Botany emerged as an independent science in eighteenth-century France, and one aspect of study was the search for species, American trees in particular, that would have value not only for industry but also for reforestation. Progress in the development of useful cultivars from American stock and seeds was cut short in 1789 by the French Revolution, which inadvertently unleashed waves of vandalism in fine gardens and plantations, the seed banks of that day. Recovery began with subsidence of revolutionary passions. The Michaux family shipped supplementary stock and seeds for state nurseries, and private nurserymen began experimenting with exotic species.

The events described below occurred during the reigns of Louis XV (1715–1774) and Louis XVI (1774–1792), the decade of the Revolution (1789–1799), and the Napoleonic era (1799–1815). The political climate of the French Revolution ranged from moderate reformist to radical terrorism to conservatism to reactionary terrorism, culminating in military dictatorship when Napoleon obtained the consent of a people weary of insecurity and uncertainty. Conservation ought to depend upon the application of botanical knowledge, but for several decades in France, political and social interests intervened.

FRENCH CONNECTIONS

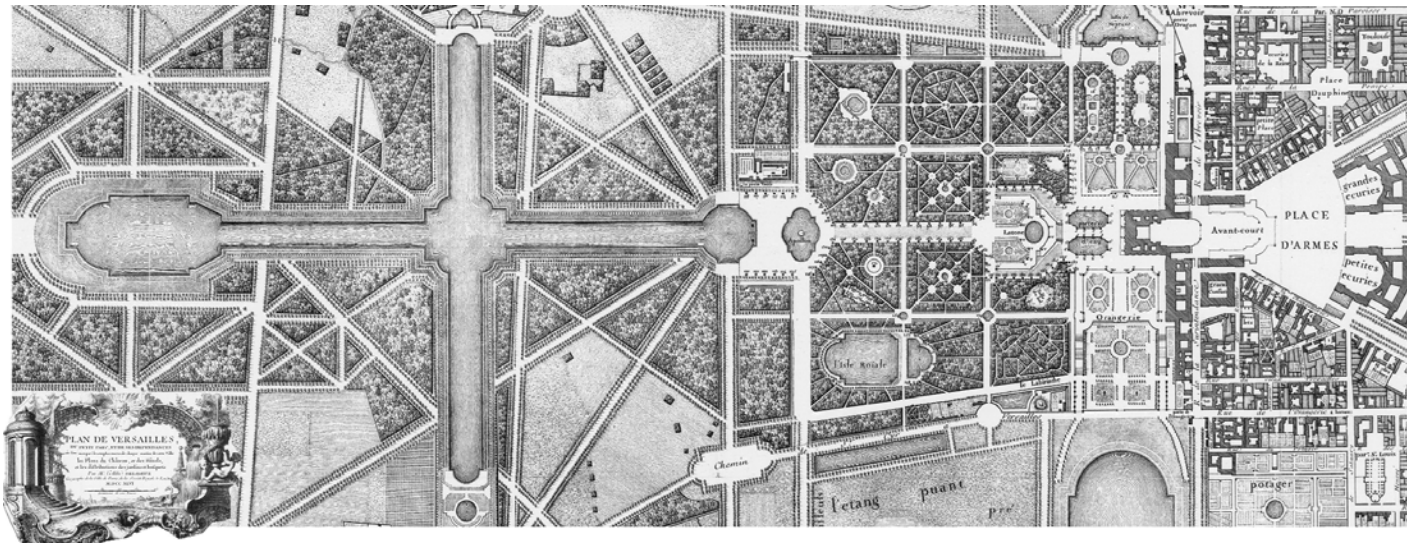
CULTIVATING AMERICAN TREES IN REVOLUTIONARY FRANCE

Historians of botany have paid considerable attention to the emergence of botany as a science in the eighteenth century, when it branched from traditional herbalism. The passion for new and universal knowledge, characteristic of that era, had stimulated the search for new plant species, as well as research into a method of classification that could accommodate all known species. In effect, the quest was for those principles, or natural laws, that defined the unique character of every species.

The successes of the explorers and researchers who provided the basis for the science of biology in the early nineteenth century have attracted more notice than the contemporary search for exotic useful species—a more mundane enterprise perhaps, but one entirely consistent with the spirit of that time in seeking the improvement of life here on Earth. New plants held the promise of better nutrition, improved medicines, ornamentation for homes and parks, and timber for fuel, construction, and reforestation. The last goal was particularly important: deforestation, proceeding for centuries as French lands were cleared for agriculture, had been recognized as a national crisis by the eighteenth century.

Equally alarming was the recognition that much land, impoverished by successive timbering over the centuries, could no longer sustain some native species, such as chestnut, oak, walnut, fir, and pine. The French presence in Canada and Louisiana had long

BY ROGER WILLIAMS



Remodeling royal gardens like this one at Versailles sparked an interest in importing trees, plants, and animals from North America, in part because King Louis XV was an avid botanist.

since indicated North America as a source of seeds and stock for regeneration. But beyond the matter of acquiring such material was the question of how exotic plants could be acclimatized. The foremost *agronome* of the eighteenth century, Henri-Louis Duhamel du Monceau, if primarily known for agricultural innovations, was committed to experimentation with exotic trees, especially those from North America.

