

HUNTIA

A Journal of Botanical History



Volume 9 Number 1
1993

Hunt Institute for Botanical Documentation
Carnegie Mellon University

Pittsburgh

Huntia publishes articles on all aspects of the history of botany and is published irregularly in one or more numbers per volume of approximately 200 pages by the Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213-3890.

Executive Editor	Robert W. Kiger
Managing Editor	Sharon M. Tomasic
Book Reviews and Announcements Editor	Charlotte A. Tancin
Associate Editors	Gavin D. R. Bridson T. D. Jacobsen Anita L. Karg James J. White

External contributions to *Huntia* are welcome. Please request our "Guidelines for Contributors" before submitting manuscripts for consideration. Editorial correspondence should be directed to the Managing Editor. Books for announcements or review should be sent to the Book Reviews and Announcements Editor.

Page charge is \$50.00; the charges for up to five pages per year are waived for Hunt Institute Associates, who also may elect to receive *Huntia* as a benefit of membership. Please contact the Institute for more information about Associates membership.

Subscription rate is \$50.00 per volume. Orders for subscriptions and back issues should be sent to the Institute.

Typeset, printed and bound by Allen Press, Inc., Lawrence, Kansas.

Copyright © 1993 by the Hunt Institute for Botanical Documentation
All Rights Reserved

ISSN 0073-4071

Spanish botany during the Age of Enlightenment: A. J. Cavanilles

Francisco Pelayo and Ricardo Garilletei

Introduction

Antonio José Cavanilles (1745–1804) was the most outstanding botanist of the Spanish Enlightenment. His contributions to the taxonomic knowledge of the world flora (more than 80 genera and 1,000 taxa) are good proof of his significance. His biography seems to have been rather well-studied, particularly in the classic works of Pizcueta (1830), Reyes Prósper (1917), and Alvarez López (1946). The relatively unknown parts of his manuscripts (kept in the Archive of the Royal Botanical Garden of Madrid), together with his letters to José Viera y Clavijo (1731–1813) that have been recently published by A. Cioranescu (cf. Cavanilles, 1981), bring new insights to our knowledge of his botanical activities. These partial manuscripts and published letters not only contribute more information on the life and botanical activities of Cavanilles but also conclude with some commentaries that help to introduce and present from a botanical point of view the manuscript on which he was working toward the end of his life, the *Hortus regius Matritensis*.

Biography

Antonio José Cavanilles was born in Valencia, Spain, on 16 January 1745. He studied philosophy and theology. While competing for the mathematics and physics Chairs, he defended the ideas of authors such as the physicist Isaac Newton (1642–1727), the Leibnizian mathematician Christian Wolff (1679–1754) and the Newtonian physicist Pieter van Musschenbroeck (1692–1771). Having failed to win the Chair, Cavanilles became the tutor

of the son of the Oidor de la Audiencia de Valencia (The Valencia High Court Judge). Later, when his employer was appointed Regent to Oviedo, Cavanilles moved with him and there became a priest in 1772. After his employer's death, he moved again to Murcia where he worked as a teacher of philosophy at San Fulgencio school. It was there that the Duke of the Infantado contracted him as a tutor for his children, and in 1777 when the Duke and his family went to Paris Cavanilles went with them.

The stay in Paris was the turning point in the botanical training of the naturalist. Cavanilles and his pupils participated in all the different and popular activities and scientific courses offered in the capital of France: physics by Mathurin Jacques Brisson (1723–1806), Joseph-Aignan Sigaud de La Fond (1730–1810) and Jean-Jacques Filassier (1736–1806); chemistry by Hilaire Marin Rouelle (1718–1779), Jean Darcet (1725–1801), Balthasar Georges Sage (1740–1824), and Pierre Joseph Macquer (1718–1807); and natural history by Jacques Christophe Valmont de Bomare (1731–1807).

Cavanilles' Training as a Botanist

Although Cavanilles' attendance at the different courses had enhanced his basic knowledge of natural history, in his letters and personal notes he revealed that his knowledge of botany was learned in a manner that was mostly autodidactic. It is not known exactly what role the abbé de Chaligny, family friend of the Duke of the Infantado, played in his interest in botany. Cavanilles, in his letters to

José Viera y Clavijo, a naturalist and historian he met during his journey to Paris, hints that the abbé of Chaligny was aware of his interest in the vegetal domain. It is nevertheless true that the journeys he made with the Duke allowed him to collect plants, visit both public and private botanical gardens, and study and compare specimens in herbaria. These opportunities helped Cavanilles to gradually build a solid training and a reputation as a botanist.

It was in 1780 that Cavanilles began to be interested in botany. By the middle of the following year he came to know approximately 100 plants, many of them exotic, that were found in the residential gardens of amateur naturalists. He thought that was a small number of plants to know, but he was sure his enthusiasm and constancy would allow him to enter "little by little into that hall of the Palace of Nature."¹ To complete his botanical training, Cavanilles collected plants he found by the road during his journeys to Belgium with the Duke of the Infantado and to the La Chevrette country house where the Duke used to spend his summers. He also took advantage of these occasions to visit the botanical gardens of the Duke's acquaintances. It was thus that while he was in Brussels he had the opportunity to go to the English garden of the Viscount of Walckiers, of which he wrote: "In this garden, I have increased my herbarium and improved my botanical knowledge. Here, I have seen the four magnolias, the liriiodendron, the catalpa with its other species of bignonias, the azalea, the American cornus . . ."² There he also bought the botanical books of Christian Jacob Trew, *Plantae selectae* and *Plantae rariores*, which had a rich iconographic collection of 100 illuminated drawings of plants. On a journey through Louvain, Belgium, Cavanilles came to know its botanical garden, which, although small, he commented, had a teacher whose explanations compensated for the lack of space that hindered the growing of exotic plants. Cavan-

illes, because of his position as tutor to the Duke's sons, knew he had no other way to continue his botanical training than to be self-taught, as he complained to Viera: "You have the pleasure of seeing in order, in that Botanical Garden [of Madrid], native and exotic plants and of comparing their structure and fructifications but I have the pleasure of guessing and learning on my own (although I owe a lot to the abbé Chaligny)."³

As Cavanilles improved his botanical education, he did not neglect the theoretical side of that science. He bought *Flora Suecica* by Linnaeus and the *Amoenitates academicae*. His theoretical studies were simultaneous with his practical training. In a few years his herbarium increased as a result of his visits to the gardens of Aremborg (a Belgian aristocratic family), the garden of Jacques Philippe Martin Cels—about which Étienne Pierre Ventenat (1757–1808) would publish *Description des plantes nouvelles et peu connues cultivées dans le jardin de J. M. Cels*, which Cavanilles would comment on in *Anales de ciencias naturales*⁴—to the Saint Germain gardens in Paris, to those of Triannon palace and Monnier palace in Versailles, and his collections from the pond of Montmorency, a village in the northern part of Paris, and around La Chevrette.

His good relationships with French botanists, and later his contact with botanists from other countries, contributed to his botanical progress. French botanists provided him with access to their herbaria, and other botanists provided an exchange of botanical information and materials. In Paris, Cavanilles was in contact with the most important botanists of the time, some of them linked to the Jardin du Roi (the Royal Botanical Garden of Paris): Antoine Laurent de Jussieu (1748–1836), Jean Baptiste Pierre Antoine de Monet, Chevalier de Lamarck (1744–1829), René Desfontaines (1750–1833), André Thouin (1747–1824), and also Michel Adanson (1727–1806) who would be appointed Curator of the Triannon

garden by Louis XV when the botanist returned from Senegal. All of them allowed him to use their herbaria and to have access to many other herbaria that contained exotic plants from Oceania, gathered by Philibert Commerson (1727–1773) and Pierre Sonnerat (1748–1814) during the expeditions of Louis Antoine Bougainville (between 1766 and 1769) and Count Jean François de Galaup de La Pérouse (between 1785 and 1788). Without a doubt, André Thouin, the Head of the Gardeners at the Jardin du Roi, must have worked very closely with Cavanilles. He made the way easier for Cavanilles, encouraging him to collect whatever he needed, sharing his observations with him, and sending Cavanilles the plants and seeds he had requested. It is not strange that Cavanilles favorably contrasted Thouin to the teachers of the Botanical Garden of Madrid and wrote to Viera: “What a difference between this man [Thouin] and those of that garden [the Botanical Garden of Madrid]!”⁵

In 1784, thanks to his excursions, the visits to gardens, the study of French botanists’ herbaria and other collections from those who had travelled overseas, and to the seeds Viera, Antonio Palau y Verdera (1734–1793) and Cándido María Trigueros (1736–1798) had sent him from Spain, Cavanilles could begin to work on his monograph of the Linnaean class *Monadelphia*: “I work like a slave on my botany. I will publish a dissertation about the genus *Sida* if the botanical writers from here approve my small observations.”⁶ This monograph, the work of many years, consisted of ten dissertations, of which the first eight were published in Paris between 1785 and 1789. The last two dissertations had to wait until Cavanilles came back to Madrid, where they eventually would be published. The political situation in Paris forced Cavanilles to return to Spain with his employer in the autumn of 1789: “When will I publish these? you say. It is impossible to say. . . . We are on the point

of departing at midday (the day I’ve waited for has finally arrived) and, although nobody has said a word to me about this, I saw, when I came back home, that the furniture had disappeared. . . . So, I don’t dare begin the printing; because of the doubtful circumstances in which I find myself, I do not know if I will have enough time to do it.”⁷ The publication of the last two dissertations was made possible in part by Francisco A. Moñino (1730–1808), Count of Floridablanca and Secretary of State of Carlos IV, who had already financed him with 1,000 pesos for the publication of the second volume of *Monadelphia*: “I arrived fine, and I had the pleasure of being welcomed by the minister, as he did two years ago. . . . Here I will continue to publish my work, and I have an official order to have published the 9th and tenth dissertations which complete my work.”⁸

