REVISTA DE LA ACADEMIA
COLOMBIANA DE CIENCIAS
EXACTAS, FÍSICAS Y NATURALES

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Material suplementario

The pioneering scientific endeavor and contributions of José María González Benito (1843-1903), the first Colombian modern astronomer

Los esfuerzos y aportes científicos de José María González Benito (1843-1903), el primer astrónomo moderno colombiano

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Contenido

5.2 Mars

Schiaparelli selected the four images shown in the left panel in **Figure 6,** which served to stress his ideas that there were narrow and dark areas on Mars, which, according to his hypothesis, were channels possibly built by an intelligent civilization on the red planet. Below we present the transcription of JMGB's report:

The construction of the large building that today constitutes the Flammarion Observatory, was not completed in the most favorable time for observing Mars (August-September, 1892) and the new instruments are not yet installed, thus we had to limit ourselves to using the assembled instrument in the temporary installation, namely: an excellent Secretan equatorial telescope, 0m,108 and a Bardou telescope of 0m,095; however, we were able to successfully perform the strongest magnifications that these facilities, both due to the considerable altitude of our Observatory above sea level (2640 m) than from the great height of the planet above the horizon, from the clarity of the sky and the calm of the atmosphere for several nights" and complemented it with "convinced of the great difficulty that the observation of Mars represents and not having at the moment powerful enough devices to pretend to study the channels discussed and so interesting there, we limit ourselves to studying the most outstanding configurations and details: we present what we have really seen. On 1st August, at 10 p.m., under a magnificent sky, the look was admirable; the southern polar cap appeared in dazzling and still widespread light, embroidered with a rather accentuated dark line bearing a strongly marked notch at the 300° meridian.

The boreal region was quite white like the outline of the star: the central parts showed a very pure matt white, and the dark regions were painted a very soft greenish-gray tone and slightly dark in the center.

And follows

From August 7 to 8, the southern cap showed in a sufficiently clear way the dark notch around the 300° meridian with a tendency to expand and that reached its maximum greatness from August 14 to 17.

*The report from JMGB was followed by the letter signed by Schiaparelli (**Figure 8S**) commenting on the Colombian astronomer's drawings (**Flammarion**, 1909): "These observations are particularly interesting, given the altitude of this observatory established on the equator (4°35'48'' N). At the height of 2640 m, the atmosphere is very clear. Mr. González is a careful and sincere observer. Of the 24 drawings that the wise founder of this equatorial establishment wanted to direct us, we chose four to be annexed here in our general documentation. Remarkably, the polar notch and the Main Sea (Lake Mœris) could be observed with the aid of a 108 mm. As for the decrease in the red coloration of the planet with its elevation in the sky, this may be due in part to an effect of our atmosphere that acts on the coloration of the Moon and the Sun, and in part to the objective of the lens, less achromatize, perhaps, by the blue and violet rays".*

Figure 1S: Historical photos of the OAN. Left: In 1870 with the original configuration when JMGB assumed his first period as director of the institution. Middle: In 1898, with the new dome installed at the beginning of that decade under the direction of JMGB (repository of the Biblioteca Nacional de Colombia). Right: In 2022, showing a top view of the main room with the meridian on the floor during the zenithal day on April 1st at 12:00 m (local time). Photo taken by the authors.

