

# From Tropical Flora to Neotropical Flora: José Cuatrecasas and his botanical works

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**Abstract.** The aim of this article is to present the life and professional trajectory of José Cuatrecasas Arumí (1903–1996), one of the 20th century’s most important Spanish botanists. Therefore, this is a historical study that intends to link the historical circumstances Cuatrecasas experienced with his training as a botanist. This Catalan botanist developed his work in various settings (Barcelona, Madrid, Geneva, Berlin) from his early studies to his doctorate and postdoctoral training, but he began to take an interest in tropical flora from the late 1920s and, more importantly, from the 1930s onwards, when he obtained a chair of botany at the Facultad de Farmacia of the Universidad de Madrid and also became part of the Real Jardín Botánico of Madrid by directing its Tropical Flora Section. The Civil War permanently disrupted the development of his scientific career in Spain, as his Republican militancy forced him into exile. Initially in Colombia and later in the United States, Cuatrecasas continued his lines of research on tropical flora, completing them in the 1960s with an ambitious project in the field of Neotropical Flora. This is how the life and scientific curriculum of one of the best Spanish botanists of the 20th century was forged.

**Keywords:** José Cuatrecasas, Royal Botanical Garden of Madrid, Tropical Flora, Neotropical Flora, history of botany.

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## Introduction<sup>2</sup>

Some of the most outstanding episodes of the history of Spanish botany in the 20th century have been influenced by the figure of José Cuatrecasas Arumí, whose scientific career began to focus on tropical botany from the 1930s onwards and who, after the Spanish Civil War, continued a line of research enhanced by his exile in Colombia and the United States, where he was the driver and head of a Commission for the study of Neotropical Flora. The life story and scientific development of this botanist would be impossible to understand without going back to his origins and the circumstances in which his subsequent career took shape. During the first third of the 20th century, what is known as the ‘Silver Age of Spanish Science’ developed -an appellation that refers to the most brilliant period that science in Spain had experienced until then. The Junta para la Ampliación de Estudios e Investigaciones Científicas (JAE) took the lead, a state institution created in 1907 to implement a scientific policy intended both to train new generations of scientists and to found research institutes and laboratories according to the most modern parameters in each scientific discipline. Except for a few illustrious examples, such as Santiago Ramón y Cajal, Spanish science was, around the turn of the century, prey to all the vices that could cause it to fall behind.

The Spanish university system had remained far from experimentation, and out of touch with the most modern currents of scientific research and, thus, was anchored to outdated budgets that had prevented its renewal throughout the 19th century. Outside the university, there was also a lack of institutions with a distinct vocation for scientific research that would compensate for its deficiencies. This situation delayed the emergence and consolidation of research teams when science had reached cruising speed and was no longer the product of layman’s ingenuity, but of common efforts. To make matters worse, the meager resources of the Ministerio de Fomento, who had taken on these responsibilities during the 19th century, sentenced Spanish science to a situation of underfunding (Otero Carvajal, 2017).

This situation began to take a new direction in 1900 with the creation of the Ministerio de Instrucción Pública, whose first measures were the reform of university curricula to include research, the promotion of “foreign pensions” and the foundation of the JAE so that it could administer the new scientific policy. The Junta managed to achieve its goals thanks to two basic tools: on the one hand, the pensions or grants for furthering studies in foreign institutions, where young Spanish scientists could access the most significant advances and innovations in their disciplines, and on the other hand, the strengthening or establishment within the country of

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<sup>2</sup> This work has been conducted within the framework of research project PR65/19-22409.

research centers, where pensioners could continue their work. The JAE, chaired by Santiago Ramón y Cajal and having the most important Spanish scientists of the time among its members, succeeded in both lines of action. To do so, it took advantage of the precarious pre-existing structure dedicated to natural studies in Spain: in 1871 the Sociedad Española de Historia Natural (Martínez Sanz, 1982) was founded, which brought together the main scholars in natural sciences in the country. Among them, Entomologist Ignacio Bolívar Urrutia, professor of the Universidad Central, stood out. He took over the directorship of the Museo Nacional de Ciencias Naturales from the year 1900, a responsibility he combined with the directorship of the Real Jardín Botánico of Madrid in the 1920s. Bolívar was, in turn, vice-president of the JAE, and in charge of revitalizing the research work at both the Museum and the Jardín with the financial support of the Junta (Casado de Otaola, 2010, 2006).

In May 1910, the Junta founded the Instituto Nacional de Ciencias Físico-Naturales (INC), an organization that included scientific institutions that depended on the State and were linked to the Universidad Central, such as the Museo Nacional de Ciencias Naturales and the Real Jardín Botánico de Madrid among others. These two organisms would promote the awakening of natural sciences in Spain. Simultaneously, the JAE launched a pension program in which zoologists, geologists, paleontologists, geographers and botanists participated, giving birth to the first human capital with which the precariousness and lethargy that had existed until then could be rectified. The INC sought to encourage the formation of research groups through four lines of action: “1.º Dar cursos de Laboratorio para iniciar en las investigaciones a un corto número de alumnos, los cuales podrían después salir a ampliar estudios al extranjero. 2.º Aprovechar en esos cursos la preparación de los pensionados que regresaran. 3.º Organizar excursiones y misiones científicas dentro de España. 4.º Preparar, como consecuencia de todo ello, publicaciones que haría la Junta”<sup>2</sup>.

