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Beiträge

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Alexander von Humboldt, the Spanish crown and Hispanic science

RESUMEN

El artículo examina la relación de Alexander von Humboldt con la ciencia hispánica y su interacción con científicos peninsulares y criollos. Se destaca cómo Humboldt, a pesar de las críticas y malentendidos sobre su aprovechamiento de los trabajos científicos hispánicos, mantuvo una relación significativa con la corona española y sus científicos. Se menciona la importancia del apoyo administrativo y político que Humboldt recibió, así como su interacción con científicos españoles. En su viaje americano, Humboldt y Bonpland también colaboraron con científicos y personajes locales, lo que enriqueció sus investigaciones y contribuyó a su obra. En síntesis, el artículo subraya la relevancia de la colaboración y el intercambio de conocimientos entre Humboldt y la comunidad científica hispánica, y cómo esto influyó en sus descubrimientos, en la nueva imagen de América en el continente europeo y en la percepción de la ciencia hispánica en el contexto global.

ABSTRACT

The article examines Alexander von Humboldt's relationship with Hispanic science and his interaction with peninsular and Creole scientists. It highlights how Humboldt, despite criticisms and misunderstandings about his use of Hispanic scientific works, maintained a significant relationship with the Spanish crown and its scientists. The importance of the administrative and political support Humboldt received is mentioned, as well as his interaction with Spanish scientists. During his American journey, Humboldt and Bonpland also collaborated with local scientists and figures, enriching their research and contributing to their work. In summary, the article underscores the relevance of collaboration and knowledge exchange between Humboldt and the Hispanic scientific community and how this influenced his discoveries, the new image of America on the European continent, and the perception of Hispanic science in the global context.

RÉSUMÉ

L'article examine la relation d'Alexander von Humboldt avec la science hispanique et son interaction avec des scientifiques péninsulaires et créoles. Il souligne comment Humboldt, malgré les critiques et les malentendus concernant son utilisation des travaux scientifiques hispaniques, a maintenu une relation significative avec la couronne espagnole et ses scientifiques. Il est fait mention de l'importance du soutien administratif et politique que Humboldt a reçu, ainsi que son interaction avec scientifiques espagnols. Lors de son voyage en Amérique, Humboldt et Bonpland ont également collaboré avec des scientifiques et des personnalités locales, enrichissant leurs recherches et contribuant à leur œuvre. En résumé, l'article souligne la pertinence de la collaboration et de l'échange de connaissances entre Humboldt et la communauté scientifique hispanique, et comment cela a influencé ses découvertes, la nouvelle image de l'Amérique sur le continent européen et la perception de la science hispanique dans le contexte mondial.

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Introduction

Twenty-five years ago, we coordinated a dossier in the journal *Debate and Perspectives,* published by the Fundación Histórica Tavera, on Alexander von Humboldt's relationship with the Hispanic world. This dossier raised a number of controversial questions, such as the possible modernity of this Hispanic world compared to other modernities, the universal consciousness raised by Ottmar Ette, Humboldt's presence as a hero of American independence, his critical stance on colonialism, his reformist or pro-independence thinking, and his media impact on the Hispanic world. A few years later, Ottmar Ette insisted on a similar idea in his book, in which he begins with the Humboldtian idea of deprovincialisation and universal consciousness, which led Humboldt to become a theorist of globalization and modernity until he reached his culminating work *Cosmos,* with a great universal impact, and to give a new idea of the American world after the famous discussions initiated by the Count of Buffon, Cornelius de Pauw, William Robertson, Thomas Raynal, etc., about the inferiority of the New World, about the inferiority of the New World. Ette, who shortly before had edited an important work condensing Humboldtian knowledge,[1] describes Humboldt's ideas and his multidisciplinary thinking about the interactive forces in nature, the creation and circulation of knowledge, and his cosmopolitan vocation. These aspects are highly appreciated today and sometimes misunderstood by more nationalistic viewpoints.[2]

The purpose of this article is to review some of these issues, with a particular focus on Humboldt's specific relationship with Hispanic science, especially with peninsular, insular, and Creole scientists. We will consider recent research, which clarifies this relationship and addresses some exaggerated claims regarding the Prussian scholar's extensive use of Hispanic scientific work.[3] We will also analyse Humboldt's genuine relationship with the Spanish crown, represented by Carlos IV, his ministers, and the viceroys. This will counter the claims of the naturalist's radical republicanism and alleged disdain for the Hispanic world, which are largely the result of biased perspectives from some European and American scholars. These scholars, representing a new post-colonial "criollismo", often distort facts to fit their nationalist hypotheses, overlooking Humboldt's cosmopolitanism and global vision.

Alexander von Humboldt's arrival in Spain and the political framework

The Spain that Humboldt encountered in 1799 was a society full of contradictions, which culminated in the 1808 crisis following Napoleon's invasion of the Peninsula. Bourbon absolutism was dismantling some aspects of the old Hispanic monarchy through centralist policies and reforms in education, economy, politics, society, and science. These reforms often paved the way for a certain modernity, particularly in creating new spaces for individual sociability. However, it is evident that these changes only affected a minority of the population, as reflected in various cultural circles such as literary gatherings, official Economic Societies of Friends of the Country, and new scientific institutions where Enlightenment ideology was clearly present. In the case of Spanish science, the ideology of modernity, with its absolute faith in reason,

1 Ette (2018).

2 Ette (2019).

3 Thurner and Cañizares-Esguerra (2023).

was often combined with rhetorical discourse on the "usefulness" of scientific knowledge for social modernisation, an assumption that frequently failed. Generally, Spanish Enlightenment science was based on modern theoretical assumptions and characterized by its centralisation, a goal not always achieved, as evidenced by the failure to create a national Academy of Sciences and the emergence of regional academies. Additionally, there was a marked interest in applied science, addressing technological problems, which led to scientific policies based on hiring foreign experts and sending scholars to other countries. This was particularly evident in the case of Germany, due to its interest in developing mining and mineralogical knowledge, a circumstance that naturally favoured Alexander von Humboldt's interests when proposing his American voyage. Another notable characteristic of Spanish Enlightenment science is its militarisation in certain activities, particularly in scientific-technical and health-related fields. This includes the creation of modern non-university institutions, through which new scientific paradigms were introduced, such as botanical gardens, natural history cabinets, astronomical observatories, etc.[4]

At the end of the Spanish Enlightenment, Spain was a complex society that combined the backwardness of the majority with the modernity of an enlightened elite. Hanno Beck, discussing this Spain, mentions a "populace" that was suspicious when Humboldt attempted to carry out his astronomical and barometric measurements on the Peninsula, highlighting the superstitious beliefs of the people. Beck categorically describes the lack of scientific knowledge in the Spain visited by Humboldt, an "unknown country" where he managed to validate his valuable instruments with countless measurements of latitude, longitude, and altitude, as well as demonstrating the geographical profile of the peninsula, emphazising the presence of the plateau as a geographical and cultural nucleus. These statements, along with his disparaging remarks about Minister Urquijo, appear overly simplistic. Beck himself admits that Spanish scientists were involved in the preparation of Humboldt's voyage and in his work on the Iberian Peninsula.[5]

The political framework for organizing Humboldt's journey was favoured by the strong support of the Saxon ambassador, Baron de Forell, and especially the Minister Mariano Luis de Urquijo and his allies at the Madrid court. According to the Danish Ambassador Herman de Schubart, Queen Maria Luisa particularly protected Urquijo, to whom Schubart attributes absolute power at the time, with the support of a "secret committee" orchestrating political intrigue, including Baron de Forell and the Dutch Ambassador Johan Valckenaer.[6] Wilhelm von Humboldt described Forell[7] as a Saxon pedant with democratic ideas who had significant influence in Spanish scholarly institutions and was working on a possible marriage between the Prince of Asturias and a Saxon princess. In contrast, Valckenaer was seen by Schubart as a former Leyden professor with terrorist ideas supportive of the French revolutionaries, leading to his removal from the Dutch Court. This opinion aligns with Wilhelm von Humboldt's view of Valckenaer as a Jacobin with considerable influence over the Spanish government, apparently due to his role in arranging credits from Dutch bankers.

