press, 1988), 27-44; and John C. Greene, "American Science Comes of Age, 1780-1820," *Journal of American History* 55, no. 1 (June 1968), 22-41.

[19] Samuel Powell to George Washington (9 September 1788), *Founders Online,* National Archives, https://founders.archives.gov/documents/Washington/04-06-02-0449 (original source: *The Papers of George Washington*, Confederation Series, vol. 6, *1 January 1788–23 September 1788*, ed. W. W. Abbot (Charlottesville: University Press of Virginia, 1997), 506–8); See also Philip J. Pauly, *Fruits and Plains: The Horticultural Transformation of America* (Cambridge: Harvard University Press, 2007), 40-48; A. Hunter Dupree, "Nationalism and Science: Sir Joseph Banks and the Wars with France," in David H. Pinkney and Theodore Ropp, eds., *A Festschrift for Theodore B. Artz* (Durham, N.C.: Duke University Press, 1964), 41-42; and Bedini, *Thomas Jefferson: Stateman of Science* p. 168-170; see also Thomas Jefferson to William Drayton (30 July 1787) *Founders Online,* National Archives, https://founders.archives.gov/documents/Jefferson/01-11-02-0568 (original source: *The Papers of Thomas Jefferson*, vol. 11, *1 January–6 August 1787*, ed. Julian P. Boyd. Princeton: Princeton University Press, 1955, pp. 644–650); and Thomas Jefferson to Edward Rutledge (14 July 1787), *Founders Online,* National Archives, https://founders.archives.gov/documents/Jefferson/01-11-02-0506 (original source: *The Papers of Thomas Jefferson*, vol. 11, *1 January–6 August 1787*, ed. Julian P. Boyd. Princeton: Princeton University Press, 1955, pp. 587–589).

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[23] 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); 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), 174, 179, 180, 190, etc. See also "Editorial Note: The Northern Journey of Jefferson and Madison," *Founders Online,* National Archives, https://founders.archives.gov/documents/Jefferson/01-20-02-0173-0001 (original source: *The Papers of Thomas Jefferson*, vol. 20, *1 April–4 August 1791*, ed. Julian P. Boyd. Princeton: Princeton University Press, 1982, pp. 434–453).

[24] See, for example, Robert M.S. McDonald. *Thomas Jefferson's Military Academy: Founding West Point* (Charlottesville: University of Virginia Press, 2004).

[25] See, for example, C.S. Sargent, ed., "Portions of the Journal of Andre Michaux, Botanist, Written during His Travels in the United States and Canada, 1785 to 1796," *Proceedings of the American Philosophical Society* Vol.26, no. 129 (1889), 1-145; Reuben Gold Thwaites, ed., "Journal of André Michaux, 1793-1796," in *Early Western Travels, 1748-1846*, vol. 3 (1889), 27-306; 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*, vol. 101, no. 4 (1957), pp. 344-361; Henry Savage, Jr., and Elizabeth J. Savage, *Andre and Francois Andre Michaux* (Charlottesville: University Press of Virginia, 1986); Susan Delano McKelvey, *Botanical Explorations of the Trans-Mississippi West, 1790-1850* (Eugene, Ore.: Oregon State University Press, 1991); *Memoirs of the life and botanical travels of Andre Michaux by J.P.F. Deleuze* (C.D.E. Koenig and J. Sims, Trans., 1805), reprinted and edited with supplementary study materials by C. Williams (Charlotte, North Carolina: Forebears Press, 2002); and Elizabeth Hyde, "André Michaux, Thomas Jefferson, and the 'Injunction of Science,'" *Transactions of the American Philosophical Society* 110, no. 2 (2022), 111-128. See also "André Michaux's Observations on His Proposed Western Expedition, 20 January 1793," *Founders Online,* National Archives,

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consisting of Logan, Republican Stephen Row Bradley, Republican Abraham Baldwin, and Federalist James Hillhouse. There it died, never to be brought before the entire Senate again."

[68] Thomas Jefferson to United States Congress (December 2, 1806), 125–26, https://founders.archives.gov/documents/Jefferson/99-01-02-4615. According to Jefferson, "a public institution alone can supply those sciences which, though rarely called for, are yet necessary to complete the circle, all parts of which contribute to the improvement of the country, and some of them to its preservation."

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