Through the different centers and laboratories, the INC activated “research work” and “extension and laboratory courses”, organized every academic year to prepare the students who were to benefit from a pension or to give continuity to the work of returning pensioners. The Junta had the privilege of appointing the professors in charge of teaching them, who could request assistants and scholarships for students who lacked resources or who had proved to be especially valuable in the performance of their work. The first research works and extension courses began in December 1910 and were consolidated over the years. The JAE was in charge of the funding, and those directed by Francisco de las Barras, Antonio Casares Gil, Romualdo González Frago, Florentino Azpeitia Moros, Ernesto Caballero, Blas Lázaro e Ibiza, Francisco Beltrán Bigorra, José Madrid Moreno, Luis Crespi, Faustino Miranda and

Antonio García Varela were the most prominent in the botanical field (Baratas Díaz & González Bueno, 2013; Otero Carvajal & López Sánchez, 2012; López Sánchez, 2011; Casado de Otaola, 1999).

Barcelona at the end of the XIX century showed an intense naturalistic activity, both scientific and institutional. Catalanism as a politic stream showed support to natural sciences in Catalonia through the Mancomunitat (1914), and the Institut d'Estudis Catalans. The Institució Catalana d'Historia Natural was funded in 1899 and key researchers worked there such as Josep M. Mas, Antoni Novellas and Salvador and Josep Maluquer. The Maluquer brothers were connected to the Royal Academy of Sciences and Arts of Barcelona where they met other Catalans naturalists. Then, the Barcelona city council organized the Natural Sciences Board, owning a natural museum, from 1906. In 1907, the Institut d'Estudis Catalans were created; it established a section on sciences in 1911 (Roca, 1988; Camarasa y Roca, 2010: 385–421; Casado, 2010: 193–194). In 1917, the Spanish government supported the Natural Sciences Board of Barcelona through the ‘Diputación Provincial de Barcelona’ and the Faculty of Sciences of the University of Barcelona, creating the so called ‘Junta de Ciencias Naturals.’ That scientific and institutional environment served to develop the botanic research areas where Pio Font i Quer participated decisively during the first decades of the XX century. Cuatrecasas recognized him as the most important mentor he ever had in Spain.

### Botanist by vocation

José Cuatrecasas was born on 19 March, 1903, in a small village in the Girona Pyrenees, Camprodon, where –according to his testimony– he was educated by his parents in an environment “de recia tradición cristiana y rigurosa disciplina moral y de trabajo” [of strong Christian tradition and rigorous moral and work discipline]<sup>3</sup>. According to Cuatrecasas’ testimony, his father, José Cuatrecasas y Genís, ran a pharmacy with an apothecary’s shop where he came into contact with botany at a very young age. The pharmacy allowed his father to engage within the boundaries of a sort of well-to-do bourgeois family, capable of guaranteeing his sons an education that was not easily accessible in the Spain of the first third of the 20th century. The Cuatrecasases were able to address some of the shortcomings of the Spanish educational system. In Camprodon, for example, there was no high school or middle school, so the father decided that his son should study on his own, under careful parental supervision (except for Latin, which he entrusted to a student who was going to become a priest), and take his exams in Girona and Barcelona (Cuatrecasas Genís, Cuatrecasas i Arumi, Subirá i Rocamora, 2006). So “mi padre, fue, pues, mi

<sup>2</sup> Minutes of the Executive Committee, vol. I, session of February 18, 1910, pp. 8–9. Archives of the Junta para Ampliación de Estudios (JAE), Residencia de Estudiantes, Madrid.

<sup>3</sup> Biography of José Cuatrecasas y Arumi at the Archivo Histórico del Real Jardín Botánico (AHRJB). Fondo José Cuatrecasas. Biography. Miscellaneous, Box 1. File Div. XV, 1,1,1.

primer y verdadero maestro”<sup>4</sup>. His degree in pharmacy from the Universidad de Barcelona and doctorate from the Universidad Central of Madrid completed his educational period. Cuatrecasas was fortunate to find a vibrant scientific environment, including the field of botany, in both Barcelona and Madrid. He carried out his first botanical works in Barcelona under the supervision of one of the most important figures in this discipline in Catalonia, Pio Font i Quer, whose prestige attracted young Cuatrecasas during the 1920–21 academic year, and since then he always had reverential respect for his teacher. At that time, Font i Quer directed a Botany Department at the Museo de Ciencias Naturales de Barcelona, but he also worked at the Institut d’Estudis Catalans and a Junta de Ciències Naturals supported by the Barcelona City Council (Camarasa 1989, 2000). At these institutions, a group of naturalists of Catholic and nationalist convictions also emerged, who were committed to a *Renaixença* (Renaissance) of the Catalan landscape, flora and fauna.

