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Research Article

Martius and *Flora Brasiliensis*, Names Not to be Forgotten•

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There are three stages of scientific discovery: first people deny it is true; then they deny it is important; finally they credit the wrong person. (...)
How a person masters his fate is more important than what his fate is.

Alexander von Humboldt

Abstract

This article focuses the life and work of the German botanist and explorer Karl Friedrich Philipp von Martius (1794-1868), notably his *Flora Brasiliensis*. Martius' most important work is an unrivalled (and well succeeded) attempt to classify the plants (mostly angiosperms) of Brazil, a country of continental dimensions that encompasses one third of South America; in spite of the fact that the *Flora Brasiliensis* became a standard reference for the identification of Brazilian and South American vegetation in general, in Brazil, Martius and his magnificent work have been systematically relegated to oblivion.

Keywords: Martius; Flora Braziliensis; Brazil; Plants; Nature

Introduction: without plants...

The following lines concern the life and work of the German naturalist Karl Friedrich Philipp von Martius (1794-1868), notably his *Flora Brasiliensis*. Martius' most important work is an unrivalled (and well succeeded) attempt to classify the plants (mostly angiosperms) of Brazil, a country whose surface of 3.2 million square miles encompasses almost one third of South America[1]; no wonder that the *Flora Brasiliensis* became a standard reference for the identification of Brazilian and South American vegetation in general[2]. One should bear in mind that, "In the face of the enormous amount of diversities of the natural world, man instinctively classifies. He divides this diversities in more accessible groups"[3]. Without classification, which is an information storage and retrieval system, "there would be chaos"[4]. Not surprisingly, the fact is that.

•The following text broadly reproduces the conference I gave during the 2nd European Plant Science Conference, held in Milan, Italy, in October 18th, 2019. I must express my gratitude to Ms Eva Jones for the invitation and the organization of the Congress, as to Ms Despo Evangelou, who brilliantly coordinated the event *in loco*; in Brazil, the same applies to Ms Maria da Penha Ferreira and Ms Rosana Medeiros, from the Library of Rio de Janeiro's Botanic Garden, as well as to Ms Cristina Mamouros, from the Library of the Tércio Pacitti Institute of the Federal University of Rio de Janeiro, for their generosity in giving of their time to finding most of the works I read to prepare my conference. I am also grateful to my colleague, Professor B. Mink, who helped me in the review of the final text; to my cousin, the Botanist Jorge Pedro Pereira Carauta (in memoriam), who was the first person to tell me about Martius and his *Flora Brasiliensis*; and to the Federal University of Rio de Janeiro, who funded my voyage to Italy.

[1]See Karl Friedrich Philip Von Martius. "A fisionomia do reino vegetal no Brasil" (translated from German into Portuguese by Ernesto Niemeyer and Carlos Stellfeld), in Arquivos do Museu Paranaense, v. III, 1943, p. 1.295.

[2]"All living things were traditionally placed into one of two groups, plants and animals. This classification may date from Aristotle (384 BC-322 BC), who made the distinction between plants, which generally do not move, and animals, which often are mobile to catch their food. Much later, when Linnaeus (1707-1778) created the basis of the modern system of scientific classification, those two groups became the kingdoms Vegetabilia (later Metaphyta or Plantae) and Animalia (also called Metazoa). Since then, it has become clear that the plant kingdom as originally defined included several unrelated groups, and the fungi and several groups of algae were removed to new kingdoms. However, such organisms are still often considered plants, particularly in popular contexts. The term 'plant' generally implies the possession of the following traits: multicellularity, possession of cell walls containing cellulose, and the ability to carry out photosynthesis with primary chloroplasts" (https://en.wikipedia.org/wiki/Plant#Definition [2019]).

[3]Vernon H. Heywood. Taxonomia vegetal (translated from English into Portuguese by Kurt G. Hell), São Paulo, Companhia Editora Nacional/Universidade de São Paulo, 1970, p. 17.

[4]Id., p. 18.

Naming and classifying our surroundings has probably been taking place as long as mankind has been able to communicate. It would always have been important to know the names of poisonous and edible plants and animals in order to communicate this information to other members of the family or group. Medicinal plant illustrations show up in Egyptian wall paintings from c. 1500 BC, indicating that the uses of different species were understood and that a basic taxonomy was in place[5].