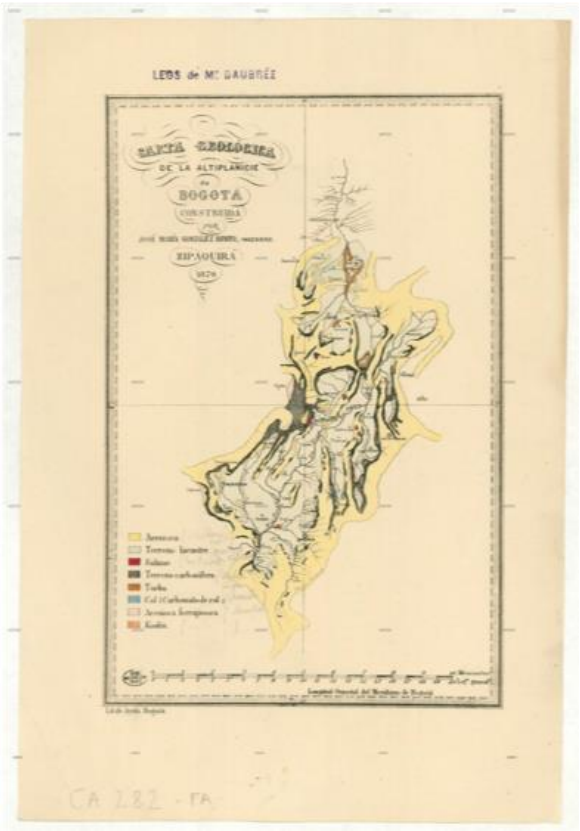
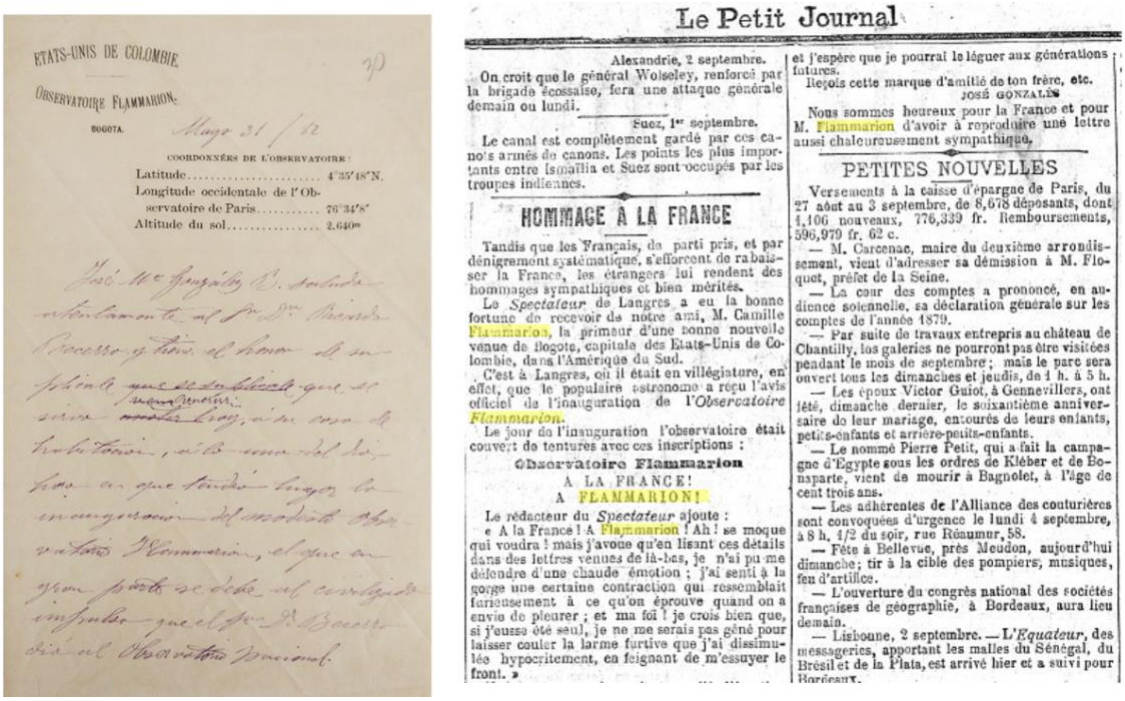


Figure 2S: Geological chart of the Bogotá plateau, published in 1870, which after 8 years of work by JMGB was donated by him to the National Government. With this work JMGB obtained the honorable mention in the outstanding Exhibition of the National Industry of 1871, the most important in the country (repository of the Biblioteca Nacional de Colombia).

Figure 3S. Memorial plaque installed by JMGB in 1881 at the OAN to acknowledge the reinstatement of astronomical observations with the new instrumentation. Photo taken by the authors.



ETATS-UNIS DE COLOMBIE.

OBSERVATOIRE FLAMMARION.

BOGOTA. Mayo 31 / 82

COORDONNÉES DE L'OBSERVATOIRE :

Latitude..... 4°35'48"N.
Longitude occidentale de l'Observatoire de Paris..... 76°34'8"
Altitude du sol..... 2.640m

Le Petit Journal

Alexandrie, 2 septembre.

On croit que le général Wolseley, renforcé par la brigade écossaise, fera une attaque générale demain ou lundi.

Suez, 1er septembre.

Le canal est complètement gardé par ces canots armés de canons. Les points les plus importants entre Ismaïlia et Suez sont occupés par les troupes indiennes.