Cuatrecasas needed to forge a rigorous career path within the parameters of modern science. This required training abroad, and although his request for a pension to the JAE in 1927 had not been granted, he moved that same year, thanks to a scholarship from the Universidad de Barcelona, to Geneva where Professor Chodat was teaching a course on Botany and Geobotany at the “La Linnaea” Alpine Laboratory. In February 1930 he tried his luck again with the JAE, this time with a pension to England “para el estudio de Sistemática Botánica en Kew Garden’s, bajo la dirección del Profesor Rendle, durante un año, por lo menos a partir de uno de los próximos meses o del mes de julio o cuando la Junta determine”<sup>5</sup>. By then, Cuatrecasas had begun to interest tropical flora topics, specifically vascular plants. The processing of his file was excessively delayed, so in June 1930, with the support of the University of Barcelona, Cuatrecasas moved to the Botanical Museum and Garden at Berlin-Dahlem (Casado, 2000). From the German capital, he wrote to the Secretary of the JAE in August to solicit an exchange of the pension’s original destination with the idea of staying in Berlin, which is why the final granting of the pension was further delayed. A suitability report, which was not ready until October, was issued by Antonio García Varela, who was just then taking over from Ignacio Bolívar at the head of the direction of the Real Jardín Botánico of Madrid. García Varela gave a positive evaluation of the change requested by Cuatrecasas, and the JAE agreed on November 4 to authorize the Ministerio de Instrucción Pública “a dicho señor para disfrutar en Alemania, además de Inglaterra, la pensión que le fue concedida por Real orden de 17 de octubre último”<sup>6</sup>. In Berlin, Cuatrecasas did not miss the opportunity to start studying the African plants native to Spanish Guinea. Under the direction of professors Diels

and Markgraf, he attended several courses they gave and was trained in the treatment of these plants from a systematic botanical point of view by making several excursions. The pension included a possible stay in England and was for twelve months, but Cuatrecasas did not move to London or exhaust the pension time, which he reduced to eight months and twenty days. In October 1931, when Cuatrecasas was back in Barcelona, he gave up the remaining three months and ten days of his stay in Berlin because of “las oposiciones a la Cátedra de Botánica de la Facultad de Farmacia de Madrid, cuyos ejercicios pueden empezar ya muy pronto”<sup>7</sup>. The gamble paid off for Cuatrecasas, who won the chair at the Universidad Central, which at the time was the pinnacle of academic careers in Spain (López Sánchez, 2019).

The JAE was responsible for shaping a generation of scientists in all branches of knowledge under the parameters of modern scientific rationalism and naturalists born around the turn of the century. The Secretary of the JAE, José Castillejo, made this clear in the Junta’s first report on its activities, when he appealed to a “inquietud renovadora de una minoría que aspira a una formación científica sólida sobre la base de una educación humana e ideal” [renewed concern of a minority that aspires to a solid scientific formation based on a humane and ideal education] (Anon., 1908: 4). Cuatrecasas belonged to that generation, but so did Geologist José Royo, Entomologist Cándido Bolívar, and many other names of young scientists and intellectuals who came into existence under the Junta’s pensions and the laboratories of the Museo Nacional de Ciencias Naturales and the Real Jardín Botánico, among others: “estos investigadores abordaron una modernización de contenidos y métodos científicos, teniendo como horizonte no tanto la superación del retraso acumulado al que se habían enfrentado generaciones anteriores como el desarrollo de programas de investigación homologables internacionalmente, aunque fuera en campos concretos” (Casado de Otaola, 2000: 276).

Once he obtained the chair in Madrid, José Cuatrecasas joined the Real Jardín Botánico, where he had the decisive support of Ignacio Bolívar (San Pío Aladrén, 2005). In May 1928, the Real Academia de Ciencias Exactas, Físicas y Naturales appointed a commission comprised by Ignacio Bolívar, the Duke of Medinaceli, Agustín Jesús Barreiro, Antonio García Varela and Arturo Caballero Segares to “se encargue de investigar la existencia de manuscritos, iconografías y datos resultantes de las expediciones realizadas por naturalistas españoles en los pasados siglos”<sup>8</sup>. It was the “Comisión para el Estudio Retrospectivo de las Ciencias Naturales en España”, and in the 1930s, Francisco de las Barras de Aragón and José Cuatrecasas joined it with the aim of contributing to Bolívar’s personal

<sup>4</sup> Interview conducted by Walter Rubin with José Cuatrecasas (January 1973). AHRJB. Fondo José Cuatrecasas. Biography. Official documents, Box 1. File Div. XV, 1,1,3.

<sup>5</sup> Application for pension, February 6, 1930. JAE Archive, file 40-728.

<sup>6</sup> Notice to the Minister of Public Instruction, November 10, 1930. JAE Archive, file 40-728.

<sup>7</sup> José Cuatrecasas to the President of the JAE, October 18, 1931. JAE Archive, file 40-728.

<sup>8</sup> José María de Madariaga, Secretary General of the Real Academia de Ciencias, to Ignacio Bolívar, November 6, 1928. AHMNCN. Fondo Museo Expediciones científicas, Comisión de Estudios Retrospectivos de Historia Natural Series (1929–1935), Roll 30, Reference ACN 0044/771-773.

project, determined to “examinar y poner de manifiesto cuanto se conserva en nuestras colecciones y archivos acerca de las grandes exploraciones realizadas por los españoles de los siglos XVIII y XIX con la intención de redimir a los españoles de la nota de indolentes en materia científica”<sup>9</sup>. That was enough to give rise to the Tropical Flora Section of the Jardín Botánico, officially established in March 1933 and directed by Cuatrecasas. In fact, it had begun operating in 1932 after a trip by the Catalan botanist to Colombia, representing the JAE, to participate in the bicentennial events of José Celestino Mutis (Huber, 1996). It was in this context that Cuatrecasas began: “los trabajos de la sección tomando conocimiento directo del teatro vegetal que fue asiento y objeto de la Expedición Botánica; otro de los primeros actos fue el intercambio de material con Smithsonian Institution, otro el estudio y publicación de mi propia colección colombiana del año 1932, otro el estudio de la colección de Isern”<sup>10</sup>. The JAE arranged for the creation of a section devoted exclusively to tropical flora, a research field of growing international interest, as Professor Werdermann from Berlin-Dahlem and Dr. Killip of the Smithsonian Institution in Washington implied to the direction of the Jardín Botánico (Otero Carvajal & López Sánchez, 2012).