Unquestionably one of the most important books of Botanic of all time, the *Flora Brasiliensis* is, to this day, the unique Brazilian flora that can be considered complete, so to say. Besides, it stands out not only for its scientific content and background, but also for the monumental scale of the work as a whole (that is to say, the physical size of its dozens of volumes) and the beauty of its illustrations. Until 2004, there was no such a large flora project completed in the world; in that year, the Flora Republicae Popularis Sinicae ("Flora of the People's Republic of China") was published and surpassed it in terms of size.

As we all know, without plants, there would be neither irrational animals, nor us, who are animals too. One should always bear in mind that.

Plants help in maintaining oxygen balance, the most important gas that enables us to breathe. Animals emit carbon dioxide by taking in oxygen. This rise in carbon dioxide levels in air is reduced by plants. Removal of carbon dioxide from the atmosphere reduces the greenhouse effect and global warming. It also maintains the ozone layer that helps protect Earth's life from damaging UV radiation[6].

Last but not least, what about Agriculture, this magnificent practice of cultivating plants which enabled "enabled the human population to grow many times larger than could be sustained by hunting and gathering"? [7].

Martius: a genius not duly prized

In Amazonian rainforests alone, whose unparalleled biodiversity was diligently studied by Martius *in loco* during a whole year (1819-1820), lives one in ten known species of our planet. Notwithstanding, many Brazilians never heard neither about Martius nor of his work. Even the distinguished New dictionary of written works of all times and all countries, Paris, Laffont/Bompiani) makes absolutely no mention of Martius' opus magnum in the field of Botanic. It is high time to save the *Flora Brasiliensis* from oblivion, and the 2nd European Plant Science Conference, held in 2019, seems to me a perfect occasion for it, since this year we also celebrate the 200th anniversary of Martius' journey to the Amazonian rain forest, authentic tropical vegetal maze "dark as Hell and tangled as chaos"[8].

Martius was among the many European researchers-scientists (they would be more accurately described as polymaths: people who are "very knowledgeable in many different subjects"[9]) that followed the footsteps of his fellow countryman Alexander von Humboldt and Aimé Bonpland [10]; to name just a few, Adalbet von

[5]M. Manktelow et alii. https://en.wikipedia.org/wiki/Taxonomy_(biology)#History (2019). "The Swedish botanist Carl Linnaeus (1707-1778) ushered in a new era of taxonomy. With his major works Systema Naturae, Species Plantarum and Systema Naturae, he revolutionized modern taxonomy. His works implemented a standardized binomial naming system for animal and plant species, which proved to be an elegant solution to a chaotic and disorganized taxonomic literature. He not only introduced the standard of class, order, genus, and species, but also made it possible to identify plants and animals from his book, by using the smaller parts of the flower. Thus the Linnaean System was born, and is still used in essentially the same way today as it was in the 18th century. Currently, plant and animal taxonomists regard Linnaeus' work as the 'starting point' for valid names (at 1753 and 1758 respectively). Names published before these dates are referred to as 'pre-Linnaean', and not considered valid (with the exception of spiders published in Svenska Spindlar, from the Swedish arachnologist and entomologist Carl Alexander Clerck). Even taxonomic names published by Linnaeus himself before these dates are considered pre-Linnaean" (Ib.).

[6]Supriya Sarma**.** http://www.scienceindia.in/home/view_article/59 (2019).

[7]Jean-Pierre Bocquet-Appel et alii. https://en.wikipedia.org/wiki/Agriculture#History (2019).

[8]Karl Friedrich Philip Von Martius. "A fisionomia do reino vegetal no Brasil", in Arquivos do Museu Paranaense, op. cit, p. 1.298.

[9]Jane Bradbury et alii. Collins-Cobild English Dictionary, London, HarperCollins, 1995, p. 1.274.

[10]See, for instance, Sigrid Achenbach. Kunst um Humboldt. Reisestudien aus Mittel- und Südamerika von Rugendas, Bellermann und Hildebrandt im Berliner Kupferstichkabinett, Munique, Hirmer, 2009, pp. 17-25 et passim.