The published monograph of *Monadelphia* was well-received by the botanical community. The first two volumes were presented in the Académie Royale des Sciences de Paris (the Royal Scientific Academy of Paris) by Lamarck, Jussieu and Auguste Denis Fougereux de Bondaroy (1732–1789), making it easier for Cavanilles to be in contact with European botanists such as Joseph Banks (1743–1820), Nikolaus Joseph von Jacquin (1727–1817), Carl Peter Thunberg (1743–1828), and Paul Usteri (1768–1831). Cavanilles exchanged information and botanical materials with all of them. The publication of the first dissertation of *Monadelphia* was also the cause of the first botanical controversies.

The Botanical Controversies with Medikus and L’Héritier

Cavanilles had created several new genera and species of *Monadelphian* plants in his first dissertation. In fact, this gave rise to two polemics: Friedrich Kasimir Medikus (1736–1808) and Charles Brutelle de L’Héritier (1746–1800) published their respective ar-

guments in the *Journal de Paris*, in the *Observations sur la physique, sur l'histoire naturelle et sur les arts*, and in the *Magazin für die Botanik*. Medikus was a professor at the University of Heidelberg and Director of the Botanical Garden of Mannheim. A confessed follower of Joseph Pitton de Tournefort and Johann Jakob Dillenius and opposed to Linnaeus, he began his critical notes by making a distinction between genus and family. He defined genus as "an artificial distribution of plants upon the basis of a unique character of the fructification parts." To establish the family of the plant, he thought it necessary to consider all of the parts, from the roots to the top. He gave three names to each plant: one for the natural family, another for the artificial genus and another for the species. Medikus was opposed to the "sexualists" like Linnaeus, adducing the variability present in these characters.

With regard to Cavanilles' dissertation about the genus *Sida*, Medikus held that in Malvaceae, because the flower parts are rather similar, fructification characters had to be the basis of defining new genera, and although Cavanilles had worked from this premise he had not applied it uniformly for fear of diverging from Linnaeus' doctrine. Medikus, strictly following this rule, created several new genera from the descriptions in Cavanilles' first dissertation. Another criticism Medikus made of Cavanilles was that he had only worked with dried plants. This practice was something that Medikus thought a good botanist must avoid, because the best herbarium sheet is only useful for determining the family character but not for determining the genus. For the creation of new genera, Medikus reported that it was necessary to follow the evolution of the fructification parts from their formation to their ripeness, and this was not possible with dried plants.⁹

Cavanilles' response to Medikus was not long in coming. In the same journal, *Obs-*

ervations sur la physique, sur l'histoire naturelle et sur les arts, he published a letter to clarify some points.¹⁰ He began with some anatomic explanations about fructification to justify his newly created genus; for him, a genus could only be defined when the differences in the fructification demanded it. From his point of view, Medikus had unnecessarily increased the number of genera. Though Cavanilles distinguished genera based on the number of fruit capsules, he knew, as Medikus wrote, that this number could vary according to the number of abortions, and for that reason he thought it necessary to work with dried plants in numerous and complex genera such as *Sida* or *Geranium*.

The other polemic was of a different nature. In 1789 Cavanilles accused L'Héritier of plagiarism.¹¹ Cavanilles' paper began on a surprising tone when he revealed that in the fifth volume of *Stirpes novae* by L'Héritier some descriptions of plants appeared without documentation of the sources—plants previously described by Cavanilles. L'Héritier had dated his work "1785" when in reality it was announced and published in 1789. Cavanilles disclosed these plagiarisms on a chart and reduced the principles L'Héritier established in his work to two: 1) The lack of outer calix did not require a new genus creation, and 2) The more or less numerous divisions of the outer calix were not an obstacle to the establishment of a new genus. Cavanilles thought L'Héritier had settled on these principles to nullify Cavanilles' genera *Palaua*, *Solandra*, and *Pavonia*. Cavanilles could not agree with principles that would reduce universally accepted genera such as *Sida*, *Malva*, *Malachra*, *Lavatera*, *Althaea* and *Urena* and his three genera, *Solandra*, *Laguna* and *Pavonia*, to only one genus with 196 species. For Cavanilles, this would promote confusion and complexity instead of easing the task of the botanist.

In issue 63 of the *Journal de Paris* L'Héritier's response appeared. Lacking a concrete rebuttal

supported by facts, he ironically asked Cavanilles "whether he was writing for France or for a country where nobody had read *Philosophia botanica* by Linnaeus."¹² Curiously, this opposes Medikus' argument in which he accused Cavanilles of being afraid to diverge from Linnaeus' doctrine.

Cavanilles' Relationship with the Spanish Botanists

During his stay in Paris, Cavanilles received a letter from Viera in 1781 informing him of the creation of the Royal Botanical Garden at El Prado de Atocha.¹³ He was delighted but at the same time suspicious about the method Casimiro Gómez Ortega (1740–1818) and Palau would employ in the teaching of botany. He also hoped that they would take the necessary measures to ensure that the Garden would surpass in quality the Jardin du Roi of Paris, which he considered to be the model that Gómez Ortega should follow for the arrangement of the plants. In any case, Cavanilles thought, as he wrote to Viera, that besides the explanations needed to publicize the "useful knowledge contained in the plant kingdom,"¹⁴ it was also necessary to have a botanical dictionary that several botanists could compile and use to follow an adequate classification system, which was to have been Linnaean. Cavanilles, however, was also involved in an ambitious project of identifying "particular floras of each kingdom"¹⁵ that would converge into a book on the general flora of Spain. He wanted Viera "to make the way easier"¹⁶ for him to achieve this by promising to send him the books of Linnaeus and Lamarck so that he would be able to find "a teacher who teaches me" when he returned to Spain.¹⁷

At the end of 1782, Cavanilles received Linnaeus' *Explicación de la filosofía botánica*, translated by Palau, Second Professor of the Royal Botanical Garden. Cavanilles thought that al-

though this book was the first of its kind in Spanish, it had the defect of not presenting anything new, because in his view one could find everything that was written in it by going out into the countryside, and he commented: "I am sorry he does not adopt more technical names and that he labels them [the different parts of the plant] in two ways, like *petiole* and stalk; *corolla* and mantle; *petals*, blush; *umbel*, cup; *stipules*, ears; and several others you can verify yourself. I would like to know whether he has written another book as he had wanted to do if *Filosofía botánica* were accepted, and also whether he is working on a botanical dictionary."¹⁸ Cavanilles suggested to Viera that he use Lamarck's works as the basis for the dictionary. Regardless, he recognized the efforts Palau had made in the translation of Linnaeus' *Philosophia botanica* and expressed to Viera: "I would like to take lessons from him."¹⁹ He also recognized the importance of spreading Linnaeus' system, as Palau had done with that translation, because he thought that to be the best system for learning botany. Cavanilles himself was able to assemble in two years an herbarium of 470 well-conserved plants, raising the number of plants he knew to about 800.²⁰ In addition, Cavanilles thought that the interest in botany of the Prince of Asturias, the future Carlos IV, was very important because "he alone was able to create more teachers with his protection than Linnaeus, with of all his science, pupils."²¹

Through his letters to Viera it seems clear that Cavanilles held Palau in high esteem and often corresponded with him during 1785. But Cavanilles wanted Palau to include, among other things, the supplement written by Linnaeus' son in his translation of Linnaeus' work. Besides, in order to bring it up-to-date, Palau had to "change and correct genera, species, and even classes."²² Cavanilles realized that a lot of time and effort was needed to do this, but considered it better to delay its publication so that it would be much more complete.