The pension that Cuatrecasas enjoyed in Berlin was key to the internationalization of his works. In Germany, he collaborated with the Berlin-Dahlem Botanical Garden in the study of African plants from Spanish Guinea and was able to expand his network of international connections upon contacting the Smithsonian Institution in Washington through Ellsworth P. Killip, its curator. Killip and the Smithsonian were very interested in Mutis’ collections, which they helped to identify and classify<sup>11</sup>. The collections held by the Jardín were very attractive to foreign institutions working with tropical flora, and so in May 1933, Antonio García Varela received a request from S. C. Simms, director of the Chicago Natural History Museum, to establish a plant exchange with the Jardín Botánico of Madrid. The Chicago Natural History Museum was interested in Peruvian flora and, consequently, in the collections of Ruiz y Pavón that the Jardín held<sup>12</sup>. In 1934 the Royal Botanic Gardens also contacted Cuatrecasas to exchange duplicate samples<sup>13</sup>, and in 1935 Harvard University requested photographs

of several samples from Ruiz y Pavón’s herbarium, while the Museum of Natural History in Stockholm was grateful for the shipment of more than 100 samples from Mutis’ collection<sup>14</sup>. During December 1934 and January-February 1935, Cuatrecasas still traveled to Berlin and Paris to complete his work on Colombian flora and the collections held by the Jardín de la Expedición al Pacífico<sup>15</sup>.

The Tropical Flora Section, directed by Cuatrecasas, was dedicated to organizing and preparing American herbaria, to undertake “trabajos de sistemática y de geobotánica de grupos representados en los trópicos y de regiones florales del Trópico. En primer término procede la ordenación de los herbarios clásicos de América del sur y central y de la expedición del Pacífico al mismo tiempo que se vayan estudiando, como actualmente se está procediendo con respecto a las colecciones de Mutis y de Ruiz y Pavón [...]. La Sección intentará organizar o proponer nuevas expediciones a Hispano-América y a las posesiones españolas del África Occidental”<sup>16</sup>. The Ruiz y Pavón Herbarium was sent to Berlin for its study and on its return to Madrid, it constituted the initial nucleus of the tropical flora collections on which JAE scholarship holder Miguel Martínez and *preparador* (Assistant Curator) Antonio Rodríguez worked.

## War and exile

When the Civil War broke out in July 1936, José Cuatrecasas remained faithful to the Republican side. After the government moved to Valencia, when Madrid was threatened by Franco’s troops, Cuatrecasas was commissioned in Valencia as a member of the Consejo Técnico Nacional de la Restricción de Estupefacientes and advisor to the Personnel and Professional Organizations Department of the Consejo Nacional de Sanidad. When García Varela did not resume his position as director of the Real Jardín Botánico of Madrid, Cuatrecasas was appointed its provisional director as well until finally, in September 1937, he was officially named director replacing García Varela. In practice, José Cuatrecasas directed the Real Jardín Botánico of Madrid from his government post in Valencia, with the collaboration of Antonio Rodríguez, preparador of the Jardín and assigned to the capital’s Quinto Regimiento. This collaborator was the right-hand man of Cuatrecasas when heading the Jardín Botánico, which had reduced its activity to a minimum due to the wartime circumstances in Madrid. One of the issues that captured Cuatrecasas’ attention was the protection of Mutis’ illustrations and their possible publication. The JAE reached an agreement with Seix y Barral

<sup>9</sup> Ignacio Bolívar to the Duke of Medinaceli, February 16, 1929. AHMNCN. Fondo Museo Expediciones científicas, Comisión de Estudios Retrospectivos de Historia Natural Series (1929–1935), Roll 30, Reference ACN 0044/771-773.

<sup>10</sup> Summary of Cuatrecasas’ curriculum. AHRJB. Fondo José Cuatrecasas. Biography. Miscellaneous, Box 1. File Div. XV, 1,1,1.

<sup>11</sup> José Cuatrecasas to Ellsworth P. Killip, March 4, 1933 and Killip to Cuatrecasas, March 22, 1933. AHRJB. Division I. Contemporary Fund, Direction of the Jardín Botánico, Correspondencia Series, Box 102, File 102.12. Letter from José Cuatrecasas to Ellsworth P. Killip, April 13, 1934. AHRJB. Division I. Contemporary Fund, Direction of the Jardín Botánico, Correspondencia Series, Box 102, File 102.18.

<sup>12</sup> S. C. Simms to Antonio García Varela, May 10, 1933. AHRJB. Division I. Contemporary Fund, Direction of the Jardín Botánico, Correspondencia Series, Box 102, File 102.12.

<sup>13</sup> AHRJB. Division I. Contemporary Fund, Botanical documentation, Correspondencia Series, Box 133, File 133.25.

<sup>14</sup> AHRJB. Division I. Contemporary Fund, Botanical documentation, Correspondencia Series, Box 133, File 133.26.

