

DJORDJE STANOJEVIĆ IN WORKS OF JULES JANSSEN

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Abstract. Jules Janssen (Paris 1824 - Meudon 1907) is well known as the founder of the "Observatoire d'Astronomie Physique de Paris (sis à Meudon)". He was also teacher and coworker of Djordje Stanojević, who was the first Serbian astrophysicist, rector of the Belgrade University and the second person on the head of Belgrade Astronomical Observatory, the first builder of hydro power plants in Serbia, the author of the first color photography in Serbia and the book with colored photographs ("Srbija u slikama" - Serbia in photos), pioneer of electrification and industrialization of our country. His articles in the journal of the French Academy of Sciences (*Comptes Rendus de l'Académie des Sciences*) are in the Serbian Astronomy the first modern scientific papers. They are presented and commented in Academy by Jules Janssen, who also mentions Stanojević in his works in various contexts. In this contribution, the presence of Djordje Stanojević in works of Jules Janssen, and his comments on Stanojević's work in *Comptes Rendus* are analyzed. Also, the work and life of Jules Janssen are presented.

1. INTRODUCTION

Djordje Stanojević (07. April 1858, Negotin, Serbia - 24. December 1921, Paris, France), the first Serbian astrophysicist, rector of the Belgrade University and the second person on the head of Belgrade Astronomical Observatory, the first builder of hydro power plants and the author of the first color photography in Serbia, pioneer of electrification and industrialization of our country (Dimitrijević 1997ab, 2002, Dimitrijević and Petrović 1999), learned solar physics and made his first steps in European science in Meudon Observatory, in Paris, working with the founder of this astronomical institution, Jules Janssen. This famous French astrophysicist presented also to the French Academy of Science all astronomical articles of Djordje Stanojević, published in its journal *Comptes Rendus Hebdomadaires de l'Académie des Sciences*. We note that these are the first scientific papers in the modern sense in Serbian Astrophysics (Dimitrijević 1997a).

In this work, we will present life and work of Jules Janssen and his relations with Djordje Stanojević.

2. LIFE AND WORK OF JULES JANSSEN

Jules Janssen (Fig. 1) was born in Paris on 22nd February 1824. His father was a clarinetist and his mother was the daughter of an architect (Launay and Hingley

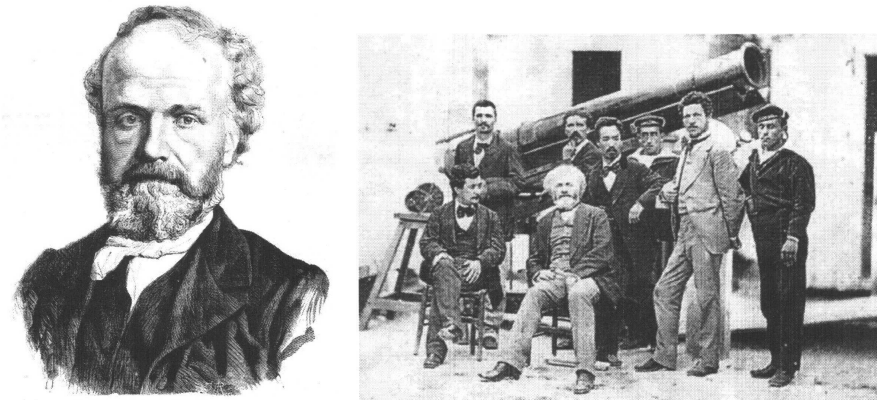


Figure 1: Left: Jules Janssen from "L'illustration", 1873, when he was elected in French Academy of Sciences. Right: Jules Janssen (sitting in the middle) in Japan 1874 for the Venus transit observation. His "photographic revolver" is on the left side of the photo. From Launay and Hingley (2005).