4 Puig-Samper (1988).

5 Beck (1971).

6 For a complete study of Alexander von Humboldt's stay in Spain, see Puig-Samper and Rebok (2007).

7 Humboldt (1998), pp. 132–133.

Schubart attributed exceptional skill to Alexander von Humboldt for allying himself with Baron de Forell and Minister Valckenaer to secure permission to travel to America. The Danish diplomat also highlighted another interesting relationship, that between Humboldt and the Prince of Parma, who was married to the Infanta Maria Luisa. Humboldt met the prince at his home in Madrid and described him as an exotic plant at court, due to his scientific and literary knowledge:[8]

> It was at his home that I got to know the famous Alexander Humbold (sic), who since then has visited our house almost daily, where the charm of his instructive conversation has been a source of delight for us. He plans to travel to Mexico as a naturalist and mineralogist. He is bringing with him the famous French scholar Bonpland. They have come to Madrid to obtain permission. Baron von Humbold (sic) had the good sense to befriend the Dutch ambassador, Valkenaar (sic), and the Saxon minister, Forell, both of whom wield great influence over the Queen and her young minister. Through them, he obtained not only free passage, but also all kinds of privileges that the Spanish government, very jealous of its colonies, rarely grants to foreigners. Baron Humboldt is delighted and will soon be travelling via Cadiz to his destination. He often speaks to me of the knowledge and merits of the Prince of Parma, who seems to be something of an exotic plant at this court. Despite the formalities, he often goes out on foot to visit scholars and booksellers in Madrid.[9]

The Prince of Parma's friendship and support for Humboldt is evidenced in a letter addressed to the viceroy of New Spain, Miguel José de Azanza, dated 4 May 1799 in Aranjuez. In this letter, the son-in-law of Carlos IV informed Azanza that the Prussian Alexander von Humboldt, an expert in mineralogy, chemistry, and natural history, would provide him with a letter of recommendation for his American trip. The Prince of Parma indicated to Azanza, who had been a diplomat in Prussia a few years earlier and would later end his days in exile in France with Urquijo, that Humboldt was aware of their friendship and had requested this letter to ensure the viceroy's support for his travels and research in the Americas, for which he already had the king's permission.[10]

Another aspect of great interest is the financial support provided by the Marquis of Iranda. Although Humboldt had funds in various promissory notes issued from Berlin, he encountered difficulties in exchanging them during his journey. A few years later, Humboldt published an

8 Gigas (1902), pp. 393–436.

9 "C'est chez lui que j'appris à connoître le célèbre Alexandre Humbold (sic), qui depuis est venu presque journellement dans notre maison, où le charme de sa conversation instructive formoit nos délices. II se propose de faire le voyage du Mexique en naturaliste et minéralogue. Il amène avec lui le célèbre savant françois Bonpland. Ils sont venus á Madrid pour en obtenir la permission. Le baron de Humbold (sic) a eu le bon esprit de se lier avec l'ambassadeur d'Hollande, Valkenaar (sic), et le ministre de Saxe, Forell, qui exercent l'un et l'autre une si grande influence sur la Reine et son jeune ministre. Par leur moyen il a obtenu, non seulement un libre passage, mais des facultés en tout genre, que le gouvernement Espagnol, très jaloux de ses colonies, n'accorde que difficilement aux étrangers. Le Baron Humboldt en est enchanté et ne tardera pas á se rendre par Cadix a sa destination. Il me parle souvent des connoissances et des mérites du Prince de Parme, qui a cette Cour-ci paroît être une plante exotique. En dépit des étiquettes, il sort souvent á pied et va voir les savants et les libraires à Madrid", *ibidem,* p. 422.

10 Correspondence between Miguel José de Azanza and Luis de Borbón-Parma. Archivo General de Indias (AGI), Miscellaneous, 56, N. 1.

explanation in the Journal de Bordeaux on how he had financed his travels. He clarified that he had financed the journey at his own expense, albeit with the magnanimous protection of the King of Spain during the five years of his travels, which undoubtedly helped to save certain expenses.[11] We know that, as early as Barcelona, Humboldt had asked Kunth for money to settle in Madrid, and on 4 April 1799, he informed him that the Marquis of Iranda, a member of the Royal Treasury Council and one of the most distinguished men in Europe, treated him like a father and would provide him with everything he needed for his journey.[12] On this occasion, he also wrote to Gustav Graf von Schlabrendorf four days later to request the 8,500 ducats he had on deposit, so that they could be transferred to Abraham Mendelssohn in Paris, and then to the Marquis of Iranda in Madrid, for investment with a 28% profit in consignments in Mexico. A few days later, Humboldt thanked David Friedländer for sending the Marquis of Iranda 30,000 reales de vellón, asked him to clarify with Kunth the sending of another 20,000 libras, and informed him of the advantages of his financial alliance with Iranda, a man with great influence at the court in Madrid and in the Indies, whose relatives and friends included notable figures such as O'Reilly, Las Casas, and Gardoqui.[13] The preparations for Humboldt and Bonpland's American voyage were nearing completion, but they still awaited the final approval of King Carlos IV. Humboldt, who always respected and was grateful for the monarch's support, did not let this imply an uncritical stance towards Spanish colonialism in America or a renunciation of his republicanism.

The presentation of Humboldt's American project to the court in Aranjuez

Of his audience at the Spanish Court, there remains the testimony that he himself recalls in his *Voyage aux régions équinoxiales du nouveau continent:*

> Je fus présenté à la cour d'Aranjuez, au mois de mars 1799. Le roi daigna m'àccueillir avec bonté. Je lui exposai les motifs qui m'èngageoient à entreprendre un voyage au Nouveau continent et aux îles Philippines, et je présentai un mémoire sur cet objet à la secrétairerie d'état. Le chevalier d'Urquijo appuya ma demande, et parvint à aplanir tous les obstacles. Le procédé de ce ministre fut d'autant plus généreux que je n'avois aucune liaison personnelle avec lui. Le zèle qu'il a constamment montré pour l'exécution de mes projets, n'avoit d'autre motif que son amour pour les sciences. C'est à la fois un devoir et une satisfaction pour moi de consigner dans cet ouvrage le souvenir des services qu'il m'a rendus.[14]

11 Roquette (1865), pp. 175–176.

12 Julian (2012).

13 Jahn and Lange (eds.) (1973), pp. 648–658.

14 Humboldt and Bonpland (1816–1831), v. I, p. 80. "I was presented to the court of Aranjuez in March, 1799. The king received me graciously. I explained to him the motives, which led me to undertake a voyage to the new continent, and the Philippine islands, and I presented a memoir on this subject to the secretary of state. Mr. d'Urquijo supported my demand and overcame every obstacle. The conduct of this minister was so much the more generous, as I had no personal connection with him, and the zeal which he constantly showed for the execution of my projects had no other motive than his love for the sciences. I feel that it is no less a duty than a pleasure, to record in this work the services which he rendered me." (Humboldt (1814–1829), p. 14).

Until a few years ago, the possible *Memoir* that Humboldt presented to King Carlos IV, in which it was hoped to find the reason given for the approval of the voyage, was considered lost. Our patient search in the archives bore fruit, as we found this *Memoir,* together with other documents, in the Saxon papers in the State section of the National Historical Archive in Madrid.[15] Alexander von Humboldt's brief but important *Memoir* addressed to the king reads as follows:

> Sire,
>
> Penetré de cette admiration respectueuse qu'inspìre un Monarque, dont la protection auguste a fait fleurir les sciences et les arts, j'ose présenter aux pieds de Votre Majesté les voeux qui m'animent. Si c'est une audace d'approcher Son Throne, l'espérance que j'ai de me rendre utile, me donne peutêtre quelque droit à Sa Clémence. Occupé depuis plusieurs années de l'étude de la Nature en Europe, je brule du désir de me transporter dans cette partie du Globe, dont les contrées les plus belles et les plus vastes jouissent des bienfaits de Votre Majesté. Les progrès qu'ont fait depuis quelque tems les sciences chimiques et physiques, l'usage des nouveaux instrumens, construits pour analyser l'Atmosphere et en connaitre des propriétés souvent aussi nuisibles à la vie de l'homme; la reunion de tous ces moyens promet une riche moisson au Naturaliste observateur. Ce n'est, Sire, que dans l'étendue immense des Royaumes soumis à Votre Sceptre, que l'on puisse étudier la Construction du Globe, mesurer les couches qui le composent, et reconnaître les rapports généraux qui lient les êtres organisés. Ce sont ces considerations qui, de l'approbation du Roi, mon maître, m'ont conduit dans la Peninsule, ce sont elles, qui me font réclamer la Protection auguste de Votre Majesté, pour oser pénêtrer dans le nouveau monde. Je n'ai d'autres droits à Sa Clemence que le zele qui m'anime, mais ce zele est apprecié par un Souverain, qui ne Se lâsse pas de faire des sacrifices pour l'étendue des connoisance humaines. Puisse les succès de mes recherches être égal aux soins infatigables, avec les-