<sup>15</sup> José Cuatrecasas to the President of the JAE, February 6, 1934, and letter to Gonzalo Jiménez de la Espada announcing his arrival to Berlin, December 7, 1934. JAE Archive. File 40/728.

<sup>16</sup> Report signed by José Cuatrecasas. AHRJB. Division I. Contemporary Fund, Jardín Botánico Sections. Tropical Flora Section, Reports Series, Box 108, File 108.13.

Publishers to publish Mutis' *Quinología (Quinology)*, but the volume's development was incomplete due to difficulties in obtaining paper and printing materials. In addition to these obstacles, Cuatrecasas traveled to Colombia in the summer of 1938 to participate in the 400th anniversary of the founding of Bogota. The first printing proofs came to a halt and Cuatrecasas could no longer return to Spain because when he tried to do so in January 1939, the fall of Catalonia forced him to stay in France until the end of the war (López Sánchez, 2018).

Besides editing Mutis' illustrations, Cuatrecasas made efforts to incorporate Carlos Pau's library and herbaceous collection into the Jardín Botánico. Pau was a botanist who died in 1937 and with whom he had maintained a close personal and professional relationship (Mateo Sanz, 1996). After a series of negotiations marked by the reluctance of the Facultad de Ciencias of Valencia to give up the herbarium and library, the JAE and Cuatrecasas managed to have them added to the Jardín's collections in August 1938, in exchange for financing the creation of the Herbario del País Valenciano at the University of Valencia. Meanwhile, in Madrid, the most urgent task was to safeguard the Jardín's collections and materials. The Republican government decided to house the Herbarium of the Jardín Botánico in the Prado Museum to protect it from the bombing, while Mutis' prints –once it was impossible to publish them– were evacuated along with the Tesoro Artístico Nacional (National Artistic Treasure) to Valencia, Barcelona and finally Switzerland.

Cuatrecasas' trip to Colombia lasted from 30 July 1938 to half January 1939. During those months, he took part in different events representing the government of the Spanish Republic. Facing a possible worsening of the state of war, the government also requested that he try to find out if the Colombian authorities were willing to accept refugees. During those months, Cuatrecasas also negotiated the possibility of joining the Universidad de Bogota and the Instituto Botánico in that city, and even signed a contract, but the Spanish government demanded his return and Cuatrecasas made his way back.<sup>17</sup> At the beginning of February, he was in Paris, where he met his family because it was impossible for him to enter Spain due to the war. From then on, given the Republican defeat, and in coordination with his fellow naturalists Ignacio and Cándido Bolívar, Enrique Rioja, José Royo and Federico Bonet, he began negotiations to try to obtain accommodations outside the country for as many of his university colleagues and other refugees as possible (Camarasa & Casado, 2005).

Cuatrecasas' arrival in Paris from Washington was preceded by some contact between Ignacio Bolívar and Marta María Nowack, Cuatrecasas' wife, in order to arrange for the exile of the main scientists from the Museo Nacional de Ciencias Naturales and the Real Jardín Botánico in Madrid. The war was lost and it was only a matter of time until what was left of the Republic collapsed. What happened behind the scenes during

the conflict was the announcement of a tough post-war period for the defeated thus exile was the only alternative. And those naturalists who fled and avoided purge as teachers or researchers, jail and even worse retaliation were not mistaken (Claret, 2006; Otero Carvajal, 2006). Cuatrecasas, the Bolívars, Rioja, Royo and Bonet considered two main scenarios, Mexico and Colombia, countries where they were able to obtain an invitation to join their scientific institutions. The Catalan botanist dreamed of reproducing the scientific community of Madrid's Museum and Jardín in Colombia, but in the end, the Bolívars, Rioja and Bonet went to Mexico, while Cuatrecasas and Royo went into exile in Colombia (López Sánchez, 2018).

During his trip to Colombia, Cuatrecasas established personal and scientific ties with Colombian Botanist Enrique Pérez Arbeláez and Essayist, Historian and Politician Germán Arciniegas. With the former, he concluded his incorporation into the Instituto Botánico of Bogota, where he was the director. Through the latter, he managed to strengthen his contacts in the political circles of the Colombian government and arrange not only his departure but also that of other colleagues. Cuatrecasas arrived in Colombia in April 1939 with a contract to work at the Instituto Botánico of the Universidad de Bogota and attempted to rebuild his scientific career as a professor there until September 1942. During the following weeks, he negotiated the acceptance –by the Colombian government– of other Spanish university students, and even though there were eventually only a few, Cuatrecasas was able to get Colombia to accept some of his colleagues, such as Geologist José Royo and Historian José María Ots Capdequí. On a personal level, Cuatrecasas took advantage of the collaboration between the Smithsonian Institution and the Instituto Botánico of Bogota, during a 1939 campaign on the Colombian Pacific coast, to consolidate his relationship with Ellsworth P. Killip, a member of the Department of Botany at the United States National Museum, one of the world's leading specialists in tropical flora (Anon., 1940). Throughout this first stage, Cuatrecasas' botanical work was determined by the Institute's lack of bibliographic material and by its primary focus on the herborization and exploration works of Colombian territory. His position as a professor in Colombia provided him with a haven from the desolation of defeat, but for Cuatrecasas, it was a step backward compared to what he had at the Real Jardín Botánico in Madrid. As he confessed to Ignacio Bolívar: “here they are in the phase that we had managed to transpose in Spain”<sup>18</sup>.