2005, Launay 2008). Due to financial problems in family, he started to work as an accountant in the bank before his 17th birthday. He also began to study mathematics and physics. In 1855 he became an assistant teacher in a grammar school in Paris. In 1857 he was sent to Peru to determine the course of the magnetic equator. On his return to France he obtained a job for the industrialists of Le Creusot, where he studied the absorption of radiant heat in the mediums of the eye. He obtained with this research the doctorate of science in 1860. In 1861 he constructed an ophthalmoscope (Launay 2004) but also he started the research on the solar spectrum, as one of the first in France who started to study spectral analysis and its astronomical applications. He found that some spectral lines are particularly prominent at sunrise and sunset. Assuming that they are due to the water vapor of the earth's atmosphere he named them "telluric lines" which stayed in the science up today. In order to investigate this hypothesis he studied the absorption spectrum of the water vapor, what enabled him to announce in 1867 the presence of water vapor in the atmosphere of Mars.

Next year, he observed the total solar eclipse of 18 August 1868 at Guntur, India. Here he realized that the spectrum of solar prominences may be observed without eclipse using the spectroscopic method which enables observations in monochromatic photospheric lines. This method was proposed independently by Lockyer. In honor of this discovery, the French Academy of Sciences coined a medal with portraits of both scientists. So, in 1869 he describes the principle of the spectrohelioscope enabling to obtain monochromatic images of the Sun.

In December 1870, when Janssen was in Paris besieged by Prussians, during the Franco-Prussian war, a total eclipse was announced to be visible in Algeria. In order to observe it, he left the besieged Paris during the night in a balloon. He could not observe the event due to clouds but during the flight he invented an aeronautic compass.

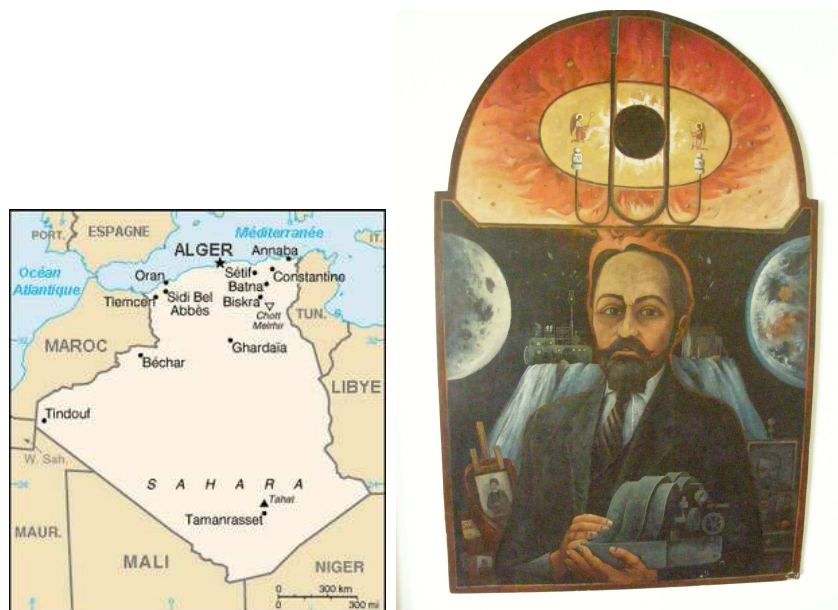


Figure 2: Left: Map of Algeria with Biskra. Right: Portrait of Djordje Stanojević by Milić of Mačva in Memorial room of Stanojević in Negotin (photo Jan Vondrak).

On the 10th of February 1873, he was elected to be a fellow of the French Academy of Sciences. His portrait in the Fig. 1 (left) was published on this occasion.

He is very important as well for the history of photography. Not only due to his astronomical photographs and first photos in the monochromatic light, but also due to his "photographic revolver", precursor of the movie camera, invented to obtain a number of photographs in quick succession of the Transit of Venus, which he observed in Japan in 1874 (Fig. 1, right).

In 1875, he founded the "Observatoire d'Astronomie Physique de Paris", in Meudon, devoted to the astrophysics, as a difference from Paris Observatory, traditionally devoted to positional astronomy and navigation.

On the International Meridian Conference in Washington, for the determination of the starting meridian, he was the leader of the French delegation, proposing a neutral meridian which would cross the Ocean instead of the Greenwich one.

From 1885 to 1890 he carried on spectroscopic investigations in Meudon and experiments on the absorption laws of the oxygen spectra at Mont Blanc. In 1893 he established on Mont Blanc an Observatory for such a research.