HOMMAGE A LA FRANCE

Tandis que les Français, de parti pris, et par dénigrement systématique, s'efforcent de rabaisser la France, les étrangers lui rendent des hommages sympathiques et bien mérités.

Le *Spectateur* de Langres a eu la bonne fortune de recevoir de notre ami, M. Camille Flammarion, la primeur d'une bonne nouvelle venue de Bogota, capitale des Etats-Unis de Colombie, dans l'Amérique du Sud.

C'est à Langres, où il était en villégiature, en effet, que le populaire astronome a reçu l'avis officiel de l'inauguration de l'*Observatoire Flammarion*.

Le jour de l'inauguration l'observatoire était couvert de tentures avec ces inscriptions :

Observatoire Flammarion
A LA FRANCE!
A FLAMMARION!

Le rédacteur du *Spectateur* ajoute :

« A la France ! A Flammarion ! Ah ! se moque qui voudra ! mais j'avoue qu'en lisant ces détails dans des lettres venues de là-bas, je n'ai pu me défendre d'une chaude émotion ; j'ai senti à la gorge une certaine contraction qui ressemblait furieusement à ce qu'on éprouve quand on a envie de pleurer ; et ma foi ! je crois bien que, si j'eusse été seul, je ne me serais pas gêné pour laisser couler la larme furtive que j'ai dissimulée hypocritement, en feignant de m'essuyer le front. »

et j'espère que je pourrai le léguer aux générations futures.

Reçois cette marque d'amitié de ton frère, etc.

JOSÉ GONZALÈS

Nous sommes heureux pour la France et pour M. Flammarion d'avoir à reproduire une lettre aussi chaleureusement sympathique.

PETITES NOUVELLES

Versements à la caisse d'épargne de Paris, du 27 août au 3 septembre, de 8,678 déposants, dont 1,106 nouveaux, 776,339 fr. Remboursements, 596,979 fr. 62 c.

— M. Carcenac, maire du deuxième arrondissement, vient d'adresser sa démission à M. Floquet, préfet de la Seine.

— La cour des comptes a prononcé, en audience solennelle, sa déclaration générale sur les comptes de l'année 1879.

— Par suite de travaux entrepris au château de Chantilly, les galeries ne pourront pas être visitées pendant le mois de septembre ; mais le parc sera ouvert tous les dimanches et jeudis, de 1 h. à 5 h.

— Les époux Victor Guiot, à Gennevilliers, ont fêté, dimanche dernier, le soixantième anniversaire de leur mariage, entourés de leurs enfants, petits-enfants et arrière-petits-enfants.

— Le nommé Pierre Petit, qui a fait la campagne d'Egypte sous les ordres de Kléber et de Bonaparte, vient de mourir à Bagnolet, à l'âge de cent trois ans.

— Les adhérentes de l'Alliance des couturières sont convoquées d'urgence le lundi 4 septembre, à 8 h. 1/2 du soir, rue Réaumur, 58.

— Fête à Bellevue, près Meudon, aujourd'hui dimanche ; tir à la cible des pompiers, musiques, feu d'artifice.

— L'ouverture du congrès national des sociétés françaises de géographie, à Bordeaux, aura lieu demain.

— Lisboune, 2 septembre. — L'*Equateur*, des messageries, apportant les malles du Sénégal, du Brésil et de la Plata, est arrivé hier et a suivi pour Bordeaux.

Figure 4S: Left: Invitation to the inauguration of the Flammarion Observatory in Bogotá, on May 31, 1882 (found in the repository of the Biblioteca Nacional de Colombia). Right: Publication in the Le Petit Journal spotlighting the inauguration of the Flammarion Observatory honoring France.