In 1790, after his final return to Spain and in the middle of his disputes with Gómez Ortega and Hipólito Ruiz López (1754–1816), Cavanilles maintained the same high opinion of Palau and his translation:

You ask me about the botany of this country. It is little less than nothing. With the exception of Palau who is decrepit and incapable of working, all the rest are little more than beginners. His translation is not even known outside of Spain nor has anything been lost by it not being so. I always thought it was useless: It cost the State a lot, and him his health. The truth is: What could a man with neither books nor exotic plants do to verify the many incorrect propositions of Linnaeus? Copy and compile terms. It is a pity that this hard-working, intelligent man did not have the opportunity to meet the great botanists, observe their herbaria, and examine their gardens. Without a doubt he would have been one of the great men of the century.²³

On the other hand, Cavanilles' opinion about Gómez Ortega was quite different. In his *Colección de papeles sobre controversias botánicas* (1796), Cavanilles remarked that up until 1787 the letters Gómez Ortega had sent to him in Paris had not shown any animosity and on the contrary were attentive and full of praise and expressions of gratitude. In one letter Gómez Ortega had even offered to translate Cavanilles' answer to Masson into Spanish. This offer was not unusual when one considers that Gómez Ortega had received a good report in the pamphlet in question: "Modern sciences such as physics and chemistry are not unknown to us: Qualified teachers teach them with success in Cádiz, Valencia, Vergara and many other cities. I will only name one here, the most well-known one in France, D. Casimiro [Gómez] Ortega, worthy successor to his uncle D. Joseph Ortega. This scholar is a member of many European academies. Chemistry and botany are familiar to him as is proven by his famous dissertations."²⁴ Gómez Ortega's only attack of Cavanilles in his letters was that Cavanilles was a botanist who did not concern himself with plants from the

countryside but limited himself to working only with dried plants. In spite of that criticism, the letters in the collection are no more than an educated exchange of good manners. In those days, around 1784, Gómez Ortega might not have considered Cavanilles important as a botanist. Up to that point Cavanilles had not published any botanical works but was well-connected with the botanists of the Jardin du Roi in Paris. For that reason, at the beginning of 1785, the Garden staff formed by José Pérez Caballero as Intendant, Giuseppe Lumach as First Gardener, and Gómez Ortega and Palau as Professors named Cavanilles a corresponding member of the Garden. Even so, in a letter to Viera dated 18 November 1875, Cavanilles mentioned that he started to notice a change in the atmosphere of the Garden. Gómez Ortega wrote to him, consigning a Malvacean species among those sent from Peru; he made it clear to Cavanilles that he had done it "against the express advice (saying this in a confidential air like the rest) of the Garden Staff, who agreed with the Ministro de Indias [Secretary of the Colonies], that you were not well informed about the discoveries of the Peru Botanical Expedition and about the rights of each of its members, and for that reason in your publication you documented Dombey as the source of the discovery, which his Spanish companions could also probably claim as their own."²⁵

But Cavanilles had never really had a high opinion of Gómez Ortega. At the beginning of 1784 he would write to Viera: "With regard to Ortega, I have never had great hopes. What the devil does he want now with Tournefort's system, when everybody already knows the height of glory this great man can reach? Nothing is more opposed to good than the best and having seen Linnaeus' progress, it is ridiculous to go back, presenting us with works of little use today. Nevertheless, I would like to see it, as well as Palau's dissertation on the *Verbena citriodora*, called the Princess' herb

there."²⁶ Viera sent that paper, based on materials that Ruiz and Pavón must have sent from Peru, in November of 1784. Cavanilles would write to Viera in a letter the following year, in which Viera had sent Palau's paper to him: "The more I study, the more passionate I feel about botany, and I keep finding defects in those persons that earlier I respected as oracles. This makes me fear that our botanists from Madrid have also made some mistakes, as they did in identifying the genus of *Aloysia citriodora*, that is a *Verbena*; this has caused them harm because it proves that they do not know enough about existing genera."²⁷ In another letter dated the same year, he continued: "[Gómez] Ortega's jealousies, well-known here, have not stopped causing harm and prove that he loves the botanists more than botany. My friend Thouin will always value the hundred and some seeds sent to him through any channel, and I think our Palau has done well in removing his list to avoid quarrels and anger on the part of that egoist."²⁸ Nevertheless, Cavanilles did not reveal his opinion of Gómez Ortega when, later, he offered to translate Cavanilles' pamphlet written in response to Masson.²⁹ Cavanilles accepted and thanked him for his offer, asking him to correct any mistakes that he found.

Controversies with Spanish Botanists

One polemic began with an anonymous letter published in the *Memorial literario, instructivo y curioso de la Villa y Corte de Madrid* in September 1788. A so-called "neighbor of Lima" expressed that the Peruvian botanists Hipólito Ruiz and Joseph Pavón had been surprised when they received an extract of Cavanilles' first dissertation on the Linnaean class Monadelphia, in which he had created nine new genera. Cavanilles was attacked because he had created too many genera, whereas the expeditionary forces, in a location of such vegetal variety as the Viceroyalty of Peru, had

found only one genus. The strongest argument of the anonymous writer was that Cavanilles did not follow Linnaeus' thesis, in which he distinguished the genera of Monadelphia by the calyx. He accused him of being a "laboratory botanist" who did not see plants in their natural habitats. Throughout the second stage of the polemic until 1802 these were the arguments voiced by Cavanilles' opponents.

Cavanilles based his response on the opinions that the Académie des Sciences of Paris and distinguished botanists, such as Lamarck, Thunberg, Jussieu, Usteri, and Willdenow, held about his genera. He also said it was not necessary to go overseas to work as a botanist because "one only needs plants and botanical knowledge: Plants are collected and brought back by those who travel, be they educated or ignorant, as long as they dry and conserve the plants well with flowers and fruits; and one studies these by consulting educated men and good books."³⁰ When he wrote to Viera, Cavanilles thought the matter was closed: "The letter you saw in the *Memorial literario* was written by a discontented botanist who wanted to give me a hard time, whom you know. I answered him forcefully, demonstrating his ignorance and insolence, and he became as silent as a mute."³¹ But a second so-called anonymous letter-writer from Madrid responded to Cavanilles' letter, defending the arguments of the first letter-writer and stressing the same points while directly criticizing Cavanilles' new genera. Cavanilles thought that Gómez Ortega was the author of both anonymous letters, although often it seemed that they were written by two different people. In any case, he had never thought the author of either was Ruiz.³² The polemic continued for two more years.

A beginning of the second stage of the polemic can be found in the preface of *Quinología, o tratado del árbol de la quina* (1792) by Hipólito Ruiz, in which Ruiz criticized the

laboratory botanists who based their descriptions on dried specimens and garden plants and did not take into account their possible uses and virtues. Cavanilles would comment on this preface: "Although Ruiz, or the author of this paragraph, does not mention me, he has pointed a finger at me."³³ The issue of *Florae Peruviana et Chilensis prodromus*, in which numerous genera of Cavanilles were refuted while their names were applied to other plants, provoked Cavanilles' counterattack, which appeared in the preface of the third volume of *Icones*. Ruiz would publish his counterattack the same year in his pamphlet *Respuesta para desengaño público a la impugnación que ha divulgado . . . Josef Antonio Cavanilles contra el Pródromo de la Flora del Perú* (1795), in which he confessed that he was author of the previous anonymous letters and that he was still of the same opinion. Cavanilles' last contribution to the polemic was the publication of his *Colección de papeles sobre controversias botánicas* (1796), in which he related the whole polemic, responding especially to the last attack written by Ruiz. In the introduction of this work he answered Ruiz's accusation that he prematurely published descriptions of the plants collected during the expedition overseas:

It is a clear mistake to think that one appropriates the work of another when he publishes plants that others gather without examining them; because he credits them for their part in traveling and drying the plants, and he only takes credit for his examination and scientific work. The one who collects plants and seeds and sends them back without the necessary examination is not the author: The real author of a plant is the one who lets the public know about it, and the first one who risks exposing himself to criticism as I have working with both dried plants and live ones I have seen in the Spanish gardens and those of other Kingdoms. It is not the same to be a traveller and a botanist; nor to see plants and to be a competent judge to determine fructification, genus, and species.³⁴

Gómez Ortega would answer in the preface

of the third volume of *Florae Peruviana et Chilensis*. With regard to this preface, Cavanilles mentioned to José Celestino Mutis (1732–1808):

You have been the target of this intrigue stirred up and directed by Ortega; a man who neither admits his wrongs nor hides the evidence of his ignorance, nor subdues the public demonstrations that the Government has made, taking him away from teaching. Like a squashed snake or rabid dog, he turns everywhere trying to poison the virtue and true worth of the meritorious. So he has just done in the third volume of Flora although with the usual precaution of omitting his name, and expressing his rancour through the lips of his nephew Ruiz. In this preface he loosened the dam of his mordacity. Mutis, Zea [Francisco Antonio Zea (1770–1822)], Cavanilles, Wahl [Martin Vahl (1749–1804)], De Jussieu, all have had their reputation damaged to some extent by him but especially the first ones and I, with each plant which I have published. I have done my best to ignore his insolence and slander, leaving everything to the public judgment; and I think you must do the same because merit must win in the end and its victory will triumph over the greed and slander.³⁵

This polemic would end with Cavanilles' death.