In 1889 he was the chairman of the International congress of the photography and celestial photography (Launay 2004) and in 1907, seven months before his death, he was the chairman (Launay 2004) of the Conference of the International Union for Solar Research, held at Meudon.

Janssen died at the age of 83, in Meudon Observatory on the 23rd of December 1907, the day of the winter solstice. His statue (Fig. 4, right) at the Meudon Terrace, besides the Observatory, was unveiled by Camille Flammarion in 1920.



Figure 3: Tower near Biskra in Algeria, used as observatory by Janssen and Stanojević in 1890. Photographed by Jan Vondrak in the Memorial room of Djordje Stanojević in Negotin.

3. DJORDJE STANOJEVIĆ AND JULES JANSSEN

From 1883 to 1887 Djordje Stanojević, as a bursar of Military Ministry, was on studies and specialization at the most known astronomical and meteorological institutions in Europe, but majority of time he spent in Meudon Observatory working with Jules Janssen. When Janssen in 1885 started spectroscopic investigations in Meudon, Stanojević was with him. In a number of papers from that period (Janssen 1885, 1886, 1890b) Janssen acknowledges the help of Stanojević in his research. In Janssen (1885) is written: " Je ne veux pas terminer sans dire combien j'ai été secondé dans ces études, avec zèle et capacité, par M. Stanoïevitch, attaché en ce moment á l'observatoire comme élève serbe" (I do not want to finish without saying how much I was supported in this study, with devotion and capacity, by M. Stanoïevitch, attached at this moment to the Observatory as an serbian student.). In Janssen (1886) is stated at the end: "M. Stanoïevitch a continué á m'assister dans ces études" (M. Stanoïevitch continued to assist me in these studies.)

The first astrophysical scientific papers in the modern sense published by a serbian astrophysicist (Dimitrijević 1997a) in the journal of French Academy of Sciences (*Comptes Rendus de l'Académie des Sciences* - Stanoiewitch 1886, 1887, 1888) were presented to Academy by Janssen, always with an acknowledgement to him, and in Stanoiewitch (1886, 1888) with comments of Janssen.

When Serbian Academy of Sciences refused to publish his work on Solar Photospheric network, he wrote a paper (Stanojević 1888), presenting arguments against this decision and underlying that Janssen, whose results were criticized by Stanojević



Figure 4: Left: Djordje Stanojević in the oasis Biskra in Algeria in 1890 (photographed by Jan Vondrak in the Memorial room of Djordje Stanojević in Negotin). Right: The monument to Jules Janssen in Meudon Observatory and M. S. Dimitrijević (photo by Paskal Sotirovski).

in the brief note published by French Academy (Stanoiewitch 1886), and who was against the given conclusions, presented this note to Academy and recommended its publication.

In 1887, on the special recommendation of Janssen, the Serbian government sent Stanojević to Russia, to observe the total solar eclipse of the 19th of August 1887. The report of Stanojević, together with the big comment of Janssen is published in Stanoiewitch (1888). This expedition was also commented in Janssen (1887ab).

Janssen invited Stanojević to join him in the expedition in Biskra (see Fig. 2, Left) in Algeria to study solar spectrum near horizon in order to investigate the influence of terrestrial atmosphere on solar spectrum, in particular telluric lines. The expedition continued during four months and a half in the end of 1889 and the beginning of 1890. This expedition is described in detail in Janssen (1890a). It is interesting that the participation of Stanojević is only acknowledged by the sentence:

"Dans ce travail, j'ai été successivement aidé par MM. Stanoiévitch et Gabriel Gaupillat". (In this work I was alternatively helped by MM. Stanoiévitch and Gabriel Gaupillat". The word "succesivement" indicates that maybe Stanojević was not in Biskra the whole duration of the expedition.

In 1907, Stanojević attended the Third Conference of the International Union for Co-operation in Solar Research, held at Meudon, May 20-23, 1907 (** 1908) chaired by Janssen (Launay 2004) seven month before his death.

Jules Janssen, due to his collaboration with Djordje Stanojević, and his role in the publication of the first modern serbian astrophysical scientific papers, has an important role in the history of not only European and French, but also Serbian astronomy.

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