Chamisso, Friedrich von Kittlitz, Eduard Poeppig, Wilhelm Ludwig von Eschwege[11]. Humboldt, between 1799 and 1804, travelled extensively in the Americas, exploring and describing them for the first time from a modern scientific point of view. His description of the journey was written up and published in an enormous set of volumes over 21 years. Humboldt was one of the first to propose that the lands bordering the Atlantic Ocean were once joined (South America and Africa in particular)[12].

Martius himself, primarily a botanist, was not alone in his scientific adventure in the Tropics; he came, travelled and worked in the company of Johann Baptist von Spix (1781-1826), primarily a zoologist[13]. During a period of three years (1817-1820), Martius and Spix travelled more than 6.200 miles (on foot, by boat and on the back of donkeys and mules) and had the opportunity of seeing and analysing all of the most important types of Brazilian vegetation, which trend to gigantism reminds the Carboniferous geologic period (358.9 million years ago (Mya) to 298.9 Mya), a time when giant plants literally covered the Earth [14].

Universal genius of Italian descent[15] and endowed with an opened-mindedness typical of his generation (suffice it to remember Alexander von Humboldt!), Martius engaged in correspondence with Goethe, another German giant that is also a paradigm for that second to none period of the History of Culture, namely the 19th century. Still quite young, in 1817, Martius, together with Spix, was sent to Brazil by the king of Bavaria, Maximilian I Joseph. After arriving in Rio de Janeiro (turned into capital of the very Portuguese Empire in 1808 and main port of Brazil), they travelled across Brazilian southern and eastern lands; then, they headed for Amazonia, by that time a land of Cockaigne par excellence for every single researcher whose aim was Nature, as was exactly the case of Martius and Spix – a kind of Nature, that of the New World pioneered by Christopher Columbus and his followers, which Martius described as an entity whose overwhelming power overcomes every living being, including man[16]. Back in Europe three years later, they immediately began to publish the results of their experience, starting with the account of the remarkable voyage they made, which was given the suitable name Reise in Brasilien ("Travels in Brazil"). In parallel with this, Martius was given a leadership position in the Botanic Garden of Munich; in 1826 (the year Spix died prematurely of schistosomiasis, a disease he contracted in Brazil, seven years before) he was appointed as professor of Botany in the Munich's University. Both offices were held by Martius until 1864, when he was already a septuagenarium, four years before his own death.

Martius and his delving in the matters of a foreign country

Martius' chief attention was devoted to Brazil's flora. Apart from various short essays, Martius produced the Nova Genera et Species Plantarum Brasiliensium (1823-1832) and Icones selectae Plantarum Cryptogamicarum Brasiliensium (1827). Besides, "An account of his travels in Brazil appeared in three volumes between 1823 and 1831, with an atlas of plates, but probably the work by which

[11]See Gerd-Helge Vogel. "Zwischen Eldorado und Gelobtem Land. Deutsche Künstler als Forscher und Exilanten in der Neuen Welt", in Die Welt im Grossen und im Kleinen: Kunst uns Wissenschaft im Umkreis von Alexander von Humboldt und August Ludwig Most (book organized by Gerd-Helge Vogel), Berlin, Lukas Verlag, 2009, p. 23.

[12]Helmut Thielicke et alii. https://en.wikipedia.org/wiki/Alexander_von_Humboldt (2019).

[13]See Gerd-Helge Vogel. "Die Pflantze in der Kunst Amerikas", in Pflanzen, Blüten, Früchte: botanische Illustrationten in Kunst und Wissenschaft (book organized by Gerd-Helge Vogel), Berlin, Lukas Verlag, 2014, p. 155.

[14]See Johannes Ebert et alii. Die grosse Chronik Weltgeschichte: vom Urknall zu den ersten Lebensformen: von 13.7 Mrd bis 292 Mio., Gütersloch/Munique, Wissen Media, 2008, v. I, p. 297 et passim; und Stefan Rahmstorf and Katherine Richardson. Wie bedroht sind die Ozeane? Biologische und physicalische Aspekte, Frankfurt am Main, Fischer, 2007, pp. 58-59 et passim.

[15]Martius family came from Umbria; one of his ancestors was the humanist, poet, philosopher and astrologer Galeotti (Galeotto) Marzio (Martius), who lived 15th century (see Hermann Merxmüller. Carl Friedrich Philipp von Martius [translated from German into Portuguese by Guido F. J.Pabst], São Paulo, Instituto Hans Staden, 1971, p. 6).

