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A Translation of *Der Mond*

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With the Collaboration of Nicolas Matsopoulos

Springer

Johann Friedrich Julius Schmidt (1825–1884)

Translated by
Stephen Harvey
Horsham, United Kingdom

English translation of the German work "Der Mond" by J.F. Julius Schmidt, published by Barth, Leipzig, 1856

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Introduction

Johann Friedrich Julius Schmidt was one of the most dedicated and tireless visual observers of the heavens and other natural phenomena, both as an amateur and professional.

Julius Schmidt's interest in astronomy started from an early age and he was a compulsive observer of just about everything in the sky, but his enduring interest was the Moon. As W.H. Pickering said, Schmidt "… perhaps devoted more of his life than any other man to the study of the Moon." (Cited in Dobbins and Sheehan, 2014). That interest was spurred by the work of fellow Germans, Johann Hieronymous Schröter (1745–1816; Cunningham, 2014) and the lunar mappers, Wilhelm Beer (1797–1850; Baum, 2014) and Johann Heinrich von Mädler (1794–1874; Joeveer, 2014). Beer and Mädler's (1834) *Mappa selenographica : totam lunae hemisphaeram visibilem complectens observationibus propriis: quatuor sectionibus constructa et delineate* was, at that time, considered to be the 'be-all and end-all' of lunar cartography, and ironically its perceived perfection led to a fading of interest in further observation of the Moon. Julius Schmidt was to reverse that trend. So who was Julius Schmidt?

Fig. 1 Schmidt in Athens. (Courtesy National Observatory of Athens (copy from Prof. Ostwald Thomas collection))

Julius Schmidt: A Brief Biography

Johann Friedrich Julius Schmidt was born in Eutin, the Grand Duchy of Oldenburg, in Germany, on 26 October 1825 (Dobbins and Sheehan, 2014). His parents were Carl Friedrich Schmidt, a glazier, and Maria Elizabeth Schmidt, née Quirling.

As a child Schmidt went to school in Hamburg, where he developed a keen interest in nature. When he was 14 years old, he accidentally encountered the world of the heavenly bodies. As he says in his short biography, included in his monumental work *Charte der Gebirge des Mondes nach eigenen Beobachtungen in den Jahren 1840-1874* (Schmidt, 1878: IV-VIII):

> *"In Autumn 1839, in my homeland Eutin, in an auction I have found Schröter's book (Selenotopographische Fragmente, Vol I Lilienthal 1791, Vol II Gottingen 1802) about the Moon. The impression of the shadowed mountains and craters was so intense and lasting, that determined the rest of my life. I was only 14 years old and although I had been involved in zoology and botany for quite a while and I knew about some astronomical phenomena, there could be no definitive decision. I decided only when I was able to see the Moon's surface through a telescope. This desire was fulfilled soon, because a small but good telescope made by my father, showed me the numerous Moon craters. After I put it on a street lamppost, I spotted the rays of the Tycho crater and made my first sketch. The study of Schröter's book and the continuation of making Moon sketches became my main occupation...because of which I neglected my lessons..."*

In July 1841 the Hamburg Gymnasium (where he studied) made a school visit to Altona Observatory, whereby Dr. Petersen fascinated young Schmidt with views of the craters of the Moon. Here, he also was able to study the map of Beer and Mädler (which he would later refer to as his 'working lunar catalogue').

Whilst living in Hamburg, he was a frequent visitor at Hamburg Observatory and was soon entrusted as a volunteer observer by Dr. Christian Karl Ludwig Rümker (1788–1862; Holland, 2014) who allowed him to use the instruments of the Observatory in the years 1842–1845. Schmidt published his first astronomical report in *Astronomische Nachrichten* in 1843, (Nr.468) detailing his observations of variable stars and the Sun in 1841 and 1842.

When Schmidt was just 20 years of age, Professor Johann Friedrich Benzenberg (1777–1846; Kokott, 2014) offered him an assistant's position at his private Observatory at Bilk[1], near Dusseldorf. During this period, he was tasked with observing meteors and naked eye objects, as well as searching for possible intra-Mercurial planets using small telescopes. However, he was unable to continue his lunar observations, particularly with the primary telescope, as Professor Benzenberg was afraid that the "… looks and polish …" (Laios, 1962: 20) would suffer if Schmidt were to use it. The Professor died the following year (1846) and Schmidt moved onto another observatory.

