

## BOOK REVIEW

***Pic du Midi. One Hundred Years of Life and Science at a High Altitude Observatory*, by Emmanuel Davoust. Translated by Barbara Jachowicz. (Vic-en-Bigorre, MSM, 2014), pp. 478 + [ii]. ISBN 978-2-3508-0143-8 (paperback), 140 × 205 mm, €29.95.**

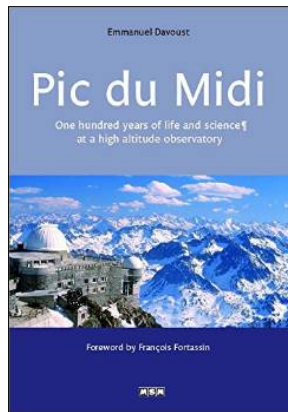
Mention of the Pic du Midi immediately conjures up childhood memories of this mystical observatory nestled high in the Pyrenees Mountains where some amazing observations of Mars were made during a particularly favourable opposition in the 1950s. But upon reading the recent English translation of Emmanuel Davoust's book, *Pic du Midi. One Hundred Years of Life and Science at a High Altitude Observatory*, I quickly discovered it was much more than this.

I also discovered that the idea of a French high-altitude observatory was born not with Jules Janssen but much earlier, in the 1860s, when a number of local enthusiasts founded the Ramond Society. Among its objectives was the erection of an astronomical observatory at the summit of the 2,876-m high Pic du Midi. In the early 1870s the idea emerged of combining meteorology with astronomy. Following its defeat by Prussia in the recent war, France was seeking projects that would contribute to its 'moral recovery'. Davoust notes that French astronomers used this tactic

... to obtain the creation or funding by the State of six Provincial astronomical observatories ... [But he stresses that] the creation of Pic du Midi Observatory owes nothing to French astronomers, except for some encouraging words. This was a project of pure Pyrenean regionalism, very active in the 19th century, and it fit perfectly into the spirit of the time, when people everywhere were ready to explore uncharted territory. (Page 21).

Construction began in 1875, and six years later the Pic du Midi Observatory was functioning. As Chapter 1 clearly documents, the driving force throughout the challenging construction phase was General Charles de Nansouty, a former career military officer.

In 1882 the Ramond Society succeeded in transferring the ownership and operation of the Observatory to the State: its budget was attached to the Ministry of Public Education, and its primary function was to be meteorology (not astronomy). "The Observatory's first ten years" is the title of



Chapter 2. However, during this decade visiting scientists also carried out experiments on atmospheric electricity and on the chemical composition of the atmosphere, and in 1883 the Observatory was designated a first order geodetic station in France's national network.

Astronomy, meanwhile, was not entirely ignored. In 1882 Paris Observatory sent Pierre and Prosper Henry to the Pyrenees in order to observe the 6 December transit of Venus from the Pic du Midi Observatory, but the winter was so severe that they could not reach the Observatory. So they tried to observe the transit from a lower altitude but failed because it was snowing. Three of the porters in the party carrying their equipment perished during an avalanche. The following year, Paris Observatory Director, Admiral Mouchez, sent two other astronomers to the Pic, to explore the possibility of establishing an astronomical station there. Although they reported exceptional seeing both day and night, Mouchez was unable to gain support for his plan.

During the first decade, two other astronomers carried out significant observations from the Observatory. In August 1890 Professor Charles André, Director of the Lyon Observatory, and his colleague, Emile Marchand, successfully observed lunar occultations and Jovian satellite phenomena using 6-in (15-cm) and 8-in (20.3-cm) refractors that had been lent by Paris Observatory in 1884.

The Pic du Midi Observatory's inaugural Director, Célestin-Xavier Vaussenat, lobbied relentlessly to have an astronomical facility added to the Observatory, but he died on 16 December 1891 before this could be accomplished.

Astronomy at the Observatory only came of age under the second Director, Emile Marchand. Under his guidance, the Pic du Midi Observatory

... would truly play the role it had been destined for by its founders – progressively becoming a centre of multidisciplinary scientific observations, where daily data were gathered in the fields of meteorology and atmospheric physics, seismology, astronomy and botany. (Page 59).