It has often been assumed that knowledge of North American species dates from the travels of André Michaux at the end of the eighteenth century, but in fact, a substantial portion of the continent's eastern flora was already known in France by the mid-eighteenth century. Duhamel's catalogue of trees and shrubs that could be grown outdoors in France, published in 1755, remains a gold mine for the historian of forestry. His writings on trees have led to his being called the father of silviculture.[1]

The book was written at the request of Louis XV as a dictionary of useful trees and shrubs. An amateur botanist himself, in 1750 the king had also ordered the construction of a new garden near the Trianon Palace. The complex would be known as the Petit Trianon and was put under the management of Claude Richard, an exceptional gardener; there, in 1759, Bernard de Jussieu would plant the first garden to demonstrate his new method of the natural classification of plants, in which the king took a personal interest. But what the king wanted from Duhamel was a guide to plant species that would be useful for shipbuilding, construction, and reforestation.

Since Duhamel believed there was no tree that did not have some particular use, he chose to limit his species to those that could survive winters outdoors in the various regions of France. He placed a considerable number of species on trial, especially to test winter survival, in various regions of the country. He included exotics, frequently grown from seed, that had passed a survival test, whether on his own plantations or on those of trusted correspondents, whose names and sites he listed:

1. The Duhamel plantations in the Gatinais near Pithiviers, including the four seigneuries of le Monceau, Vrigny, Bondaroy, and Denainvilliers, notably the latter, where the experiments were supervised by Duhamel's brother, Alexandre.

2. The seigneury of Lamoignon de Malesherbes in the Gatinais, just north of Pithiviers.

3. Bernard de Jussieu in the Jardin du Roi in Paris, providing not only species raised outdoors but also books, articles, and advice to foster research.

4. Claude Richard of the new Trianon garden, notably trees grown outdoors from imported seeds or obtained by correspondence with English botanists.

5. The garden in Saint-Germain-en-Laye belonging to the duc D'Ayen de Noailles but managed by Dr. Louis-Guillaume Lemonnier, former student of Jussieu and physician to the king, who shipped species of interest to Duhamel.

6. The garden near Nantes of the marquis de la Galisonnière, governor of French Canada 1747–1749, who had returned with Canadian seeds and stock.

7. Trees from the comte de Buffon's property in Bourgogne, château de Montbard.

Duhamel relied on those trusted experimenters but also acquired seeds from correspondents overseas, including three royal agents in North America: Jean-François Gaultier, serving as a royal physician and on the Conseil supérieur de Québec (honored by Linnaeus with the genus *Gaultheria*, wintergreen); Dr. de Fontenette, a royal physician in Louisiana; and a royal provost who sent a shipment annually from Ile Royale.

American seeds acquired via England were sent by Dr. John Mitchell, an American then residing in England; the celebrated gardener Philip Miller; and Peter Collinson, a Quaker merchant. Their seeds, in turn, were mainly procured from the Quaker commercial gardener near Philadelphia, John Bartram, a plant enthusiast without scientific training. He is remembered in the United States as one of the first members of the American Philosophical Society.[2]

A prospective reader of Duhamel's treatise should expect to find his genera arranged in alphabetical order, as in a dictionary, but with considerably more specific information. Although it was published two years after Linnaeus's 1753 *Species Plantarum* with its binomial nomenclature, Duhamel believed it expedient to use the Tournefortian nomenclature more familiar to his

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Henri-Louis Duhamel du Monceau's experimentation with exotic trees and his writings on the subject have led some to call him the father of silviculture. His 1764 book, De l'exploitation des bois *("Forest Management"), is considered the cornerstone of silviculture.*

intended audience, albeit fully aware of the superiority of the binomial method.

When listing genera such as *Morus*, *Olea*, and *Vitis* (the foundations of the silk, olive oil, and wine industries), Duhamel inserted lengthy essays on their culture and fabrication, sometimes with drawings of machinery employed. That such major industries depended upon introduced species and techniques accounts for the readiness of the French to seek additional benefits from exotic introductions.

Much was anticipated, for instance, from the conifers as a group. The following examples of Duhamel's successful experiments are rendered in Linnaean nomenclature for the contemporary reader:

- *Juniperus virginiana* L., red cedar (1:322, no. 6).
- *Larix laricina* (Du Roi) K. Koch, tamarack (1:332, no. 3).
- *Picea mariana* (Miller) Britton, Sterns, and Poggenburg, black spruce (1:3, no. 8).
- *Pinus banksiana* Lambert, jack or gray pine of Canada (1:125, no. 10).
- *Pinus echinata* Miller, shortleaf pine (1:126, no. 15).
- *Pinus taeda* L., loblolly pine (1:126, no. 17).
- *Pinus palustris* Miller, longleaf pine (1:126, no. 18).
- *Pinus resinosa* Ait., red pine of Canada (1:125, no. 8).
- *Pinus strobus* L., white pine (1:126, no. 19).
- *Taxodim distichum* (L.) Richard., bald cypress (1:198, no. 4).
- *Taxus canadensis* Marsch., yew (1:3, no. 4).
- *Thuja occidentalis* L., arborvitae (2:310, no. 1).[3]
- *Tsuga canadensis* (L.) Carr., eastern hemlock (1:3, no. 7).