In 1846 Schmidt took up an Assistant's position at Bonn Observatory with Professor Friedrich Wilhelm August Argelander (1799–1875; Markkanen, 2014). At Bonn his work was to measure the visual magnitudes and the positions of the

[1] Bilk Observatory was destroyed during a WWII air raid. A telescope memorial now stands on the site.

stars laying in the V hour sector of the celestial sphere, for the completion of the most famous star catalogue named "*Bonner Durchmusterung Des Nördlichen Himmels",* or as it is generally known 'B.D', and its accompanying star map. That was an enormous task because it contains the visual magnitudes and the celestial coordinates of 325,037 stars to visual magnitude 9–10, of the northern hemisphere of the sky (declination zones +89 to –1 degrees). Rather impressively, this catalog is that it is still in use by the astronomers (Batten, 1991).

During his stay at Bonn (1845–1853) his duties of making routine observations prevented him from making significant observations of the Moon, but he did find time to process older observations and prepare many drawings of lunar features based upon his previous measurements. Furthermore, he was able to observe the Moon during two visits (April 1849 and May 1853) to the Berlin Royal Observatory, where the famous Gottfried Johann Galle (1812–1910) provided him access to the 9.6-in. refractor.[2]

In 1848 he made an important set of drawings of Saturn during the equinox (a selection is reprinted in Lardner's "*Handbook of Astronomy"* – although incorrectly attributed to M. Julius Schmidt).

Argelander recommended Schmidt to take up the Director's position of the private Observatory of Baron Eduard Ritter von Unkrechtsberg (1790–1870) in Olmütz (today Olomouc, Czech Republic), Moravia, in 1853, where he stayed for almost six years until 1858. There he could work, as he wished, without any restrictions, or obligation for routine observations.

Fig. 2 Young Schmidt at Olmütz. (From Etching at Akademie der Wissenschaften (Wien))

[2] This was the same instrument that was used by Johann Gottfried Galle (1812–1910), in 1846, to confirm the existence of the planet Neptune.

Schmidt's work led him to participate in 1854 with the Curator of the Natural History Museum in Bonn, Thomas Dickert (1801–1883), in the construction of a giant relief model (half-globe) of the Moon's visible hemisphere. At over 19ft in diameter (see Fig. 3) the model was described in his book *Das Relief …* (Schmidt,1854b) and illustrated in a 1925 leaflet issued by the Field Museum of Chicago (Farrington, 1925). The vertical relief on this model was exaggerated by a factor of three, compared to what Schmidt felt the correct relief should be. Although attracting much interest at the time, the present-day whereabouts of this remarkable model is unknown.

