

170 Years of Observational Astronomy in Greece: Telescopes and Instrumentation

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Abstract

The most important milestones in the history of observational astronomy in Greece during the last 170 years are presented. In particular, the telescopes and observation instruments that have been used or are in use in various observatories in Greece are mentioned, and their contribution to the development of research in astronomy and astrophysics is underlined.

1. From Ancient to Contemporary Astronomy

Beginning around 600 BC, Greek philosophers and scientists developed a number of important astronomical ideas which helped form the foundation of modern astronomy. Among those Greek philosophers and astronomers we mention Pythagoras (500s BC), Euxodus of Cnidus (370 BC), Aristotle (300s BC), Heraclides of Pontus (387-312 BC), Aristarchus of Samos (200s BC), Eratosthenes (276 BC), Hipparchus (140 BC). Heraclides and Aristarchus were way ahead of their time, and their theories were not really accepted. Ptolemy (100s AD) expanded Aristotle's and Hipparchus's theories. He published the *Almagest*, in which he presented his ideas and summarized those of his predecessors. In the Middle Ages, Islamic scholars are often credited with preserving the scientific writings of Antiquity through the Dark Ages of Europe. In this new light, the medieval Islamic astronomers played a fundamental role in the scientific revolution that was forged in Europe during the Renaissance.

2. Astronomy in Greece from 1600-1840

During the Turkish occupation (lasted till 1821), only some scholars, educated in Western Europe, translated books of European physicists and astronomers and made comments on some books of ancient Greek astronomers. Others, like Benjamin of Lesvos (1762-1824), distinguished mathematician, astronomer and clergyman, embraced the messages of the then modern times and worked passionately for the transfer of the new scientific knowledge to the young Greek people. The first telescope (50mm) was brought to the occupied Greece by the scholar Theophilus Kairis (1784-1853).

3. Astronomy in modern Greece (1840-present)

The astronomy in modern Greece dates from the foundation of the University of Athens in 1837 and the erection of the Astronomical Observatory of Athens a few years later. Around 1840, the national benefactor, Baron Georgios Sinas, Greek ambassador in Vienna, decided to donate the Greek Government with 500,000 drachmas for founding an Astronomical Observatory in Athens. The place selected for the Observatory was a location on the hill of Nymphs at Thisio, facing the Acropolis. The Observatory of Athens foundation ceremony took place in June 26, 1842.

3.1 The Astronomical Observatory of Athens

The first building of the Astronomical Observatory of Athens, known as Sinas building, was designed in 1842 by the architects Theophil Hansen of Denmark and Edward Schaubert of Germany, based on the suggestions of the Danish astronomer Heinrich Christian Schumacher. The cross-like neoclassical building had its sides oriented toward the four main directions of the horizon. There was a small dome for a telescope on the top of the building (see Plakidis and Kotsakis, 1978). The building was completed in 1846.

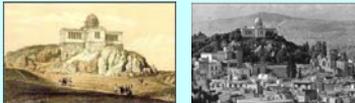


Fig. 1. The main building of the Astronomical Observatory of Athens (left:1850, right: present)

3.1.1 The first period 1846-1855

The Observatory's founder and first Director Professor Georgios Vouris, using the Sinas donation, ordered in Austria and installed the first instruments in the new building. The new instruments were:

- **The 6.2" (158mm, f/15) refractor Ploessl** (Fig. 2). It was the main observing instrument during the first period (1845-1902) of the Observatory of Athens. It was also used for solar H α observations in the period 1955-1970.
- **The meridian circle** (Fig. 3), made by Starke, was bought from Vienna in 1845 and it was one of the first instruments of the observatory. The diameter of the circle is 1 m, the length 1.25 m, and the diameter of the telescope 94 mm. The focal ratio is f/15.
- **Five small telescopes** for observations of comets
- **Chronometers** for civil and sidereal time
- **Set of meteorological instruments**
- **Spectrometer** of simple prism made by Ploessl in 1845. Donation of Sinas
- **Astronomical spectrometer** (Fig. 4), made in 1884. Dimensions: 38x16x5 cm
- **Filar micrometer** with six eyepieces. It was made by Casella in 1850, the dimensions are 17x9x6 cm and the material is brass
- **Theodolite** of the beginning of the 20th century, with length 24 cm, width 28 cm, and base diameter 9 cm
- **Sextant** (Fig. 5), for the determination of the altitude and the azimuth of celestial bodies
- **Stellar photometer** (Fig. 6) with selenium cell. Made by Rougier around 1930, material: brass
- **Kessel chronometer** for sidereal time. Dimensions: 200x70x50 cm. It was made by Kessel in 1845
- **Nautical clock** of late 19th century. Dimensions: 16x16x7cm. It was used for astronomical observations and the determination of the longitude in the sea.
- **Mercury barometer Fortine** for the measurement of the atmospheric pressure. Material: wood and brass. Dimensions: 120x15 cm.



