

## Astronomical Institutes of Prague Universities in 1882–1945

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**Abstract.** In 1882, the *Prague Charles–Ferdinand University (Universitas Carolo–Ferdinanda Pragensis)* was divided into two national universities — German and Czech. Astronomical institutes at both new universities were established, and they operated independently until the end of World War II when the *German Charles University in Prague (Deutsche Karlsuniversität in Prag)* was abolished. This article summarizes the development of astronomical research at both universities during this period, its institutionalisation and biographies and mainly scientific activities of astronomers, based on the sources from archives of these institutions.

### Introduction

In 19<sup>th</sup> century the Prague university, founded in 1348 by Charles IV and reconstructed in 1654 by Ferdinand III to *Prague Charles–Ferdinand University (Universitas Carolo–Ferdinanda Pragensis)*, became bilingual. The tension between German and Czech speaking students and staff members resulted into a split in the year 1882. The observatory in the tower of the Clementinum College (erected 1722 and rebuilt 1751–1755) was attached to the *German Charles–Ferdinand University (k.k. deutsche Karls–Ferdinands-Universität)* and served as its Astronomical Institute (GeAI), under the leading of Ladislaus Weinek. After World War I, the Clementinum tower and adjacent rooms became the *State Observatory* of the new Czechoslovak Republic. The newly established *German Charles–Ferdinand University* incorporated the GeAI which existed until the end of World War II. The GeAI operated observatories in Telnitz (today Telnice, district Ústí nad Labem) (1929–1945) and Ondřejov (1943–1945).

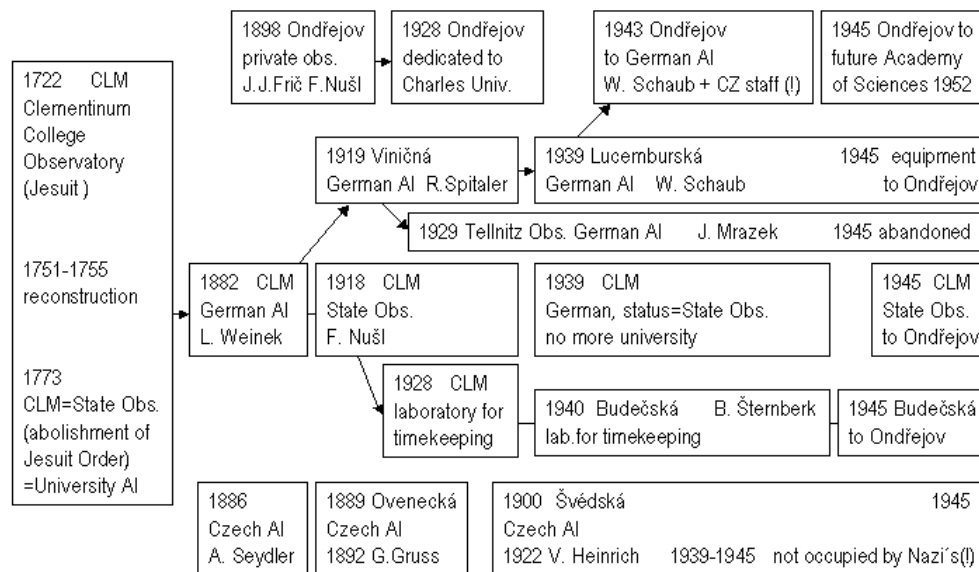
The beginnings of the Astronomical Institute of Czech university (CzAI) proceeded in two steps — the first being the appointment of August Seydler the Professor of Theoretical Astronomy and Theoretical Physics in 1885, and the other step his suggestions to establish the institute on 1886. Even if the foundation decree was missing or not existent, since 1<sup>st</sup> January 1887 Seydler led the inventory of the “*Provisional Astronomical Institute of the Bohemian Charles–Ferdinand University of Prague*”, how he named his institute. Hence we date the origin of CzAI to the preceding year 1886. The existence of this institute (in some periods under slightly different names) continues until now, remarkably without interruption after the 17<sup>th</sup> November 1939, when the Czech colleges were closed.

In 1890, the Czech university had 3 faculties, 122 staff members, 2195 students, and the German university had 4 faculties, 147 staff members and 1458 students. In the period 1882–1945 several dozen students graduated in astronomy at both universities.

### German Astronomical Institute 1882–1918

The astronomical observatory at Clementinum College was rebuilt to the present status in ca. 1751–1755, under the first director Joseph Stepling (1716–1778), Jesuit mathematician and physicist. The records of his meteorological and astronomical observations unfortunately disappeared, like another documents from the observatory, due to the abolishment of Jesuit Order in 1773 and secularization of the university.

