РОССИЙСКАЯ АКАДЕМИЯ НАУК

ИЗВЕСТИЯ ГЛАВНОЙ АСТРОНОМИЧЕСКОЙ ОБСЕРВАТОРИИ В ПУЛКОВЕ

№ 219

Выпуск 4

Труды
Всероссийской астрометрической конференции
«ПУЛКОВО – 2009»

Санкт-Петербург
2009

Издание осуществлено с оригинала, подготовленного к печати
Главной (Пулковской) астрономической обсерваторией РАН

ИЗВЕСТИЯ
ГЛАВНОЙ АСТРОНОМИЧЕСКОЙ ОБСЕРВАТОРИИ
В ПУЛКОВЕ
№ 219
Выпуск 4
Труды Всероссийской астрометрической конференции
«Пулково – 2009»

Утверждено к печати
Главной (Пулковской) астрономической обсерваторией РАН

Компьютерная верстка оригинал-макета Е.Л. Терёхиной

ISBN 978-5-9651-0403-1

2009 **№ 219**

И З В Е С Т И Я

Главной астрономической обсерватории в Пулкове

Выпуск 4

ТРУДЫ ВСЕРОССИЙСКОЙ АСТРОМЕТРИЧЕСКОЙ КОНФЕРЕНЦИИ «ПУЛКОВО – 2009»

СОДЕРЖАНИЕ

ИСТОРИЯ АСТРОНОМИИ

ИСТОРИЯ АСТРОНОМИИ

VICTOR KNORRE LAST MEMBER OF THE KNORRE DYNASTY OF ASTRONOMERS – AN OVERVIEW OF HIS LIFE AND WORK

Dieter Wanderka[1], Gennadiy Pinigin[2]
[1]*Berlin, Germany*
[2]*NAO, Nikolaev, Ukraine*

Introduction

Victor Carl Knorre (1840-1919) was the third in a line of three generations of distinguished astronomers, a skilful and diligent observer of numerous stars and stellar systems, talented calculator of the orbits of minor planets and comets, visual discoverer of four minor planets and a practitioner with an interest and ability in mechanical matters, which assisted him in designing new astronomical apparatus. V. Knorre was the grand-son of Ernst Christoph Friedrich Knorre (1759-1810), since 1803 appointed to the post of associate professor of mathematics and observer at the interim Observatory at Dorpat, a city located in the Russian province of Livonia (now Tartu, Estonia) and the son of Karl Friedrich Knorre (1801-1883), director of the Nikolaev Marine Observatory.

V. Knorre`s astronomical career and later life was deeply influenced by his superior and mentor Professor Wilhelm Julius Foerster (1832-1921). From the beginning V. Knorre was completely absorbed in the astrometric programmes, promoted by Foerster, and he devoted himself to these research plans with tireless efforts over a period of 33 years until his retirement. Most likely V. Knorre did not intend to pursue a career as a University Professor, which certainly was a mandatory precondition for becoming director of an observatory. He was already 33 years old when he commenced at the Berlin Observatory in 1873. While many of his colleagues chose the Berlin observatory as a convenient springboard into a higher level of an astronomical career, V. Knorre preferred to stay and spent the remainder of his professional life entirely devoted to the duties of his profession with exemplary diligence and fidelity. His scientific contributions are well documented by numerous papers of his own observations, which he mainly published in the influential astronomical journal “Astronomische Nachrichten” (82 articles were issued between 1866 and 1912).

Little is known about V. Knorre`s private life except the fact that he was a brilliant chess player, who was considered as a vital force in German chess during the years from 1864 to 1865. In 1864 he beat Karl Ernst Adolf Anderssen (1818-1879), who was rated as the leading chess player in the world from 1851 to 1855 and 1861-1866. He also succeeded over elite players like Louis Paulsen (1833-1891), Johannes Hermann Zukertort (1842-1888) and Gustav Richard Ludwig Neumann (1838-1881).

In the following three stages of his life are described, covering his years of study, his professional career at the Royal Berlin Astronomical Observatory and finally his fruitful activities after his retirement in 1906 until his death in 1919.