Fig. 2. The 6.2" refractor Ploessl



Fig. 3. The meridian circle



Fig. 4. The astronomical spectrometer



Fig. 5. The Sextant



Fig. 6. The stellar photometer

3.1.2 The period 1855-1884

After the resignation of professor Vouris, the Director's duties were temporarily carried out for the period 1855-1858 by Professor Ioannis Papadakis of the University of Athens. In December 4, 1858, Director of the Athens Observatory was nominated the German researcher **Johann Friedrich Julius Schmidt**. His mostly brilliant work is the Topographical Map of the Moon (Fig. 7), "Chapitre der Gebirge des Mondes", published in Berlin in 1878. In an area of two meters diameter, consisting of 25 parts and representing the visible surface of the Moon, there were drawn about 30000 craters as observed with the 158mm Ploessl telescope (Schmidt, 1867, 1872, 1873, 1878).

3.1.3 The period 1884-1935

After the death of Julius Schmidt, the directorship of the Athens Observatory was given to his collaborator Dimitrios Kokkidis (1840-1896) for the years 1884-1890. In June 19, 1890, the Athens observatory became a governmental research centre and its name was changed to National Observatory of Athens (NOA). In addition to the Astronomical Institute, two others were created, the Meteorological and the Seismological Institutes. Prof. Dimitrios Egnitis, an astronomer educated in France, was appointed Director of the NOA (see Theodossiou et al., 2007). He ordered the purchase of modern instruments, educated the personnel, enriched the library with the necessary and up-to-date books and arranged for new buildings to be built in a neighbourhood area to the Thisio site of the Observatory. Considerable was his contribution in accepting the World Time Zone system and the Gregorian Style Calendar in Greece. He also organized the edition of the "Annales de l'Observatoire National d'Athènes". The new instruments purchased by D. Egnitis were:

- **16cm Meridian Circle "Syggrou"** (Fig. 8)

The new meridian circle of NOA, made by the French firm Gautier, was bought in 1896. The optical system of the refractor had a diameter of 16cm and focal length 200cm. The meridian circle was

extensively used for the time service of NOA since its installation in 1896 up to 1964.

- **The new telescope - 40cm Refractor "Doridis"** (Fig. 9)
The new 40cm telescope of NOA was made in 1902 also by Gautier. The telescope was named "Doridis" in honour of its donor. It is a refractor with double achromatic lenses of 40cm diameter and its focal length is 5m. The Doridis refractor was extensively used for observations of planets, moon, and comets, for astrometry and for variable stars photometry.

• Newtonian Telescope

A small telescope provided with an astrostat and micrometer for double stars observations; it replaced in 1891 the refractor Ploessl. Donation of Ionides, a Greek who lived in London. It was made by Browning in 1882 and the mirror diameter is D=200 mm.



Fig. 7. Topographical Map of the Moon



Fig. 8. The 16cm Meridian Circle



Fig. 9. The 40cm Refractor "Doridis"



Fig. 10. The dome of the 62.5cm refractor "Newall"



Fig. 11. The 62.5cm refractor "Newall"

3.1.4 The period 1935-1964

After the death of Professor D. Egnitis in 1934, Stavros Plakidis, Professor in the University of Athens, at the same time was nominated Supervisor of the Astronomical Institute of the National Observatory of Athens. Professor Plakidis made many efforts to move the observations far from the city centre. In 1936 the beginning of the Astronomical Station Penteli was set, but the World War II significantly delayed the development of the station.