Clementinum, situated in the centre of the city, soon became unsuitable for almost all types of observations. Karl Hornstein (1824–1882) who was director since 1867 decided to leave the purchased instruments in shipping boxes and to carry out only the necessary observations for timekeeping and meteorological service. He influenced joining Clementinum observatory to the German university, but died there in 1882. The renaissance of scientific work, both theoretical and observational, came with the next director Ladislaus Weinek, who gained international recognition for his lunar photographic atlas and participation on the discovery of the effect called “polar motion.” Under the next astronomers, Rudolph Spitaler and Adalbert Prey, the work never comprised such a broad spectrum, although the last head, Erwin Finlay–Freundlich, intended far-reaching projects before he was forced to emigrate.



**Figure 1.** Development of astronomical institutes in Bohemia 1882–1945.

### Ladislav Weinek

Ladislav Weinek (1848–1913) studied mathematics, physics and astronomy at the *University of Vienna*, and astronomy at the *Leipzig University*. In years 1873–1875 he participated on expedition to Kerguelen Islands to observe the transit of Venus across the Sun on 9 December 1874. Afterwards he took the position of the main observer at the observatory of the University of Leipzig, where he stayed until 1882. In autumn of 1883 he was appointed the Professor of Astronomy at the *German Charles–Ferdinand University* and came to Prague.

Weinek and his adjunct Dr. Gustav Gruss systematically observed occultations of stars by the Moon and passages of stars through the meridian using transit instruments, for which Weinek adapted a room under the roof of the eastern wing of the building, adjacent to the tower. From here also the measurements of the pole height were carried out using the Horrebow–Talcott method. This project, organized by the director of Bonn observatory Friedrich Küstner, in 1889 already confirmed the fact that Earth’s rotational axis slightly changes its position within the body of the Earth. Since then this quasiperiodical motion of the Earth’s rotational pole has been continuously observed on many observatories, nowadays in pursuance of the *International Earth Rotation and Reference Systems Service (IERS)*.

Weinek gained his first experience with astronomical photography at the research photographic laboratories in Schwerin (where he became Head in 1873, when preparing the expedition to Kerguelen Islands). Photography remained his favourite activity — on 20<sup>th</sup> November 1885 he succeeded to take a picture of meteor from the Leonid shower, for the first time in the world. Thanks to his skills in photographing the Venus transit he received pictures of Moon surface from the Lick and Meudon Observatories, in order to prepare the first lunar photographic atlas (the Lick 36-inch refractor was the world’s largest telescope). The project comprised 10 bands with drawings of 200 lunar craters, each under western and eastern illumination; they appeared in 1897–1900 with financial support of 1000 USD by Catherine Wolfe Bruce from USA.

Weinek also suggested and coordinated cooperation with observatories in Postdam, Berlin, and Strasbourg, when observing the geomagnetic phenomena (especially declination, inclination and horizontal component of magnetic intensity).

### Rudolf Spitaler, Adalbert Prey and the German Astronomical Institute in 1918–1938

In October 1918 František Nušl took over the management of Clementinum observatory that became the *State observatory* of the new Czechoslovak Republic. The former German university

transformed into *German University in Prague (Deutsche Universität zu Prag)* and the GeAI had to move to its building in Viničná 7, without access to any observatory. In 1929 the Sudetenland factory owners founded the *Society of Friends of the Observatory of the German University in Prague*, whose purpose was to compensate the GeAI for insufficient funding from the side of the Czechoslovak government. The Society bought an estate and built an observatory with cellar for geomagnetic observations (equipped with the instruments from Clementinum) there. Astronomical and meteorological instruments were supplied by the Society. The staff consisted of permanent observer Josef Mrazek and, as archival documents suggest, an assistant arrived around year 1930. In Prague, the former staff members continued with lecturing, now in the frames of the new *German University in Prague*, but their scientific activities were focused on other fields.

Rudolf Ferdinand Spitaler (1859–1946) graduated at the *University of Vienna* in 1884 and since then to 1892 he worked at the Vienna observatory. Observing with the 27-inch refractor, he discovered several comets (e.g., 113P/Spitaler), 55 galaxies and 9 star clusters; using mainly photography.

In 1893–1901 Spitaler worked as adjunct at the Clementinum observatory and in 1896 he entered the *German Charles–Ferdinand University* as associate professor. He founded and led the *Institute for Space Physics (Institut für kosmische Physik)*. In 1904 the meteorological observatory on Milešovka (Donnerberg) was completed. Spitaler chaired the scientific committee for building the observatory and became its first director. At 7 a.m. 1 January 1905 he started the continuous Donnerberg meteorological observations.

Spitaler's studies of climatic changes in connection with fluctuation of Earth axis significantly contributed to research on climate in the past, mainly Quaternary period. In 1940 he was the first to pronounce the hypothesis that changes in Earth's orbit may influence thermal conduction and thus the intensity of meteorological phenomena. After retirement in 1929 he continued publishing on climatology and physics.