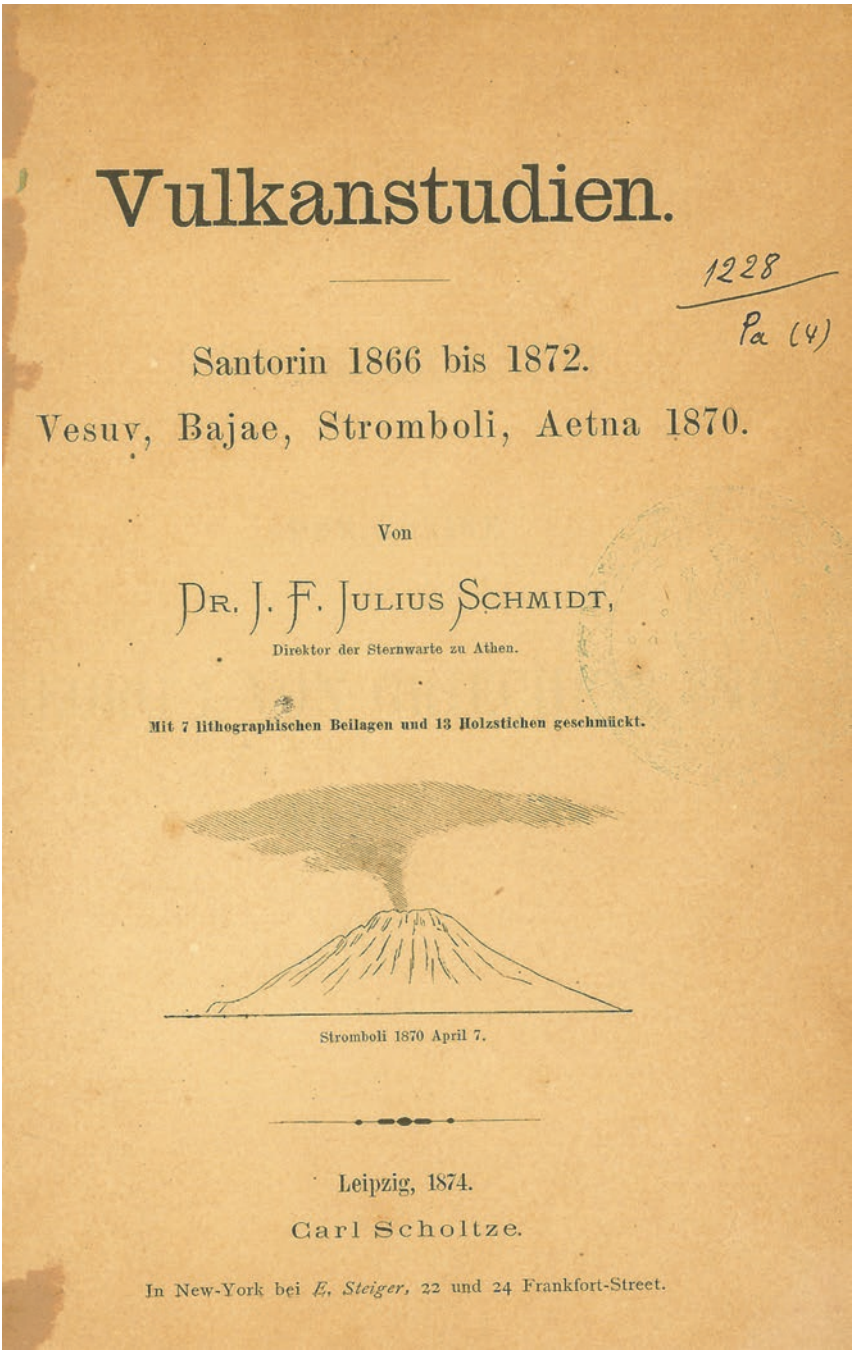
Fig. 3 A cropped photograph of the 19 ft. diameter semi-hemispherical model of the Moon made by Thomas Dickert and Julius Schmidt in 1854. (From http://www.idaillinois.org/cdm/search/collection/fmnh2/page/33)

During March and April 1855 Schmidt visited both Naples and Rome, making use of the great refractor in Rome to carefully map selected areas of the Moon; in Naples he made careful measurements of the heights of lunar mountains and craters with the use of a micrometer attached to the telescope, resulting in the publication of his book *Der Mond…* (Schmidt, 1856b).

Furthermore, during all this period he managed to continue many of his other observational projects - which actually continued for all his life – regarding the

heights of various lunar formations (Schmidt, 1854a), the Zodiacal Light (Schmidt, 1856a), meteor showers (Schmidt, 1852b), sunspots covering a whole 11 years solar cycle (Schmidt, 1857a) and the observation of eclipses, especially the total Solar Eclipse of July 28, 1851(Schmidt, 1852a). Besides these major publications, Schmidt was a regular contributor to Argelander's prestigious journal *Astronomische Nachrichten.*

But that was not all. Schmidt had a deep interest in Natural Science. Thus, he was observing and recording any kind of natural phenomena he could. He visited volcanoes in order to study them, such as Etna and Vesuvius in Italy, where he measured the heights of different sites whilst determining the performance of a newly developed aneroid barometer (Schmidt, 1856d).



Vulkanstudien.

Santorin 1866 bis 1872.
Vesuv, Bajae, Stromboli, Aetna 1870.

