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José Celestino Mutis and Scientific Advancements in Nueva Granada

José Celestino Mutis is considered by many to be one of the key scientific figures of the Spanish Enlightenment, most notably for his work in the Spanish viceroyalty of Nueva Granada, particularly in regards to his contributions to academic reform and botanical knowledge within the region. Mutis was born on April 6, 1732, in Cádiz, Spain. He went on to study medicine, botany, physics, and chemistry at the University of Cádiz, before attending the University of Seville where he received his Bachelor's degree in 1753, and then his doctorate in medicine in 1757. Despite Mutis continuing his career in medicine, notably for a time being King Ferdinand VI's physician and also an anatomy professor, Mutis remained very passionate about botany, spending much of his time studying the plants within the Migas Calientes Botanical Gardens.In 1760, Mutis was appointed as the private physician of Pedro Messía de la Cerda, the viceroy of Nueva Granada, which marked the start of his work within Latin America.

Upon arriving in Santa Fe de Bogotá on February 24, 1761, Mutis turned to heavily focusing on his botanical studies. He observed the plant species within Nueva Granada, and began to write a book classifying them and their uses, creating botanical drawings as well. Mutis was also incredibly interested in researching the effects of cinchona specifically, due to its multiple uses which could treat different diseases. Based on his research of cinchona, Mutis went on to publish *El Arcano de la Quina.* Mutis was determined to further study the flora and fauna of the region, and in 1763 he made his first proposal to the king regarding the possibility of

Spain sponsoring a botanic expedition across Nueva Granada, a request which ended up getting refused. He then requested financial assistance to start his own botanic garden in Nueva Granada, which also ended up being denied.

Aside from his passion for botany, Mutis was also determined to bring "modern science", specifically Copernican and heliocentric viewpoints to Nueva Granada's colleges. Upon arriving in Nueva Granada, Mutis quickly ingrained himself in many of the academic institutions in the region, and in 1762 he became the Mathematics Chair at the Colegio de Nuestra Señora del Rosario. He also brought with him modern medical and surgical ideas which he had learned at Colegio de Cirugía de Cádiz. In 1773, Mutis taught the first modern mathematics and physics courses in Nueva Granada at the Colegio de Nuestra Señora del Rosario as well. He also was the first to teach Copernican astronomy in Nueva Granada. He is known for bringing Newtonian Physics to Nueva Granada as well, creating the first known Spanish translation of Newton's *Principia* in order to assist his teaching. Later, he would also go on to popularize Linnaean botany and lead reforms around the teaching of medicine in the region. When it came to the conflicts between the Jesuits and Dominicans over control of academia within Nueva Granada, Mutis was one of many figures who came under criticism by the Dominicans especially once the Jesuits were expelled as they believed the more modern scientific views he was determined to spread went against the Dominicans more traditional, religion-centric scientific beliefs. For example, his courses on Copernican astronomy were especially attacked by the Dominicans for supposedly going against the astronomy doctrine authorized by the Inquisition. This conflict over Copernican theories was started between Mutis and the Dominican Congregation of Santa Fe de Bogotá in 1773, both sides holding contradicting philosophical views, as well as social and political interests. Both the Dominicans and Enlightenment era scientists desired to control

education within the region. With the Dominicans in power, Mutis' attempts at institutionalizing modern science within these same academic spaces was incredibly impactful.

Despite his clear determination to spread Copernican ideas it was not until 1773 that he directly came out as a Copernican himself, stating that "Being well educated with fine knowledge and a clear understanding that I could never have gotten in the darkness of the old philosophy, I openly confess that I am a Copernican.(108)" This was a revolutionary choice considering how heavily Copernican thought was demonized by the Dominicans and the Church, and while he may have mostly gotten away with teaching Copernican ideas beforehand, this admission left no doubt for what his belief system was. Still, even prior to this he was known to openly defend Copernican beliefs, as shown in the excerpt from *Science of Latin America: A History* below.

