

Eugène Antoniadi (1870–1944) and Planetary Observation

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Born a Greek citizen at Constantinople on 1870 March 10, Eugène Michel Antoniadi was a cultured man, well-read and scholarly, an historian and linguist, but above all an artist. His artistic tools were pencils, washes, pastels and watercolours, all handled with exquisite delicacy. This talent was the all-important factor in his magnificent contribution to observational planetary astronomy.

In 1888, at the age of 18, he made his first observations, using a small 75-mm refractor, which was soon replaced by a 108-mm instrument. He drew the appearance of the sky and of the planets and sent his observations to the great Camille Flammarion in France. Some of them can be found in the earliest numbers of *L'Astronomie*.

He was a great admirer of French culture and, intrigued by Camille Flammarion's striking personality, he decided, at the age of 23, to come to Paris. That was in 1893. Flammarion welcomed him at Juvisy Observatory. Access to the 242-mm refractor provided his artistic talent with unparalleled views of the planets. The first books of observations – a marvellous series of pictures, like medieval illuminations – are carefully preserved at Juvisy, entitled “Juvisy Observatory: Observations made under the direction of Camille Flammarion by Eugène M. Antoniadi”. Volume I, dated 1896, contains some exquisite drawings, watercolours and wash-drawings of the nebulae in Orion and Lyra, the pair Messier 65 and 66, the occultation of Jupiter by the Moon on 1896 June 14, the zodiacal light, the Moon in front of the Pleiades, Venus, Jupiter, Saturn and, in particular, Mars, for which he had already produced a projected chart.

There was to be a total eclipse of the Sun on 1896 August 8, when the zone of totality would cross the Arctic Ocean, just touching North Cape. Camille Flammarion decided to entrust the young Eugène Antoniadi with the scientific expedition. This was a considerable journey for those days, and although the sky was covered at the time of the event, Antoniadi brought back exquisite watercolours and wash-drawings for the Juvisy records.

Then, at Juvisy, Antoniadi deliberately turned towards the study of the planets. His portfolios accumulated drawings in true colour of Jupiter, Saturn and Mars, whilst his wide cultural interests were employed to publish his discoveries. This was the period when Percival Lowell, on the other side of the Atlantic, was publishing his strange works on Mars. The “canal” theory was rampant, whilst surface markings

seen through the telescope revealed changes linked with the seasons. Antoniadi set about clarifying the problem and the study of Mars was to remain his principal preoccupation for the rest of his life. The British Astronomical Association soon entrusted him with the Directorship of its Mars Section.

At the same time, E.M. Antoniadi undertook, in 1904, a fundamental, historical work, a major publication, the *Atlas of the Mosque of Saint Sophia at Constantinople*. Published in 1907 in three large volumes, in Greek, this extremely rare work documented, for the first time, the interior of this famous basilica, which was turned into a mosque after the fall of Constantinople. More than 1000 photographs and innumerable watercolours, drawings and plans are reproduced and documented. A unique feature was that Sultan Abd-ul-Hamid gave special authority for the photography of the interior of the famous mosque for the first time.

In 1909, an important event again helped to decide the direction of his work. That year Mars was closest to the Earth. Henri Deslandres, Director of the Meudon Observatory gave Antoniadi permission to use the great 83-cm refractor, which was the most powerful instrument then available in Europe, and almost in the world. This was a revelation. Taking advantage of atmospheric conditions that are rarely so favourable, Antoniadi had a view of the planet that surpassed everything that anyone had ever had previously. Moreover, he had the talent to reproduce what he saw with his pencil or with his brush. He was being offered the chance of taking planetary exploration a stage farther, and he understood that. Calling himself "an honorary astronomer", he dedicated most of his later activity over a period of more than thirty years to that end.

With Mars he saw the myth of the "canals" disappear in front of his eyes. In 1897 he may have written in the Juvisy observing books, as a conclusion of his observational analyses "We cannot avoid concluding that the famous canals of Mars do have a truly objective existence", but he promptly revised his judgement. In 1930, his vigorous pen firmly stated:

"No one has ever seen a true canal on Mars, and therefore the essentially straight, single or double "canals" of Schiaparelli's do not exist as canals, or in any geometrical form. They do, however, have a basis in reality, because at the site of each of them, the surface of the planet shows either an irregular streak that is more or less continuous and speckled, or a ragged, greyish edge, or even an isolated, complex lake."