Among the various groups of trees, the oaks became the prime concern of Duhamel because of their value in construction and shipbuilding. He asserted that wide areas in Bretagne, Poitou, Guyenne, Bourgogne, and Champagne had been degraded gradually over past centuries until totally stripped of forest. The soils no longer favored the regeneration of native oaks.[4] How would the navy procure stout timbers? Duhamel reported successful experiments on six American oaks:

- *Quercus alba* L., white oak (2:203, no. 16).
- *Quercus falcata* Michx., southern red oak (2:203, no. 17).
- *Quercus prinus* L., chestnut oak (2:203, no. 18).
- *Quercus phellas* L., willow oak (2:203, no. 19).
- *Quercus prinoides* Willd., chinquapin oak (2:203, no. 20).
- *Quercus virginiana* Miller, live oak (1:314, no. 8).

Nut-bearing trees were sought not only for their fruit but also because their wood was prized by cabinetmakers. Duhamel recommended six species:

- *Carya alba* L., pecan (2:51, no. 12).
- *Carya ovata* (Miller) K. Koch, shellback (2:51, no. 14).
- *Castanea dentata* (Marsh.) Borkh., chestnut (1:134, no. 1).
- *Castanea pumila* (L.) Miller, chinquapin (1:134, no. 5).
- *Juglans cinerea* L., butternut or white walnut (2:51. no. 11).
- *Juglans nigra* L., black walnut (2:51, no. 13).

As potential ornamentals, Duhamel gave American maples high marks. He listed three species but indicated that several others had not yet been tested adequately:

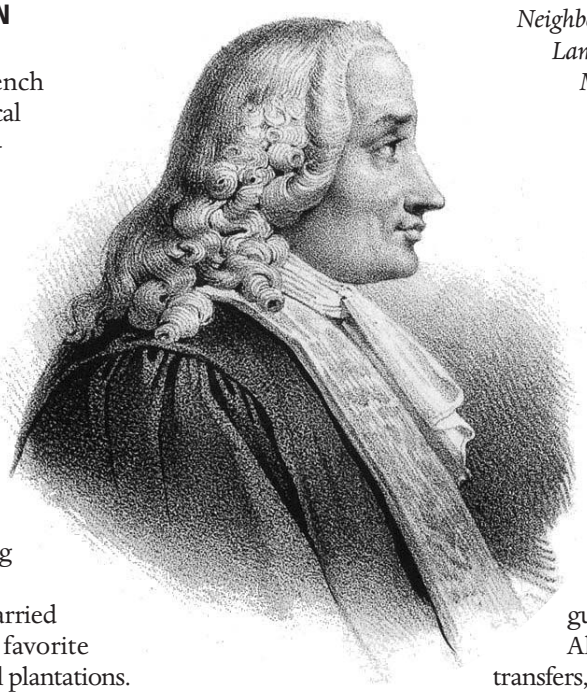
- *Acer rubrum* L., red maple (1:28, no. 5).
- *Acer negundo* L., boxelder (1:28, no. 10).
- *Acer pensylvanicum* L., striped maple (1:28, no. 11).

Two species that he would have known because his neighbor, Malesherbes, cultivated them were *Acer saccharinum* L., silver maple; and *Acer saccharum* L., sugar maple. Duhamel included *Plantanus occidentalis* L., sycamore (2:172, no. 3), as one of the most beautiful of ornamentals.

For all the species above, and for the many more he had tested, Duhamel claimed no more than that he had raised the plant successfully, often from seed, and that it could survive French winters. This implied that they could be used successfully as cultivars. The word *naturalized* never appears in the text. Left unclear, therefore, is whether he assumed that naturalization was the logical consequence of his positive experiments, or whether he knew that only time would tell whether naturalization had occurred. His expressed distrust of theory and his insistence upon experimental proof would suggest the second interpretation.[5]

It appears, in fact, that most of the species with which Duhamel experimented never became naturalized in Europe. But a good many are still grown as valuable cultivars, including a half-dozen of the conifers. The great plantations that he oversaw in the Gatinais, along with those of Malesherbes and at the Jardin du roi in Paris, directed by André Thouin, were the seed banks of their day.

REVOLUTION AND DESTRUCTION



Neighbors and botanists, Chrétien-Guillaume Lamoignon de Malesherbes and Duhamel du Monceau exchanged information and seeds. Malesherbes' decision to defend the king before the National Convention in 1792 cost him his life and led to the destruction of his famed personal gardens.

After the beginning of the French Revolution in 1789, the entire botanical enterprise was put in jeopardy. Revolting peasants "wrought a terrible revenge on the nobility, aristocracy, and church by appropriating forests for pasturage and cultivation" or for personal use. The restraints that existed before 1789 over their own extensive communal forests were ignored, leading to faster deforestation in some regions.[6] The word *vandalism* was coined by the abbé Grégoire in 1793 to characterize not ravages by barbaric invaders but widespread looting by fellow patriots.

Duhamel had died in 1782, unmarried and childless, but had trained a favorite nephew to carry on the experimental plantations. When the nephew died prematurely in 1789, the great seed bank fell prey to a wealthy lumberman who secured the right to harvest the trees. Malesherbes, who had no male heirs, sealed his doom and that of his plantations by volunteering, as an attorney, to defend the king before the National Convention in 1792. He was beheaded in 1794.

The third great seed bank, the Jardin du roi—a crown property—was in peril immediately after the overthrow of the monarchy. All officers and employees were suspect as royalist sympathizers, including the chief gardener, André Thouin, when in fact they welcomed the removal of the royal keepers, who had all been courtiers, not botanists, much less horticulturists.