Relations with the direction of the Instituto Botánico of Bogota gradually deteriorated, at first with Enrique Pérez Arbeláez and later on with Armando Dugand – his successor– to the point that in April 1942, Cuatrecasas began to consider emigrating to the United States. He had maintained contact with important botanists in this country, such as William Andrew Archer from

<sup>17</sup> AHRJB. Fondo Cuatrecasas i Arumí. Biography Series. Official Documents, Box 1, File Div. XV, 1, 2, 11.

<sup>18</sup> José Cuatrecasas to Ignacio Bolívar, December 15, 1939. AHRJB. Fondo José Cuatrecasas i Arumí. Scientific correspondence, Box 4. File Div. XV, 2, 1, 14.

the National Arboretum Herbarium, Killip from the Smithsonian, and Leon Croizat from Harvard University. Among the members of the American botanists circle who supported Cuatrecasas were also Thomas Harper Goodspeed, from the University of Berkeley, whom he must have known in Germany before the war. It was Goodspeed who made it clear to Cuatrecasas that his desire to work in the United States was not going to materialize since U.S. authorities objected to Cuatrecasas' Spanish nationality due to his status as a Republican exile and to his wife's Czech origin. Goodspeed recommended that he secure his career in Colombia, obtain Colombian nationality, and think about taking the leap to go to the United States later on<sup>19</sup>. In September 1942, Cuatrecasas completed his contract with the university and accepted an offer to work at the Escuela de Agricultura in Cali. In October 1943, he transferred to a botanical section of the Secretaría de Agricultura del Departamento del Valle, which was called the Comisión Botánica del Valle. He was appointed director there and also professor at the Escuela de Agricultura del Valle, in Cali, working from October 1943 to April 1947. But the perennial lack of resources made Cuatrecasas always consider his time in Colombia as temporary. In 1946, with the end of the World War and with the increasingly distant possibility of returning to Spain, he resumed contacts to try and go to the United States.

His first attempts were through Richard Evans Shultes, a botany professor at Harvard, who interceded to get him a scholarship to work at the Arnold Arboretum there. Despite Schultes' efforts, this initiative did not prosper, nor did obtaining a scholarship from the Guggenheim Foundation, once again because of his Spanish nationality. In the summer of 1946, Thomas H. Goodspeed stepped in again and began taking action with the Chicago Natural History Museum in Chicago. E. Killip and other colleagues who were interested in bringing Cuatrecasas to the United States lobbied in the same direction. Finally, Cuatrecasas received a firm offer from the Chicago Natural History Museum to join its staff for two years. After completing bureaucratic procedures, the Catalan botanist arrived in Chicago in June 1947<sup>20</sup>.

In 1947, Cuatrecasas began a new professional and personal stage in which, despite certain difficulties, he would no longer leave the United States. He arrived in Chicago to take up the post of Curator of Colombian Botany at its Museum of Natural History. The contract lasted three years until 1950, and although he had the support of Goodspeed and Killip, he found it difficult to consolidate his position in the United States. He succeeded when the John Simon Guggenheim Memorial Foundation finally granted him a scholarship, in June 1950, to work on a project preparing a Colombian flora catalog for a period of twelve months, starting 1 January, 1951. Works on tropical flora in Colombia and his personal collections were of great importance

for this project. E. P. Killip, then Chief Curator of the Department of Botany at the Smithsonian Institution, acted as an intermediary for the Guggenheim grant. This grant was maintained by means of a contract as a researcher of the National Science Foundation, attached to the Chicago Natural History Museum as well, for the study of Colombian flora between 1952 and 1955. In 1955, José Cuatrecasas' professional status was finally settled in the United States, not without some uncertainties, when he obtained a position as a researcher at the National Science Foundation and was hired as Research Associate at the United States National Museum of the Smithsonian Institution in Washington, where he remained until his retirement in 1977 (López Sánchez, 2018).

### Tropical and Neotropical Flora

Tropical flora had been one of Cuatrecasas' priority lines of work before his exile in Colombia, which is why the presence of Cuatrecasas in this country during the 1940s allowed him to continue his lines of research coherently. This was not a common situation among Republican scientists in exile, most of whom had to completely redo their scientific careers. Cuatrecasas maintained as priority lines of work the systematic taxonomy with phylogenetic and evolutionary criteria of tropical families and the geobotany of Colombian tropical flora. His works made valuable contributions to the Herbario Nacional Colombiano and the Herbario Departamental del Valle del Cauca (González Bueno, 1983: 12–13). Cuatrecasas wanted his research to be useful in understanding Colombian flora, but also to economic development and the creation of wealth. He prioritized taxonomy, phytography, applied botany, and botanical phytosociology as his lines of work. In these fields, according to Cuatrecasas himself, it was possible to develop the study of Colombian flora and geobotany, undertake general studies of plant biology, and finally use the knowledge to solve certain agronomic problems, in addition to the dissemination and higher studies of botany<sup>21</sup>.

Cuatrecasas' mind had designed a company that systematically explored territory, which ended up turning into the seed of the Herbario Nacional Colombiano. The aim was to produce a Colombian Flora based on Mutis' illustrations, to which a geobotanical vision was to be added by the taxonomic work. The explorations and taxonomic classifications of his herborizations in Colombia were followed by studies of plant physiology, with a very modern focus on the botanical work that culminated in a third stage, that of practical applications of botanical knowledge to improve agriculture. Despite bibliographical deficiencies and difficulties in the availability of support staff, the herborization campaigns

<sup>19</sup> AHRJB. Fondo José Cuatrecasas i Arumí. Scientific correspondence, Box 8. File Div. XV, 2, 1, 79.