This metamorphosis is recounted in Chapter 3, while Marchand's own research is described in Chapter 4.

Marchand began his Directorship on 1 August 1892, and in September and October spent six weeks at the Observatory organising the expansion into astronomy. The following year the 8-in refractor was housed in a hexagonal wooden observatory and he began to visually monitor the Sun and selected planets: between 1893 and 1914 he and Sylvain Latreille made 2,800 solar sketches and 1,400 drawings of Venus, Mars, Jupiter and Saturn. They also observed Jovian

satellite phenomena and variable stars, and made visual observations of meteor showers. In 1910 Comet 1P/Halley attracted their attention. But despite these 'successes', Marchand's attempts to develop astronomy further were frustrated, and he is now remembered for developing meteorology and geophysics at the Pic and elsewhere in the Pyrenees. Perhaps he is best known for 'Marchand's Law', which states:

There exists a series of terrestrial or atmospheric phenomena: magnetic storms, aurora borealis, electric storms, waterspouts, cyclones, strong barometric depressions with violent wind, strong rain, earthquakes, ... all of which tend to occur when an area of activity on [the surface of] the Sun passes at the central meridian; but, furthermore, for certain of these phenomena to be produced, various local conditions (atmospheric or geological) must be met. (Page 79).

Davoust notes (page 76) that between 1894 and 1912 Marchand published more than 100 research papers, 12 in astronomy, about the same number in botany and 77 in meteorology and geophysics, plus a biographical monograph about Jérôme Lalande. Yet, despite this output he

... never managed to become well known during his career. One of the reasons for this was that he was often satisfied with a limited audience, such as readers of the *Bulletin de la Société Ramond*, or the proceedings from meetings in which he participated.

As the subtitle foreshadows, *Pic du Midi* ... is about more than science, and Chapters 5 and 11, titled "Daily life in Bagnères and at the Pic" and "Daily life at the summit", illustrate this. We also are reminded that this book is about more than astronomy and meteorology when we encounter Chapters 6, 12 and 19 on "The botanical garden at the summit", "Geophysics" and "The cultivation of potatoes", respectively. There are also chapters (9 and 15) about the Observatory's activities during World Wars I and II.

For those with a passion for astronomy, the book really starts with Chapter 7 ("The beginnings of the Baillaud telescope") on page 117. Despite Marchand's frustrated efforts, it was Toulouse Observatory Director Benjamin Baillaud who first succeeded in installing a telescope at the Pic capable of producing research results. This was a 50-cm (20-in) reflector with a 23-cm (9-in) guidescope, which was installed in a new purpose-built dome and became operational in 1909. This marked the start of a close association between the two observatories, which caused Marchand more worry. Initially the Baillaud Telescope was used to obtain a series of impressive photographs of Mars, and in 1910 observations of Comet 1P/Halley followed, and it quickly became apparent that when the sky was clear the seeing was usually exceptional, but for much of the year the uncooperative high-altitude weather prevent-

ed any observing. Even when observing was possible, there were problems with the telescope and dome, and there was also the hardship of daily life at the summit to contend with. So the Baillaud Telescope saw little use.

All this hardly impressed Marchand and

As the years went by ... [he] became ever more bitter. His career did not progress, he had health problems, his scientific work did not receive the recognition it deserved and the administration of the Pic by Toulouse University brought only worries." (Page 137).

This sorry situation finally came to an end on 25 April 1914 when Marchand died. He was just 61 years of age.

With almost undue haste, just three months later the Council of Toulouse University abolished the Director's position at the Pic, leaving only an Assistant Director there who would take orders from Toulouse. The new Assistant Director was Joseph Rey who had a background in meteorology, terrestrial magnetism and atmospheric electricity, but not astronomy. Like his predecessor, Rey became embittered by his situation at the Pic, and he resigned in February 1920.

The Pic du Midi Observatory entered a new era with the appointment of a Toulouse school teacher, Camille Dazère, as Assistant Director on 31 August 1920. Dazère had a doctorate in physics. His first priority was to renovate the Observatory, and to improve access and living conditions there. Meanwhile, political considerations forced him to devote all of his research efforts to geophysics, as outlined in Chapter 12 (where the achievements of other scientists based at the Pic also are discussed).

