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The Paris Observatory appoints a director in 1907

Toby Peres, Jose Gomez Mena, Edmund Robertson, Isobel Falconer, John O'Connor

Félix Tisserand, the Director of the Paris Observatory, died in 1896 and Maurice Loewy (1833-1907), was appointed to succeed him as Director. Loewy, born in Vienna, had been an assistant at the Vienna Observatory but, being a Jew, could not advance to a senior position. He had moved to France, working at the Paris Observatory from 1860. When he died on 15 October 1907 the Observatory began the process of appointing a new Director. The appointment was made by the Minister after receiving advice from the Academy of Sciences and the Council of the Observatory. There were several candidates but the close call came between Guillaume Bigourdan and Benjamin Baillaud. These two men were both exceptional astronomers but had different qualities which made the choice a particularly difficult one. Their biographies are among the outcomes of a summer project, supported by the Royal Astronomical Society, to enhance the astronomy content of the MacTutor Archive. We begin by looking at their careers up to 1907.

Bigourdan, nicknamed the "Benedictine of Astronomy", was born in Sistels, France, on 6 April 1851 to peasant parents Pierre Bigourdan and Jeanne Carrère. The family name 'Bigourdan' shows that the family were originally from Bigorre. Guillaume's younger sister Marguerite was born in 1853 and his brother Sylvestre in 1857. He began his education at the village school when seven years old but at the same time he worked in the fields. Both his teachers and the local curate noticed that the young boy was highly intelligent so arranged for him to attend a boarding school in Valence d'Agen, a few kilometres from his home. Guillaume was very aware that his parents were making considerable sacrifices both by paying for his education and also by losing his assistance in the fields. He began learning Latin and his performance in all his subjects was excellent.

Graduating from the school in Valence d'Agen, Bigourdan began studying at the University of Toulouse, while teaching at a boarding school to support himself. He was awarded his Bachelor of Science degree from Toulouse in 1870, followed by a degree in physics in 1874, and in mathematics in 1876. He caught the attention of one of his teachers, Félix Tisserand, who offered him the post of assistant astronomer at the Toulouse Observatory provided he first studied at the École d'Astronomie in Paris. After graduating from the École d'Astronomie, Bigourdan began work at the Toulouse Observatory in 1877.

Baillaud, who was three years older than Bigourdan, had gone through a more rigorous university training in Paris. He was born on 14 February 1848 in Chalon-sur-Saône, in the attic of the house at 9 Place de l'Obélisque above the Brasserie du Tonneau d'Or. His father, Joseph Désiré Baillaud (1811-1889), was an employee at the City Hall in Chalon who had served in the military for seven years, and instilled

the importance of education in his son. Benjamin was one of seven children, two of whom died young. His mother was Anne Antoinette Rosalie Zoé Jouvenot (1824-1880). The family were poor and Benjamin might have had to leave school young to get a job had it not been for his elder sister Emma (1843-1934) who worked as a substitute teacher; Benjamin was forever grateful for the advantage this gave him.

He was educated very well from early on, receiving a scholarship from the municipality (rare for the time) to study at the Chalon Middle School. His teachers suggested that he look for a position as a teacher but Baillaud had higher ambitions. He was able to get his scholarship renewed upon graduation, enabling him to study special mathematics at the lycée in Lyon. There he lived with his uncle Louis Baillaud, an accountant, who had moved to Lyon to help his nephew. Graduating from the lycée in Lyon, Baillaud spent the three years 1866 to 1869 at the École Normale Supérieure in Paris. Here he met the future mathematician Jules Tannery and future physicist Edmond Bouty. These three would remain lifelong friends, and in some sense become each other's family: Baillaud went on to marry, on 31 December 1873, Marie Hélène Pons (1847-1920), a sister of Bouty's wife; Tannery married Baillaud's sister, Esther. Moreover, their children subsequently maintained this family friendship. Baillaud graduated in mathematics from the École Normale Supérieure in 1869 and was appointed to teach mathematics at the lycée in Montauban.