The early years

Victor Knorre was born on the 4th October 1840 at Nikolaev as the 5th child of Dorothea von Dieterichs (1814-1851) and Karl Friedrich Knorre, eminent astronomer and director of the Nikolaev Marine Observatory. His father was very strived to allow for his son an excellent education and sent him to the well respected school at the Hanseatic city of Fellin in the Russian province of Livonia (today Viljandi / Estonia), where he graduated in 1859.

On his return home V. Knorre assisted his father in the technical works related to the observatory, and certainly there he established the basis for his technical skill, from which he benefited in his later years at the Berlin Observatory. His extraordinary observational ability

was documented by his father, who published an article in the “Astronomische Nachrichten” in 1862, announcing the first ever made observations of the “Pleiades occultation”, accomplished by his son Victor on the 17th of September 1859.

In 1862 he commenced his studies of astronomy at the “Berliner Königliche Friedrich-Wilhelms-Universität”, where he particularly attended the lectures of the then associated Professor Foerster. At the same time he carried out practical exercises held by the Director and famous Professor of Astronomy Johann Franz Encke (1791-1865), who was succeeded by Foerster in March 1865.

After graduation and receipt of his PhD in philosophy in 1867 V. Knorre left for the Pulkovo Observatory - “Russian National Observatory”- outside St. Petersburg, at that time headed by Otto Wilhelm Struve (1819-1905), where he resumed the position of an astronomical calculator. In 1869 he accompanied the Swiss physicist and meteorologist Heinrich Wild (1833-1902), director of the ”Physikalisches Central-Observatorium” at St. Petersburg and member of the Imperial Academy of Science, on an inspection tour to examine the meteorological and magnetic stations within the Russian Empire. V. Knorre was responsible for the determination of astronomical coordinates and magnetic measurements. The tour led through Moscow, Kazan, Samara, Zarizin, Rostov, Tbilisi, Kerch, Sevastopol, Odessa, Kiev and back via Moscow to St. Petersburg. At Odessa he had to termi-nate prematurely on grounds of ill health.

At the end of 1869 he returned home to his parent`s house, the observatory at Nikolaev, where he firstly cared for the education of his brothers and sisters and later resumed the position of a teacher at the local high school. Unsatisfying circumstances caused him to apply for a job opportunity at the Royal Berlin Observatory. In August 1873 he received a positive reply from the director Foerster.

V. Knorre`s professional career at the Royal Berlin Observatory (1873-1906)

When V. Knorre was appointed as second assistant (observer), the various fields of classical astronomy, which employed positional measurements of stars and planets and star charting, were performed at the Berlin Observatory. Particularly the latter subject intended largely to advance the search for minor planets, which became a speciality of the Berlin astronomers.

V. Knorre in the course of his astronomical career predominantly used the 9-inch “Fraunhofer equatorial”, a refractor with a significant historical background. Formerly, very valuable discoveries were already obtained with this famous instrument, such as the identification of the new primary planet “Neptun” on the 26th of September 1846 by Johann Gottfried Galle (1812-1910) (Fig. 1, 2).

Fig. 1. Royal Berlin Observatory, around 1900.

Fig. 2. Berlin Fraunhofer refractor.

First and foremost representatives of astronomy at Berlin in V. Knorre`s era

When V. Knorre took up employment at the Royal Berlin Observatory the field of astronomy in and around the Berlin was dominated by the internationally recognized astronomers Wilhelm Julius Foerster, Arthur Auwers (1838-1915) and Hermann Carl Vogel (1841-1907). Foerster, director of the Berlin Observatory for nearly 40 years, seems to have exercised a marked influence on V. Knorre`s path through life. He was an extraordinary versatile promoter and initiator of science and director of several important scientific and technological institutions. Two other influential scientists and contemporaries of V. Knorre were the astrophysicist Vogel and the astronomer Auwers. Vogel spent only a few years at the Berlin Observatory and in 1882 he was appointed as director of the "Astrophysikalisches Observatorium Potsdam", where he made his greatest discovery, the detection of "spectroscopic binary stars". Auwers, however, from 1866 to his resignation in 1911, as elected member of the "Prussian Academy of Science", closely cooperated with the astronomers and calculators of the Berlin Observatory. He became one of the foremost representatives in his generation of those who worked on "fundamental astronomy", which had for its object the accurate determination of the positions of the brighter stars in the sky and of their proper motions. With his family he resided at first in the official residence at the observatory building and from 1884 at the "Astronomisches Recheninstitut" (Astronomical Computation Institute) on the premises of the Observatory. V. Knorre and his wife Martha were neighbours for around 30 years.