Cavanilles' Botanical Activities in Spain

The social upheaval produced by the French Revolution obliged Cavanilles to leave Paris and to return to the Spanish Court: "The persecutions every man undergoes, especially the rich ones, and above all the priests, obliged me to flee, hide and travel in disguise, and forced my employers to leave that city."³⁶

Cavanilles returned to Spain thinking he was going to direct the Royal Botanical Garden. He had based this assumption on the fact that when the Intendant of the Garden, José Pérez Caballero, was promoted the prior year to the Treasure Council, it had been mentioned to Cavanilles that on his return he would be appointed to that post. Just after his arrival, he published the last two dissertations

of Monadelphia and began to work on his new project, *Icones et descriptiones plantarum*. At first he did not seem to have a high opinion of it: "It will be a miscellany of whatever falls into my hands that is new or badly recorded and recognized. This kind of work, more difficult but pleasing although not so useful, could be continued anywhere and will be for me a relaxation and distraction, especially if the idea of getting the post as Director [of the Royal Botanical Garden] comes true."³⁷ This book consists of six volumes, each with 100 plates, and, as the author wrote, it deals with new plants (those not well-known), and occasionally with natural history (especially with the vegetation of the areas visited and studied by him). Moreover, on some occasions, he would use it to support his scientific arguments against Ruiz and Gómez Ortega. *Icones* also discusses the plants collected from the Royal Botanical Garden, from the garden of La Priora, from the garden of the Duke of Infantado, the surrounding areas of Madrid, from his journey around the Kingdom of Valencia and from scientific expeditions, such as the one made by Née in the Malaspina expedition or by Baltasar Manuel Boldo (?–1799) as a part of the expedition that the Count of Mopox undertook to the island of Cuba (1796–1802).

Shortly after his return to Spain, Cavanilles would find a declared opposition to him from Gómez Ortega and his group. The negative attitude of the board of the Royal Botanical Garden Staff, supported by the botanists of the Peru Expedition, toward his study of the plants cultivated in the Garden forced him to turn to the Count of Floridablanca. In turn, Floridablanca ordered Pérez Caballero, at the end of 1789, to give Cavanilles all the plants of the Garden that he asked for so that he could record, draw, and publish his descriptions of them.

In 1791, he received a Royal Order to study and write the natural history of Spain, beginning with the Kingdom of Valencia. The fruit

of this activity was *Observaciones sobre la historia natural, geografía, agricultura, población y frutos del Reyno de Valencia*, published in two volumes in 1795 and 1797. In the same way, as a result of this journey, the publication of several new plants and interesting descriptions of the vegetation of the regions he had visited appeared in *Icones*. In a letter to Mutis, he commented: "I do not think I have exhausted the large number of objectives I had proposed for myself, but I still have the glory of having provided a model that others can improve on and follow in other provinces of Spain: Although my mission is to cover all of Spain, unfortunately the King can guarantee me neither the life nor health necessary to finish so great an enterprise with dignity."³⁸

Floridablanca's loss of political power in 1792 did not cause Cavanilles to lose his own political support. There is no doubt that Cavanilles had a good relationship with Manuel Godoy, Prince of Peace, as Godoy's official notes, written between 1793 and 1796, prove. Godoy gave him both an official order to publish his scientific works and a passport allowing him to travel throughout Spain to mountains, meadows, or private preserves with no obstacles.³⁹ Cavanilles' appointment as the Director of the Royal Botanical Garden in 1801, by an official note of Pedro Cevallos (1764–1840), Secretary of State and friend and relative of Godoy, confirms the good political connections he held during his lifetime.

Cavanilles also contributed to the establishment of the first scientific journal of the natural sciences in Spain. It began its publication in 1799 as *Anales de historia natural* but was changed to *Anales de ciencias naturales* beginning with the third volume. The journal reflected the works of all the branches of the natural sciences. Cavanilles may have exercised a strong control over its content, as his antagonists' works were not published in it although the works of his more recent pupils were. The journal would also cease publica-

tion at his death. He used it to publish not only his botanical works but also his works about rabies, the domestic pigeon and the white stork. It also contained foreign book reviews, in the custom of European journals of that time, and advertisements for the sale of his own botanical books.

Cavanilles, Director of the Royal Botanical Garden of Madrid

On 17 June 1801, Cavanilles was appointed Director of the Royal Botanical Garden of Madrid. The official note of Cevallos began: "The fondness and protection that the Sciences and Art owe to the King, for the usefulness and happiness of all his subjects, have moved his Majesty to find out the present state of the Establishment of the Royal Botanical Garden of Madrid; and He has seen with sorrow that in spite of the efforts and sacrifices made in His Reign and that of His August Father, blessed be His memory, this Establishment has not lived up to His beneficial and noble intentions."⁴⁰

In this communication, it was acknowledged that delays in scientific progress were not caused by lack of zeal or lack of capability on behalf of the previous Directors, "but by the multitudinous and complicated ways that were thought suitable when they were adopted but which in the long run have generated excessive expenses."⁴¹

For botanical progress in the colonies of his Majesty, the Royal Botanical Garden had to be rearranged "in a solid, effective, and simple way."⁴² For that reason, the posts of Intendent, Privative Judge, Assistant Director, First and Second Professor, Doctor, Surgeon, Clerk, Architect, Bookkeeper, one of the Doorkeepers, and the School Teacher of Plant Imitation and his workers were eliminated, and the cabinet of Natural History inherited their duties. The post of Honorable Assistant Director held by the abbé Pierre A. Pourret also was elim-

inated. Every directive post was eliminated, including those posts held by Gómez Ortega, Barnades' son, and the Assistant Director Jerónimo de la Torre. These men had to hand in their papers, orders, and documents of the Garden as well as drawings, manuscripts, printed sheets, dried plants, seeds, and roots and all the papers of the correspondents of the Garden.

As a result of this new organization, the government and direction of the Garden were carried out by Cavanilles, who would be the only Professor, Head of the Establishment and Subdelegate of the First Secretary of State and of the Office of his Majesty. His functions were to teach botany according to the system he thought most applicable, to identify each new plant brought to the Institution, to arrange the herbarium and seedbed and to preside over scientific public acts.

In lieu of a salary, Cavanilles was assigned a canonry of 40,000 reales of rent or an ecclesiastical pension for the same value, relieving him of the obligation to live outside of Madrid.

At the establishment, a chart showing the organization of the posts of Professor, Student and Artist, High Gardener, Assistant Gardener and Doorkeeper was created.

The Associate had a salary of 10,000 reales of copper a year. His functions were to take care of the herbarium, library and seedbed; to collect plants, with the help of the students, around Madrid and to bring plants back to the herbarium; to assist the Teacher in the examination of plants from the garden and the herbarium; and to replace the Teacher in his absences and illness but depend on him for the assignment of tasks.

The Student was paid 3,300 reales and was Assistant and Clerk to both the Professor and the Associate at the same time. He was required to go to lessons and help on the jobs of the Professor and the Associate, to demonstrate a good knowledge of the humanities

and philosophy and regular instruction in botany.

The Artist had a fixed salary of 3,300 reales plus 20 reales more for each plate the Teacher requested. He also had to follow exactly the Teacher's instructions on the representation of the anatomy of the flower and the fruit.

The High Gardener, with a salary of 1,200 reales, was the head of his department, although he had to report directly to the Teacher. He was in charge of general and particular cultivation and the piping of water for irrigation; the election of soils and "shelters" for sowing and planting; the arrangement of plants in the hothouses and greenhouses, taking plants outdoors at the right time, giving the Teacher all of the plants he needed for his demonstrations and lessons; the collection of seeds, and packaging them with their names after consulting the Teacher; and choosing the workers.

Cavanilles, as Director, had the responsibility of choosing a person for each post. He also had to decide where to place the hothouse and the best design and size for it suitable for the conservation of the plants. At the same time, he had to figure out the cheapest and most efficient way to maintain the herbarium, seedbed, and library.

In order to facilitate the gathering of plants in the surrounding areas of Madrid and royal places, a royal decree was enacted to eliminate all possible obstacles for the Professor, his Associate, the Student and their companions to enter these areas and examine plants whenever they liked at the Casa de Campo, Retiro, and other royal places.

The Botany Chairs of the Peninsula and other Colonies were made available and assigned to those pupils of the Royal Botanical Garden who had studied and progressed more in the knowledge of the science, according to the Director of the Garden. Those who wanted to travel on future scientific expeditions were given preference.

The Royal Botanical Garden became the center of the remaining gardens of the Peninsula and those gardens already existing or to be created in the Spanish colonies. Moreover, a detailed report from each garden had to be sent to Madrid each year, with special reference to the herbarium plants, the library, the professors and pupils, along with another report on expenses and economic resources and a list of findings and books that should be printed. These reports had to be checked and approved by the Professor of the Royal Botanical Garden.

The Associate post, vacated when Cavanilles was appointed Director of the Garden, would later be occupied by Francisco Antonio Zea. Cavanilles recommended Mariano La Gasca Segura (1776–1839) to be the Student and José Demetrio Rodríguez (1780–1846) to be the Second Student instead of having an Associate. Rodríguez earned the same salary as La Gasca. For the post of Artist he suggested José Guio, who had been an artist for the Malaspina expedition and was in Cuba with the Mopox expedition at that time.

For changes in the establishment itself, Cavanilles gave the proposed layout of the hothouse to the architect Pedro de la Fuente. The architect's estimation of the cost was 60,000 reales if the work was carried out with the original dimensions of the design but with an increase in "the wire netting that covers part of the framework of the façade, to preserve the windows from hailstones by taking advantage of the existing walls of the garden,"⁴³ and without including the placement of the iron heater and its flues, which would be taken care of at the end of the work.⁴⁴ Cavanilles' proposal for the placement of the library, herbarium, and seedbed was approved by the King.