Adalbert Prey (1873–1949) arrived from Innsbruck in 1917 and focused mostly on spherical astronomy and celestial mechanics. He worked at the observatory until March 1930, when he was called to department of theoretical physics of the *University of Vienna* to succeed the late professor Oppenheim. In 1940's he published two books on spherical astronomy, after a pause of 8 years.

### **Erwin Finlay–Freundlich**

Erwin Freundlich (1885–1964) graduated at the *University of Göttingen*. Finishing his studies in 1910, he took the position of assistant at the observatory of the *University of Berlin*. In 1911 he began cooperating with Albert Einstein. Einstein approached Freundlich with the request for performing thorough observations of Mercury to confirm Einstein's theory. In 1913 Freundlich published his results despite disagreement of Berlin observatory and thus confirmed Einstein's statement, that Newton's law of universal gravitation needs a correction. In 1914 Freundlich led a scientific expedition to Feodosia in Crimea to observe solar eclipse and measure the deviation of light rays in gravitational field of Sun. However, the expedition failed due to outbreak of the World War I. In 1918 he gave up his position at the Berlin observatory and engaged in construction of the future *Einstein Tower*, of which he became the director. Its goal was to observe the gravitational redshift.

Being of Jewish origin, Freundlich left Germany in 1933 and for years 1933–1936 he settled in Turkey, where he established and built an astronomical institute of the reorganized and secularized *Istanbul University*. In 1937 he was appointed Professor of Astronomy at the *German University in Prague* and on 13 January 1938 he began lecturing theoretical astrophysics. As an opponent of Nazism, he gained support from Czech astronomers. In autumn 1938, after Nazi Germany occupied Czechoslovak Republic, Freundlich immigrated to Scotland. On recommendation of Arthur Eddington, the *St. Andrews University* awarded him the John–Napier professorship (1951–1959), and invited him to supervise the construction of 37-inch Cassegrain.

### **Ondřejov Observatory 1898–1943**

In 1898, the factory owner Josef Frič bought an estate on the hill Manda near Ondřejov and started to build a private observatory. He cooperated with the astronomer František Nušl and was supported by Vojtěch Šafařík (1829–1902), Professor of Chemistry and Astronomy who bequeathed

him his library and instruments from his private observatory, including an original comet seeker and 20-cm Clark refractor. Observatory was named Žalov in tribute to the deceased Jan Ludvík Frič, Josef's younger brother, with whom he ran a factory producing fine mechanical and optical instruments.

In 1928 Josef Frič offered the observatory to the Czechoslovak Republic for the *Charles University (Univerzita Karlova)*. The donation was formally realized in 1933. The observatory had independent administration and accountancy, František Nušl was appointed its director and the observatory was named *Žalov, hvězdárna bratří Josefa a Jana Friče při universitě Karlově*.

At that time the Ondřejov observatory consisted of two domes with large telescopes, five observation houses with removable roofs, three residential houses and 6 hectares of forests and gardens. Specialized staff included the director, 3 scientific workers, mechanic and photographer.

### Josef Jan Frič

Josef Alexander Frič (1861–1945) was born in the family of the Czech revolutionary Josef Václav Frič. He studied zoology and palaeontology and was an amateur astronomer. He and his younger brother Jan founded a factory that developed high quality optical and geodetic instruments. After Jan's sudden death, Josef adopted his first name and since then signed as J. J. Frič. Josef Frič and Professor František Nušl constructed an astronomical-geodetic instrument called "circumzenital" for highly precise measurement of geographic positions. J. J. Frič got two doctorates honoris causa, in 1927 at the *Czech Technical University (České vysoké učení technické)* and in 1931 at the *Charles University*. His factory survived until nationalization in 1950, when its optical instruments development programme was abolished.

### František Nušl

František Nušl (1867–1951) constructed his first simple telescope at the age of 15. As a student of the *Bohemian Charles–Ferdinand University of Prague (c.k. česká universita Karlo–Ferdinandova)*, he helped out at CzAI making practical observations and numerical calculation of asteroidal orbits. Since his studies he showed interest rather in practical astronomy; as a teacher in Hradec Králové he used to spend vacations working at observatories, constructing astronomical instruments and popularizing astronomy.

About 1900 he began to focus on construction of an instrument that determined geographic coordinates by the Gauss method. In 1901 he moved to Prague, started to cooperate with J. J. Frič and soon they became lifelong close friends. In 1905 Nušl got the position of associate professor at *Bohemian Charles–Ferdinand University of Prague*, in 1908 he was appointed Professor of Mathematics at the Czech Technical University and in 1928 Professor of Practical Astronomy at the *Faculty of Natural Sciences of the Charles University*. In 1928 F. Nušl was elected the vice-president of the *International Astronomical Union*. Retiring in 1938, he continued to build astronomical instruments.