"In 1767, at the Colegio San Bartolomé, Mutis presented his "Reflexiones sobre el sistema tycónico" (Reflections on the Tychonic System), in which he defends Copernican ideas by using two propositions: (1) that the Earth indeed moves like the other planets do, but the Sun and the stars remain static, except for a unique movement by the Sun on its axis; and (2) that the Copernican system is by no means opposed to the holy scriptures. In general terms, "Reflexiones" is a discourse that we could place toward the end of the period during which the new philosophy was adapted to traditional worldviews. It is a clear attempt to make the Copernican theses viable, starting from the traditional options represented mainly by Aristotelian metaphysics and, secondarily, by the Cartesian system. (108) "

In this time period, the Tychonic system, the model of the universe in which the Earth is at the center of the universe and the Sun and Moon revolve around Earth while other planets revolve around the Sun, as the most widely accepted model of the universe. This was of course

greatly due to religious thought, and the idea that Earth must be the most important planet due to its closeness to God. Any deviations from this belief were considered blasphemous by the Dominicans and the Church, another reason why Mutis' public support of Copernican theories was so influential. Mutis spread the heliocentric Copernican belief that the Earth and other planets all revolve around the Sun at a time when such thought was considered unthinkable by many religious individuals. But Mutis wanted to prove that Copernican ideas did not actually contradict the Bible, in an effort to make Copernican thought more easily considered by others. When widely considered blasphemous, of course in a greatly religious society a large majority of individuals would refuse to even contemplate Copernican theory. By making an effort to portray Copernican thought as something not blasphemous and instead worthy of consideration, he was able to make many actually analyze Copernican thought instead of simply avoiding it. This is further shown in another excerpt from *Science of Latin America: A History:*

"Mutis presented sixteen theses to support the heliocentric system. What stands out is that he dedicated at least eleven to proving that these theories were not forbidden and that, on the contrary, teaching them was ordered in the new reforms proposed by Charles III. Therefore, "Reflexiones sobre el sistema tycónico" is a text in which the cognitive strategy for the defense of Copernican thought articulates theoretical and conceptual arguments within normative and juridical rules and makes a clear case for the feasibility of Mutis's theses. (108)"

In his defense of Copernican theory, simply trying to prove that consideration of a heliocentric model was not "forbidden" remained his main priority, as fear of appearing blasphemous was one of the primary things holding modern science back from gaining ground in Latin America at this time. When spreading Copernican ideas, he made sure everything else was in line with traditional standards, using more traditional scientific beliefs to back up his views

rather than dismissing them completely. He wanted the teaching of Copernican thought to be considered a necessary part of scientific reform happening at the time. In his heliocentric theses he made sure to work within religious ideals, not against them, and thus made Copernican theories palatable to a large audience for the first time. As stated by Mutis, “If love of truth has stopped me more than was fair from manifesting my inclination toward the Copernican system, there will be reason enough to conclude with celebration the happy time when we see the rebirth of natural philosophy taking place in this kingdom. (106)”

Despite his large focus on academic reform, Mutis was still continuing his botanical studies, even as he was moving between Nueva Granada and Spain rather frequently. When in Spain, he continued teaching medicine, botany, botanical drawing, mathematics, physics, etc.. He also continued his botanical research on the medicinal and agricultural uses of plants. But eventually, Mutis did end up retiring, and relocating to Mariquita, a town within Nueva Granada. It was here that he befriended the new viceroy Antonio Caballero y Góngora, who on Mutis’ behalf proposed the same previously rejected botanical expedition to the King. This time the King chose to accept the proposal, naming Mutis the first botanist and astronomer of the expedition.

In 1783, the Royal Botanical Expedition to New Granada, also known as the Expedicion Botanica, officially began. Mutis led this expedition for twenty five years, using the Magdalena river to travel; they covered more than three thousand miles of Nueva Granada, including what in the present day are known as Peru, Panama, Venezuela, Columbia, Ecuador, Brazil, and Guyana. The primary goal of this expedition was to classify, collect, and oftentimes illustrate the vast variety of plant species across Nueva Granada, as well as learning of their cultural and medicinal significance.