15 AHN, State, leg. 4709. "Sir, penetrated by the respectful admiration inspired by a Monarch, whose august protection has made the sciences and arts flourish, I dare to present at the feet of Your Majesty the wishes that animate me. If it is audacious to approach His Throne, the hope I have of making myself useful perhaps gives me some right to His Clemency. Occupied for several years with the study of Nature in Europe, I burn with the desire to transport myself to that part of the Globe, whose most beautiful and vast regions enjoy the benefits of Your Majesty. The progress made in recent times in chemical and physical sciences, the use of new instruments constructed to analyze the Atmosphere and understand its properties, often harmful to human life; the combination of all these means promises a rich harvest to the observing Naturalist. It is only, Sir, in the immense extent of the Kingdoms subject to Your Sceptre, that one can study the Construction of the Globe, measure the layers that compose it, and recognize the general relationships that bind organized beings. These are the considerations that, with the approval of the King, my master, led me to the Peninsula, and it is they that make me seek the august Protection of Your Majesty, to dare to penetrate the new world. I have no other rights to His Clemency than the zeal that animates me, but this zeal is appreciated by a Sovereign who does not tire of making sacrifices for the extent of human knowledge. May the success of my research be equal to the tireless efforts with which I intend to carry it out, to render the first homage to Your Majesty and to prove to the whole of Europe that I have not been entirely unworthy of the august Protection with which She has deigned to honor me.
It is in the consoling hope of seeing wishes formed so long ago fulfilled that I dare to place myself at the feet of Your Majesty, presenting the homage of the deepest veneration and the most respectful obedience, with which I shall be, until the end of my days, Sir, Of Your Majesty, at Aranjuez, this 11th of March, 1799. The very humble and very obedient and very devoted servant, Alexandre de Humboldt."

quels je compte les faire, pour en rendre le premier hommage à Votre Majesté et pour prouver à l'Europe entière, que je n'ai pas été tout à fait indigne de la Protection auguste, dont Elle a daigné m'honorer.

C'est dans l'espérance consolante de voir accompli des voeux, formés depuis si longtems, que j'ose me mettre aux pieds de Votre Majesté, en Lui présentant les hommages de la vénération la plus profonde et de l'obéissance la plus respectueuse, avec lesquelles je serai, jusqu'à la fin de mes jours,

Sire,
De Votre Majesté,
le très – humble et très – obéissant
et très-dévoué serviteur,
Alexandre de Humboldt.

à Aranjuez
ce 11. de Mars,
1799.

As we have indicated elsewhere, it is interesting that Humboldt requested the king's permission to penetrate the New World[16], citing the perfection of the new instruments for measuring atmospheric phenomena, but above all emphasising the study of *the formation of the globe, the measurement of the layers that compose it and the recognition of the general relationships that unite organised beings.* These objectives contrasted with those indicated in Urquijo's passport and special permission, which emphasised the study of mines, a more practical objective for the Spanish rulers and which was perfectly in line with the autobiographical account that Humboldt attached to his request to the minister Mariano Luis de Urquijo through the Baron de Forell.

On 15 March 1799, Baron de Forell received a letter from Minister Urquijo informing him that permission had been granted to Baron de Humboldt to study the mines and other discoveries he was proposing and that he would give him the passports of Humboldt and Bonpland, who was described as a servant, as well as the letters of recommendation for the generals and commanders of the various provinces. The continuation of the administrative process is recorded in the official letter sent by José Antonio Caballero, Minister of Grace and Justice of Spain and the Indies, to Mariano Luis de Urquijo a few days later[17]. Despite the issuance of this first passport, Urquijo issued a second passport or safe-conduct shortly afterwards, much more detailed than the one signed by Caballero and more in line with Alexander von Humboldt's interests.[18]

Humboldt's relationship with Spanish scientists

One of the key figures in Humboldt's Spanish stay was José Clavijo y Fajardo, vice-director of the Royal Cabinet of Natural History,[19] Baron de Forell's friend and Minister Urquijo's protégé. Through Clavijo, he was able to establish his first scientific connections in Madrid, starting with the Germans whom Clavijo protected in the Royal Cabinet, Cristiano Herrgen, director of the chair of mineralogy, and the Thalackers, collectors of the museum. Humboldt frequently visited

16 Puig-Samper and Rebok (2007), pp. 32–47.

17 AHN, State, leg. 4709.

18 AGI, Estado, 52, no. 113.

19 Puig-Samper (1999), pp. 329–355; Barreiro (1992).

the Royal Cabinet, which housed important American mineralogical and zoological collections, and the School of Mineralogy,[20] accompanied on some occasions by the French chemist Louis Proust, who at that time was moving from Segovia – where he had directed the House of Chemistry of the Royal College of Artillery (Spanish: Casa de la Química del Real Colegio de Artillería) – to Madrid to direct a new chemical laboratory.[21] With Juan Guillermo Thalacker, then collector of the Royal Cabinet of Natural History, Alexander von Humboldt published a graph representing the heights from sea level in Valencia to Madrid and from there to Navacerrada and San Ildefonso, in the *Anales de Historia Natural,*[22] the new scientific journal that was to bring together the group that supported Humboldt in Madrid and to publish the first news of his American voyage.

Humboldt also met Antonio J. de Cavanilles in Madrid,[23] well known in his time for his botanical knowledge.[24] Cavanilles' European prestige was unquestionable, both for his botanical publications and for his scientific relations with personalities of Joseph Banks' stature, the patriarch of English botany, Antoine L. de Jussieu and Heinrich Friedich Link, Humboldt's professor in Göttingen and future director of the Berlin Botanical Garden, a post in which he replaced Carl Ludwing Willdenow, another of Cavanilles' friends who in May 1799 sent greetings to his disciple Humboldt.[25] Humboldt also visited Casimiro Gómez Ortega, then director of the Royal Botanical Garden in Madrid, who showed him and Bonpland the herbariums of the Royal Botanical Garden, as well as those of the expeditions of Ruiz and Pavón to Peru and Chile, those of Sessé and Mociño to New Spain, and those of Luis Née of the Malaspina expedition.[26]

Cavanilles put Humboldt in contact with his fellow countryman Juan Bautista Muñoz, who was able to provide him with important Americanist documentation, as at that time he was organizing the General Archive of the Indies – first with the support of Gálvez and then of Porlier[27] – and was preparing his unfinished *History of the New World,* based on an incalculable collection of documents and with the express intention of creating a new history of America with scientific pretensions, as Muñoz had stated to Cavanilles and in his reports reserved for the authorities.[28]

During his stay in Spain, Humboldt was also in contact with astronomers, engineers, and sailors, who provided him with data for his later work in America. We should mention the mathematician and astronomer José Chaix, who trained in Paris in 1789 and who, from 1792,

20 Rumeu de Armas (1979), pp. 301–335; Parra and Pelayo (1996), pp. 163–181.

21 Gago (1990), pp. 5–51; Gago (1998), pp. 129–142.

22 *Annals of Natural History,* No. 1, October 1799, p. 86.

23 Álvarez López (1960); Álvarez López (1964); Melón (1957), Manjarrés (1915).

24 Pelayo and Garilleti (1992). See also the dossier on Cavanilles in the journal *Asclepio,* XLVII-1, 1995, pp. 135–260.

25 ARJB, XIII, 4, 20, 4.

26 Puerto Sarmiento (1992).

27 Solano (1988).

28 Letter from Juan Bautista Muñoz to Cavanilles, 31 December 1783. ARJB, XIII, 5, 8, 8; "Idea de la obra cometida a Dn. Juan Bautista Muñoz, y del estado de ella", Madrid, 28 November 1783, ARJB, XIII, 5, 8, 9; "Razón de la obra cometida a D. Juan Bautista Muñoz", Madrid, 16 November 1785, ARJB, XIII, 5, 8, 10. On the new history of America, see Cañizares Esguerra (2001).

participated alongside Peñalver in the operations to measure the meridian arc in Spain in an enterprise directed by Jean-Baptiste Delambre and Pierre Méchain, commissioned by the Paris Academy of Sciences. A year later, Chaix moved to the Astronomical Observatory in Madrid for a few months before going to Great Britain for two years. Humboldt supported Chaix in his return to the Madrid Observatory[29]. Alexander von Humboldt played a major role in Chaix's rise and prestige at court from 1799 onward, as he recommended him to Baron de Forell to intercede with the Count de Guzmán to be assigned to the General Inspection of Roads (Spanish: Inspección General de Caminos). It should be remembered that Humboldt – who had begun his astronomical observations at the palace of the Duke of Infantado on 4 March – had collaborated with Chaix in calculating the position of some places such as Madrid and Aranjuez.[30]

Likewise, his connection with the Madrid group is definitively established if we consider his astronomical observations at Herrgen's house on Calle del Turco, with the help of Martín de Párraga, to establish the position of Madrid.[31]

Among the sailors who provided data for Humboldt's voyage, although there is no record that he knew them all personally, we should mention Martín Fernández de Navarrete and José Vargas Ponce, two of the most notable scholars of their time, closely linked to the Hydrographic Depot (Spanish: *Depósito Hidrográfico*) in Madrid,[32] as well as José Mazarredo, a close friend of Urquijo's and then head of the squadron, and Federico Gravina, the hero of Trafalgar and second in command to the former. Mazarredo's assistant was also José Espinosa y Tello, director of the *Depósito Hidrográfico* from 1797, whose work was especially praised by Humboldt, who explicitly acknowledged that he provided him with valuable information during his visit to Madrid.[33]

There is evidence of later cooperation between Humboldt and Felipe Bauzá, who succeeded Espinosa in directing the *Depósito Hidrográfico* and was exiled in London from 1823. Their collaboration began in 1804, after the conclusion of Humboldt's voyage through America.