Although the leading revolutionaries were ideologues, indifferent to the sciences, there were also those who believed it was folly to sacrifice national treasures in the name of political purity. They generally paid more attention to increasing attacks upon monuments illustrating or celebrating the royal past, or upon the properties of people of wealth or political power, recognizing it as looting in the guise of political principle, than they paid to the threats to vegetation.

Jean Roland, the first minister of the interior under the Republic, was a notable exception among the ideologues, but even he was known to be under the aegis of an even higher authority, his wife, who was a devout amateur botanist and disciple of Linnaeus. Roland realized that for the study of botany, it was important not to lose the rare plants in gardens financed from the former royal civil list or belonging to émigrés. He authorized André Thouin to bring into the Jardin des plantes—the national garden in Paris—those species he did not yet have, or not in sufficient number, from the gardens of the Petit Trianon, Rambouillet, Bellevue, Bagatelle, and Versailles, as well as the Tessé gardens in Chaville and the abbé Nolin's nursery in le Roule.

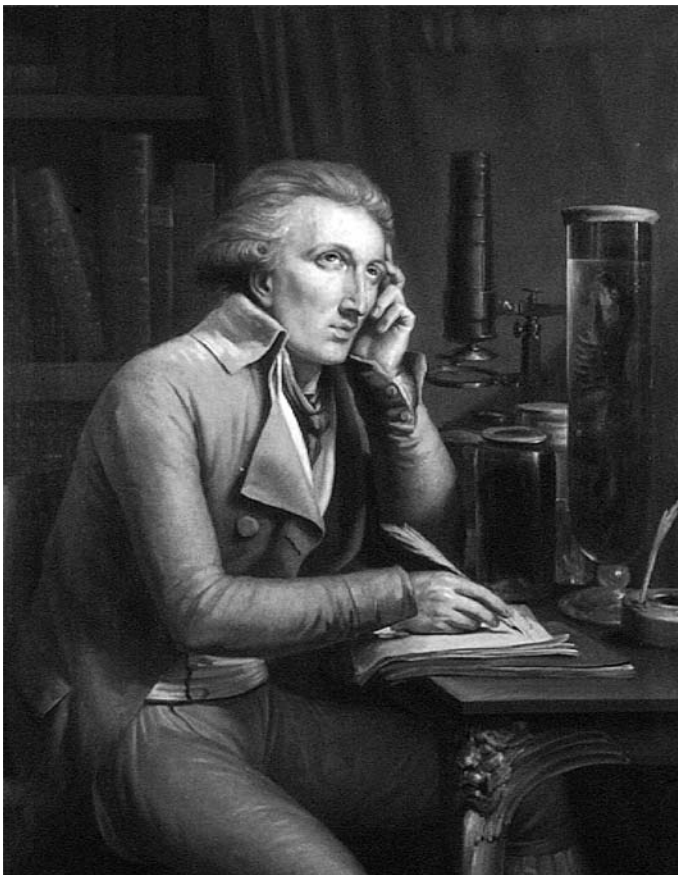
Thouin was additionally authorized to remove exotic species from any properties declared "national lands" and to give private gardeners any orders he judged necessary to fulfill the mission. Such confiscations were justified on the grounds that many such gardens or plantations had received much of their stock originally from Thouin, and most of their gardeners had been trained by Thouin in Paris. Roland urged immediate action, aware that some remarkable species had already disappeared. He left to Thouin's discretion the transfer of such species to the Petit Trianon rather than Paris if they could be adequately guarded there.

Although Thouin reported successful transfers, he also met resistance from private gardeners, most of whom had not been paid for several years after the flight of émigré proprietors. Resolution of such impasses required promises of salary payments by the state, most of which were ultimately paid by Thouin personally, thanks to Roland's short tenure at interior. In Versailles, he met resistance from the departmental authorities and succeeded only in removing the exotics from the private garden of the comte de Provence, brother of Louis XVI. Thouin described them as magnificent specimens and transferred them to the care of Antoine Richard at the Petit Trianon in December 1792. Roland's resignation the next month brought the project to an end.[7]

Official dedication to the preservation of silvicultural or horticultural treasures, in fact, could not have been sustained in that revolutionary climate. All the institutions of learning, having had the name *royal* in their titles, were subject to suspicion: the Société royale d'agriculture de Paris, for instance, recognizing the erosion of royal authority by the autumn of 1790, endeavored to recast itself as a national institution by adopting a new set of regulations and changing its name to the Société d'agriculture de France. That initiative, recommended by the abbé Grégoire as a member of the National Assembly, was designed to enable *savants* to gather fraternally rather than under royal authority.

The move was advantageous: in October 1790 the assembly established a Comité d'agriculture. Among the initial twenty-four members appointed by the president of the assembly were three prominent members of the agricultural society, notably its leader, Auguste Broussonet, a natural scientist. The existence of comemberships meant that the two agencies could work in common cause to promote and protect agriculture, a practice maintained under the subsequent Legislative Assembly.