Distinguished staff members at the Berlin Observatory during V. Knorre`s employment

Many astronomers and scholars were given the opportunity to work at the Berlin Observatory within the realm of classical astronomy, characterized as the "German school of practical astronomy", in which celestial mechanics and the improvement of the astrometrical instruments were the two main subjects of research, following the twin founders of this school, Friedrich Wilhelm Bessel (1784-1846) and Friedrich Georg Wilhelm Struve (1793-1864) and their successors Encke and Foerster.

All have more or less distinguished themselves by their ability and activity and several of them became well known in the astronomical world, among them Friedrich Tietjen (1834-1895) and Karl Romberg (1836-1898), V. Knorre`s closest friend, successfully worked at the Pulkovo Observatory for 21 years. F. Tietjen spent his whole professional career at the Royal Berlin Observatory and the Astronomical Computation Institute. V. Knorre maintained a close scientific cooperation with Tietjen for 22 years. Tietjen had a passion for solving instrumental and mechanical problems, a faculty which he shared with him. Tietjen`s experiences and ideas flew directly into the improvements and further developments of various micrometers, in part also into the registering micrometer, the "declinograph" (see below).

V. Knorre`s accomplishments in astronomy and related instrumentation

V. Knorre was particularly entrusted to care of the "Fraunhofer equatorial" and of the micrometrical observations. His main attention became directed to the determination of positions of minor planets, comets and double stars, which he carried out with the 9-inch refractor, equatorially mounted and furnished with an object glass of 244 mm aperture and a focus of 4.3 m and manufactured by the famous Munich workshop of "Utzschneider und Fraunhofer". This around 45 years old instrument, the historical background was mentioned before, was equipped with large, fine graduated position circles and readout microscopes to allow direct position determination outside the meridian by measuring right ascension (or hour angle) and declination differences of the celestial objects. For micrometrical measurements of the coordinates or angular distances of celestial objects V. Knorre initially used the parallel wire (filar) micrometer attached to the equatorial, but in the course of observations he devised new methods to improve the accuracy and facility of manipulation of the measurements.

Deklinograph or self-registering micrometer

Already in October 1878 V. Knorre applied his newly designed self-registering micrometer or as he called it, the "Deklinograph" (declinograph), which was constructed by the renowned precision mechanical and optical workshop "Rudolf Fuess" at Berlin (Fig.3). The device was equipped with a flange for attachment to the tube of the refractor [1].

Particularly the application of the declinograph enabled V. Knorre the discovery of 4 minor planets. On the 4th of January 1878 he discovered "158 Koronis", followed by "215 Oenone" on the 7th of April 1880, "238 Hypatia" on the 1st of July 1884 and finally "271 Penthesilea" on the 13th October 1887. With the recommendation of Foerster V. Knorre was awarded with the Honorary Professorship for his outstanding scientific achievements on the 9th of March 1892.

The device was based on an ordinary wire micrometer, containing a fine thread that could be moved across the field for measuring declinations, and a fixed thread for transit times of stars. The prevailing position of the movable thread towards the optical axis of the refractor was not measured by means of the micrometer screw, but effected in such a way, that at the very moment of setting of the declination of a star an endless paper tape was manually pushed against a steel pin, mounted on the slide of the movable thread, like the ocular lens. Simultaneously the paper tape was pushed against a further pin attached to the fixed part of the ocular piece. The distance between the two punctures in the tape indicated the actual setting of the declination. The pushing against the steel pins happened towards the axis of the telescope, in order to avoid least possible movements of the telescope. When changing from one star to the other by revolving a "fast" screw the paper tape was caused to continue accordingly. This method of graphical recording of differences in declination enabled the observer to improve the accuracy and speed of the performance of his measurement.