Antoniadi described the seasonal variation of the martian polar caps. He studied the short-lived clouds that are seen occasionally in the atmosphere, and well as the dust storms that sometimes obscure vast areas. He also depicted, as no one had before, the evolution of the spots and strange marblings detected on the surface of the planet, and his artistic talent allowed him to record colour variations. His scholarship enable him to trace the history of the seasonal or random variations over more than a century. His hellenic, classical and mythological backgrounds helped him in the problem of nomenclature, because the markings on the martian surface are identified with names borrowed from the Graeco-latin world of the Mediterranean. They are extremely evocative. Antoniadi introduced both order and harmony. As a result, his comprehensive publications *The Planet Mars*, a monumental work dating

from 1930, remains, more than fifty years later, the bible for the telescopic mapping of Mars.

As regards Jupiter, through the refractor Antoniadi saw a dense, turbulent and restless atmosphere. Against the astrophysical evidence he argued, with his acid pen, for a very hot planet, essential, he thought to account for the eddies that he saw and drew. Here, the artist gained the upper hand on the physicist. On Mercury, his observations enabled him to make out a characteristic feature in the shape of the numeral 5. The recurrence of this reference point led him to announce that its rotation was about an axis perpendicular to the orbital plane and had a period of 88 days, equal to the planet's orbital period around the Sun. To him the situation seemed similar to the case of the Moon and the Earth, and being accounted for by tidal theory. Antoniadi showed that the tidal forces producing synchronous rotation would vary as the 6th power of the distance from the central body. His work *The Planet Mercury*, published in Paris in 1934, asserts the reality of the 88-day rotation in very definite terms.

We now know that the rotation of Mercury is $\frac{2}{3}$ of that period, i.e. 58.6 days, and that this exact fraction results from the combination of tidal forces and the eccentricity of the orbit. The progress of science sometimes takes place like this, Antoniadi was the victim of a stroboscopic effect between the true rotation period and that of elongations easily observable from Earth, and he buttressed his arguments with an only approximate theory.

The linguistic and hellenistic talents that inspired Antoniadi also led him to an important work, *Egyptian Astronomy*, published in Paris in 1934. In this, Antoniadi examines and describes the astronomical knowledge of ancient Egypt, and of the Greek and Mediterranean world. In a striking parallel, he compares extracts from Copernicus' *De Revolutionibus Orbium Coelestium* with ancient texts. He shows that Copernicus drew the heliocentric idea that made his fame from his knowledge of Greek works.

Apart from the publications mentioned, all of which were of fundamental importance, Eugène Antoniadi wrote more than 40 astronomical papers, many of which appeared in *L'Astronomie*, the journal of the Société Astronomique de France.

Naturalized French in 1928, he was later honoured by being made a Chevalier of the Legion d'Honneur. The Académie des Sciences awarded him the Prix Lacaille in 1932, then the Prix Gusinan in 1940. The great "honorary astronomer" also received from the Société Astronomique de France the prestigious Prix Janssen, which honours a major contribution to astronomical knowledge. This was a unique award to an amateur. Eugène Antoniadi died in Paris on 1944 February 10, in his beloved France, which was in the middle of a war and occupied by the enemy.

Publications by Antoniadi

Books

La planète Mars, Hermann, Paris, 1930

La planète Mercure et la rotation des satellites, Hermann, Paris, 1934

L'astronomie égyptienne, Gautier Villars, Paris, 1934

Articles

- “Le retour de la planète Mars”, *L’Astronomie*, 1926 Aug. p.346
“Les satellites de Jupiter”, *L’Astronomie*, 1927 Aug. p.353
“Le retour de la planète Mars”, *L’Astronomie*, 1928 Dec. p.564
“La rotation des satellites”, *L’Astronomie*, 1929 Sept. p.385
“La planète Saturne”, *L’Astronomie*, 1930 Feb. p.49
“La planète Mars (1659–1929)”, *L’Astronomie*, 1930 Sept. p.411
“La planète Mercure”, *L’Astronomie*, 1933 Dec. p.545

Investigating Astronomy’s History

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Abstract

Amateur astronomers play an important role in historical astronomy and publish a wide range of studies. They can participate nearly as well as professional astronomers since neither are professional historians or archaeologists. Amateurs often restore old instruments and facilities, discovering clues to their design, manufacture and use that would not be noticed by non-astronomical historians.

Possible studies include histories of institutions and of astronomy in different countries, biographies, and evolution of ideas. Publications and manuscripts could be studied for matters of current and historical importance. Folklore (of all countries) should be recorded before it dies out, and the beliefs behind it examined. More study groups involving amateurs, professionals and others should be established.