Word of peasant vandalism in rural France began reaching Paris in 1791. Society meetings became subdued, its members anxious about the future. During the session of December 28, 1791, Broussonet commended the legislation that had promoted liberty by abolishing many abusive evils of the Old Regime. But popular passions had been unleashed, and fanaticism became "the single evil worse than all the others combined"—a threat to



The wanton destruction of crops and farm animals observed by French naturalist and zoologist Georges Cuvier during the French Revolution led him to question the wisdom of democracy. Democracy, he declared, became a despotism a thousand times multiplied.

the people's nascent liberty. The assembly seemed ready to destroy the throne it had sworn to uphold.[8]

In the aftermath of the rural uprisings, the naturalist Georges Cuvier summarized what had occurred. Beyond his own observations, he drew upon those of Dr. Alexandre-Henri Tessier, *agronome* and naturalist, who had been appointed in 1784 as director of l'Etablissement rural de Rambouillet, the royal park designated to receive the specimens sent from America by André Michaux. He also drew upon the testimony of Jacques-Martin Cels, amateur botanist and experimental gardener, who had served on the Commission de l'agriculture et des arts, created by the Convention as successor to the Comité d'agriculture. Philippe-Victoire de Vilmorin was Cels's close colleague, founder of a nursery and seed bank that survive today.

Their memories were bitter. Democracy, Curvier wrote, became a despotism a thousand times multiplied. The great agricultural establishments were destroyed because they had belonged to the wealthy. To feed the hungry, animals of the finest breeds were slaughtered. Old timber as well as trees along roadways were cut in order to plant potatoes. Ponds were drained so that their beds could be seeded, reducing whole cantons to sterility by removing their irrigation sources. The death sentence became the penalty for those who sowed artificial meadows, a reference to the proponents of the new, scientific agriculture.

Much as the agricultural authorities in Paris deplored such vandalism, they found themselves unable to stop it. Cels, a countryman, was in a good position to argue for restraint, since he spoke the language of the peasantry. But peasant rage gave way to greed and guile. "That is, the desire to destroy the wealth of others was replaced by the desire to seize it for oneself."[9]

The emigration of many important landowners contributed to the destruction of gardens and woodlands. Malesherbes opposed the emigration of aristocrats, arguing that they should seize the opportunity to curtail royal absolutism. But because the plantations required expensive maintenance, their abandonment resulted in ruin even when not subjected to vandalism. The pace of forest degradation certainly accelerated after 1790, some of it due to uncontrolled timbering, but also to assaults upon woodlands previously protected by private owners for their own use. A recent study indicates that between 1790 and 1820, French forests were reduced from 9 million to 3 million hectares.[10]

MICHAUX IN AMERICA

Meanwhile, efforts to acquire American stock for renewal were already underway. The three botanist-horticulturists most critical to the continuing enterprise—André Michaux, André Thouin, and Joseph-Martin Cels—were close and cooperative friends. All three had enjoyed official appointments under the former regime but had escaped the guillotine. André Thouin, the central figure in the acquisition and distribution of exotic seeds in the old Jardin du roi, subjected to lengthy police surveillance, survived every interrogation and saw the garden transformed into the nationalized Jardin des plantes.

Michaux had been born in Versailles, where his youthful interest in plants was encouraged by Louis-Guillaume Lemonnier, the royal physician, and by the work of Bernard de Jussieu at the Petit Trianon. In 1785, Michaux received an assignment from Louis XVI to go to America, not to discover new species but to collect and propagate trees and shrubs that could be shipped to France for beneficial cultivation, specifically with an eye toward timber for shipbuilding. The crown had acquired the domain of Rambouillet for the development of stock and seeds Michaux shipped home.[11]

He reached New York on November 15, 1785, accompanied by his son, François-André, and a trained gardener, Pierre-Paul Saunier. Land was purchased for a nursery nearby in New Jersey. In 1787, he established a second nursery at Charleston, South Carolina. André Michaux would spend about ten years in North America; his son left after five years but later returned. His numerous outings took him from Florida to Hudson Bay and westward from the Blue Ridge Mountains to the Mississippi River. The immense physical barriers he faced and overcame in remote country were compounded early on by money shortages. The royal minister responsible for sending his funds became an émigré in 1791 after the king's flight to Varennes. Michaux learned in the spring of 1792 that no more funds would be available and his mission should be terminated. The threat of war with the rest of antirevolutionary Europe and the equivocal situation of Louis XVI consumed ministerial attention entirely.

Michaux had projected a trip into Canada for the collecting season of 1792. Having already shipped large quantities of seeds and stock to Paris, mainly for planting at Rambouillet, with some meant for preservation in the Jardin du roi and the gardens of

Malesherbes, Lemonnier, and Cels, Michaux was reluctant to abandon the enterprise. Although much of what he had shipped augmented supplies of species already known, he believed he was also finding new genera and species, and he wanted to publish a flora of North America.[12]