[16]"A fisionomia do reino vegetal no Brasil", in Arquivos do Museu Paranaense, op. cit., p. 1.294.

[17]Hugh Chisholm et alii. https://en.wikipedia.org/wiki/Carl_Friedrich_Philipp_von_Martius (2019). "Martius described approximately 70 genera and 400 species as new to Science. Like most botanists who visited the Amazon, palms in particular attracted his attention, and he spent nearly thirty years studying them. He described hundreds of new species of palms in his Historia Naturalis Palmarum (1823-1853). The first part of this monumental work included current knowledge on palms from all over the world and was one of the first attempts to provide a classification of the family. In the second part of Historia Naturalis Palmarum, Martius described and illustrated with lavish color plates the palms he had observed in the Amazon, including 85 as new species, 54 of which are accepted by The Palms (1995) by the NYBG's own Andrew Henderson. Nevertheless, it was Carl Georg Oscar Drude, not Martius, who published the treatment of the palms for *Flora Brasiliensis* in 1881 and 1882, some 17 years after Martius' died" (Scott Mori. "*Flora Brasiliensis:* How a 19th-Century Flora Continues to Inspire", in https://www.nybg.org/blogs/plant-talk/2013/05/science/flora-brasiliensis-how-a-19th-century-flora-continues-to-inspire/ [2019]).

he is best known is his Historia naturalis palmarum (1823-1850), published in three large folio volumes, in which all known genera of the palm family are described and illustrated. The work contains more than 240 chromolithographs, with habitat sketches and botanical dissections"[17]. What is more, "On the outbreak of potato disease in Europe he investigated it and published his observations in 1842. He also published works and short papers on the aborigines of Brazil, on their civil and social condition, on their past and probable future, on their diseases and medicines, and on the languages of the various tribes, especially the *Tupi*"[18].

In a sense, those were all preludes for his opus magnum, namely the *Flora Brasiliensis*, which he began in 1839, assisted by the best European botanists. Sponsored by illustrious characters such as Emperor Ferdinand I of Austria, King Ludwig I of Bavaria and Emperor Dom Pedro II of Brazil (without whose support, such an undertaking would be close to impossible to accomplish), the work was also Martiu's swansong; the project and its publication needed to be carried on until its completion after his death (1868) by A. W. Eichler (1839–1887), one of his collaborators, and subsequently by the botanist Ignatz Urban (1848-1931), born eight years after the *Flora Brasiliensis* was initiated by Martius and the Austrian botanist Stephan Endlicher (1804-1849). In 1906, the titanic work obtained its final shape, with its more than one hundred fascicles, dozens of them composed by Martius himself.

Enriched by drawings, engravings and paintings made by artists like Thomas Ender, Benjamin Mary and Johan Jacob Steinmann – let alone the photos taken by the photograph George Leuzinger –, the more than 20.000 pages of the *Flora Brasiliensis* contain descriptions of more than 20.000 species of plants – almost 6.000 of them described as new to Science at that time[19]. In their attempt to "describe the wealth of Brazilian flora"[20], Martius and his collaborators show the Nature of the Tropics in its most amazing exuberance and variety. Fully in line with the Romantic tradition, Brazilian vegetation and landscapes in general are given an aesthetic approach in the *Flora Brasiliensis* [21]. It would be no exaggeration to consider the *Flora Brasiliensis* a work of art.

Still very young (that means, as soon as he arrived back in Europe, returning from Brazil), Martius became the kind of man that "Academies and Scientific Associations dispute the honour of having him as member"[22]. Nonetheless, Martius has not been properly praised in the scientific world. The eminent German botanist, professor and writer Julius von Sachs (1832-1897) does not even mention Martius in his History of Botanic from the 16th century until 1860. In Brazil, Martius and his magnificent work have been systematically relegated to oblivion. As "consolation prize", his name was given to a street near the Botanic Garden of Rio de Janeiro, what must be considered a positive and well-intentioned measure [23]. Ironically, however, for Rio's population in general, rua Von Martius (Von Martius Street) is illustrious not because of the historical character evoked by such a name. Reduced to a mere flatus vocis, "Von Martius" nothing more became than the name of the street where Rede Globo has its headquarter – not forgetting that Rede Globo, one of the largest media networks on Earth, has became a stronghold of political correctness that uses its enormous power to misinform and brainwash Brazilian population, imposing on it the left-wing totalitarian blueprint. Under the banner of the communist cliché I am as good as you, Rede Globo promotes a dictatorship of mediocrity and the consequent abolishment of true education

[18]Hugh Chisholm et alii. https://en.wikipedia.org/wiki/Carl_Friedrich_Philipp_von_Martius (2019).