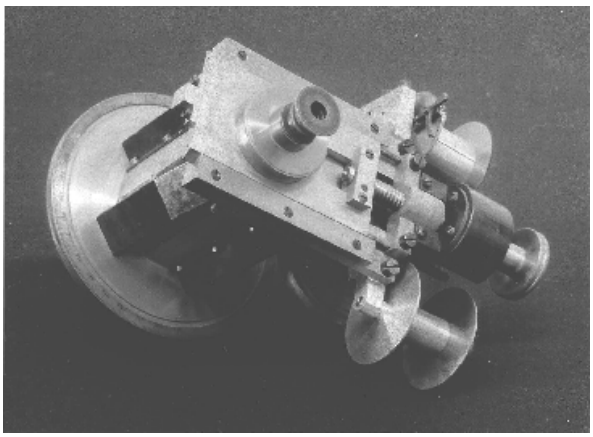

Fig. 3. The declinograph.

Later V. Knorre improved the accuracy level of the declinograph by applying a pneumatic device actuated by means of a foot controlled rubber ball, which in turn activated a piston system and accordingly released the setting of the declination [2]. At present the declinograph is kept in the Museum of the Babelsberg observatory [1].

An improved equatorial mounting design

V. Knorre throughout his professional career was constantly attended to improve the accuracy of his measurements caused by instrumental (mechanical) errors of the refractor, particularly in respect to its equatorial mounting. Suggestions for improvement of steadiness of the mounting were published in volume 160 of the 1903rd edition of the "Astronomische Nachrichten", where he described in detail an elaborate design option, which enabled a highest possible relief of the axes and bearings during the telescope´s handling.

The precision instrument makers Hans Heele (1848-1923) and Carl Reichel (1832-1911), both from Berlin, gave V. Knorre the idea of employing ball bearings as constructional ele-ments for equatorial mountings instead of cylindrical or tapered bearings. They pointed out that the manufacturing process of a ball bearing could be executed with much higher precision.

V. Knorre developed a construction in which both the upper part of the right ascension axis (polar axis) and declination axis were executed as spherical sections resting in ball bearings. This construction ensured a lower and more equal pressure of the respective axis on its bearings in every position of the instrument, minimising twisting in the axis. In order to verify that the optical axis of the telescope could be quickly positioned reasonably close to parallel with the polar axis of the equatorial mounting, V. Knorre furnished it with an alignment telescope, which was integrated in the hollow polar axis. The declination axis perpendicular to the polar axis was carried out in a similar manner [3].

A refractor of the "Knorre-Heele version" built at Heele`s workshop and intended for exhibition at the "Exposition Universelle Paris 1900" (world trade fair), furnished with an objective of 120 mm aperture and a focal length of 1.6 m, could not be accomplished in time.

The reconstruction works for providing the "Fraunhofer equatorial" with the improved mounting did not proceed according to plan. The instrument was dismantled in 1901 and reassembled in 1904. V. Knorre, however, was no more able to continue his astronomical research work according to his high expectations. He retired on the 1st of April 1906.

The final years at Groß-Lichterfelde (1906-1919)

After his retirement in April 1906 V. Knorre and his wife Martha moved from their official residence at the Astronomical Computation Institute to their own villa at Groß-Lichterfelde, a place then still outside the Berlin city limits. They resided at "Potsdamerstrasse 57". Their house was designed by Gustav Lilienthal (1849-1933), a famous architect and master builder, in the English Tudor style, a characteristic feature of his art. G. Lilienthal became V. Knorre`s brother-in-law. When V. Knorre took up his employment at the Berlin Observatory in 1873 he lived the first four years with his parents and half-brother Georg Karl von Knorre (1859-1910) in the four-storey building at the Berlin district "Luisenstadt". Their neighbour, the physician Dr. E. Rothe, ran a respected clinical practice in the ground floor. He had five children, three daughters and two sons. Martha Rothe (?-1933) became V. Knorre`s wife. Anna Rothe (1858-1938), the youngest of the "Rothe children", married G. Lilienthal in May 1889.