In order to increase the resources of the herbarium, Cavanilles proposed that Ruiz and Pavón deliver their dried plants, whether descriptions had been published or not, with the roots and the seeds, and leave the best speci-

men of each one. Mutis had to send duplicate specimens of his plants from Santa Fé de Bogotá; Martín Sessé La Casta (1751–1808) sent his collection from Nueva España. In addition, the herbarium gathered by Louis Née (1734–1803) during the expedition of Malaspina that had been kept in the Navy had to be passed over to the Botanical Garden, and the European herbarium of the French botanist had to be appraised. The protests of Ruiz and Pavón delayed the transfer of unpublished plants until their works were finished.

With regard to the library, Ruiz and Pavón had to return all the books they had used as necessary references for the publication of their *Flora Peruviana*. The King also approved the use of temporary funds for the payment of the publication of Cavanilles' botanical works, the sale of which was to pay the cost of his library, thereby adding to the establishment. Cavanilles' library was inventoried to be 420 volumes valued at 70,151 reales.⁴⁵

As Director of the Royal Botanical Garden, Cavanilles published apart from his botanical lessons (*Descripción de las plantas que D. Antonio Josef Cavanilles demostró en las lecciones públicas del año 1801 y 1802* [1802, 1803]) a pamphlet, *Elenchus plantarum hortii regii Matritensis*, in 1803. This pamphlet contained information on the plants grown and gathered that year in the Garden. The names of some taxa are given in *Elenchus* in the actual way of the nomenclatural combinations and, as Rothmaler pointed out, perhaps those names must be taken as new nomenclatural combinations.⁴⁶

The *Hortus Regius Matritensis*

The *Hortus regius Matritensis* was to remain incomplete due to Cavanilles' sudden death in 1803. It followed the model of his previous publication—*Icones et descriptiones plantarum*—in that there were 100 plates, sometimes with

more than one species represented, for a total of a little more than 100 descriptions in each volume. It seems that Cavanilles had the idea of starting a series of new publications similar to the *Icones*. This can be inferred from the translation of Cavanilles' letter dated 27 February 1804, which is kept in the Royal Botanical Garden Archive.⁴⁷ The letter was written to Olof Swartz (1760–1818), physician and botanist of Uppsala and member, like Cavanilles, of the Regia Societas Scientiarum Uppsaliensis. Swartz and Cavanilles had previously exchanged letters and botanical materials. One hundred plates and 85 handwritten descriptions, out of a total of the 104 the *Hortus* was to have, are also kept in the Archive.⁴⁸ The *Hortus* differed from the *Icones* in that each description in *Hortus* had its own plate.⁴⁹

The history of the materials of the *Hortus regius Matritensis* is not clear. With regard to the plates, while Colmeiro (1858, pp. 49, 85) gave an account of the existence of 100 plates kept at the Garden, Álvarez López (1946, p. 63), just a century later, said he did not know where they could be located. At first sight, it seems surprising that no reference to the plates being checked out from that institution appeared in the registry of the Botanical Garden. Concerning the manuscript, Colmeiro (1858) commented that the text seemed to have been lost. This also is strange because there is no mention of any transfer or sale of the manuscript during the 20th century; Álvarez López (1946) talked about two manuscripts, one kept in the Archive of the Royal Botanical Garden of Madrid and the other kept by Cavanilles' heirs.⁵⁰ An annotation by José Cavanilles, brother of the botanist, on the manuscript that has been preserved at the Royal Botanical Garden since the end of 1804 seems to indicate that this manuscript was the original: "This is the original my brother Dⁿ Ant^o J. Cavanilles wrote with his own hand, with the exception of *Atriplex verticillata* in Dⁿ Mariano

Lagasca's own hand and *Mimosa leptophylla* by Dⁿ José Rodríguez, both pupils of the R^l Botanical Garden. The manuscript is given to S^r Dⁿ Fran^{co} Ant^o Cea, successor to the post of Director and Chairman of the Garden, for its publication in compliance with an official ordinance. November 14th, 1804, Madrid."⁵¹ A copy of this manuscript, written in two different handwritings and with a few missing and several incomplete descriptions, is held by the same institution. We think that the manuscript, from the so-called "Cavanilles' Archive" of his heirs, might not differ from the original. This opinion is based on the fact that all of the descriptions in the Royal Botanical Garden classified with the mark "I, 13, 5" are in Cavanilles' own handwriting, with the exceptions of numbers 21, *Atriplex verticillata*, and 93, *Humata trifoliata*. Both were copied by Mariano La Gasca (1776–1839), and number 38, *Mimosa leptophylla*, was written by José Demetrio Rodríguez (1777–1846). Both pupils eventually would be Directors of the Royal Botanical Garden. On the other hand, this is a carefully prepared manuscript, almost without corrections, and meticulously written in a careful hand, practically ready to be handed over for publication.

Although the book was not published at the time, a good portion of the taxa (61 taxa, as listed in the appendix) had been published previously, some of them by Cavanilles himself.⁵² The *Hortus regius Matritensis* is interesting because of Cavanilles' commentaries on some plants previously published—some of them had been only briefly described—that clarified the nature of the taxa. Most of these descriptions were published without their accompanying plates. Through Cavanilles' writings we know that he placed a lot of importance on the plates. This was in keeping with the norms for the authors of this era. It was for this reason that he wanted to publish them. This manuscript has special interest when the role these illustrations played in the

work of Olof Swartz, his contemporary Swedish author, is appreciated.

Swartz had the proofs of the *Hortus* plates. In a letter of 27 February 1804, Cavanilles informed him that the plates would be sent with some dried plants.⁵³ After Cavanilles' death and with the description of the plants still unpublished, Swartz made use of the plates, describing some ferns with the same names Cavanilles used on their plates: *Polypodium elegans*, plate 68; *Pteris imbricata*, plate 82, fig. 1; and *Woodwardia stans*, plate 82 (cf. Swartz [1806, pp. 35, 102, 117, respectively]). Unfortunately, from the protologues of Swartz's taxa, we can not be sure Cavanilles also would have sent herbarium material of the three ferns. The inexactness and the absence of the localities of origin are reasons enough to suspect he did not receive the material, as Cavanilles was exact in his labels;⁵⁴ in that case (as has to be confirmed by studying Swartz's herbarium), the plates might be considered the nomenclatural types of those taxa.

Swartz was not the only botanist who used the names or plates that Cavanilles had prepared for the *Hortus*. Römer and Schultes (1817, p. 616) described *Papophorum phleoides*, giving as a reference the original name and the material studied: "H. R. matrit (fide *Herb. Zee*)." Although this reference can not be taken as an allusion to the manuscript, it seems they took the name from herbarium sheets kept at the Herbarium of the Royal Botanical Garden;⁵⁵ the name was, without a doubt, given by Cavanilles, who used to label the plants with the name he had chosen to use when publishing them.⁵⁶ In the synonymy of their two species (*Aegopogon trisetus* and *Aegopogon pusillus*) appears "Cynosurus gracilis Cavan. H. R. M. I. T. 5. f. 3." and "Cynosurus tenellus Cav. H. reg. matrit. I. t. 5. f. 2," respectively (Römer & Schultes, 1817, p. 805), a clear indication of its origin.

The plates are credited to Cavanilles, José Guío and Antonio Delgado Meneses. From

1789 to 1794 Guío had taken part in the scientific expeditions around the world of Alejandro Malaspina (1754–1809), leaving the expedition because of illness in Mexico in 1791. Later he would travel in the Count of Mopox's expedition to Cuba. Of Delgado Meneses it is only known that he worked as Artist at the Royal Botanical Garden at the beginning of the 19th century.

The plates were engraved in copper at the Royal Chalcography by a team under the direction of the Valencian Tomás López Enuguídos. With the proofs of the print kept in the Royal Botanical Garden Archive and the copper plates conserved in the National Chalcography, it could be deduced that at least 86 plates were engraved.⁵⁷ Forty-five of the plates are kept at the National Chalcography, and the whereabouts of the remaining 41 are unknown.⁵⁸

By a Royal Order issued from Cevallos to Francisco Zea, Cavanilles' manuscript passed to the Royal Botanical Garden for publication:

The King having been informed that the defunct Director of the Royal Botanical Garden, Don Antonio Josef Cavanilles, was already well advanced in the preparation of an interesting book titled *Hortus regius Matritensis*, and his Majesty considering that the people, to whom the teaching of botany at the Royal Garden had been entrusted are the greatest followers of Cavanilles' singular merit, now takes great pains to honor the worthy memory of this wise man; for that reason, they are worthy of being trusted with the precious writings, together with the herbarium of the deceased, for which they had been destined: his Majesty has decided that one and the other are in your hands; I thereby inform you by Royal Order and the Duke of the Infantado, who is one of the executors of the deceased, by an official note. God protect you for many years. Aranjuez, May 17th of 1804. Pedro Cevallos.⁵⁹

Nearly two centuries later, in 1991, this Royal Order was observed, and Cavanilles' *Hortus regius Matritensis* was finally published by his successors in the Royal Botanical Garden of Madrid.