3.1.5 The Astronomical Station Penteli

The Astronomical Station Penteli was founded in 1937 on the top of the hill named *Koufou* on Penteli Mountain. Those years it was a remote dark site, although it is only about 15km from the Athens Observatory (Fig. 10)

The 62.5cm Newall Refractor

In 1955 the National Observatory of Athens accepted the donation offered by the University of Cambridge, the 62.5cm telescope (Fig. 11) designed by R. S. Newall and constructed by the firm Thomas Cooke & Sons in 1868. It has a tube about 9m long and a German-type equatorial mounting (with a total weight about nine tons). After completion of the new building and the 14m diameter dome, in 1959, the telescope was installed in its new home, the Astronomical Station Penteli.

4. The present status

There are several optical telescopes operating in various observatories in Greece. Six of them have a primary mirror greater than 50cm in diameter. We briefly present four of them, which are used by professional astronomers for observations in various research fields.

4.1 Stephanion Observatory

In June 1971, the 30-inch (76-cm) Cassegrain reflector (Fig. 12) of the University of Thessaloniki was installed at Stephanion Observatory, in northern Peloponnese. Its focal ratio is f/3 for the primary hyperbolic mirror and f/13.5 for the Cassegrain focus. Key photometric observations of variable stars (flare stars, cepheid variables, RR CVns, etc) have been undertaken in co-operation with large ground and space instruments. More info at <http://www.stephanion.gr/asteroskopeion.htm>

4.2 Kryoneri Observatory

The Institute of Astronomy and Astrophysics (IAA) of the National Observatory of Athens (NOA) operates a 1.2m Cassegrain telescope the main observing instrument of NOA from 1975 till 2008. It is located in the Astronomical Station Kryoneri in the Northern Peloponnese (Fig. 13). The station is on the top of the mountain Kilini (1000 m above the sea level), at about 110 km westward from Athens. The main scientific instrument of the 1.2m telescope is a 516 x 516 CCD Camera, a Series 200 Camera System made by Photometrics (now Roper Scientific). More information at http://www.astro.noa.gr/ASK_1.2m/ask_main.htm

4.3 Chelmos Observatory

The new telescope "Aristarchos" of the IAA of NOA, a 2.3m Ritchey-Chrétien reflector (made by Carl Zeiss Jena), is under final tests on site. The new site (Fig. 14) that hosts the telescope, is located on the top of Chelmos mountain (2350m) in Northern Peloponnese, at about 150km westward from Athens. There are instruments for both imaging (optical CCD imaging cameras) and spectroscopy (low/medium dispersion and high resolution spectrometers). Research Topics at IAA of NOA (telescopes 1.2 m and 2.3 m) include: *Extragalactic Astronomy, Observational Cosmology, Interstellar Matter, X-ray Astronomy, Binary Stars and Variable Stars*. More information at <http://www.astro.noa.gr/helmos/>

4.4 Skinakas Observatory

The University of Crete operates a 1.3m Cassegrain telescope (Fig. 15) at Skinakas Observatory which is located in the Ida Mountain in Central Crete at an altitude of 1750m, 25km line-of-sight distance and 60km by road from the city of Heraklion. The instruments include optical CCD imaging cameras, Near Infrared Camera, high resolution Echelle Spectrograph and Adaptive Optics system. Research Topics at Skinakas Observatory include: *Optical studies of Active Galactic Nuclei, Structure of Spiral galaxies, Photometry of star clusters, RR Lyrae variables, Supernova Remnants, Planetary Nebulae, X-Ray binary systems, Interaction of Cometary tails with Solar Wind*. The Skinakas Observatory uses a significant percentage of the observing time for simultaneous observations with X-ray space observatories such as ASCA, RXTE, XMM-Newton and Chandra. More information at <http://skinakas.physics.uoc.gr/>



Fig. 12. The 76cm telescope of Stephanion Observatory.



Fig. 13. The dome and the telescope of Kryoneri Observatory.



Fig. 14. The dome and the telescope of Chelmos Observatory.



Fig. 15. The telescope of Skinakas Observatory.

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