However, Humboldt's engagement with the *Depósito Hidrográfico* had already started earlier. In April 1804, he had sent some of his observational results from Havana to José Espinosa, demonstrating his involvement in scientific exchanges even before his formal collaboration with Bauzá.

Additionally, Humboldt expressed his gratitude to José Espinosa for the support he had received in Mexico, specifically acknowledging the contributions of Espinosa's brother, Manuel Espinosa, to his work.

There is also evidence of a later cooperation between Humboldt and Felipe Bauzá, Espinosa's heir in the direction of the *Depósito Hidrográfico* and exiled in London from 1823, from 1804,

29 Garma (1994); Rumeu de Armas (1980).

30 Jahn and Lange (1973), p. 655 and pp. 667–676.

31 *Anales de Ciencias Naturales,* No. 7, January 1801, pp. 78–84, No. 8, February 1801, pp. 163–170, No. 11, July 1801, pp. 131–147, No. 12, October 1801, pp. 302–321.

32 On the activities of the Hydrographic Repository and the new cartography, see Capel (1982).

33 Fernández de Navarrete (1851).

after the conclusion of the voyage through America,[34] although collaboration with the *Depósito Hidrográfico* had already begun before that, since in April 1804 Humboldt had already sent some results of his observations from Havana to José Espinosa, to whom he also thanked his brother Manuel Espinosa for the collaboration he had received in Mexico.[35]

José Joaquín Ferrer y Cafranga, a member of the Philadelphia Philosophical Society, together with Chaix, Bauzá, Jorge Juan and the geographer Isidoro de Antillón, were the authorities cited by Alexander von Humboldt in his main work on the Iberian Peninsula, published by the journal *Hertha* in 1825, in which he effectively discovered the main characteristics of the peninsula's geography, such as the connection of its plains and the presence of the plateau,[36] and revealed some of his research throughout his journey, always contrasting his measurements with those of the Spanish scientists.[37] Alexander von Humboldt's contributions during his time in Spain were undoubtedly his contributions to peninsular geography, which he made known in a limited way to Germans in the journal *Hertha* and to the French and Spanish through the publication of the *Notice sur la configuration du sol de l'Espagne et son climat,* included in Laborde's *Itinerario,*[38] as well as his reflections on the geography of plants and volcanism in the Canary Islands.[39] Even more important seems to be his global and radically modern conception, which appears in the Memoir he presented to King Carlos IV when he requested the American voyage, a remote foretaste of his most beloved project, the description of the Cosmos.

Humboldt and the Hispanic Scientists on Their American Journey

In this section, we will basically focus on the relationship between Humboldt and Bonpland and the peninsular and Creole scientists and personalities in the American territory, to elucidate to what extent the Prussian scholar and his companion received help and collaboration in their exploration and in the subsequent preparation of results for their important American work[40].

In Venezuelan territory, the Orinoco River and the exploration of the connection with the Amazon basin, which was already known to the indigenous people and which the Jesuit priest Manuel Román had communicated to the King of Spain in 1742, should be highlighted. In the balance of Humboldt and Bonpland's journey along the Orinoco, on which they were accompanied by the Spaniards Nicolás Soto and Father Bernardo Zea, it is worth mentioning their scientific recognition of the Casiquiare, the mapping of the Orinoco, Apure, Meta, Guaviare and Caura, the discovery of new animal and plant species, and their analysis of the substances used

34 Bauzá (1994).

35 Letter from Alejandro de Humboldt to José Espinosa, dated Havana, 25 April 1804. Museo Naval, Madrid, Ms. 132, "Observaciones y padrones de América", volume I, doc. 5, fols. 370–372.

36 Melón and Ruiz de Gordejuela (1960); Díez del Corral (1975).

37 Humboldt (1825).

38 Laborde (1809). Published in Spanish as *Itinerario descriptivo de las provincias de España y de sus islas y posesiones en el Mediterráneo,* Valencia: Imp. de Ildefonso Mompié, 1816, pp. 5–10 of the Atlas del *Itinerario* with two plates (2 and 3).

39 Humboldt (1995).

40 For the case of New Granada, it is essential to consult Gómez Gutiérrez (2018).

in the exploration of the Orinoco. This includes his analysis of the substances used to cure and kill in the jungle, among which the famous curare stands out, and his anthropological observations of the indigenous people, such as the Otomacos, ball players and earth ball eaters, and those of some extinct tribes as the authors of the petroglyphs they were able to observe along their journey[41]. As for Humboldt's comments on Spanish scientists, it must be said that in his *Voyage aux régions équinoxiales du nouveau continent,* in the part corresponding to his arrival in Cumaná, where the enlightened Vicente Emparán ruled, he alluded to Félix de Azara's zoological work in Paraguay and highlighted the observations of Fidalgo and other Spanish sailors, collected in Espinosa y Tello's work.[42]

Alexander von Humboldt's figure and, more specifically, his knowledge of Cuba has caused a strong controversy among historians. For the most conservative, some of them even detractors, Humboldt's work is reduced to a compilation of data on Cuba – especially Havana – offered to him by personalities such as Francisco de Arango y Parreño, Antonio del Valle Hernández and the chemist Francisco Remírez, among others, which he recorded in his *Essai politique sur l'île de Cuba*[43], published in Paris in 1826 and translated into Spanish a year later. Although the Havana City Council withdrew some copies of Humboldt's work because of his criticism of the slavery, the book was known and used by most Cuban scientists, from Ramón de la Sagra and Felipe Poey in the 19th century to the present day, and has become an obligatory reference work in the study of Cuban history and science.

His meticulous analysis of the data allowed him to produce a work of synthesis, in which the conclusions are much richer and more relevant than the data simply presented by other authors. Likewise, his knowledge derived from his own observations meant that on many occasions they differed from the data presented by some of the people who received him in Cuba, especially on issues related to slavery: its economic valuation, its moral justification, and its importance as a system on which a society was built. It should be remembered that the Berlin scholar and the French botanist arrived in Cuba in mid-December 1800 and stayed in the homes of the Cuesta and Count O'Reilly families. In addition to these personalities, Humboldt and Bonpland were in contact with a part of the Spanish-Habanero elite of the time, including the intendant José Pablo Valiente, the Marquis of Casa Calvo, the Counts of Mopox and of Jaruco, the Counts of Casa Peñalver and the Counts of Casa Peñalver and of Jaruco, counts of Casa Peñalver, Bayona, Santa María de Loreto, counts of Lagunillas, as well as Francisco de Arango y Parreño, José Agustín Caballero, Antonio del Valle Hernández, O'Farrill, and the botanist José Antonio de la Ossa. He also acted as a naturalist, with collections of Cuban flora and fauna, all of which allowed him to establish comparisons of the island with other nations, although his travels around the island were limited.[44]

41 Rodríguez García (2004).

42 Espinosa y Tello (1809).

43 Humboldt (1826).

44 Humboldt (2021).

The Map of the Magdalena River and the Controversies with Vicente Talledo y Rivera

As Sergio Mejía indicates, the engineer Vicente Talledo arrived in Cartagena de Indias at the same time as the viceroy, who commissioned two works on the Magdalena River, one constructive and the other cartographic, although the order seems to have come from the previous viceroy Pedro Mendinueta y Musquiz, who already had a copy of Humboldt's work on the Magdalena River. Talledo was to revise Alexander von Humboldt's map of the Magdalena River, something that was to be a colossal merit for this engineer turned cartographer. During his fifteen years in the New Kingdom of Granada, Talledo worked on different commissions, but the main one was the construction of the cartography of the New Kingdom. In this sense, his enormous cartographic work must be highlighted, constructing local maps and three versions of the *Corographic Map of the New Kingdom of Granada*.