The ties between the members of the extended family "Knorre" were traditionally very close. V. Knorre maintained the value of close relationship with his relatives and provided support whenever it was necessary. In 1904 V. Knorre`s eldest brother Theodor von Knorre (1831-1911), the only child of Elisabeth von Dieterichs (1811-1832) and Karl Knorre, also moved in the villa and shared the first floor with his halfsister Olga. Theodor von Knorre, registrated as „Ziv. Ingen. Kaiserlicher Russischer Staatsrath a.D." (Civil Engineer, Imperial Russian privy Councillor, retired) remained there until 1910. V. Knorre`s half-brother Georg von Knorre, since 1898 Director of the "Electrochemical Laboratory" and Professor of Electrochemistry at the "Königlich Technische Hochschule" (Royal Technical University) at Charlottenburg, near Berlin, deceased in 1910. When his wife Bertha died in 1918, the two sons (probably Walter and Karl) moved in V. Knorre`s house in February 1919.

The "theory of the equatorial" and continued development of the mounting

Despite the set-backs V. Knorre had experienced with the application of the improved moun-ting for the "Fraunhofer equatorial", he continued with his theoretical studies about the "per-fect" equatorial mounting. Five comprehensive publications appeared in the "Astronomische Nachrichten" between 1908 and 1912. In addition he furthermore carried on to finalize his private equatorial, also manufactured by the workshop of Heele. Problems occurred in

finding an adequate location for the instrument`s installation and alignment. It is assumed that the concerned people of the Berlin Observatory were not very supportive probably due to the upcoming relocation of the facilities to the new location at Babelsberg near Potsdam.

In 1907 he requested for help in this matter from the director of the observatory at Berlin-Treptow Friedrich Simon Archenhold (1861-1939), which seemed to be successful. Archenhold provided at his premises a small observatory for the mounting of telescope. Later V. Knorre`s equatorial was delivered to the Observatory at Münster in Westphalia, and used under the direction of professor Joseph Plaßmann (1859-1940). Unfortunately the instrument is considered lost or destroyed. The photo below shows the "Knorre-Heele improved equatorial mounting" located in the dome of the Münster University-Observatory (Fig. 4) [4].

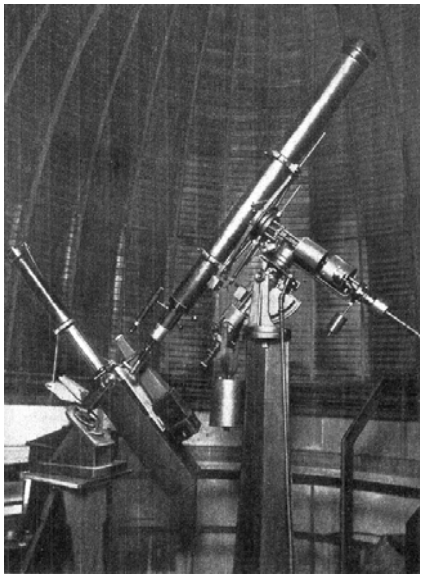

Fig. 4. Equatorial mounting by Knorre and Heele.

Review

Up to the latest period of his life V. Knorre with tireless efforts was determined to contribute his part to significant achievements in astronomy. The services he rendered to astronomical science, although not gilded with any brilliant discovery, however, possess a value, which can only appreciated by those, who are profoundly acquainted with the subject of which they treat. The last months before he died his mental health deteriorated increasingly. V. Knorre, a third generation member of a famous dynasty of astronomers [5], deceased on the 25th of August 1919 and was buried at the cemetery "Parkfriedhof" in Lichterfelde. His friend Archenhold dedicated him a short review of his life and characterized him as very generous to those, who sought his help and advice, a personality with a simple and upright character, who was beloved and respected by his colleagues, friends and students [6]. It is worth emphasizing that V. Knorre, unlike his brothers and sisters, never bore the title of nobility, which he inherited by his parents. He lived a happy marriage with his wife Martha but unfortunately they had no children.

References

1. The Museum of the Babelsberg Observatory, Invent.-Nr.26 03780.
2. *Ambronn, L.*: Handbuch der Astronomischen Instrumentenkunde, Zweiter Band, Berlin 1899, p.538.
3. *Knorre, V.*: Montierung von Äquatorealen nach Knorre und Heele, Astronomische Nachrichten, Vol. 177, 1908, pp. 179,180.
4. *Plaßmann, J.*: Der Sternenhimmel, 1928, p. 17.
5. *Pinigin, G.*: The Knorre astronomers' dynasty, Astronomische Nachrichten, 2009, Vol.330, pp.578-581.
6. Das Weltall, 20 Jahrgang, 1919/1920, p. 56.