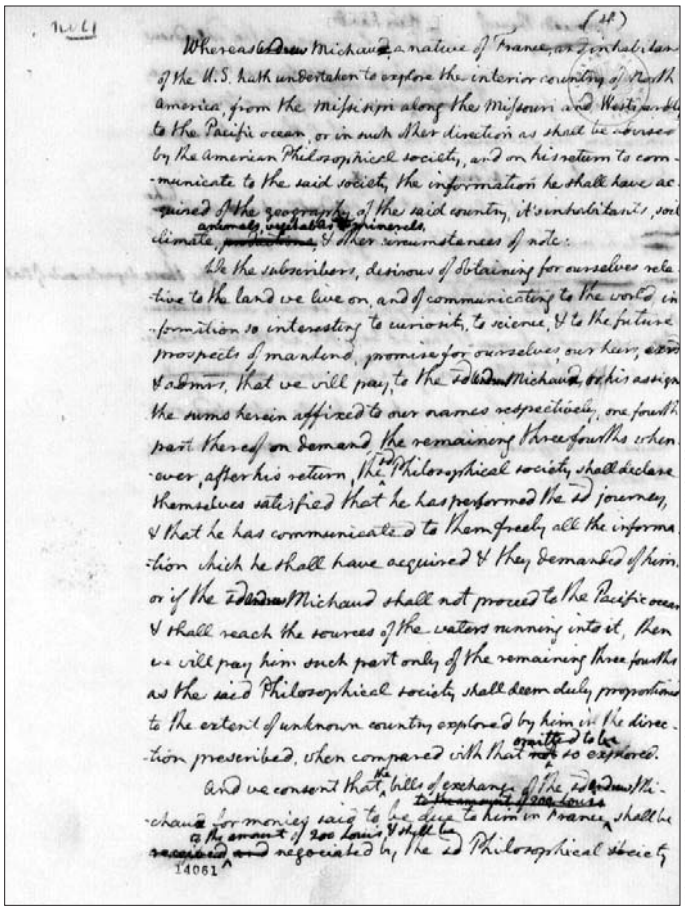
His decision to fall back on his private finances would result, after his lengthy foray into Canada, in briefer outings and increased attention to the nurseries. An attempt to gain backing from the American Philosophical Society to mount a western expedition through the Louisiana Territory and on to the headwaters of the Pacific Slope—an itinerary he designed with then Secretary of State Thomas Jefferson with promise of funding from the society's members, including George Washington, John Adams, Jefferson, James Madison, as well as many other Founding Fathers—collapsed in the spring of 1793.[13] As president, Jefferson sent Lewis and Clark on that same trip. Michaux, however, limited his travel to the South until 1795–1796, and never went farther west than the Mississippi River. His personal finances near exhaustion, he then returned to Paris to seek compensation and renewed state support from the Republic.

Sailing from Charleston on August 13, 1796, he had an uneventful voyage until within sight of the Dutch coast, where the ship was struck by a sudden tempest and driven onto the rocks. All on board could have been lost had not the people of the nearby village of Egmont come to the rescue. Michaux's cases carried on the deck had been swept away, but those stored below deck were recovered. He spent the next six weeks drying and remounting herbarium specimens, finally reaching Paris at the end of December.

The warm welcome he received from the professors at the Jardin des plantes was offset by the shocking news that only a small number of the more than 60,000 plant stalks he had shipped over the ten years still remained. The fine nurseries at Rambouillet had been ravaged during the Revolution, and it was rumored at the time that private individuals had secured desirable specimens with official connivance. Marie-Antoinette was said to have diverted 30,000 plants to her father's botanical garden in Vienna. Records, obviously, are lacking.[14]

No record remains, furthermore, of a shipment Michaux made to Malesherbes in 1786; it was likely lost at sea. Another shipment, sent from Charleston in 1789, arrived in France after a stormy crossing with all specimens ruined by seawater. But Michaux was heartened to find that large quantities of seeds he had sent to Paris from his more recent field trips remained undistributed, so his first order of business was to divide them among Thouin, Lemonnier, and Cels.

Thereafter, he approached the ministry of the interior, hoping both for reimbursement of his personal expenses in the service of the nation and for pledges of new funds to enable him to retrace his steps in America. He was dismayed to learn that the Republic felt no obligation to honor engagements made by the Old Regime; military expenses had priority in 1797. He was given a small sum to cover recent expenses in the Netherlands when restoring his mounted collections and conceded a plot of state property in the Bois de Boulogne to conduct experimental seeding. There was nothing left to do except begin work on his *Flora Boreali-Americana*, or *Flora of North America*.[15] Published in 1803, a year after his death, the beautifully illustrated *Flora* was the first systematic study of the floral of North America available to botanists.



FROM THE THOMAS JEFFERSON PAPERS, 1606–1827, LIBRARY OF CONGRESS

A letter from the proposed contract between André Michaux and the American Philosophical Society, dated January 23, 1793. Michaux was to "to explore the interior country of North America, from the Missisipi [sic] along the Missouri and Westwardly to the Pacific ocean." Due to international intrigue, the deal was called off. The mission was fulfilled by Lewis and Clark ten years later.

THE RISE AND FALL OF CELS

Notable in his own day, Jacques-Martin Cels is now largely forgotten. Born to an official in the royal buildings service in Versailles, like Michaux he had received early training in botany, and at a young age he began accumulating a personal library. Because of his location, he was among those privileged to follow Bernard de Jussieu's botanizing. Through official favor, he found employment in the office of the farmer-general, a lucrative position in tax collection at the Barrière Saint-Jacques. He devoted his leisure time to the development of a private botanical garden. By organizing plant exchanges through correspondence with Lemonnier and other plant lovers, he had developed by 1788 one of the finest personal gardens in the realm.