In mid-1803, Mendinueta requested from José Celestino Mutis "two copies of the topographical chart drawn up by Mr. Alexander de Humboldt", entitled *Carta del curso del Río de la Magdalena desde Honda hasta el Dique de Mahates (Chart of the course of the Magdalena River from Honda to the Mahates Dam, based on astronomical observations made in April, May and June 1801).* Talledo must have received one of these copies in Cartagena in October 1803, and the following month he began his geographical and cartographic work, which was completed in this first phase in May 1804, going up the Magdalena River accompanied by the pilot Manuel Álvarez de Eulate, a close collaborator of Mutis and especially of José Ignacio de Pombo. One of the most relevant results of Talledo and Álvarez's commission was the *Plano corográfico de una porción del Nuevo Reyno de Granada que comprehende el curso del Río de la Magdalena desde la entrada del Río Saldaña en el Magdalena hasta el lugar de Barranca Nueva o del Rey* (Chorographic plan of a portion of the New Kingdom of Granada that includes the course of the Magdalena River from the entrance of the Saldaña River into the Magdalena to the place of Barranca Nueva or del Rey), dated by Talledo on 15 May 1810 in Mompox. The *chorographic plan* includes an explanatory note in which the engineer explains that due to the lack of a chronometer, his calculation of longitudes was "disadvantageous" with respect to Humboldt's. Therefore, starting from his measurements, he determined the "courses [of the river] according to the currents, their variety, non-uniformity [sic] of the force of the bogas and by latitudes deduced from the meridian heights of the Sun, observed with a proven sextant". Despite this statement, which declares Humboldt's possible metric superiority, Talledo was able to prove that, after some measurements at the Astronomical Observatory of Santafé with a telescope and a longitude clock to observe dives of the first satellite of Jupiter, he deduced the longitude of this city at 76º 24' 26" (with a difference of 10' 04" with respect to Humboldt's, which was 76º 34' 30"), a very appreciable difference.

As Mejía indicates in his admirable work, Talledo had spent almost six months on his commission, between November 1803 and April 1804, while Humboldt had produced his map in less than a month and a half. The Prussian scholar later acknowledged that his map, drawn up in Santa Fe in August 1801, had been the result of astronomical and barometric observations taken during a 65-day navigation. Humboldt also explained that he had not been able to take into account the topographical peculiarities found in the map published in London by Don Vicente Talledo and the pilot Manuel Álvarez de Eulate who had also used sextants and other instruments, although he doubted the possible use of chronometers and the use of his own measurements taken in 1801, instead of those published by Oltmanns in 1811 *in the Collection of Astronomical Observations.* Talledo had accepted many of Humboldt's latitude and lon-

gitude measurements, correcting only in seconds most of them (except Guarumo, Guaduas and Santafé), but he did correct the different river directions and the places in between.

In Mejía's opinion, Talledo's map was superior in the catalogue and location of islands, turns, mouths of tributaries, and neighbouring relief. Unlike the *Carta,* the engineer's *Plano* was a chorographic map of the river, its valley, and mountainous spurs on both banks, whereas Humboldt had limited himself to a linear representation of the river. Mejía recognizes that the *Carta del curso del Río de la Magdalena de Humboldt* was of great value from a cartographic point of view, as he established for the first time the characteristic lathes of Tamalameque and Barrancabermeja, which determined its characteristic wedge shape towards the east. However, Talledo's map of the Magdalena acquired great value as it became the axis of calculation for the general cartography of the New Kingdom of Granada.[45]

Scientific Relations with Mutis and His School

Humboldt's relationship with Mutis was quite fluid, and it was the Prussian scholar who was most interested in visiting the Cadiz doctor in his refuge in Santa Fe de Bogotá to see his herbariums, his library, and his drawings. This visit followed his time in Cartagena de Indias, where he met Pombo and had the privilege of following the work of the Fidalgo expedition. This expedition was very useful in describing the tropical floras, which resisted being classified by the strict Linnaean system and, as Humboldt himself would later see, fitted better into the natural systems of classification that his friend Jussieu was trying to develop at the time. Both Bonpland and Humboldt frequently acknowledged the debt they owed Mutis for his help in resolving their botanical doubts, and already in Ecuador they "felt the lack of his advice which was much needed" regretted not having his valuable advice.[46] Despite these statements, the very representation of Nature in Humboldt's work marked a departure from the strictest Enlightenment vision. Without disregarding the *icons* typical of Linnaean descriptions, which represented the singularity of a species, which Humboldt and Bonpland would use in their taxonomic works, Humboldtian *paintings* sought a global and synthetic representation of natural regions and a new aesthetic sense of a romantic nature, combining the cold rationality of the Enlightenment with the subjective feeling of the scientist when contemplating Nature. Humboldt himself would comment many years later – in the eulogistic biography dedicated to him in Michaud's biographical dictionary – on the great impression produced by the collection of two thousand plates that he had been able to recognize in his meeting with the Spanish naturalist. He highlighted forty-three of passion flowers and one hundred and twenty of orchids, in addition to the botanical collection put together with his disciples Valenzuela, Zea and Caldas.[47] He also commented in the same text on the violent disappearance of Mutis's disciples due to the intervention of General Morillo in 1816, which included Francisco José de

45 Mejía (2021).

46 The study of the contact between Mutis and Humboldt can be done very well through the manuscripts preserved in the *Royal Botanical Garden* and perfectly classified in *Catálogo del Fondo Documental José Celestino Mutis del Real Jardín Botánico,* Madrid, Instituto Colombiano de Cultura Hispánica – Real Jardín Botánico, 1995.

47 *Biographie Universelle ancienne et moderne.* Publiée sous la direction de M. Michaud, Paris, A. Thoisnier Desplaces Éditeur, 1843, pp. 658–662.

Caldas, José Joaquín Camacho, José María Carbonell, Jorge Tadeo Lozano, Miguel de Pombo and Salvador Rizo, some of the main disciples and collaborators of José Celestino Mutis.[48]

Humboldt's appreciation of Mutis is evident. In a letter to Jean-Baptiste Delambre dated 25 November 1802, Humboldt praised the hundred drawings given to him by the Cadiz scholar and sent to the Institut National, which have not been found. On a negative note, mention should be made of Lagasca's reproach to Humboldt for not giving more specific credit to Mutis and his draughtsmen, largely corrected in the biography published by Michaud, for getting from them the model he would later use in his botanical work. Humboldt and Bonpland had dedicated their work *Plantae aequinoctiales,* published in Paris in 1805, to José Celestino Mutis as the director of the Botanical Expedition of the Kingdom of New Granada and royal astronomer in Santa Fe de Bogotá, "as a shy token of admiration and recognition".[49]

The struggle for priority was present in Humboldt's writings. In the preface to his work, Humboldt insisted on the greater extent of his botanical exploration in comparison with the expeditions of Mutis, Ruiz y Pavón or Sessé, Mociño and Cervantes. Regarding Mutis he commented:

> Long before us, Mr. Mutis examined the forests of Turbaco, the beautiful banks of the Madeleine and the environs of Mariquita; but this great botanist, whose kindnesses impose eternal gratitude on us, was unable to penetrate the Andes of Quindiu into the provinces of Popayán and Pasto. It is in these regions, on the banks of the Cauca and on the high plateau stretching from Almaguer to the town of Ibarra, that we have collected precious plants.[50]

A little later, the Prussian scholar insisted on the originality of his botanical work, despite explicitly acknowledging the previous work of the Spanish naturalists who had travelled the American territory collecting new species, sometimes without naming them:

> We undoubtedly possess many of the plants found in the herbaria of our friends Mr. Mutis, Mr. Ruiz, Mr. Pavón, Mr. Cervantes, Mr. Mociño and Mr. Sessé: having her-borized in countries with a similar climate, it is natural that we have encountered the same plants. It will be a gentle duty for us to indicate what we owe to these famous botanists; but it will not be our fault if, unaware of their work, we sometimes give new names to genera to which they may have intended others long before us.[51]

48 Glick (1991).

49 Puig-Samper, Maldonado and Fraga (2004).

50 "M. Mutis a examiné, long-temps avant nous, les forêts de Turbaco, les belles rives de la Madeleine et les environs de Mariquita; mais ce grand botaniste, dont les bontés nous imposent une reconnoissance éternelle, n'a pas pu pénétrer par les Andes de Quindiu dans les provinces de Popayán et Pasto. C'est dans ces régions, sur les bords du Cauca et sur le haut plateau qui s'étend d'Almaguer jusqu'à la ville d'Ibarra, que nous avons recueilli des végétaux précieux." Humboldt and Bonpland (1805), I, p. II.