Despite Dazère's research interests, during the period between the two World Wars,

Three astronomers, each in his own way, would contribute to turning the situation around and putting the Observatory on the path that would soon lead it to the forefront of planetary and solar astronomy ... (Page 201).

They were Jules Baillaud, Benjamin's son, who worked at the Paris Observatory, used the Baillaud Telescope for stellar spectrophotometry, and would become Director in 1937; Bernard Lyot from Meudon Observatory (who perfected and used his new invention—the coronagraph—while based at the Pic); and Henri Camichel, who joined the staff at the Pic in December 1936 and used the Baillaud Telescope for planetary observing. Their stories are recounted in Chapter 13, which appropriately is titled "The return of astronomy". Also mentioned in this chapter is the work of other visiting astronomers, including Emile Paloque (Toulouse Observatory), Gilbert Rougier (Strasbourg Observatory) and Louis Roy (Toulouse University). For me, this chapter and the

following one, on Jules Baillaud's directorship (from 1937 to 1947), were among the most interesting chapters in the whole book. Davoust justly describes the Baillaud decade as "... an exceptional period in the history of Pic du Midi Observatory, after which it became a nationally important centre in many fields of research." (page 223).

After describing life at the Observatory during WWII, the next three chapters (16–18) are devoted to telescope projects that occurred during the war years: "The transformation of the Baillaud telescope", "The large telescope project" and "The domeless telescope project". The refurbished Baillaud instrument was a refracto-reflector with a 60-cm (24-in) objective, while the 'large telescope' and the 'domeless telescope' projects related to a mooted 1.5-m reflector, and a large Schmidt, neither of which was constructed (although much later, in 1964, a 1-m telescope was installed—see Chapter 28).

Jean Rösch took over as Director of the Pic du Midi Observatory in 1947, and remained in office for 34 years. A key innovation during his 'reign' was the opening of a cable car service in 1952 which dramatically facilitated ease of access to the Observatory, and significantly increased the number of scientists, visitors and support staff at the Pic, especially in summer. Apart from those who came from Britain and from France to study cosmic rays, there was an influx of astronomers:

First, British astronomers came to observe the Moon and scientists from Meudon Observatory to observe the Sun. The International Geophysical Year (1957-1958) brought renewed activity to the Pic, both in studies of the upper atmosphere and of the Sun. (Page 310).

Another major innovation was the formal merging of the Pic du Midi and Toulouse Observatories in 1971.

Rösch was a dynamic Director, and his constant efforts soon gave the Pic an international reputation (especially after 1954 when he was finally able to return to his own research). Post-war research at the Pic on cosmic rays, the Sun, the Moon, and the planets and their satellites occupy Chapters 23 through 26.

After these welcome astronomical treats we are exposed to a short chapter on "The alpine biological laboratory" before returning once more to astronomy. In Chapter 27, "A wide range of activities", we are reminded that although best known for research on the Sun, Moon and planets, the Pic also contributed in other areas of astronomy, as well as high altitude medicine and radioactivity caused by nuclear explosions. Davoust notes (page 398) that

This eclecticism was not typical of traditional research institutes, but the Pic's location and its status as a de facto assignment observatory favoured a multitude of research projects in diverse fields ...

The penultimate chapter brings us back to telescopes, rather than the research accomplished with them. Titled "The large nocturnal telescopes", it documents the long and very difficult path followed by those who made the Pic's largest telescope, a 2-m reflector, a reality. Although conceived in the 1960s, first light only occurred in July 1980.

Rounding out this long and very detailed book is a short (3-page) concluding chapter; 32 pages of black and white photographs and a locality map; acknowledgements; two pages about the sources used in researching this book; and an 8-page "Index of proper names".

So how should I rate this book? *Pic du Midi ...* is a long book, with a great deal of reading that has nothing to do with astronomy. I found this a little overpowering, although some of the human drama associated with those who chose (or were coerced) to work at this rather inhospitable high-altitude observatory, especially in winter, was captivating. *Pic du Midi ...* is well illustrated, and it is good value at just €29.95. I believe that it belongs on the bookshelf of everyone interested in French astronomy or the pioneering efforts required to establish and then conduct research at a high-altitude observatory.

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