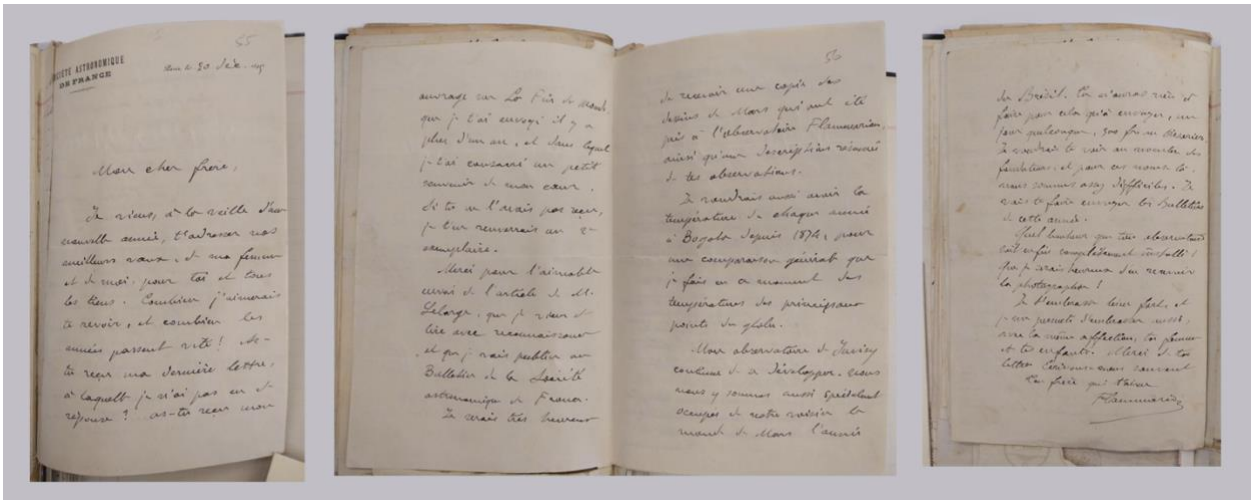


Figure 5S: Private communication sent by Flammarion to JMGB (**Flammarion,** 1895), found by the authors in the repository of the Biblioteca Nacional de Colombia.

Proposed Observatory at Bogotá, South America.

M. Gonzalez, Director of the National Observatory of Columbia, announced at the meeting that it was his intention to establish a Physical Astronomical Observatory at Bogotà, the capital of that State, at an altitude of about 3,000 mètres above the level of the sea, and in latitude 4° 30′ N. On account of the transparency of the atmosphere, M. Gonzalez believes that this observatory will be most favourably situated for delicate observations, such as the spectrum analysis of the heavenly bodies, especially of the Sun, the Zodiacal Light, &c. He intends to give up the direction of the National Observatory, so that he may be able to devote his whole attention, free from the control of the Government authorities, to this peculiar class of physical observation. M. Gonzalez expressed a desire that his private observatory might be considered as, in some measure, a dependence of this Society and the British Association, and he would therefore be happy to receive any suggestions from the leading Fellows as to the best means of utilising the observations which he hopes to make in such an exceptionally elevated locality. He is most desirous to carry out any recommendations he may receive so far as his resources will permit. M. Gonzalez will be assisted by his brother, as well as by a friend who is devotedly attached to the science.—[E. D.]

Figure 6S: JMGB proposal to the Royal Astronomical Society for the establishment of a mountain observatory in Bogotá at 3000 m.a.s.l, published in the Monthly Notices of the Royal Astronomical Society (**González,** 1874).

Figure 7S: Drawing of the great sunspot observed by JMGB in August 1893, corresponding to the growing phase of solar cycle 13, published in L'Astronomie the following year (**Flammarion,** 1894).

LETTRE DE M. SCHIAPARELLI. 77

Ces observations sont particulièrement intéressantes, étant donnée l'altitude de cet observatoire établi sur l'équateur (4°35'48" N). A cette hauteur de 2640 mètres, l'atmosphère est d'une heureuse limpidité. M. González est un observateur consciencieux et sincère. Sur les 24 dessins que le savant fondateur de cet établissement équatorial a bien voulu nous adresser, nous en avons choisi quatre pour être annexés ici à notre documentation générale. Il est remarquable que l'échancrure polaire et la mer Main (lac Mœris) aient pu être suivies à l'aide d'un 108mm. Quant à la diminution de la coloration rouge de la planète avec son élévation dans le ciel, il est possible qu'elle soit due en partie à un effet de notre atmosphère — le même que celui qui agit sur les colorations de la lune et du soleil — et en partie à l'objectif, moins achromatisé peut-être pour les rayons bleus et violets (1).