51 "Nous possédons sans doute beaucoup de plantes qui se trouvent dans les herbiers de nos amis, MM. Mutis, Ruiz, Pavón, Cervantes, Mociño et Sessé: ayant her-borisé dans des pays qui juissent d'un climat analogue, il est naturel que nous ayons rencontré les mêmes végétaux. Ce sera pour nous un devoir bien doux à remplir que d'indiquer ce que nous devons à ces botanistes célèbres; mais ce ne sera notre faute si quelquefois, ignorant leurs travaux, nous donnons de nou-

The Geography of Plants. It's Relationship with Caldas

Alexander von Humboldt's trip to Popayán and Ecuador has left a certain bittersweet taste in American historiography due to Humboldt's treatment of Francisco José de Caldas and his categorical refusal to allow this protégé of Pombo and Mutis to accompany him on his American trip. The situation must have been somewhat complicated if we consider the comments of José Celestino Mutis in a letter to Alexander von Humboldt, dated 21 May 1802 in Santafé, in which he practically apologized for his recommendation of Caldas as a possible companion for the Prussian scholar and asked Humboldt to break his silence, which Mutis attributed to the discomfort caused by Caldas' pressure to accompany Humboldt on his voyage. On the contrary, Humboldt spoke in praise of his other disciple, Carlos Montúfar, who had been recruited in Quito:[52]

> During the whole of this part of the journey, they were accompanied by Mr. Charles Montufar, son of the marquis of Selva-alegre, of Quito, a person zealous for the progress of science, and who is, at his own expence, rebuilding the pyramids of Saraqui (sic)[53], the extremity of the celebrated bases of the *triangles* of the Spanish and French academicians. This interesting young man having followed Mr. Humboldt in the remainder of his journey through Peru and the kingdom of New Spain, is now on his passage with him to Europe.[54]

Likewise, the same historiography raises doubts about the scientific honesty of Humboldt with respect to Caldas and his similar hypsometric and plant levelling experiments, leaving in the air the possible priority of the Neo-Granadine scholar in question.[55] This issue also arises with the discovery and description of the quines.[56] Although the merit of Caldas, who had been able to make precise astronomical measurements with poor instrumentation, is unquestionable. Humboldt himself highlighted his merit as an astronomer on different occasions, from Popayán and in Ibarra, which rules out a rivalry in this field of science. Likewise, in the biographical profile of Mutis in Michaud's *Biographie Universelle,* Humboldt highlighted the merit of Caldas' botanical work, together with that of Valenzuela and Zea, that of the director of the Astronomical Observatory of Santafé and that of editor of the *Semanario del Nuevo Reino de Granada,* lamenting his death sentence by General Morillo.[57]

In another field, Caldas cannot be credited with giving priority to the idea of the *Geography of Plants* that Humboldt would later develop. It must be admitted that Caldas may have agreed with the Prussian scholar in the search for a new dimension in the geographical distribution of the plant world, as can be seen in the drawings still preserved in the Royal Botanical Garden concerning the levelling of plants. Caldas' situation is clear in a letter to Humboldt, dated

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veaux noms à des genres auxquels ils peuvent en avoir destiné d'autres long-temps avant nous". Ibid., p.V.

52 Puig-Samper and Rebok (2002).

53 Pyramids of Yaruquí.

54 *The Literary Magazine and American register for 1804,* Filadelfia 1804, tomo II, pp. 321–327, p. 324.

55 As an example, see the book *Francisco José de Caldas* (1994), Bogotá, Molinos Velasquez. A more balanced view can be found in Saladino García (1990).

56 Cuvi (2022).

57 *Biographie Universelle ancienne et modern,* pp. 658–662.

17 November 1802 in Otavalo, in which the Neo-Granadian scholar adopted a humble, perhaps excessive, attitude in comparing his work with that of Alexander von Humboldt:[58]

> But what a difference in their work! Humboldt full of light, wise, equipped with excellent instruments and accompanied by Bonpland, that is to say, associated with Linne; Caldas ignorant, obscure, with miserable instruments and alone.

Caldas himself, in the translation of the *Geography of Plants* (Spanish: *Geografía de las Plantas*) published in the *Semanario del Nuevo Reino de Granada* by Jorge Tadeo Lozano, points out the importance of the new discipline created by Humboldt and does not dispute this controversial priority[59]. Caldas commented in the same work that he had taken the liberty of correcting some of the Prussian scholar's observations in a note:

> We who have travelled within the Viceroyalty, by order and at the expense of the Royal Botanical Expedition of Santafé, and of D. Josef Ignacio de Pombo, who have visited many places which are common to us with Humboldt, in a word, who have closely followed the steps of this illustrious traveller, with the same objects and with the Geography of Plants in hand, seem to be authorised to warn the public of what we have noticed about this interesting production of the voluntary martyr of Galvanism.[60]

On the other hand, Caldas himself acknowledged in a letter to José Celestino Mutis how he had had in his hands the draft of the *Geografía,* which he would later use in his work:

> Mr. Baron de Humboldt, who left Guayaquil two months later, sent into the hands of Mr. Marquis de Selva-Alegre a tin can, containing a Memoir on the Geography of Plants. I do not know for what reason he retained it in his possession for a long time, and did not give it to me to be sent by my hand, according to the will of the Baron himself. I have detained it for fifteen days to take a copy, and I send it now accompanied by a friolera of mine almost of the same kind, which I hope you will receive with kindness.[61]

58 "Pero ¡qué diferencia de trabaxos, Humboldt lleno de luces, sabio, provisto de excelentes instrumentos y acompañado de Bonpland, es decir, asociado á Linne; Caldas ignorante, obscuro, con instrumentos miserables y solo." Staatsbibliothek zu Berlin – Preußischer Kulturbesitz. Diaries of A. von Humboldt, VII bb/c, pp. 474–476.

59 Nieto Olarte (2007).

60 "Nosotros que hemos viajado dentro del Virreinato, por orden y a expensas de la Real Expedición Botánica de Santafé, y de D. Josef Ignacio de Pombo, que hemos visitado muchos lugares que nos son comunes con Humboldt, en una palabra, que hemos seguido de cerca los pasos de este viajero ilustre, con los mismos objetos y con la *Geografía de las Plantas* en la mano, parece que nos hallamos autorizados para advertir al público lo que hemos notado sobre esta producción interesante del *mártir voluntario del Galvanismo*", Caldas, Francisco Joseph de (1809), pp. 124–126.

61 "El Sr. Barón de Humboldt, que partió a dos meses de Guayaquil, remitió a manos del Sr. Marqués de Selva-Alegre un cañón de lata, que contenía una Memoria sobre la Geografía de las Plantas. Éste no sé por qué motivo la retuvo en su poder mucho tiempo, y no me la entregó para su remisión por mi mano, según la voluntad del mismo Barón. Yo la he detenido quince días para tomar una copia, y la remito ahora acompañada de una friolera mía casi en el mismo género, que espero la reciba V. con bondad", letter from Francisco Joseph de Caldas to José Celestino Mutis, Quito, 21 April 1803, Archivo del Real Jardín Botánico de Madrid, III, 1, 1, 41.

For some authors, such as Alberto Gómez Gutiérrez[62], this fact only hides a certain ploy on Humboldt's part not to explicitly acknowledge Caldasparallel work in biogeography. Gómez Gutiérrez argues that what I have interpreted as a generous gesture on Humboldt's part would be nothing more than clear evidence of anxiety and the need for Mutis to validate his work against Caldas' parallel biogeographical work.

The *Memoir on the Levelling of some plants we grow in the vicinity of Equador* (Spanish: *Memoria sobre la Nivelación de algunas plantas que cultivamos en las cercanías del Equador*), signed by Caldas in Quito on 6 April 1803, despite Caldas' explicit acknowledgement of Humboldt, contains comments that mark the priority of other authors or of himself on some points. In the preamble to his work, he specifies how his measurements of vegetation levelling began in 1796 and shortly afterwards he comments on how he could have used Humboldt's recent barometric measurements, but that it had not been necessary as he had those made by the expedition of La Condamine, "which have not altered Humboldt's later investigations"[63].

Perhaps the categorical statement that the Andean volcanic chains were the key element for the development of this idea by Humboldt, who had already made reflections in this sense in his ascent of Mount Teide in Tenerife, should be qualified. Although it is possible that the empirical experience in the Andes consolidated his first hypotheses with sufficient strength, as Humboldt himself stated in the Preface to his *Essay*:

> I conceived the idea of this book during my earliest youth. I gave a first sketch of a Geography of Plants in 1790 to Cook's famous companion, Mr. Georges Forster, with whom I had close ties of friendship and gratefulness. My later research in various areas of physics helped me reach a wider understanding of my initial ideas. My trip to the tropics furnished me with precious materials for the physical history of the globe. I wrote the major part of this work in the very presence of the objects I was going to describe, at the foot of the Chimborazo, on the coasts of the South Sea. I thought it's best to keep the title *Essay on the Geography of Plants.*[64]

Humboldt also Acknowledged the contributions of his colleague Bonpland, co-author of most of the observations and truly the specialist in the field of descriptive botany, as well as other authors to whom he owed some consultation, such as Laplace, Biot, Sickler, Delambre and Prony. More specifically related to plant geography, he was expressly grateful for the data provided by De Candolle on the Alps and by Ramond on the Pyrenees, without forgetting those already known from his teacher Wildenow. And about Caldas …, absolute silence, until 1826,

62 Gómez Gutiérrez (2023 and 2024).

63 *Memoria sobre la Nivelación de algunas plantas que cultivamos en las cercanías del Equador,* signed by Caldas in Quito on 6 April 1803, ARJB, III, 4, 11, 43.