Acknowledgments

This paper has been written as a part of the research projects PB87-0462-C05-05 (DGICT, Spain) "*El Real Jardín Botánico y las expediciones científicas a América*" and PB042/90 (CAM, Spain) "*Instituciones científicas madrileñas de la Ilustración*."

We would like to thank Susana Pinar and Lisa Chuck for their help in translating this paper from Spanish.

Notes

1. "[P]oco a poco en ese salón del Palacio de la Naturaleza." Cavanilles (1981), p. 45.
2. En el he aumentado mi herbario y conocimiento botánico. Aquí he visto las quatro magnolias, el lirióndron, la catalpa con sus otras especies de bignonias, las azaleas, cornus de América. . ." Cavanilles (1981), p. 53.
3. "Vm. tiene el gusto de ver por orden en ese Jardín Botánico las plantas del país y exóticas y de comparar su porte y fructificación; pero yo lo tengo en adivinar y descubrir lo que nadie me enseña (aunque debo bastante al abate Chaligny)." Cavanilles (1981), p. 52.
4. Cf. *Anales Ci. Nat.* 4(3): 346–352, *Anales Ci. Nat.* 5(3): 344–371, *Anales Ci. Nat.* 6(3): 367–370.
5. "¡Qué diferencia entre éste y los de ese jardín!" Cavanilles (1981), p. 71.
6. "Yo trabajo como un jornalero en mi botánica. Espero publicar una disertación sobre el genero *Sida*, si los literatos botánicos de aquí aprueban mis menudas observaciones." Cavanilles (1981), p. 95.
7. "¿Cuándo se imprimirán estas últimas? dirá Vm. Me es imposible responder . . . Estamos en vísperas de viajar acia mediodía (ya llegando el término tan deseado) y, aunque no se me ha dicho aun la menor palabra, he visto al volver del campo que todos los muebles de la casa han desaparecido . . . Así, pues, no me atrevo a emprender la impresión, por la incertidumbre en que me hallo, de si tendré o no todo el tiempo necesario." Cavanilles (1981), p. 120.
8. "Llegué bueno y tuve el gusto de que el ministro me recibiese como lo hizo ahora dos años . . . Aquí continuaré en publicar mis obras y ya tengo orden superior para dar a la prensa la 9ª y décima disertación, que terminan mi obra . . ." Cavanilles (1981), p. 121.
9. Lettre de M. Medicus [sic] a M. de Reynier, sur divers objets relatif a la Botanique. *Observ. Phys.* 33(1788): 343–350.
10. Lettre de M. l'abbé Cavanilles a M. Medicus [sic]. *Observ. Phys.* 34(1789): 119–123.

11. Observations de M. l'abbé Cavanilles, de l'Académie des Sciences d'Upsal, sur le cinquième fascicule de M. L'Héritier. *Observ. Phys.* 34(1789): 183-192.
12. "[S]i escribía para Francia o para una nación en donde nadie había leído la *Filosofía botánica* de Linnaeus." Réponse de M. L'Héritier à la lettre de M. Cavanilles, insérée au journal de Paris, no. 51. *Journal de Paris*, 63(suppl.)(1789): 291-292.
13. Cavanilles (1981), p. 45.
14. "[U]tiles conocimientos que encierra el reyno vegetal." Cavanilles (1981), p. 45.
15. "[F]loras particulares de cada reyno." Cavanilles (1981), p. 45.
16. "[A]llanar el camino." Cavanilles (1981), p. 45.
17. "[M]aestro que me enseñe." Cavanilles (1981), p. 45.
18. "Siento el que no haya adoptado más términos técnicos y el que les nombre de dos maneras, como *peciolo*, *pezón*; *corola*, manto; *pétalos*, chapetas; *umbela*, copa; *stípula*, orejones y otras muchas que Vm. mismo podrá verificar. Quisiera saber si ha dado a luz alguna obra como parece deseaba hacer si tenía aceptación la *Filosofía botánica* y si se trabaja ay para formar un diccionario botánico." Cavanilles (1981), p. 55.
19. "Quisiera recibir lecciones para instruirse." Cavanilles (1981), p. 56.
20. Cavanilles (1981), p. 58.
21. "[É]l solo es capaz de criar más maestros con su proyección, que Lineo discípulos con toda su ciencia." Cavanilles (1981), p. 58.
22. "[M]udar y corregir en los géneros, especies y aun clases." Cavanilles (1981), p. 76.
23. "Me pregunta Vm. de la botánica de este pays. Poco menos que nada. Si Vm. exceptúa Palau, que ésta casi decrepito e inútil ya para el trabajar, todos los demás son poco menos que aprendices. La traducción de éste ni se conoce fuera de España, ni se pierde mucho en que no lo esté. Siempre pensé que era obra inútil: costó mucho al Estado, y a él la salud. A la verdad, ¿qué podía hacer un hombre sin libros ni plantas exóticas, para verificar las proposiciones muchas veces erradas de Lineo? Copiar y azinar términos. Es lástima que este hombre laborioso e inteligente no haya tenido ocasión de tratar con los grandes botánicos, observar sus herbarios y examinar los jardines. Sin duda hubiera sido uno de los grandes del siglo." Cavanilles (1981), pp. 123-124.
24. "La Física y la química, ciencias modernas, no son para nosotros extranjeras: las enseñan con aprovechamiento Profesores hábiles en Cádiz, Valencia, Vergara y otras muchas ciudades. Yo no nombraré aquí sino uno solo, que es el más conocido en Francia, D. Casimiro Ortega, digno sucesor de su tío D. Joseph Ortega. Este sabio es miembro de muchas Academias de Europa: la Química y la Botánica le son familiares como lo prueban sus famosas disertaciones." Cavanilles (1784), p. 53.
25. "[C]ontra consejo expreso (sea esto dicho reservadamente como todo lo demás) de los Sres. de la Junta de este Jardín, que han sabido con el ministro de Indias que no bien informado Vmd. de los descubrimientos de la expedición Botánica del Perú y de los derechos de cada individuo de ella, haya publicado como propios de Mr. Dombey los que quizás reclamaran sus compañeros Españoles." Álvarez López (1946), p. 15.
26. "En quanto a Ortega, jamás he tenido grandes esperanzas. ¿A qué diablos viene ahora, con sus tablas de Tournefort, quando todos han fixado ya el término hasta donde llegan las glorias de este gran hombre? Nada hay más contrario de lo bueno que lo mejor y, habiendo visto los progresos de Lineo, es cosa ridícula querer volver atrás, presentándonos trabajos poco útiles en el día. No obstante, quisiera ver esa producción, como también la disertación que hizo Palau sobre la *Verbena citriodora*, que llaman ay hierba de la princesa." Cavanilles (1981), p. 74.
27. "Quanto más estudio, mas apasionado me hallo a la botánica y voy descubriendo defectos en los que antes respetaba como oráculos. Esto me hace temer el que nuestros botánicos de Madrid caygan en algunos, como lo hicieron errando el género de la *Aloysia citriodora*, que es una verbena, lo que les ha hecho mucho daño, por que esto prueba que no tenían bastante conocimiento de los géneros conocidos." Cavanilles (1981), p. 97.
28. "Los zelos de Ortega, bien conocidos aquí, no dejaron de dañar y prueban que él estima más el botánico que la botánica. Mi amigo Thouin apreciará siempre las ciento y tantas semillas que se le remitirán, sea por el conducto que fuese, y nuestro Palau ha hecho bien de retirar su lista para evitar reyertas y disgustos de la parte de ese egoista." Cavanilles (1981), p. 80.
29. Cavanilles, A. J. (1784). *Observations sur l'article Espagne de la nouvelle encyclopédie*. Paris (A. Jombert).
30. "[S]olamente se necesitan plantas y conocimientos botánicos: aquellas nos las recogen y traen los que viajan, instruidos o ignorantes, con tal que las sequen u conserven bien con flor y fruto; y estos se aprenden consultando con hombres sabios y buenos libros." Cavanilles (1796), p. 25.
31. "La carta que Vm. vio en el *Memorial literario* fue una picardía que me jugó un infeliz botánico que Vm. conoce. Le respondí con nervio, demostrándole su ignorancia y atrevimiento y calló como un puto." Cavanilles (1981), p. 119.
32. Cavanilles (1796), pp. 92-93.
33. "No me nombró aquí el Señor Ruiz, ó el autor de