Von

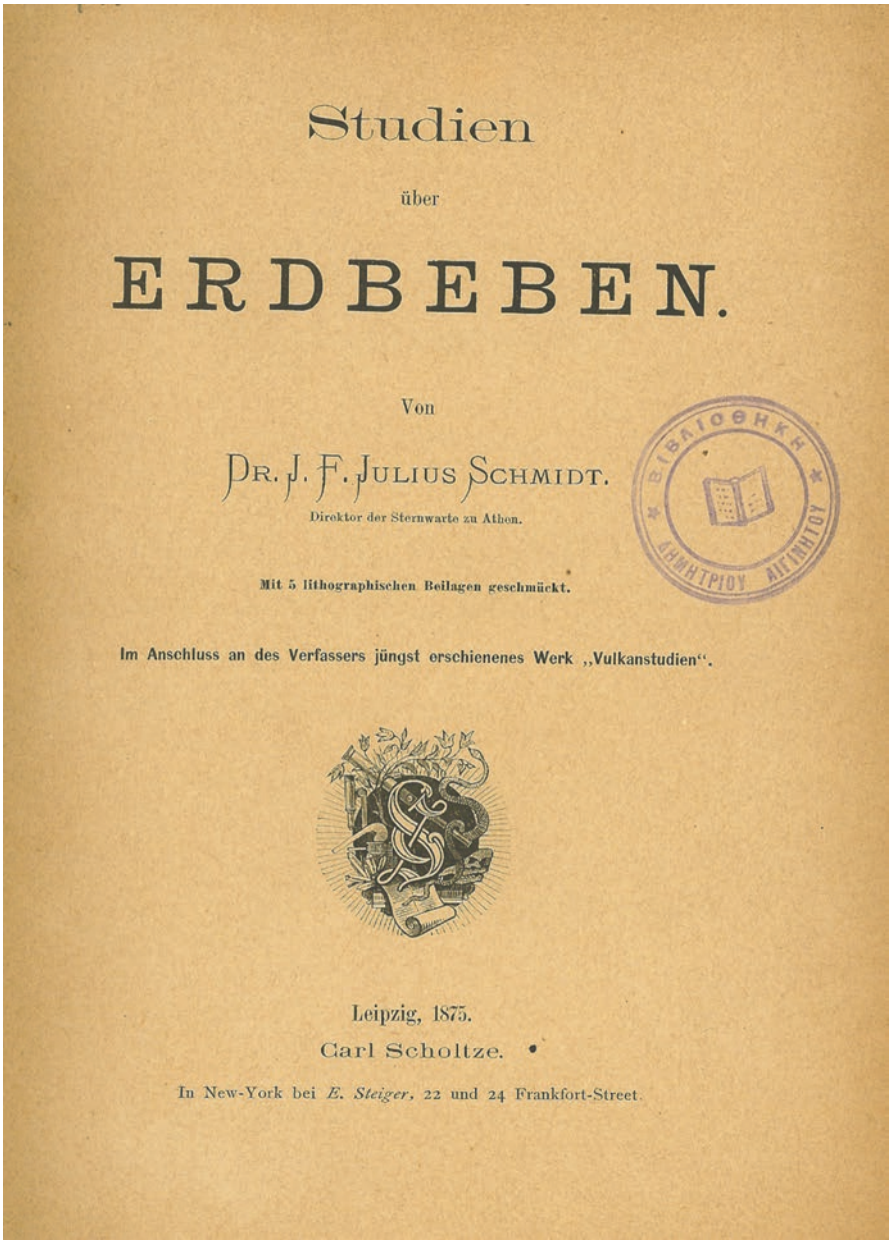
Dr. J. F. Julius Schmidt,
Direktor der Sternwarte zu Athen.

Mit 7 lithographischen Beilagen und 13 Holzstichen geschmückt.

Leipzig, 1874.
Carl Scholtze.
In New-York bei *E. Steiger*, 22 und 24 Frankfort-Street.

Fig. 4 Cover page from his book *Vulkanstudien* (Schmidt, 1874b). (From National Observatory of Athens)

He also recorded and studied earthquakes, resulting in two publications on the subject (Schmidt, 1857b; 1858b)


Studien

über

ERDBEBEN.

Von

Dr. J. F. Julius Schmidt.

Direktor der Sternwarte zu Athen.

Mit 5 lithographischen Beilagen geschmückt.

Im Anschluss an des Verfassers jüngst erschienenes Werk „Vulkanstudien".

Leipzig, 1875.

Carl Scholtze.

In New-York bei *E. Steiger*, 22 und 24 Frankfort-Street.

Fig. 5 Cover page from his book *Erdbeben* (Schmidt, 1875). (From National Observatory of Athens)

This rigorous activity provided him with a high reputation in the scientific community as a meticulous observer, although he had no formal training as a scientist.

In 1858 a very attractive proposal that could change his life, convinced him once again to relocate to a small country in the south-eastern part of Europe.

Baron Simon Sinas (1810–1876), a very wealthy merchant, banker and industrialist from Vienna, proposed Schmidt become the new Director of Athens Observatory in Greece. Sinas would provide Schmidt with a very respectable salary, from his own resources and absolute freedom to pursue his own research. Schmidt was never married and thus he had the freedom to make the decision for himself. Thus, he accepted the tempting proposal, which would secure him all that he wanted: a good salary for his living, freedom to pursue his scientific quests and above all a good astronomical site with more than 300 clear nights per year.