64 Humboldt (1990), pp. VI–VII. "C'est depuis ma première jeunesse que j'ai conçu l'idée de cet ouvrage. J'ai communiqué la première esquisse d'une Géographie des plantes, en 1790, au célèbre compagnon de Cook, M. Georges Forster, à qui l'amitié et la reconnoissance m'avoient étroitement lié. L'étude que j'ai faite depuis de plusieurs branches des sciences physiques a servi à étendre mes premières idées. Mon voyage aux tropiques m'a fourni des matériaux précieux pour l'histoire physique du globe. C'est à la vue même des grands objets que je devois décrire, c'est au pied du Chimborazo, sur les côtes de la mer du Sud, que j'ai rédigé la plus grande partie de cet ouvrage. J'ai cru devoir lui laisser le titre d'*Essai sur la Géographie des Plantes*". (Humboldt and Bonpland (2009), p. 61).

when he was mentioned in the prospectus of the new Geography of Plants that Humboldt planned with Kunth, entitled *Geography of plants based on a comparison of vegetation phenomena on the two continents* (French: *Géographie des plantes rédigé d'après la comparaison des phénomènes que présente la végétation dans les deux continents*).[65]

Another singular element in the recognition of Humboldt and his contributions to the geography of plants must also be considered, which is the representation of it in an impressive drawing, the first sketch of which dated from 1803. Indeed, the spectacular drawing that accompanied his work published in Paris added other scales such as horizontal refractions, descent of light, atmospheric composition, decrease of gravity, degree of boiling water at different heights (something Caldas had shared with him), geological considerations, limits of perpetual snow or even the scale of the distances from which the mountains were visible from the sea. He appeared at last as the image of totality and comparison in the study of Nature, something so dear to his friend Goethe, who shortly afterwards dedicated to him a drawing or sketch of the main heights of the two continents, showing Humboldt at the foot of Chimborazo in contrast to two other champions of science and heights: Saussure on Montblanc and Gay-Lussac flying 3600 feet up in his marvellous hot-air balloon.

As Nieto Olarte[66] points out, concerned about the Eurocentric view of the history of science, the works of Caldas and Humboldt are quite parallel, and we must recognize the value of those carried out by the Neo-Granadian with scarce means, as well as his contribution to the measurement of altitudes through his experiences with the boiling temperature of water. On the other hand, Humboldt was more interested in describing global phenomena in the natural world, while Caldas in his studies and levellings seemed to be more concerned with the usefulness of plants and their cultivation according to altitudinal levels. It is evident that Caldas would be greatly influenced by the geographical thinking of the Prussian baron and that the latter would be influenced by the ideas and scientific practices of the scientist from Nueva Granada, in an encounter in which European and American science complemented each other, albeit with some friction.[67]

The dissemination of Humboldt's work in Europe and his ability to communicate science made him the absolute founder of this type of study in the centers of power of European science. Humboldt's snub of Caldas, replaced by Carlos Montúfar, after enjoying the Babylon joys of Quito and a wonderful stay at the hacienda of the Marquis of Selva Alegre,[68] had, in the opinion of Amaya and Suárez Lozano, a clear explanation. Humboldt understood that Caldas was attached to his scientific commission to observe, copy, duplicate his collections and learn from everything the Prussian did, by direct order of José Celestino Mutis, who wanted to place a "scientific spy" next to the Prussian scholar.[69] Although Caldas accused Humboldt of having become a young Telemachus, distanced from science in favour of passions, Humboldt wrote in his diary that in the hacienda of Chillo of the Marquis of Selva Alegra he had finished the maps of the Orinoco, of the Rio Negro and of the countries to the east of them, calculated his

65 Humboldt and Kunth. (1826), Bl. 1–2.

66 Nieto Olarte (2008).

67 Arias de Greiff (2001).

68 Moreno Yáñez (ed.) (2005), pp. 27–32.

69 Amaya and Lozano (2018).

astronomical observations made from Santa Fe de Bogotá, taught Carlos Montúfar to draw up plans and military positions, made experiments on electricity, measured the Pichincha, etc.[70]

Humboldt in Peru

Of Humboldt's contacts with Juan José Tafalla and José Agustín Manzanilla, the continuators of the Royal Botanical Expedition to Peru and Chile that had been led by Hipólito Ruiz and José Pavón, we could say something similar about their affable relations, although the experience was sourer because of the latter's polemics with Mutis and Cavanilles. In Humboldt's work, there is an express recognition of the importance of the taxonomic work carried out by this Spanish scientific expedition, as shown in Humboldt's letter to Pavón from Guayaquil.[71] However, there is no lack of cross-criticism due to Humboldt's clear position with Mutis and Cavanilles. There was a strong controversy over the issue of the quinas, always charged with economic and political undertones, in which Humboldt agreed with Mutis and Zea regarding the priority of his discovery of the quinas of New Granada over the claims of Sebastián López Ruiz, positioned with Ruiz and Pavón. The Prussian scholar also disputed the validity of the classifications of the quinas by Ruiz and Pavón, which earned him a strong reprimand from the pages of the *Mercurio de España* in June 1807.[72]

As for Humboldt's passage into Peru's national imagination, the situation seems very different from that of New Granada. Perhaps his observations on the dire situation of Lima and its inhabitants, known from his letter to the governor of Jaén de Bracamoros, Ignacio Checa, his irony about Lima society – reflected in his *Diary*[73] – and his criticism of the Inca Empire have weighed more negatively than the praise of some Peruvian intellectuals. Although it has traditionally been said that Humboldt's judgement of Peruvian elites was negative, we find in the account written in Philadelphia a noteworthy exception in his praise of Lima and its Creole inhabitants:

> They remained some months in this interesting capital of Peru, of which the inhabitants are distinguished by the vivacity of their genius, and the liberality of their ideas. Mr. Humboldt had the good fortune to observe the end of the passage of Mercury over the sun's disk, in the port of Callao. He was astonished to find, at such a distance from Europe, the most recent productions in chemistry, mathematics, and medicine; and he found great activity of mind in the inhabitants, who, in a climate where it never either rains or thunders, have been falsely accused of indolence.[74]

70 Moreno Yáñez (ed.) (2005), p. 120.

71 "Carta de A. de Humboldt a José Pavón, Guayaquil 13 de febrero de 1803", Archivo de la Real Academia Nacional de Medicina, Madrid, ser. 16, leg. 42, doc. 2257.

72 "Critical observations on the botanical part of Mrs. Humboldt and Bonpland's voyage, divided into two parts. The first on the genus *cinchona* or cinchona, and the second on the seven species of the genera *ceroxylon, matisia* and *freziera,* published by Mr. Amato Bonpland in his work entitled *Plantae aequinoctiales,* and some of which were previously published in the Quinología y Flora Peruviana. Por D. Hipólito Ruiz y D. Josef Pavon", *Mercurio de España,* June 1807, pp. 224–247.

73 The transcription of the Diary in Spanish by Vegas Vélez (1991) and more recently by Núñez and Petersen (2002).

74 *The Literary Magazine and American register for 1804,* Filadelfia 1804, tomo II, pp. 321–327, p. 325.