- este párrafo, bien que me señaló como con el dedo." Cavanilles (1796), p. 8.
34. "Es una equivocación manifiesta el pensar que se apropia los trabajos de otro quien publica las plantas que ellos cogieron sin examen; porque les dexa la parte de la gloria que merecieron viajando y secando esqueletos, y él solamente toma la que le resulta del examen y trabajos científicos. No es autor el que coge plantas y semillas y las envía sin el debido examen: y aquel sólo es el verdadero autor de una planta que la hizo conocer al público, y se expuso el primero a la censura, como he practicado yo ya en plantas secas, ya en muchísimas vivas que he observado en los jardines de España y otros Reynos. No es lo mismo ser viajante que Botánico; ni ver plantas y ser juez competente para determinar la fructificación, género y especie." Cavanilles (1796), p. 12.
 35. "Vm. ha sido el blanco de esta cabala movida y dirigida por Ortega; hombre que ni corrige los desaires, ni contienen las evidencias de su ignorancia, no abaten las demostraciones publicas que el gobierno ha hecho separandole de la enseñanza. Qual vibora pisada ó can rabioso se vuelve hacia todas partes intentando emponzoñar la virtud y el merito real de los benemeritos. Asi lo acaba de hacer en el tercer tomo de la Flora, bien que con su acostumbrada prudencia de no poner su nombre, y verter su rencor por la boca de su sobrino Ruiz. En el prologo ha seltado los diques de su mordacidad. Mutis, Zea, Cavanilles, Wahl, De Jussieu todos se ven allí más o menos maltratados pero con preferencia los primeros y yo a cada planta que he publicado. He despreciado altamente sus desvergüencias e imposturas, abandonandolo todo al juicio publico; y creo que lo mismo debe hacer Vm. porque el merito debe triunfar al fin y con el triunfo confundir a la envidia y maledicencia." Gredilla (1911), p. 301.
 36. "Las persecuciones que experimenta todo hombre, mayormente los ricos, y sobre todo los clérigos, me obligó a zafarme, oculto y disfrazado, y forzó a los Señores a abandonar aquella ciudad." Cavanilles (1981), p. 126.
 37. "Será una miscelánea de quanto nuevo o mal gravado y conocido llegue a mis manos. Este género de obra, más difícil y más grata, aunque no tan útil, se podrá continuar en todas partes y me servirá de descanso y diversión, sobre todo si se llegan a realizar las ideas de dirección [del Real Jardín Botánico]." Cavanilles (1981), p. 126.
 38. "No creo yo haber apurado el gran número de objetos que me propuse, pero me quedará la gloria de haber dado un modelo que otro podrán mejorar y seguir en las otras provincias de España: Pues aunque mi comisión es para recorrerla toda, por desgracia no puede el rey asegurarme ni la vida ni la salud que se necesita par evacuar dignamente tan gran empresa." Gredilla (1911), pp. 295-296.
 39. Archivo del ilustre botánico A. J. Cavanilles (1946), p. 9.
 40. "El afecto y proteccion que deben al Rey las Ciencias y Artes para utilidad y felicidad de sus vasallos ha movido a S.M. a enterarse con particular atencion del estado en que actualmente se halla el Establecimiento del Rl. Jardin botanico en Madrid; y ha visto con sentimiento que a pesar de los esfuerzos y sacrificios hechos en su Reynado y en el de su augusto Padre de gloriosa memoria no ha correspondido este Establecimiento a sus beneficas y generosas intenciones." Archive of the Royal Botanical Garden of Madrid (A.R.J.B.), file I, 11, 2, 2.
 41. "[S]ino en la multitud y complicacion de medios que se creyeron convenientes cuando se adoptaron pero que a la larga habían generado excesivos gastos." A.R.J.B., file I, 11, 2, 2.
 42. "[D]e un modo solido, eficaz y sencillo." A.R.J.B., file I, 11, 2, 2.
 43. "[L]a red de alambres que cubrian la parte de la armadura de la fachada para que preservara los vidrios del granizo o piedra de una nube aprovechando la tapia o muro actual del Jardín." A.R.J.B., file I, 11, 2, 8.
 44. A.R.J.B., file I, 11, 2, 8.
 45. A.R.J.B., file I, 12, 4, 1.
 46. Rothmaler (1940), p. 51.
 47. A.R.J.B., file I, 21, 12, 1. In this file we can read: "I must show you that in checking the ferns again I will publish in the first volume of H.R.M. I have seen . . ." ["Debo hacer presente a Vm. que observando de nuevo los helechos que publicaré en el primer tomo del H. R. Matr. he visto . . ."]. It seems clear that the *Hortus regius Matritensis* was conceived as a series of volumes, in the way of *Icones et descriptiones plantarum*.
 48. A.R.J.B., file I, 13, 5. The beginning of another plant description, *Humata trifoliata* (plate 93), is in this file. Only the diagnostic phrase of the taxon and the synonymy are given in the description.
 49. The list of taxa forms the appendix of this work.
 50. In the catalogue of the Cavanilles' Archive kept by his heirs, folder 9, 2nd file, the reference "a bound volume that says Cavanilles. Unpublished. Hortus Regius Matritensi" can be found ["Un tomo encuadernado que dice Cavanilles. Inedito. Hortus Regius Matritensi"].
 51. "Es el m.s. original que dejó mi hermano D^o Ant^o J. Cavanilles escrito de su propio puño a excepción de la *Atriplex verticillata*, que lo está de mano de D^o Mariano Lagasca y la *Mimosa leptophylla* de pulso de D^o José Rodríguez alumnos de R^l jardín botánico. Se

- entrega al S^o D^o Fran^{co} Ant^o Cea sucesor en la dirección y cátedra del jardín p^o su publicación conforme a R^o orn. M^o 14 de Nov^o 1804.’
52. Taxa had been published in *Descripción de las plantas que D. Antonio Josef Cavanilles demostró en las lecciones públicas del año 1801 y 1802, precedidas de los principios elementales de la botánica* (1802–1803), and in some papers of the first, sixth, and seventh volumes of *Anales Ci. Nat.*
53. A.R.J.B., file I, 21, 12, 1. Literally, “I am making a package for you. In it goes, 1^o all the plates engraved for the first volume of H.R.M., 2^o some dried plants, 3^o some more from the friend Lagasca . . .” [“Estoy preparando un lio para Vm. En el lio 1^o todas las estampas ya gravadas para el 1^o tomo del H.R.M. 2^o Algunas plantas secas. 3^o Otra porción del amigo Lagasca . . .”]. Again, Cavanilles confirms that it is not a unique book but is the beginning of a series in the style of *Icones*.
54. One of those ferns, *Polypodium elegans*, lacks a named place of origin; the origin of *Pteris imbricata* might have been taken from *Pteris orbiculata* Lam., mentioned in the synonymy; at the end, in *Woodwardia stans*, “Madera, Lusitania,” appears as the place of origin, while Cavanilles, both in the manuscript and in the sheets kept at the Herbarium of the Royal Botanical Garden, believes the plant to be Philippine.
55. In those days, the Institution was in the hands of Francisco A. Zea, who succeeded Cavanilles. The allusion to Zea’s herbarium is, in fact, a reference to the Herbarium of the Royal Botanical Garden. We have not found any other reference to a herbarium gathered by Zea.
56. In fact, Cavanilles usually made a provisional label for a sheet with a preliminary identification and the origin of the plant. This label was completed after the publication of the description of the plant.
57. All of the printed proofs of the plates have been kept, with the exception of numbers 3, 4, 5, 6, **10**, 11, 39, 40, 64, 65, 66, **67**, **69**, 71, 74, 84, 85, **86**, **87**, **88**, 90, 93, **94**, **95**, **99** (those copperplates kept at the National Chalcography are given here in boldface).
58. The Catalogue of the National Chalcography, published in Madrid in 1987, made reference to plates 2, 10, 15, 16, 18, 19, 20, 27, 28, 29, 30, 33, 35, 37, 38, 44, 48, 49, 50, 52, 54, 55, 56, 67, 68, 69, 73, 75, 76, 78, 79, 80, 81, 82, 83, 86, 87, 88, 89, 92, 94, 95, 96, 97 and 99.
59. “Teniendo noticia el Rey de que el difunto Director del R^o Jardín botánico d^o Antonio Josef Cavanilles tenia ya bastante adelantada la interesante obra que habia emprendido titulada *Hortus regius Matritensis*, y considerando S. M: que las Personas á quienes se ha servido ahora confiar la enseñanza de la Botanica en

dicho R^o Jardín son los mayores admiradores del singular merito de Cavanilles, que se esmerarán en hacer el debido honor á la digna memoria de este sabio, y que por lo tanto son acreedores á que se les confie dicho precioso escrito con el Herbario del difunto para los fines á que este los tenía destinados: ha resuelto S. M. que á este efecto se pase uno y otro á poder de Vm. lo que le comunico de R^o orn. para su inteligencia y cumplimiento, previniendole que para el mismo fin dirijo hoy Oficio de orden de S. M. al Duque del Ynfantado uno de los testamentarios del difunto. Dios guarde a Vm. m^o. a^o. Aranjuez 17 de Mayo de 1804. Pedro Cevallos.”