<sup>20</sup> AHRJB. Fondo José Cuatrecasas i Arumí. Scientific correspondence, Box 8. File Div. XV, 2, 1, 79 and Box 12. File Div. XV, 2, 1, 125.

<sup>21</sup> «Estudios botánicos en Colombia» (Botanical Studies in Colombia) by José Cuatrecasas, Bogota, November 25, 1938. AHRJB. Fondo José Cuatrecasas i Arumí. Scientific correspondence, Box 39. File Div. XV, 10, 2, 2.

and exchanges established with centers abroad were fundamental in the formation of the Herbario Nacional Colombiano. This work was advertised in the magazine “Caldasia” and the “Revista de la Academia Colombiana de Ciencias” (Journal of the Colombian Academy of Sciences). From his post as professor of botany at the Escuela de Agricultura del Valle, he designed a program that sought to provide students with the use of basic concepts of mycology, genetics, phytopathology, forestry, biology, and plant propagation. These teachings had to be accompanied by clear and concise knowledge of general botany that would enable students to become familiar with the basics of physiological processes. Finally, students had to be endowed with full knowledge of the major taxonomic groups and the most important botanical species for the human economy on Colombian soil. Cuatrecasas’ teaching and research program had, in short, four main areas: general botany, plant physiology (cell theory, plant chemical constitution and genetics), taxonomy and economic botany, and finally geobotany.

The arrival in the United States meant a leap of quality in both his lines of research and the internationalization of his work (López Sánchez, 2018). His time as a fellow at the Guggenheim Foundation in New York allowed him to devote himself to the design of a Colombian flora catalog, which he continued at the Chicago Natural History Museum as Curator of Colombian Botany. Work focused on identifying numerous new species that had been the result of the herborization campaigns in Colombia. During these years, he publicized his first investigations in Anglo-Saxon and French magazines, but his work of several decades also culminated with the appearance of “Prima Flora Colombiana” in three volumes that covered the families Burseraceae, Malpighiaceae and Compositae. Colombian flora, although a priority in his scientific interests, was not the only one, he also engaged in work on the tropical vegetation of Venezuela, Panama, Ecuador, or Peru. A notable chapter in this field was the notes that Cuatrecasas prepared in 1951 from the design of a project to create a Pan-American Herbarium in San José, Costa Rica. The objective was to find a Pan-American Botanical Center that would bring together the work of regional institutions capable of gathering bibliographic resources and material on tropical flora. Part of that Center had to be a Neotropical Botanical Museum with a herbarium that would represent all the species growing in tropical and subtropical areas of the Americas<sup>22</sup>.

This plan was an extension of Cuatrecasas’ botanical projects, which announced the beginning of an idea that would be at the center of his work over the next few decades, the research on Neotropical Flora. The number of new species he described throughout the 1950s, 60s and 70s is very large, making descriptive taxonomy and plant physiology two of the central axes of his lines of research. Nevertheless, “entre sus estudios más destacados figuran las monografías sistemáticas, realizados con criterios filogenéticos y evolutivos de

las familias tropicales Humiriaceae y Brunelliaceae, y del género *Theobroma* (Sterculiaceae)” (González Bueno, 1983: 13). In 1958, Cuatrecasas published “Aspectos de la vegetación natural de Colombia” (Aspects of the Natural Vegetation of Colombia), which was the culmination of his dedication for twenty-five years to the study of Colombian flora since he began in 1934 with his first “Observaciones geobotánicas en Colombia” (Geobotanical observations in Colombia). The scientific pilgrimage of the Catalan botanist was about to conclude at the time with his most ambitious project, that of Neotropical Flora (López Figueiras, 1985; Funk, 1985; Robinson, 1985).

In those works, Cuatrecasas spoke out in favor of a theory of the unique neotropical origin of all Colombian flora. As a result, he had been thinking about setting up a comprehensive project that would summarize all the work he had done. In 1958, Cuatrecasas prepared a report for UNESCO about a project for the complete study of American tropical flora. That report was passed on to an advisory team dedicated to research on the humid tropics, although Cuatrecasas’ proposal did not materialize until a few years later, in December 1964, when a “Comisión pro Flora Neotrópica” has been established in November 1964 as a consequence of the deliberations of those invited by the UNESCO and in collaboration with the Institute of Botany of São Paulo in Brazil.