Figure 8S: Letter from the Italian astronomer Giovanni Schiaparelli published in **Flammarion** (1884), commenting on the detailed Mars observations carried out by JMGB.

vation spéciale, il n'a remarqué aucun essaim d'étoiles filantes pendant la nuit du 27, ni pendant la nuit précédente ni pendant la nuit suivante; mais, en revanche, un maximum tout à fait inattendu s'est présenté dans la nuit du 24. A partir de 8 heures du soir, voici les nombres d'étoiles filantes signalées:

De	8^h	à 9^h	750	étoiles.
	9	à 10	360	»
	10	à 11	252	»
	11	à 12	27	»
	12	à 1	25	»
	1	à 2	9	»
	2	à 3	7	»
	3	à 4	3	»
		Total.....	1433	étoiles.

On voit que le maximum a dû avoir lieu avant 8 heures du soir. Le nombre total des étoiles filantes est beaucoup plus considérable que le total indiqué; car M. Gonzalès n'avait qu'un aide, de sorte qu'un grand nombre sont passées inaperçues. Le blanc prédominait, et l'on n'a remarqué que quelques rouges, bleues et jaunes. Ces étoiles ne venaient pas, comme celles du 27, de la constellation d'Andromède, mais de celle du Lion: une carte, que M. Gonzalès nous a remise, place le radiant au nord de Régulus, près de ζ du Lion. La plupart se dirigeaient du sud-ouest vers le nord-est. Cet essaim n'appartiendrait-il pas au système des météorites du 14 novembre? Le fait est d'autant plus probable que l'inclinaison de cet essaim et de la comète Tempel de 1866, sur le plan de l'orbite terrestre, n'est que de 18 degrés.

Quoiqu'il en soit de cette pluie du 24, celle du 27 a

Figure 9S: Report from JMGB on the unknown shooting stars on the night of November 24, 1872, whose origin was the constellation of Leo published in **Flammarion** (1874).