Athens Observatory: A Potted History

In 1830 Greece had achieved its independence from Ottoman-Turkish rule, after a revolution that began in 1821 and a struggle which lasted 9 years. London's Convention approved the second son of King Ludwig I of Bavaria prince Otto as the first modern King of Greece in 1832. Because Otto was very young, his government was initially run by a three-man regency council made up of Bavarian court officials. One of them was Anton von Prokesh-Osten (1795–1876), the Austrian Ambassador to Athens, who played a very important role in the establishment of the Athens Observatory.

Bavarians tried to organize the new-born state according to German standards. In their plans were the establishment of the University of Athens which began to operate in 1837. The first professor of Astronomy and Mathematics appointed was George Bouris (1790–1860).

Bouris was of Greek descent (actually from Ioannina - Epirus) but he was born in Vienna where his parents migrated to sometime before 1784 with numerous others from this particular area. He studied at Vienna University where he had as a teacher in Astronomy, the famous J.J. Littrow (1781–1840). After completion of his studies he worked as Director of the Greek school at Vienna for ten years until 1836.

Driven by an intense patriotic zeal, Bouris moved to Greece at the end of the same year in order to offer his services to the new-born state. He was hired as a translator at the Austrian Embassy where he met and be friended the ambassador Prokesh-Osten. When the University of Athens first opened, he was appointed as the first Professor of Mathematics and Astronomy.

He was a good mathematician and had experience in astronomy since he had worked as a volunteer at Vienna Observatory under Littrow. He had also published a paper on Biela's comet ("*Elliptische Bahnberechnung des Biela'schen Cometen mit Berücksichtigung sämmtlicher Bahn-Elemente und unmittelbarer Benützung der beobachteten Rectascensionen und Declinationen, aus sechs und neunzig*

Beobachtungen des Jahres 1832." Annalen der Kaiserlich-Königliche. Sternwarte in Wien.Wien, Part 14, p XXXVII-LIV).

It was Bouris who conceived the idea of establishing an astronomical observatory in Greece. In 1840, when he learned that Baron George Sinas (1783–1856), who was also the Greek Ambassador in Austria and the Chief Director of the National Bank of Austria, wished to donate a large amount of money to the Greek government in order to be used for the advancement of science at the University of Athens, he persuaded him to finance the establishment of an observatory. Obviously, Bouris and Sinas knew each other since both were eminent persons in the Greek community at Vienna. Furthermore, Sinas was from Epirus too, and actually from a small town called Moschololis (Now this area belongs to Albania). Prokesh-Osten embraced, supported and promoted the idea by all his means, especially to the King of Greece (Otto), mentioning that such an Institution would be very helpful in education, scientific research and navigation.

Fig. 6 Portrait of Baron George Sinas founder of the Athens Observatory. (From a portrait in the Victor Wimpffen (Vienna) collection)

Thus, the construction of the new observatory, on the top of the hill of Nymphs by the Acropolis, officially began on July 26 1842. Indeed, the cornerstone ceremony was timed to occur during a solar eclipse (embedding a fragmentary block used from the previous building that was already engraved "Hill of the Nymphs" in Greek). It was a formal ceremony attended by all the authorities, including the royal family and the King himself and practically most of the Athenians. Bouris, who had already been appointed the first Director of the Athens Observatory, addressed the crowd with an excellent speech, in which he referred to the high status of Astronomy in Ancient Greece, the contribution of the ancient Greek scholars and philosophers, and focused on the benefits of the existence of such an important institution for the country.

The building of the Observatory took 3 years to be completed under the auspices of the Danish architect Theofil Hansen (1813–1891). The result was a beautiful neo-classical cross-shaped building, with its four wings oriented toward the four cardinal directions and a central dome to house the main telescope.