Baillaud, continued teaching at lycées for several years; at the lycée Saint-Quentin, the lycée St Louis, the lycée Louis le Grand, the lycée Charlemagne, and the lycée Condorcet. While still teaching, he was appointed to the Paris Observatory as Elève Astronome (student astronomer) under Urbain Le Verrier in 1872 and, in 1874, promoted to Aide Astronome (assistant astronomer). At this stage he was studying for his doctorate and consulted Charles Delaunay (by then the Director of the Paris Observatory), Charles Hermite and Victor Puiseux about possible topics for his research. He settled on studying perturbations of the motions of comets. Letters he wrote show his personality, for example writing to Edmond Bouty on 22 June 1872 (see [1]):

I cannot ... conceal that I've always had at the bottom of my heart a little vanity and much ambition. ... I do not lack patience and even energy. ... I will be working ... as hard as a man can, and if I am needed, you will find me ready to put my knowledge to the service of science and my country.

In 1876 he was awarded a doctorate in Mathematical Sciences for his thesis on perturbations of the motions of comets *Exposition de la méthode de M Gylden pour le développement des perturbations des comètes*. By 1877, he was lecturing on dynamical astronomy at the Sorbonne (University of Paris), substituting for Le Verrier who was ill. Le Verrier died in September 1877 and Félix Tisserand, who had been Director of the Toulouse Observatory since 1873, moved to the Paris Observatory to fill the vacancy in 1878, bringing his assistant, Bigourdan, with him. Baillaud, who had succeeded Le Verrier as Professor of Astronomy at the University of Paris, was a candidate for the vacant post in Toulouse. Baillaud not only became Director of the Toulouse Observatory but, for much of his time in Toulouse, he also operated as the Dean of the Faculty of Science of the University of Toulouse.

Meanwhile, Bigourdan remained at the Paris Observatory for the rest of his career, taking charge of the great equatorial telescope. In addition to his other work, he completed his doctoral thesis which he submitted in 1886. He was awarded the degree for his thesis *Sur l'équation personnelle dans les mesures d'étoiles doubles* in which he studied measurements of 2800 double stars. Using the 0.31 m. aperture great equatorial telescope at the Paris Observatory, he aimed to determine the accurate positions of all the known nebulae of the northern hemisphere, eventually verifying the positions of 6380 nebulae. He wanted to set a basis for future studies of the 'proper motion' of nebulae. This turned out to be in vain since distant nebulae won't show any proper motion.

The careers of our two astronomers took, from around 1878, very different paths. Bigourdan, working at the Paris Observatory, could spend almost his whole time undertaking research. Baillaud, on the other hand, showed a remarkable talent as an organiser and turned the University of Toulouse into a world class university.

Bigourdan spent almost every clear night observing at the Paris Observatory but found time for other important research activities. He was a participant in several expeditions. In June 1882, he took part in the observations of the transit of Venus on the island of Martinique. While away, his brother died of typhoid fever. In the same year, he built a four-roomed house in Tujague. In 1883, he left for St Petersburg, stopping in Krakow in Poland, also visiting Berlin and Vienna. He went to Joal, Senegal, in 1892 to observe the total eclipse of the Sun, which took place on 16 April 1893. On this same expedition, he determined the value of g, the gravitational acceleration, at Joal. He did this again in 1896, but atop Mont Blanc. In 1900 and 1905 he observed solar eclipses in Hellín, Spain and Tunis, Tunisia respectively. In 1902, collaborating with his colleague Henri Renan from the Paris Observatory, and Frank W Dyson (1868-1939), Henry Park Hollis (1858-1939) and others from the Greenwich Observatory, he attempted to re-determine with greater precision the longitudinal difference between London and Paris. Bigourdan made the first of two series of observations between 18 April 1902 and 29 June 1902. Both Greenwich and Paris Observatories used meridian instruments built by the English instrument makers Troughton & Simms.

In contrast Baillaud's achievements were of a very different kind. He played a key role at the University of Toulouse, developing the Faculty [5]:

The buildings were old and inadequate; students were few in number, and the number of professors insufficient for these few. His first step was to secure from the Ministry of Education the means to call the eminent Emile Picard to the chair of mathematics and to build laboratories of physics and chemistry. Much needed additions were made to the scientific library. Finally, with the assistance of the city of Toulouse, additional land was acquired and buildings erected for the faculty of science which were adequate at the time.

He raised the number of chairs from 9 to 20, and was responsible for the appointment of to-be-famous scientists such as Marie Henri Andoyer, Marcel Brillouin, Eugène Cosserat, Édouard Goursat, Gabriel Koenigs, Thomas Stieltjes and Ernest Vessiot in addition to Emile Picard. At the Observatory he aimed to expand its capabilities, attracting many collaborators and giving full support to the international *Carte du*

Ciel project. He improved the status of astronomy at Toulouse by re-launching the journal *Annales de l'Observatoire de Toulouse* in 1880, producing an initial volume of a new series, published in Paris. The series continued through to 1968. Moreover, upon his proposal, the journal *Annales de Faculté des Sciences de Toulouse* was created in 1886. He also disseminated his astronomical knowledge through public lectures, offering a popular course illustrated with photographs and drawings, for which the public were invited to the Observatory.