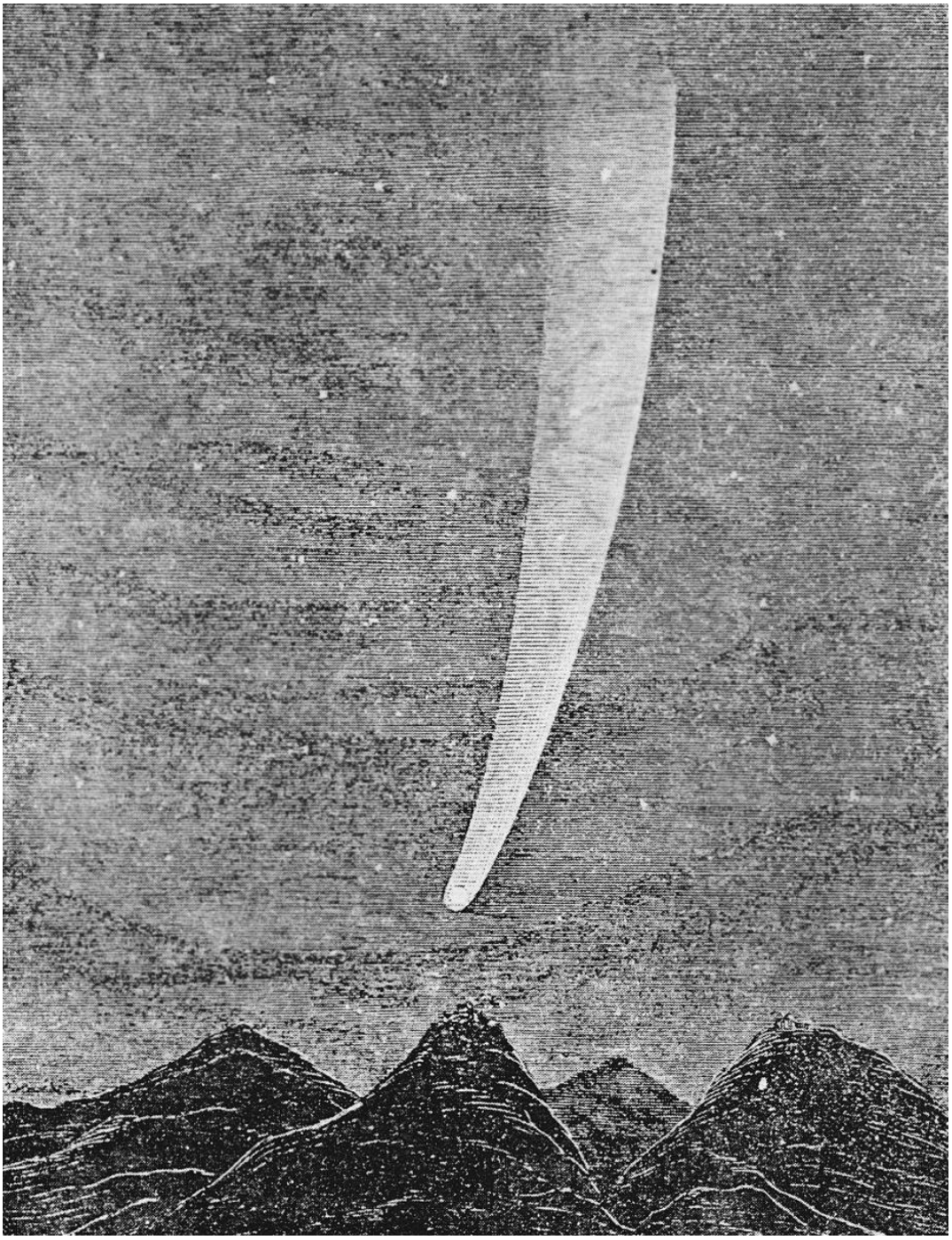


Figure 10S: Engraving of the Great Comet of 1882 made by Alberto Urdaneta as it was observed in Bogotá in September of that year. JMGB sent the report of his observation to the French Astronomical Society (**Papel Periódico Ilustrado,** 1882).

Table 1S. Ephemeris with the information about the time contacts for the transit of Venus on December 6, 1882, as presented in **González** (1882c).

Transit Phase	Time
Contact I (ingress exterior)	9h 3m 18,07s
Contact II (ingress interior)	9h 23m 33,15s
Central phase	12h 13m 2,06s
Contact III (egress interior)	3h 2m 30,97s
Contact IV (egress exterior)	3h 22m 52,14s

Table 2S. Chronology of the scientific life of the Colombian astronomer José María González Benito (JMGB).

Year	Event
1803	NAO was founded as part of the Botanical Expedition of the New Kingdom of Granada.
1843	JMGB was born in Zipaquirá on September 1.
1858	JMGB completes studies at the college and continues to receive private mathematics classes. He accompanies the engineer Manuel Ponce de León, appointed by the Government to draw up the plans of the lands of the Zipaquirá, Nemocón, Tausa and Sesquilé to make the demarcation of salt flats
1862	JMGB completes his private studies acquiring skills to raise topographic maps. JMGB is appointed as assistant to the engineer Indalecio Liévano Reyes, director of the OAN, in the design of railway lines. The study of the geology of Colombia begins, collecting various minerals and fossils in expeditions to study geological formations in various regions of the country. Redesign of the meridian at the NAO.
1863	On December 31st, JMGB's position as an assistant in the OAN culminates.
1864	JMGB is hired to carry out topographic surveys in the region of Santander. JMGB's first trip to Europe. He enrolls as a student at the Central School and attends other courses at the Sorbonne, mainly geology and astronomy. He meets Joseph Alfred Serret, Pouissex, Urbain Le Verrier, Yvon Villarcean, Jean Baptiste Élie de Beaumont, Jean-Baptiste Boussingault, Adolphe Brongniart. He is very enthusiastic about mineralogy and astronomy, acquiring books, instruments, and an abundant geological and paleontological collection.
1866	JMGB returns to Colombia. He is appointed as assistant to the Central Office of the Brigade of National Engineers, and as head of the OAN observations diary. JMGB obtains the degree of Engineer.
1867	JMGB studies with Liévano the Leonid meteor shower. Creation of the Universidad Nacional de Colombiaa.