The suppression of indirect taxes by the Revolution left Cels unemployed, and the popular pillage of the toll stations at the gates of Paris in 1789 cost him his savings, taken from his private safe. By converting his garden in the village of Montrouge, just south of Paris, into a commercial enterprise, his principal love became his only occupation and his main resource. He redoubled his correspondence, endeavoring to acquire plants from all over the world, and his friendships with Thouin and Michaux

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In addition to preparing his father's work on North American flora for publication, François-André Michaux published The North American Sylva. *Both publications remained the standard on their subjects for much of the nineteenth century.*

helped him acquire exotic seeds to grow and sell. Though ultimately successful as a provider of fine specimens, in 1789 he had been forced to sell his fine library in order to survive the transition to nurseryman.

That loss helps explain why he never published his observations or any practical applications of his knowledge. He never made notes, moreover, trusting in his excellent memory, and his premature death in 1806 precluded any memoirs. Botanical students, fortunately, had always been welcome in his garden, whether they wished to describe new species or make illustrations. Their publications frequently described "new" species from his garden.

The durable reputation of the garden derived from the efforts of Etienne-Pierre Ventenat, a sometime-clergyman-become-amateur-botanist, who fell upon a lucrative career in publishing the work of botanists and gardeners in beautiful and expensive editions, usually illustrated by Pierre-Joseph Redouté.[16] The Ventenat volume on the garden at Montrouge revealed that the major source of Cels's exotic species was André Michaux, who supplied more than any other explorer. Additional American seeds had been donated by Louis-Auguste-Guillaume Bosc, a naturalist friend of Michaux who served as French consul in the United States from 1794 to 1799.

Cels had learned the techniques of raising exotic plants before his financial losses in 1789 forced him to make it a business.[17] In particular, he had been interested in trees and shrubs that could be useful in the French climate. Among the various oaks from America, he took special interest in "*Quercus tinctoria* W. Bartram" because its bark yielded a fine yellow dye. Known today as *Quercus velutina* Lamarck, the black oak, it never became established in Europe.

Cels also cultivated "*Bartramia bracteata* W. Bartram," today *Pinckneya bracteata* (W. Bartr.) Rap., called Georgia bank, a tree in the Rubiaceae. Its bark was said to yield an excellent febrifuge, widely used in the U.S. South to reduce fevers. He hoped it could be a domestic substitute for quinine from the cinchona barks in the Andes, also in the Rubiaceae. The tree did not succeed in Europe, however.

Among the twenty-four American species described and illustrated by Ventenat from Cels's garden, only one was a tree: *Robinia viscosa* Vent. (no. 4, tab. 4), the clammy locust. Cels indicated it had been discovered by André Michaux in the Allegheny Mountains of South Carolina near the source of the Savannah River. Introduced to his garden in year II (1793–94), it had grown to more than 16 meters in height and survived winters in open ground; it multiplied easily from roots and shoots and could be grafted. Planted successfully today in central and eastern Europe for timber, it appears to be naturalized locally.[18]

Both Cels and his garden survived the Revolution, probably because his conscientious service on a series of agricultural councils under the ministry of the interior put his patriotism beyond question. Recognition had come in 1795 with his election as an initial member of the Institut de France, to the section of Economie rurale et d'art vétérinaire. He proved to be a loyal member, notable for prompt attendance at sessions and committee meetings, walking into Paris from his residence at the garden.[19]

COMPLETING HIS FATHER'S MISSION

In 1801, two years after Napoleon came to power, the interior ministry's Conseil d'agriculture was ordered to deliberate on the future of the two American plantations. Testimony was given by both Bosc, who had been officially in charge as French consul after André Michaux's departure in 1796, and Michaux's son, François-André. Both agreed that, despite grievous losses of American trees during the Revolution, sufficient seeds and stock had been preserved at the Jardin des plantes, the Petit Trianon, and le Roule to provide for the requirements of the state. Private commercial enterprises like those of Cels and Vilmorin would meet public demand.

Accordingly, François-André Michaux was provided a budget to conclude his father's work. A decision about the disposition of the property in New Jersey was postponed on the assumption that it might still be useful as a nursery for seedlings. Saunier, the French gardener, inactive for some years and neglectful of his responsibilities according to Michaux, was paid an amount reflecting official dissatisfaction.[20] He never returned to France. The Charleston property was to be sold and the interim local gardener paid 4,000 francs in back wages for his dedicated service, which had been observed by Bosc while serving in America.

To complete his father's mission, François-André was instructed to ship back specimens that had been left behind, and

he was authorized to make additional collections in the mountains for shipment and to bring back the most valued seeds in person. Before his departure for Charleston that September, he paid a visit to Cels, aware of his father's close ties; Cels would receive a portion of the seeds sent back in 1802 and 1803.[21]

According to François-André's report on the results of his expedition, the plants "from my last voyage" were distributed to the state nurseries at Trianon, to M. Cels, and to Joséphine Bonaparte, who had purchased the domain of Malmaison in 1798. Given her passion for exotic foliage and flowers, she expanded the domain to about 5,000 acres and engaged first-rate botanists and horticulturists to manage the plantations. No trace of them remains today.

François-André's report concluded with an alphabetical list, using Latin names, of North American trees 13 to 40 meters in height, plus a similar list of trees from 8 to 13 meters, all of which he asserted could be profitably naturalized in France if cultivated.[22] These lists may be regarded as a precursor of his major three-volume work, *Histoire des arbres forestières de l'Amérique septentrionale* (1810–1813), known in its English translation as *The North American Sylva*. As for the matter of naturalization, it remains unclear what he meant by the word. It seems likely that he simply assumed that the successful cultivation of many American species amounted to naturalization. In fact, naturalization would prove to be infrequent.