Mutis was especially dedicated to harvesting samples of these plants, which he sent back to Spain. Mutis and his crew discovered and classified hundreds of never before studied plant species, species which they wrote detailed descriptions of, tested their uses, and collected as much information on as they could. This expedition resulted in not only notes and manuscripts being sent back to Spain, but over twenty-four thousand dried plants, five thousand botanical drawings, collections of wood, skins, shells, and minerals being sent as well. Much of this collection ended up being placed in the Royal Botanical Garden of Madrid. Some examples of the botanical drawings created during the expedition are shown below:



Despite its clearly apparent impact on science, the Royal Botanical Expedition was not without criticism, especially at the time, as again shown in an excerpt from *Science of Latin America: A History:*

"As a consequence, two crucial aspects of the expedition were neglected, one relating to methodology and the other to its objectives. The task of collecting plants, because of the sedentary character with which Mutis had endowed the expedition, was entrusted to envoys with almost no scientific education, hence the importance painters had in this expedition. Mutis's plan

(unlike what happened in New Spain) also was unable to accomplish the utilitarian aims of the study of the flora. Both failures were strongly criticized by Creoles once Mutis lost some of his vice regal support. Caldas criticized Mutis's excessive iconicity: "Such grandiosity . . . , such literary luxury, contributes little, and, truly speaking, it delays the progress of the sciences." Expedition zoologist Tadeo Lozano complained that Mutis's theoretical insistence "tied [his, Lozano's] hands and prevented [him] from publishing as he went along." Zea summed up all this criticism in Proyecto de reorganización de la expedición botánica (Botanical Expedition Reorganization Project, 1802) by stating that his objectives had been "purely botanical, with no relation whatsoever to agriculture, economics, or the arts. (140)"

Mutis' work was considered by many of his peers to be "too botanical" focusing primarily on the plants of the region, believing the expedition to be a waste of resources that did little to actually contribute to scientific progress. Others on the expedition were also unhappy with Mutis' leadership, believing his goals were holding back their own research. Some even considered the entire expedition a failure, as plant samples were not collected by professionals and many were thus damaged, also when it came to the study of flora the original intention to discover how these new species could be used medicinally was not entirely successful. This caused Mutis to lose a lot of his support within Nueva Granada, as many felt that the expedition did not make the contributions to science that it was meant to. Still, Mutis' expedition was invaluable in many ways. It may not have met the expectations of Mutis' peers, but it was still incredibly vital in the discovery and classification of plants throughout Nueva Granada, greatly increasing botanical knowledge of the region. And although criticized by other academics, his works continued to be incredibly popular among the general public. Based on his discoveries during the expedition, Mutis went on to publish *Flora de Bogotá o de Nueva Granada,* a book

containing more than six thousand botanical illustrations. This book became so widely popular that soon after the Spanish government could no longer afford to print it.

On September 2nd, 1908 at age seventy six, José Celestino Mutis died of apoplexy while residing in Bogotá. Despite many of his other botanical works being lost, overall José Celestino Mutis was an incredibly influential figure whose contributions led to the popularization of Copernican beliefs throughout Nueva Granada. His efforts greatly shaped the curriculum within New Granada's universities, expanding the range of modern scientific thought, encouraging academic institutions to not be held back by religious belief. Despite being a religious man himself, Mutis understood that fear of modern scientific theories going against Christianity was the main thing keeping the majority from considering a heliocentric universe model. His botanical work was revolutionary, leading to the discovery of hundreds of species, even if it was criticized by some. Mutis was incredibly proud of the work he completed within Latin America, viewing the viceroyalty of Nueva Granada as a home. In 1801, he even organized the *Sociedad Patriótica* in order to show his appreciation and loyalty to Nueva Granada. Mutis managed to not only greatly expand the world's knowledge of the ecological diversity within the region of Nueva Granada, but also played a huge part in bringing Enlightenment era thinking to Latin America, and without his contributions it likely would have taken a much longer time for modern scientific thought to gain ground in the region.

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