[19]It is worth remembering that "botanical line drawings continue to be the most informative way to allow others to understand the features of plants" (Scott Mori. "*Flora Brasiliensis*: How a 19th-Century Flora Continues to Inspire", in https://www.nybg.org/blogs/plant-talk/2013/05/science/flora-brasiliensis-how-a-19th-century-flora-continues-to-inspire/ [2019]).

[20]"Propositum nobis est Florae Brasiliensis divitias discribentibus" (Karl Friedrich Philipp von Martius et alii. *Flora brasiliensis*: enumeratio plantarum in Brasilia hactenus detectarum : quas suis aliorumque botanicorum studiis descriptas et methodo naturali digestas partim icone illustratas, Munich and Leipzig, R. Oldenbourg, 1840-1906, v. I, p. 11).

[21]See Heitor Assis Junior. "Litografias e obras artísticas na *Flora Brasiliensis*", in Revista de História da Arte e Arqueologia, 2011, v. 15, pp. 95-110; see also Karl Friedrich Philipp Von Martius and Johann B. Von Spix. Viagem pelo Brasil: 1817-1820 (translated from German into Portuguese by Lúcia F. Lahmeyer), São Paulo, Itatiaia/USP, 1981, p. 11 et passim; and Paulo Ormindo et alii. Natureza, ciência e arte na viagem pelo Brasil de Spix e Martius: 1817-1820, Rio de Janeiro, Andrea Jakobsson Estúdio, 2018.

[22]Hermann Merxmüller. Carl Friedrich Philipp von Martius, op. cit., p. 9.

[23]For an overview of Rio de Janeiro's natural landscape, see Jorge Pedro Pereira Carauta. "Naturalista na Guanabara. Quatro séculos de impressões", in Boletim Geográfico, Rio de Janeiro, IBGE, n. 200, year 26, September/October 1967, pp. 3-20.

and all other positive values a healthy human society should aim at[24]. Were the author of the *Flora Brasiliensis* alive today, he would certainly feel ashamed of what Brazil, his second homeland, has become[25].

Conclusion

With a few exceptions, it would be really difficult to find another researcher that delved so deeply in the matters of a foreign country as the German naturalist Karl Friedrich Philipp von Martius did with Brazil, "country bathed by an ocean that separates and unites all things"[26] – a statement Eichler had already made more than one hundred years ago, and that remains valid today.

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[24]"In a word, we may reasonably hope for the virtual abolition of education when 'I'm as good as you' has fully had its way. All incentives to learn and all penalties for not learning will vanish. The few who might want to learn will be prevented; who are they to overtop their fellows? And anyway the teachers – or should I say, nurses? –will be far too busy reassuring the dunces and patting them on the back to waste any time on real teaching. We shall no longer have to plan and toil to spread imperturbable conceit and incurable ignorance among men. The little vermin themselves will do it for us" (C. S. Lewis. The Screwtape Letters, Nova York, Harper One, 1996, pp. 204-205; see also Tom Nichols. La conoscenza e i suoi nemici. L'era dell'incompetenza e i rischi per la democrazia [translated from English into Italian by Chiara Veltri], Roma, LUISS, 2019, pp. 229-230).

[25]Still on the theme of the *Flora Brasiliensis*, it must also be recalled that Martius' opus magnum became "an authentic school for the new generation of taxonomists, such as Engler, Eichler, Braun, Warming, Rohrbach, Sendtner, Koernicke and Progel" (Hermann Merxmüller. Carl Friedrich Philipp von Martius, op. cit., p. 13).

[26]Karl Friedrich Philip Von Martius. "A fisionomia do reino vegetal no Brasil", in Arquivos do Museu Paranaense, op. cit., p. 1.295.

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