That must explain why no subsequent French government sponsored such a massive importation of North American species, especially since sufficient seeds had been preserved to meet future public and private demand. Furthermore, the importation made little difference in the nineteenth-century efforts to reforest France, with its growing population and expanding agricultural base. But the importation of North American trees to France that slowed during the early nineteenth century did not halt. The introduction of exotic species fell out of favor among French foresters towards the end of that century, but the successful introduction of several species, including the red oak, the poplar, and the Douglas-fir since then, has altered that perception. In fact, the Douglas-fir—first introduced to France in the mid-nineteenth century—has become the most popular species for reafforestation in the country since 1980. Though it now constitutes just over two percent of the national volume, the present proportion is rapidly increasing; pure stands of it cover nearly 400,000 hectares.[23] It is a species that André Michaux would have encountered and shipped back home if he had made that journey to the Pacific Ocean in 1793. The delay in successfully introducing the Douglas-fir to France only completes the goals of Duhamel and Michaux undertaken for their king and country two centuries ago. □

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NOTES

1. In 1764, Duhamel published *De l'exploitation des bois* ("Forest Management"), the founding text of the new science of silviculture.
2. Henri-Louis Duhamel du Monceau, *Traité des arbres et arbustes qui se cultivent en France en plein terre*, 2 vols. (Paris, 1755), 1: xv–xxii.
3. Malesherbes called the arborvitae the "Tree of Life of Canada," and it was perhaps the first American tree introduced to Europe, ca. 1566.
4. Georges-Louis Leclerc, comte de Buffon, "Mémoire sur la conservation et le rétablissement des forêts," *Mémoires de la Académie royale des sciences*, 8 April 1739:140–156.
5. M.-J.-A.-N. Caritat, marquis de Condorcet, *Oeuvres de Condorcet*, 12 vols. (Paris, 1847), 2:635–638.
6. Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis: An Abridgement* (Chicago: The University of Chicago Press, 2006), 266.
7. The Roland-Thouin correspondence can be found in Yvonne Latouzey, ed., *Le Jardin des Plantes à la croissé des chemins avec André Thouin, 1747–1824* (Paris, 1989), 347–354.
8. Louis-Paulin Passy, *Histoire de la Société nationale d'agriculture de France* (Paris, 1912), 342, 372–383.
9. Georges Cuvier, "Eloge historique de Jacques-Martin Cels," *Mémoires de la classe des sciences mathématiques et physiques de l'Institut* 7 (1806): 152.
10. Louis Badré, "Le XIXe Siècle forestier (1820–1914)," *Les Eaux et forêts du 12e au 20e siècles* (Paris, 1987), 472. The well-known edict prohibiting vandalism, issued on July 24, 1793, made no mention of forests or gardens. See Joseph Lakanal, *Exposé sommaire des Travaux de Joseph Lakanal* (Paris, 1838), 11–12.
11. Jean-Philippe-François Deleuze, "Notice historique sur André Michaux," *Annales du Muséum National d'Histoire Naturelle* (Paris) 3 (1804): 223.
12. Jean-Henri Jaume Saint-Hilaire, *Mémoire sur l'administration et sur la management des forêts* (Paris, 1814), 28.
13. Stephen A. Spongberg, *A Reunion of Trees: The Discovery of Exotic Plants and Their Introduction into North American and European Landscapes* (Cambridge, Massachusetts: Harvard University Press, 1990), 53.
14. François-André Michaux, *Mémoire sur la naturalization des arbres forestiers de l'Amérique septentrionale* (Paris, 1805), 5–9.
15. Deleuze, "Notice historique," 217–219; Elie-Abel Carrière, "Une Visite aux Pépinières du Bois de Boulogne." *Revue horticule* ser. 4, 1 (1852): 412–414; and André Michaux, *Flora Boreali-Americana*, 2 vols. (Paris, 1803).
16. Etienne-Pierre Ventenat, *Description des plantes nouvelles et peu connues dans le Jardin de M. Cels* (Paris: Year VIII)[1800–1802].
17. J.-P.-F. Deleuze, "Recherches sur les plantes d'ornament et sur leur introduction dans nos jardins," *Annales du Muséum National d'Histoire Naturelle* 9 (1807): 186.
18. J.-M. Cels, "Notice historique sur la plante nommée *Robinia viscosa* (Robinia visqueux)." *Mémoires de la classe des sciences, methématiques et physiques de l'Institut* 5 (1805): 110–113.
19. Cuvier, "Eloge historique," 7:144–156.
20. 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*, Vol. 102, No. 4. (Aug. 27, 1958), 360–362.
21. Henry Savage Jr. and Elizabeth J. Savage, *André and François Michaux* (Charlottesville: University of Virginia Press, 1986), 169, 190–197, 271.
22. Michaux, *Mémoire*, 10.
23. François Le Tacon, Jean Pinon, and Francis Martin, "A Historical Perspective on French-U.S. Forestry Cooperation," in *Common Goals for Sustainable Forest Management: Divergence and Reconvergence of American and European Forestry*, ed. V. Alaric Sample and Steven Anderson (Durham, NC: Forest History Society, 2008), 47–49.