Bibliographic References

- Álvarez López, E. (1946). Cavanilles. Ensayo biográfico-crítico. *Anales Jard. Bot. Madrid* 6(1): 1–64.
- Cavanilles, A. J. (1784). *Observaciones sobre el artículo España de la nueva encyclopedia*. Madrid (Imprenta real).
- Cavanilles, A. J. (1796). *Colección de papeles sobre controversias botánicas*. Madrid (Imprenta real).
- Cavanilles, A. J. (1981). *Cartas a José Viera y Clavijo. Introducción y notas Alejandro Gioranescu*. Santa Cruz de Tenerife (Aula de Cultura de Tenerife).
- Cavanilles, A. J. (1991). *Hortus regius Matritensis*. Madrid (Real Jardín Botánico). (Introduction by Francisco Pelayo and Ricardo Garilleti.)
- Colmeiro, M. (1858). *La botánica y los botánicos de la Península Hispano-Lusitana*. Madrid (Rivadeneira).
- Gredilla, A. F. (1911). *Biografía de José Celestino Mutis*. Madrid (Fortanet).
- Pizcueta, J. (1830). *Elogio histórico de D. A. J. Cavanilles*. Madrid (B. Monfort).
- Reyes Prósper, E. (1917). *Dos noticias históricas del inmortal botánico y sacerdote hispano-valentino D. Antonio José Cavanilles*. Madrid (Mateu).
- Römer, J. J. and J. A. Schultes. (1817). *Caroli a Linné . . . Systema vegetabilium*. Stuttgart (J. G. Cottae).
- Rothmaler, W. (1940). Nomenklatorisches, meist aus dem westlichen Mittelmeergebiet. I. *Repert. Spec. Nov. Regni Veg.* 49: 51–56.
- Swartz, O. (1806). *Synopsis filicum*. Kiel (Impensis Bibliopolii Novi Academi).

Appendix

This taxa list was slated by Cavanilles to appear in *Hortus regius Matritensis*. The numbers of the plates of the taxa in the *Hortus* are given in brackets. Those taxa previously pub-

lished by Cavanilles or by other authors are given in boldface.

Agave brachystachya Cav., descr. pl. 2: 453 (1803) [plate 27].

Agave spicata Cav., *Anales Ci. Nat.* 5(3): 261 (1802) [plate 28].

Agrostemma parviflora [plate 34].

Amaryllis pygmaea [plate 25].

Angiopteris evecta Hoffm., *Commentat. Soc. Regiae Sci. Gott.* 12: 29 (1796) [plate 100].

Anoda acerifolia Cav., *Anales Ci. Nat.* 6(3): 336 (1803) [plate 46].

Asplenium flavelifolium Cav., descr. pl. 1: 257 (1802) [plate 77, fig. 1].

Asplenium fumarioides [plate 76].

Asplenium trilobum Cav., descr. pl. 1: 255 (1802) [plate 77, fig. 2].

Athanasia crithmifolia L., sp. pl.: 1181 (1753) [plate 57].

Atriplex verticillata [plate 21].

Balbisia verticillata Cav., *Anales Ci. Nat.* 7(1): 62 (1804) [plate 35].

Boerhaavia arborescens Lag. & Rodr., *Anales Ci. Nat.* 4(4): 257 (1801) [plate 2].

Boerhaavia viscosa Lag. & Rodr., *Anales Ci. Nat.* 4(4): 256 (1801) [plate 1].

Boldoa purpurescens [plate 7].

Caesalpinia pectinata Cav., descr. pl. 2: 467 (1803) [plate 32].

Capsicum microcarpum Cav., descr. pl. 2: 371 (1803) [plate 17].

Capsicum violaceum [plate 18].

Cassia papilionacea [plate 30].

Cassia torosa Cav., descr. pl. 1: 131 (1802) [plate 29].

Clementea nitida Cav., *Anales Ci. Nat.* 7(1): 64 (1804) [plate 51].

Clitoria speciosa Cav., descr. pl. 1: 182 (1802) [plate 52].

Crotalaria pygmaea [plate 54].

Cynosurus gracilis [plate 5].

Cynosurus tenellus [plate 5].

Diplazium glandulifolium [plate 79].

Diplazium juglandifolium [plate 80].

Diplazium nitidum Cav., *Anales Ci. Nat.* 7(1): 66 (1804) [plate 78].

Dyssodia porophylla Cav., *Anales Ci. Nat.* 6(3): 334 (1803) [plate 60].

Eruca hispida Cav., descr. pl. 2: 425 (1803) [plate 22].

Euphorbia pithyusa L., sp. pl.: 458 (1753) [plate 41].

Gonatocarpus micranthus Willd., sp. pl. 1: 690 (1798) [plate 11].

Heterosperma ovatifolia Cav., descr. pl. 1: 204 (1802) [plate 61].

Heterosperma trifida [plate 62].

Hibiscus hispidulus [plate 50].

Humata falcata [plate 92].

Humata ophioglossa Cav., descr. pl. 1: 273 (1802) [plate 94].

Humata pinnatifida Cav., descr. pl. 1: 273 (1802) [plate 95].

Humata trifoliata Cav., descr. pl. 1: 273 (1802) [plate 93].

Hymenophyllum cruentum Cav., descr. pl. 1: 275 (1802) [plate 97].

Hymenophyllum pectinatum Cav., descr. pl. 1: 275 (1802) [plate 98].

Ipomoea crassifolia Cav., descr. pl. 1: 100 (1802) [plate 13].

Ipomoea horrida [plate 15].

Ipomoea peduncularis [plate 14].

Ipomoea stylifera [plate 16].

Lagascea mollis Cav., *Anales Ci. Nat.* 6(3): 332 (1803) [plate 65].

Lavatera acerifolia Cav., *Anales Ci. Nat.* 6(3): 339 (1803) [plate 48].

Linaria elegans Cav., descr. pl. 2: 338 (1803) [plate 9].

Lindsaya incisa [plate 91].

Luziola peruviana [plate 40].

Macrocneum tetrandrum Cav., *Anales Ci. Nat.* 7(1): 59 (1804) [plate 19].

Malachra livida [plate 49].

Malva triloba Cav., *Anales Ci. Nat.* 6(3): 338 (1803) [plate 47].

Melampodium longifolium Cav., *Anales Ci. Nat.* 6(3): 333 (1803) [plate 64].

Meniscium serratum Cav., descr. pl. 2: 548 (1803) [plate 66].

Mentha divaricata [plate 8].

Mimosa aculeaticarpa Ort., nov. pl. descr. dec. 4: 134 (1800) [plate 39].

Mimosa leptophylla [plate 38].

Mimosa siliquastrum [plate 37].

Mimosa torquata [plate 36].

Mustelia arundinacea [plate 6].

Neurada procumbens L., sp. pl.: 441 (1753) [plate 44].

Nicotiana scabra [plate 12].

Oleandra neriiformis Cav., *Anales Hist. Nat.* 1(2): 115 (1799) [plate 75].

Onoclea glacialis [plate 90].

Ononis compressa Lag. & Rodr., *Anales Ci. Nat.* 4(4): 262 (1801) [plate 55].

Ononis inclusa [plate 56].

Ornithopus moniliformis [plate 53].

Papophorum bulbosum [plate 4].

Papophorum phleoides [plate 5].

Passiflora hibiscifolia Lam., *Encycl.* 3: 39 (1789) [plate 43].

- Polypodium elegans* [plate 69].
Polypodium grammitis [plate 68].
Polypodium longifolium Cav., descr. pl. 1: 245 (1802) [plate 67].
Polypodium plumarium [plate 70].
Pomaria glauca Cav., descr. pl. 2: 466 (1803) [plate 31].
Pteris cordata Cav., descr. pl. 1: 267 (1802) [plate 85].
Pteris humilis [plate 89].
Pteris imbricata [plate 89].
Pteris lendigera Cav., descr. pl. 1: 268 (1802) [plate 88].
Pteris sagittata Cav., descr. pl. 1: 267 (1802) [plate 84].
Pteris subverticillata [plate 86].
Pteris sulphurea Cav., descr. pl. 1: 269 (1802) [plate 87].
Ranunculus rotundifolius [plate 42].
Ranunculus setaceus [plate 42].
Rudbeckia scabra Cav., descr. pl. 1: 224 (1802) [plate 63].
Salsola eriophora Cav., descr. pl. 2: 379 (1803) [plate 20].
Scilla lutea [plate 26].
Sida deflexa Cav., *Anales Ci. Nat.* 6(3): 337 (1803) [plate 45].
Sisymbrium contortum Cav., descr. pl. 2: 436 (1803) [plate 23].
Sisymbrium crassifolium Cav., descr. pl. 2: 437 (1803) [plate 24].
Squamaria integra [plate 96].
Tagetes glandulosa [plate 59].
Tagetes peduncularis Cav., descr. pl. 1: 201 (1802) [plate 58].
Tectaria calahuala Cav., descr. pl. 1: 252 (1802) [plate 74].
Tectaria falcata Cav., descr. pl. 1: 250 (1802) [plate 72].
Tectaria fraxinea Cav., descr. pl. 1: 250 (1802) [plate 73].
Tectaria triloba [plate 71].
Trichomanes rhizophylla Cav., descr. pl. 1: 279 (1802) [plate 99].
Viviania marifolia Cav., *Anales Ci. Nat.* 7(2): 212 (1804) [plate 33].
Woodwardia caudata Cav., descr. pl. 1: 264 (1802) [plate 81].
Woodwardia radicans Sm., *Mém. Acad. Roy. Sci. (Turin)* 5: 412 (1793) [plate 83].
Woodwardia stans [plate 82].
Ziziphora spicata Cav., descr. pl. 1: 20 (1802) [plate 3].
-
- Centro de Estudios Históricos, C.S.I.C.
 Duque de Medinaceli, 6
 E-28014 Madrid, España [FP]
- and
- Real Jardín Botánico, C.S.I.C.
 Plaza de Murillo, 2
 E-28014 Madrid, España [RG]