Fig. 7 Original painting of the Athens Observatory by the architect who built it, Theofil Hansen. (From Akademie der Bildenden Kunste Wien)

Fig. 8 Portrait of the architect Theofil Hansen. (By Karl Rahl. Museum der Stadt, Wien)

Fig. 9 Theofil Hansen in Athens. (National Observatory of Athens)

Meanwhile, Bouris visited Vienna to purchase the first instruments for the Observatory. These included:

- A Plössl equatorial refractor of 6.2 in. aperture (158 mm, f/15) of dialytic design. Such a design employs a smaller concave lens, or combination of lenses, of high dispersive power, placed at a distance in the narrower part of the converging cone of rays, usually near the middle of the tube in order to correct the chromatic aberration of the objective lens.
- A Starke-Fraunhofer transit circle of 3.7 in. aperture.
- A Berthoud mean time clock.
- A Kessels sidereal time clock.
- Five small telescopes for comet hunting.
- Two Kapeller barometers.
- A set of other meteorological instruments.

In 1845 Bouris began his observations at the Observatory. He was making regular meteorological observations, meridian observations for the determination of the coordinates of the Observatory and the determination of time. He also observed the stars and the planets. His observations resulted in several scientific publications, mainly in *Astronomische Nachrichten* but the main corpus of his work remained unpublished and unfortunately is now lost. It is worth mentioning that at that time the Observatory had no other scientific personnel except its Director. Bouris worked completely alone.

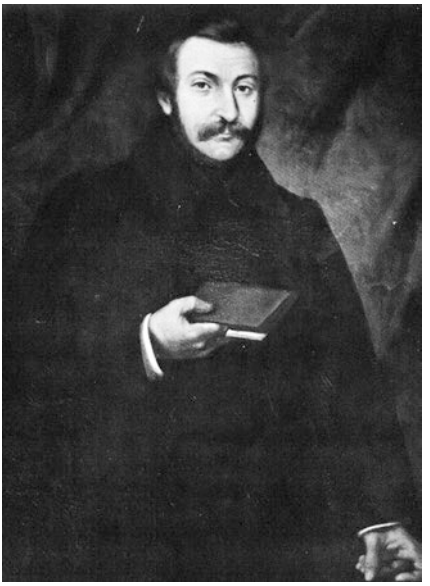


Fig. 10 Portrait of George Bouris, first Director of Athens Observatory. (From National Observatory of Athens)

Bouris' efforts were undermined by another Professor of Mathematics at the University, Ioannis Papadakis who had allies at the ministry of Education. Obviously, Papadakis wanted the prestigious position of the Director for himself. Outrageous allegations were made against Bouris, such as: he published his scientific results in foreign languages and not in Greek; his work didn't support the navigation of the Greek merchant fleet; the students of the university had not gained from his research etc. The most absurd allegation was that he proposed to demolish buildings of the ancient city in order for the Observatory to have a better view of the southern part of the sky. Joseph Ashbrook in his book *The Astronomical Scrapbook* (1984) mentions this allegation, thereby sustaining the misinformation. The truth is that the southern horizon of the Observatory was, and still is, free of obstacles. The war against him was intense, causing frustration and depression for Bouris, and ultimately undermining his health, leading to him leaving Greece and returning to Vienna in April 1855, where he died five years later.

Bouris' Publications*:*

- *ElliptischeBahnberechnung des Biela'schenCometenmitBerücksichtigungsämmtlicherBahn-Elemente und unmittelbarerBenützung der beobachtetenRectascensionen und Declinationen, aussechs und neunzigBeobachtungen des Jahres 1832*. Annalen der Kaiserlich-Königliche. Sternwarte in Wien. Wien, Part 14, pp. xxxvii-liv (1834)
- *Sur la variabilite du mouvementprope de Sirius en ascension droite.* – In: *Astronomische Abhandlungen als Ergänzungshefte zu den Astronomischen Nachrichten,* 119 (1849)
- *L'opposition de Neptune en 1848.* – In: *Astronomische Abhandlungen als Ergänzungshefte zu den Astronomischen Nachrichten,* 135 (1849)

- *Sur l'ascensiondroite de la Lune en 1847.* – In: *Astronomische Abhandlungen als Ergänzungshefte zu den Astronomischen Nachrichten,* 152 (1849)
- *Nachrichten von der Sternwarte Athens's nebst Beobachtungen der Irene ander selben. Astronomische Nachrichten,* 33(780),192–200 (1851)
- *Sur l'observatoired'Athenesetsur les extremes de temperature observes danscetteville. Archives des Sciences Physiques,* 24, 253–259 (1853)
- *Die Opposition des Mars imJahre 1849-1850 nach Beobachtungen der Sternwarte Athens's, nebst Bemerkungen über den Durchmesser des Mars. Astronomische Nachrichten,* 37(874), 153-188(1853)
- *Uber die Sirius - Tage. Astronomische Nachrichten,* 37(882), 311–316 (1853)

Ioannis Papadakis was appointed temporary Director of the Observatory, but he was not capable of any kind of scientific research. Thus, the Observatory was practically abandoned and fell into disrepair. Bouris, deeply concerned about the future of the Observatory, proposed to Simon Sinas to hire Schmidt as Director. Simon was the son of George Sinas, and his successor as benefactor to the Observatory after his father's death.