We should also comment on Alexander von Humboldt's relationship with the Basque pilot José de Moraleda y Montero on his journey to Guayaquil on his way to Mexico. The pilot wrote in his travel diary that Humboldt was his passenger on his journey. Moraleda rightly wrote that Humboldt intended to make "a general physics of the world" while Aimé Bonpland "observes and treats the part of Natural History, and of the customs of the various countries, and Medicine". Moraleda, an admirer of these two scientists, criticized the fact that this type of exploration was carried out so quickly, covering these immense countries in such a short time.[75] Rafael Sagredo points out how Moraleda, an experienced pilot in the exploration of the coasts of the South Sea, was in command of the war corvette *Castor* in December 1802, in which he transported Humboldt and Bonpland from Lima to Guayaquil, on their voyage to Acapulco. The pilot was able to take advantage of the watch Humboldt was carrying to take longitude measurements during the voyage. In his diary, he described the Prussian baron's work, giving his opinion of it, and he also mentions the use of the thermometer on the voyage. Moraleda also commented on the clues that led Humboldt to characterize the marine current that bears his name.[76]

Humboldt in New Spain

Alexander von Humboldt's arrival in New Spain was an important milestone in his American journey. Humboldt discovered a complex society, with a highly developed ancient culture from his point of view, and a capital comparable to any of the most important European cities. As for Humboldt's relationship with peninsular and Creole scientists in this viceroyalty, we know that he was able to meet Vicente Cervantes, director of the Botanical Garden in Mexico, highly praised in Humboldt's letter to Cavanilles in 1803 from the capital of New Spain. Cervantes had belonged to *the Royal Botanical Expedition to New Spain,* which carried out its work between 1787 and 1803, directed by Martín Sessé, with the collaboration of some Mexican scientists and draughtsmen, including José Mariano Mociño.[77]

Humboldt's contact with the School of Mining in Mexico, directed by Fausto de Elhuyar, with outstanding professors such as Friedrich Sonneschmidt and Andrés Manuel del Río, was very productive and left a clear mark in his *Political essay* (Spanish: *Ensayo político*), where he also shows his intellectual debt to other scholars such as Alzate, Velázquez de León and Gama. Humboldt was also a close collaborator of the *School of Mining in Mexico,* participating in the work of Andrés Manuel del Río, his former classmate in Freiberg, *Elementos de orictognosia,* in 1805, with an *Introduction to geological pasigraphy.* He was also the intermediary in sending the new element discovered by Andrés Manuel del Río, erythronium – later called vanadium – to the *Institut national de France,* although the error in the analysis caused him to momentarily lose the priority of del Río in favour of Nils Gabriel Sefström, which led Humboldt to intervene again to clarify the priority of his colleague and friend.[78]

The presence of outstanding scholars in New Spain contradicted the ignorance that European pride held against the Creoles, and demonstrated that it was not the climate that was to blame

75 Ríos Llaneza (2012).

76 Sagredo Baeza (2008).

77 San Pío and Puig-Samper (eds.) (2000); Labastida et al. (2010).

78 Castillo Martos (2021); Uribe Salas (2024).

for the supposed apathy or lack of moral energy, but isolation and the lack of social institutions. Among these, Humboldt singled out José Antonio Alzate, correspondent of the *Académie des Sciences in Paris* and the *Real Jardín Botánico in Madrid,* editor of the *Gaceta de Literatura,* so influential in Mexican cultural life, and who maintained a strong polemic with the naturalists of the *Royal Botanical Expedition,* opposing native science to the new European scientific paradigms. The Prussian baron did not fail to praise some peninsular scientists and technicians, such as the engineer Miguel Constanzó, who provided him with important data for his work:

> This scholar, as modest as he is profoundly learned, has collected over the past thirty years everything related to the geographical knowledge of the vast kingdom of New Spain. He is the only engineering officer who has dedicated himself to deeply examining the differences in longitude at the points furthest from the capital. He has himself drawn up many important plans in which we can already see how ingenious combinations can, to a certain extent, replace astronomical observations. I have greater satisfaction in doing this justice to Mr. Constanzó, especially since I have seen in the archives many manuscript maps in which the scales of longitude and latitude are nothing more than an accidental embellishment.[79]

Humboldt also made special mention of Antonio León y Gama, for his studies on ancient Mexican culture, as well as Joaquín Velázquez, who had accompanied José Gálvez on his visit to Sonora and was commissioned to California, where he carried out valuable astronomical work, even superior to that of the Spanish-French expedition led by Chappe d'Auterauche in 1769,[80] later organizing the famous *Tribunal de Minería* and the *Escuela de Minería* in the capital.

Without going into the details of the book that was the result of Humboldt's visit to New Spain, which we leave pending for a new edition, we did want to mention the vindication that the Prussian scholar made of Spanish science and technology. This includes naturalists such as Martín de Sessé, José Mariano Mociño, Vicente Cervantes, José Antonio Alzate or the old chroniclers of the Indies, as well as erudite clerics such as Cardinal Lorenzana or the Jesuit Francisco Javier Clavijero, and technicians such as his friend Andrés Manuel del Río, Fausto de Elhuyar, Joaquín Velázquez de León, and Miguel Constanzó. The most striking aspect, which he would later repeat in the *Critical review of the history of the Geography of the New Continent* (French: *Examen critique de l'histoire de la Géographie du Nouveau Continent*),[81] is the vindication of the Spanish pilots and sailors who explored the American continent and its islands for three centuries, which rules out the contempt that, according to some authors, Humboldt showed towards Hispanic science and technology.

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79 "Este sabio, tan modesto como profundamente instruido, ha recogido de treinta años a esta parte cuanto tiene relación con el conocimiento geográfico del extenso reino de Nueva España. Es el único oficial de ingenieros que se ha dedicado a examinar profundamente las diferencias en longitud de los puntos más lejanos de la capital. Ha formado por sí mismo muchos planos importantes en los cuales ya se ve cómo pueden reemplazar, hasta cierto punto, las combinaciones ingeniosas a las observaciones astronómicas. Yo tengo mayor satisfacción en tributar esta justicia al señor Constanzó, tanto más cuanto he visto en los archivos muchos mapas manuscritos en los cuales las escalas de longitud y de latitud no son más que un adorno accidental", Moncada Maya (1994), pp. 28–29.

80 Bernabéu Albert (1998).

81 Humboldt (1836).

Humboldt and Jefferson. The Delivery of Maps of Mexico. Fact and Fiction

One last aspect we would like to recall is Alexander von Humboldt's visit to President Thomas Jefferson. As Rebok[82] has pointed out, the relationship between the two was mutually beneficial. Jefferson was interested in Humboldt's information on the Hispanic territory in America and in his scientific work on his journey. From the correspondence between them, we know that part of their meeting was devoted to discussing the border between Nueva España and the United States. Alexander von Humboldt translated into French for Thomas Jefferson the *Geographical-political Tables*, which he had drawn up for the viceroy of New Spain, José de Iturrigaray. Jefferson at the time expressed his pleasure at this contact with Humboldt, considering the information he had to be a treasure, although Humboldt does not seem to have considered that he was giving confidential information to President Jefferson. Rebok considers that some scholars speculated that Alexander von Humboldt may have been a spy for the Spanish Empire. Others, following Juan A. Ortega y Medina, in his introduction to the Mexican edition of the *Political Essay on the Kingdom of New Spain* (Spanish: *Ensayo político sobre el reino de la Nueva España*), questioned the integrity of the scientist's decision to share information from the Spanish archives with Thomas Jefferson, arguing that forty-three years later, this information had been of great use to the United States when it invaded Mexico and seized part of its territory. As Jaime Labastida has studied, the information Humboldt gave to President Jefferson in 1804 was much less detailed than what he published between 1808 and 1811 in his work on New Spain.[83]

Concluding remarks

As Fermín del Pino points out, in the face of the criticism of post-colonial revisionist historiography, Alexander von Humboldt "was able to show a remarkable capacity for immersion in foreign worlds and an irrepressible curiosity for the global encounter of societies that, even today, is instructive and liberating"[84]. It is clear that his figure should not be sanctified, and that he probably had some of the defects that we scientists share in our relationship with other academics in the legitimate struggle for the priority of discovery and the advancement of knowledge. However, criticism of his figure and his r work must be situated in a setting that is close to historical reality without forcing the details to achieve the objective of undervaluing his scientific work with the argument of possible Eurocentrism and taking advantage of the unhappy scientists and academics of the Hispanic world. The brief overview of his career in this world shows us that the Prussian scholar produced scientific work of synthesis of knowledge about the New World, undoubtedly using the previous advances made by peninsular, insular and Creole scientists, with fair credit to his works, with due credit to his works and to the Crown that supported him on his journey.[85] As I have noted elsewhere[86], Humboldt did not claim to be a solitary genius, even if European science elevated him to the height of a star in the constellation of science. His passion for the Iberian discoveries and the scientific advances of Spain

82 Rebok (2019).

83 Labastida (2003).

84 Pino (2022).

85 Puig-Samper and Garrido (2016).

86 Puig-Samper (2024).

and Portugal in his *Examen critique de l' histoire de la Géographie du Nouveau Continent* proves his admiration for this Iberian revolution, unknown to Anglo-Saxon historiography. Likewise, there is unquestionable admiration for the work of the chroniclers and historians of the New World, such as Juan Bautista Muñoz or Martín Fernández de Navarrete, his most prominent and cited sources along with Washington Irving, as well as for the Iberian cartography developed since Columbus' arrival in America. It is not true that Humboldt appeared as an obscure and biased character against Spain and its empire in the Indies. There may have been some cases in which there were confrontations in the conclusions of his works, as in the case of the quinas of Ruiz y Pavón, with differences in the measurements, as happened with Alzate and Talledo, or a simultaneous finding, as could be the case of the geography of plants developed by him and Caldas, with somewhat different but parallel visions. This does not mean that there was a manifest abuse in the elaboration of the American work that transformed the European vision of the New World at the end of the Enlightenment and the beginning of Romanticism.

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