One of Baillaud's most impressive contributions to astronomy came after 1903, when the Toulouse Observatory took over the facility on the Pic du Midi, a mountain in the French Pyrenees. Founded by amateurs in the 1850s, the mountain-top observatory had been intended to house a telescope, but the 9400ft/2865m height above sea level proved too big a logistical challenge, leaving the goal unrealised. Construction of the observatory had begun in 1878, but the spiralling costs had caused the work to be suspended in 1882. Upon the Toulouse take-over, Baillaud organised a team of soldiers to erect a 20in/0.5m reflecting telescope, and a 10in/0.25m refracting telescope on the summit. The 8m dome was completed in 1908. It was here that, in 1909, those working at the Observatory discredited the Martian canal theory, the belief during the late 19th and early 20th centuries that there were canals on Mars. The Pic du Midi observations revealed that these 'canals' were merely optical illusions. It is thanks to Baillaud that this facility is in operation.

Choosing between these two outstanding astronomers for the position of Director of the Paris Observatory in 1907 proved exceptionally difficult. Both were members of the Academy of Sciences but Bigourdan was a full member while Baillaud was only a corresponding member. Bigourdan had worked at the Paris Observatory for 28 years and regularly attended meetings of the Academy of Sciences. Henri Poincaré considered Bigourdan a collaborator and even informed Baillaud that he intended to vote for Bigourdan. There was no doubt that Bigourdan had produced more research, but Baillaud had the most experience as an administrator and had achieved great things in this capacity. First one man and then the other appeared to be first choice. A committee of the Academy of Sciences met on 9 December 1907 and voted 13 for Baillaud, 12 for Bigourdan. The whole Academy met one week later with 62 members present. On the first round of voting Baillaud received 31 votes, Bigourdan 29 votes. A second round gave Bigourdan the lead with 32 votes and they recommended to the Minister that Bigourdan should be appointed. On 17 December 1907 some newspapers reported, prematurely, that Bigourdan had almost certainly won. The Council of the Observatory met on 19 December with 11 members present, 7 of whom were members of the Academy who had voted as Academy members a few days earlier, among them the mathematicians Paul Painlevé, Henri Poincaré and Gaston Darboux (who was the permanent secretary of the Academy). The Council came down heavily in favour of Baillaud who received 9 of the 11 votes, the remaining 2 going to Bigourdan.

Both candidates wrote to the Minister defending themselves from criticism they were receiving. Baillaud learnt that the Minister had been informed that he was "too religious." Rather than defend himself against this charge he got the rector of the University of Toulouse to write to the Minister on 15 December 1907, "Baillaud has always behaved as a good and loyal servant of the Republic, and if he does not conceal his religious beliefs, he does not slack either." Bigourdan wrote to the

Minister on 23 December 1907 saying, "some accuse me of being capable of acts of intolerance", and defended himself from that accusation. Newspapers having claimed that Bigourdan was almost certainly the winner on 17 December 1907, three days later changed to say that Baillaud had almost certainly won. Indeed when the official announcement came on 6 January 1908 it was Baillaud who was declared the new Director of the Paris Observatory.

Bigourdan continued to work at the Paris Observatory under Baillaud and the two men collaborated in a number of projects, each taking the lead at times. The International Astronomical Union was founded in 1919 with responsibility for unifying measurement of time on a worldwide basis. Baillaud became its first president and one of his first acts was to appoint Bigourdan as the head of the International Bureau of Time. Conversely, Baillaud was a member of the Bureau des Longitudes, of which Bigourdan was president. Bigourdan also served as president of the Académie des Sciences in 1924. Their biographies show no evidence of ongoing ill-feeling resulting from their rivalry for the Directorship of the Paris Observatory.

Acknowledgements

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Figure captions

Figure 1. Guillaume Brigourdan, graveur print by Henri Brauer. Credit: Public Domain via Wikimedia Commons

Figure 2. Benjamin Baillaud. Credit: Observatoire de Paris

Figure 3. “L'Observatoire de Paris la nuit sous la Grande Ourse,” painted 1908 by Jean Marie Michel Cazin (1869-1917). Credit: Observatoire de Paris,