Fig. 11 Baron Simon Sinas. (Depicted in the book *Honpolgarok* (Barabas, 1866))

Schmidt at Athens

Julius Schmidt accepted Sinas' proposal and he was appointed the Director of Athens Observatory on 2 December 1858. Upon commencement, he immediately requested that repair and maintenance of the building and instruments be carried out. Baron Sinas agreed to cover the expense and the restoration took place in 1861.

Records show that the Meridian Circle was sent for repair to Vienna and equipped with four micrometers, (the equatorial refractor was also repaired again in the same city in 1874). The library also received many new important books, and several small instruments (mostly micrometers), were added to the Observatory's instrumentation.

During these changes, Schmidt began a series of initial astronomical and meteorological observations, focusing mainly upon observing meteors and variable stars. Afterwards, he set to work, with rigorous activity, to organise a regular observational service.

Schmidt, during his stay in Athens systematically studied:

1. Twilight
2. Sunspots
3. Meteors
4. Zodiacal light.
5. Photometric variable stars and others.
6. Positions and physical constitution of comets.
7. The rotation period of the major planets.
8. The colour of the stars.
9. The light, the appearance, the changes, the heights of the mountains and in general the description of the Moon.
10. The size of the diameters of the big planets.
11. The rings of Saturn.
12. The satellites of the big planets.
13. The positions and the physical constitution of nebulae.
14. Solar and lunar eclipses.
15. Use of the meridian circle and sextant to determine time.
16. Meteorology.
17. Hypsometric determination.
18. The Greek vegetation.
19. Seismology.

During the 25 years that he worked at the Athens Observatory, the clear skies allowed him to make thousands of naked eye observations of meteors as well as tens of thousands of observations of variable stars, discovering five periodic variables and two novae (T Coronae on 13 May 1866 and Nova Cygni on 24 November 1876). Most of his results were published in numerous research papers of the journal *Astronomische Nachrichten*. Schmidt also added a further 18 objects to the *New General Catalogue* (NGC): on 8 February 1861 he discovered the emission nebula complex NGC 6726, 6727 and 6729 in the constellation crater. Between 1845 and 1867 he determined the positions of 110 nebulae found by Herschel and Messier (see Schmidt, 1868). For many years Schmidt studied the planets and especially Mars and Jupiter, and he recorded their changing features in more than six hundred drawings. He observed the Great Comets of 1860 (C/1860 M1) and 1861 (C/1861 J1 (Tebbutt)), and one year later discovered the periodic comet, C/1862 N1 (Schmidt).

In order to gain a clear idea about his observing activity during this period of his life, we must note that of the 111 papers that appeared in *Astronomische Nachrichten*, 9 were about the planets, 35 about comets, 40 about variable stars, 6 about the Sun and solar eclipses, 4 about meteors and the rest presented mixed observational data regarding various objects. To underline the prolific amount of work carried out, we can see from the Table below a summary of observational reports presented to the Dean of Athens University for the years 1880 (Dean's Report … 1881: 90; Dean's Report … 1882: 71):

	1880	1881
Sunspot observations	359	357
Jupiter	230 drawings - measure of its rotational period	500 observations of Jupiter plus a few of Venus, Mercury and Mars
Moon	230 new measurements and drawings of various features. One lunar eclipse (December16, 1880)	708 new measurements and drawings of various features. One lunar eclipse (December 5, 1881)
Comets	5 comets, many positional and brightness observations	7 comets, many positional and brightness observations
Meteors	40 nights. 122 meteor paths	Few observations
Variable stars	Total magnitude estimations up to date 40336	476
Publications in *AN*	9	12

Furthermore, routine meteorological observations and star transits for the determination of time were carried out all year round. In his reports, Schmidt mentions the systematic assistance by the Professor of Astronomy at the University of Athens, Dimitrios Kokkides, especially in meridian observations, while Alexander Vourlis, who was his assistant, did most of the routine meteorological and sunspot observations at the Observatory.