1868	JMGB is appointed professor of Meteorology and Astronomy at the Universidad Nacional de Colombia, receiving the position of Director of the Astronomical Observatory (first term). JMGB returns to Zipaquirá to finish a geographical chart of the savannah and the highlands of Bogotá.
1870	JMGB publishes the "Geological Chart of the Plateau of Bogotá", which compiles a work that had begun more than eight years before, and which he offers as a donation to the Government.
1871	JMGB returns to Bogotá for appointment as professor of Geology and Paleontology at the Universidad Nacional de Colombia, being a pioneer in the training of students in these areas in the country. JMGB is appointed director of the OAN (second time) and principal professor of astronomy, opening in the country studies at the university level in this area, as he had done with geology and paleontology. Publication of the meteorological and astronomical observations made at the OAN in the Annals of the Universidad Nacional de Colombia. Realization of the first National Exhibition, where JMGB contributes with a copious collection of rocks, fossils and minerals of the country, together with the geological map of Cundinamarca that he had made. JMGB receives a Diploma of Honor for the geological map of the Sabana de Bogotá. JMGB is named as a member of the Academia de Ciencias Naturales, created in 1868 at the Universidad Nacional de Colombia.
1872	JMGB retirees from the Directorate of the OAN. JMGB receives membership of the Society of Light, part of the Institute of Arts and Crafts, which aims to spread useful knowledge for the country, supporting as a professor of geology courses for general public. JMGB is appointed for the third time as Director of the NAO. The OAN is temporarily closed.
1873	JMGB is appointed by decree, and for the fourth time, director of the OAN, and professor of astronomy and geodesy at the Escuela de Ingeniería, Universidad Nacional de Colombia.
1874	JMGB travels to England. He proposes the construction of a high mountain astronomical observatory in Colombia, through a publication in the journal Monthly Notices of the Royal Astronomical Society. JMGB is appointed member of the Royal Astronomical Society.

1875	JMGB returns to Colombia and acquires astronomical instruments for the OAN.
1877	Report of the shooting stars in Andromeda observed on November 24, 1876 and published in the eighth volume of the "Studies and readings on astronomy" of 1877 at the Gauthier-Villars establishment, Paris.
1878	JMGB marries María Danies Kennedy in the city of Rioacha, at the north of Colombia. JMGB's second trip to Europe.
1879	JMGB returns to Colombia. Foundation of the Flammarion Observatory in Zipaquirá
1880	JMGB receives the shipment from Mr. Secretan consisting of an equatorial telescope (number 417 of the 1874 Catalog). Creation of the Flammarion Scientific Society, corresponding member of the French Astronomical Society. JMGB is appointed for the fifth time as director of the NAO. Return to Bogotá. The physical and instrumental renovation of the OAN begins.
1881	Installation of the NAO dome, 16 cm refractor, complete weather station. The NAO is designated an area for systematic observation between declination 40 and 55 north and participates in the unification of time management.
1882	Inauguration of the Flammarion Observatory in Bogotá, in the Parque de Los Mártires, with the invitation of prominent personalities, such as the Ambassador of France, and that of Chile. The instrumentation included 12" and 8" telescopes. JMGB creates the publication "Annals of the National Astronomical Observatory of Colombia", intended to publish the works of the establishment, which completed six issues. Observation of comet 1882I on June 10. Observation of the Great September Comet on August 14 (15 days before the official sighting).
1883	Creation of the Juvisy-Sur-Orge Observatory by Flammarion in France.

1884	JMGB is invited to the World Congress in Washington where he delegates his participation. The zero meridian is adopted at Greenwich. Unification of the hour. The Flammarion Observatory moves to the three-story house number 340 on Carrera 7, former Calle de la Carrera, which will be a temporary headquarters.
1891	JMGB surrenders for good the position of director of the OAN.
1892	Construction of the definitive headquarters of the Flammarion Observatory begins, in building number 90 on 16th Street. Observation of the planet Mars.
1893	JMGB is presented by Camille Flammarion and Anatole Bouquet de La Grye to the Astronomical Society of France as a founding member. JMGB is co-founder of the Institute of Arts and Crafts of Bogotá, which sought to teach non-formal education to low-income students in the capital. Publication of the solar observations made at the Flammarion Observatory, in L'Astronomie, the great sunspot of August 1893. Observation of comet Rordame-Quénisset on July 7, 1893, before the official discovery on July 8, 1893.
1895	Relocation of the Flammarion Observatory to its definitive headquarters.
1896	Completion of the construction of the Flammarion Observatory: North latitude: 4° 36' 43", Greenwich longitude: 74° 131' 33", altitude of the ground floor: 2645 m., altitude on the roof: 2659 m. JMGB visits the eminent architect Gaston Lelarge to the Flammarion Observatory and publishes an article describing his visit.
1899	JMGB establishes links with the French Astronomical Society to participate in the project to measure the arc of the meridian at the equator. Studies the meteor shower of the Leonids.
1903	JMGB proposes the creation of the Institute of Colombia, bringing together the academies of mathematics, natural sciences, and moral and political sciences. JMGB died in Bogotá on July 28, the day before the inauguration of the Institute of Colombia that was planned to be held in the Colon Theater.