Such Comisión pro Flora Neotrópica was established: “con el propósito de organizar la producción y la publicación de una flora general y completa de la región tropical americana. Esta flora será preparada sobre bases científicas y en la forma de una serie de monografías. Proporcionará información sobre morfología, taxonomía, nomenclatura, distribución geográfica, ecología y usos de las plantas neotropicales, así como otros aspectos de la ciencia botánica apropiados a cada caso. El proyecto estará basado sobre una amplia colaboración internacional” (Cuatrecasas, 1965a: 163). The Commission’s board of directors was made up of top-notch botanists, with the then director of the Botanical Institute of São Paulo, Alcides R. Teixeira, as its president. Joseph Lanjouw, director of the Botany Museum at Utrecht State University (Netherlands), acted as vice-president, and Raymond Fosberg, of the National Research Council in Washington (USA), as treasurer. The Secretary was Mexican Efraim Hernandez, from the Laboratorio de Botánica Sistemática de la Escuela Nacional de Agricultura in Chapingo (Mexico). The Executive Director was Bassett Maguire, Chief Curator of the New York Botanical Garden, and one of the two Scientific Directors was José Cuatrecasas while the other was Rolf Singer from the Facultad de Ciencias Exactas y Naturales of the University of Buenos Aires (López Sánchez, 2018). Fosberg remembered: “I was a member of the UNESCO International Advisory Committee for Humid Tropics Research for the full eight years of its existence. At the request of Prof. Cuatrecasas, I presented to the second meeting of this committee, held at Manaus, Brazil, in July 1957, a document prepared by him intitled “Establishment of a Permanent Commission for the Publication of a Tropical American Flora.” This

<sup>22</sup> «Centro Botánico Pan-Americano». AHRJB. Fondo José Cuatrecasas i Arumí. Scientific correspondence, Box 12. File Div. XV, 2, 1, 132.

was discussed at some length at the meeting and the result was embodied in Recommendation no. 11 in the final report, dated 10 December 1957. Prof. Cuatrecasas was then asked to prepare a report for UNESCO on “The Tropical American Flora Project” which was translated into French and Spanish and circulated to Member States by UNESCO” (Fosberg, 1985: 25). This report was used as background for Cuatrecasas in his formal presentation of the proposal for the establishment of the Commission for the complete study of American tropical flora. Fosberg had visited Cuatrecasas in 1947 to establish the first lines of a future Project for the study of Neotropical Flora.

Between Cuatrecasas’ report to the UNESCO in 1958 and the establishment of the Commission, Cuatrecasas began to publish some studies along the lines of his particular thesis on the Neotropic origin of Colombian flora. In 1962, he prepared a new summary report on an initial meeting in Sao Paulo to specify the terms of the project for Neotropical Flora and, the following year, he published his first scientific work specifically devoted to Neotropical Flora (Cuatrecasas, 1963). The project for the formation of the Commission took longer than necessary because of its excessive extent, lack of funds and professionals, and the fact that it might possibly lead to negligence in the study of local flora or botanical explorations. Cuatrecasas was one of the scientists who most enthusiastically supported the idea until it finally ended up launching an initiative that represented “una contribución básica tanto al conocimiento [...]. A nadie se le oculta que un proyecto de esta índole es de larga duración; pero una vez aceptada la necesidad de la existencia de esta obra, lo que toca es iniciarla cuanto antes, tratando de obtener el mayor número de apoyos y colaboraciones posibles” (Cuatrecasas, 1966). Cuatrecasas himself began by setting an example with the publication, in the journal *Ciencia* (Science), of a miscellany on Neotropical Flora in which he dealt with “especies o variedades que se consideran nuevas y nuevas combinaciones taxonómicas en las familias de las *Humiriáceas*, *Malpigiáceas*, *Bombacáceas*, *Hipericáceas* y *Compuestas*” (Cuatrecasas, 1964), all of which Cuatrecasas had been working on intensively during the previous years. In 1965, coinciding with the first steps of the Comisión pro Flora Neotropical, Cuatrecasas published the second issue of his miscellany on Neotropical Flora in *Ciencia*, this time on the families Piperaceae, Cunoniaceae and Compositae (Cuatrecasas, 1965b).

In July-August 1966, another meeting of the Organización para la Flora Neotropical was held and the foundations were laid for the presentation of the first monographs, including one by José Cuatrecasas on the Brunelliaceae family. From then until the end of his scientific career, in the early 1990s, Cuatrecasas devoted a significant percentage of his publications to working on the systematic taxonomy of Neotropical Flora. From 1971 to 1982, a series entitled “Miscellaneous notes on Neotropical Flora” appeared annually in the journal “Phytologia” (Phytology), which was his most outstanding contribution to this field. But it was not the only one. The taxonomic works on Neotropical Flora were the central axis of this

stage in Cuatrecasas’ research career, covering more than fifty families and nearly thirty genera (González Bueno, 1983: 13). Finally, it is worth noting that Cuatrecasas also studied some of the genetics and inherited elements in the plant physiology of the family Compositae (Cuatrecasas & Powell, 1970; Cuatrecasas, 1975).

During his years of work in the United States, at the Smithsonian Institute, Cuatrecasas had as main responsibilities: “desarrollar ciertos programas de investigación en sistemática de fanerógamas. Estos programas varían según periodo y pueden concentrarse en monografías exhaustivas de un grupo sistemático, una familia botánica, por ejemplo, Humiriaceae, o un género, p. ej. *Theobroma*. O bien se refieren al estudio de una parte de una flora de un país, en mi caso de Colombia”<sup>23</sup>. His work and research on Neotropical Flora were the culmination of a scientific career that had begun back in the 1930s as head of the Tropical Flora Section of the Real Jardín Botánico of Madrid, which he never forgot and to which he left a good part of his personal and scientific legacy (González Bueno, 1997a,b; Castroviejo, 1997).

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<sup>23</sup> Interview conducted by Walter Rubin with José Cuatrecasas (January 1973). AHRJB. Fondo José Cuatrecasas. Biography. Official documents, Box 1. File Div. XV, 1,1,3.



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