### Vladimír Guth, František Link and others

Other scientists at the Ondřejov observatory were associate professors František Link (1906–1984) and Vladimír Guth (1905–1980); Jan Kaván (1877–1933), Vincenc Nechvíle (1890–1964), Otto Seydl (1884–1959), Bohuslav Mašek (1868–1955), the editor of the *Astronomical Yearbook*, and the former astrophysicist of tsar observatory in Perm Josef Sýkora (1870–1944). J. J. Frič is mentioned on the staff list as the mechanic.

V. Guth focused on photographing of meteors and observations of comets, eclipses, and occultations. F. Link and V. Guth performed photometry of lunar eclipses and photographed spectra of stars. In 1934 F. Link treated the photometrical effect of gravitational lenses, for the French Astronomical Society, publishing the study in *Science* earlier than Einstein. V. Nechvíle studied proper motions of stars and binaries and observed the asteroid Eros during its opposition in 1931. O. Seydl administrated the *State Observatory* in Clementinum, and made meteorological measurements and time service. J. Kaván observed bolides, eclipses, Saturn rings and Jupiter moons; in 1920 he left for the observatory of Stará Ďala in Slovakia.

### German Astronomical Institute 1939–1945 and Ondřejov Observatory 1943–1945

After emigration of Georg Alter and Erwin Freundlich, the abandoned GeAI moved to Lucemburská Street at Vinohrady. The *German University in Prague* was joined to the alliance of the “*Reich’s universities*” in 1939 and since 1 September 1939 it was subordinated to the Ministry of Education in Berlin. On 4 October it was declared the Reich’s university and renamed *German Charles University in Prague (Deutsche Karlsuniversität in Prag)*. On 21 September 1939 Dr. Werner Schaub was appointed the Professor of Astronomy and director of the institute.

The unmaintained observatory in Tellnitz needed reconstruction. Schaub carried through the installation of independent high voltage transformer for Tellnitz Observatory and renovation of the building. Also an Askania transit instrument, a geodetic table, a modern 1-meter meridian telescope, and additionally a new Strasser & Rohde clock, were purchased.

On 18 November 1943 the Ondřejov observatory was officially attached to the *German Charles University in Prague*. Schaub arranged the installation of 20-cm Cassegrain telescope at Ondřejov and building of a new house for radioastronomy. The occupation of the observatory was rather formal and Schaub treated both Czech astronomers correctly. One of the helping students Miroslav Plavec described him as “the only respectable German” that he met during the war (Plavec, 1998).

*German Charles University in Prague* ceased to exist on 5 May 1945. Scientific institutions, their equipment and all properties passed to *Charles University in Prague*. In autumn of the same year Guth and Link took all equipment of GeAI to Ondřejov. As an “institution enemy to Czech nation” the *German Charles University in Prague* was legally abolished by the president’s decree from 18<sup>th</sup> October 1945 with validity back to 17<sup>th</sup> November 1939.

#### Werner Schaub

Werner Schaub (1901–1959) studied astronomy and theoretical physics at universities in Bonn and Munich, and in 1927 he became an assistant at the university observatory in Bonn. His field of interest was determination of solar parallax from radial velocities. From 1930 he was an assistant at observatory of the *Leipzig University* and in 1936 he took the position of assistant at observatory in Berlin. He performed spectral analysis and studies of proper motions of some FK3 catalogue stars. Since 1937 he was associate professor of astronomy at the *University of Berlin*.

After World War II broke out, Schaub joined the German army, suffered an injury at the battlefield, and after recovery was appointed the Professor of Astronomy at the *German Charles University in Prague* and director of its observatory. In 1943 Schaub found the relationship between Ondřejov observatory and *Charles University* and arranged its occupation. After the end of the war he was deported back to Germany, where he wrote up a textbook on spherical astronomy.

### Czech Astronomical Institute 1886–1945

The astronomical institute of the *Bohemian Charles–Ferdinand University of Prague* exists since 1886, when the chair of the Professor of Astronomy was established for August Seydler, together with the professorship of Theoretical Physics. Seydler suffered from tuberculosis and spent a part of every year on therapeutic stays. The institute found his seat in 1889, when Seydler rented a house at Letná, Ověnecká Street 80. In its garden a provisional observatory was built, for which Seydler gained fine instruments: Reinfelder & Hertel 217 mm refractor (f 260 cm, at that time the largest in Bohemia) with Heyde parallactic montage and accessories, transit instrument with pointed telescope (objective 54 mm, f/64 cm), Strasser & Rohde clock, ocular prism, universal spectroscope, a polarizing helioscope with telescope, and Dawes telescope.

In 1900 CzAI moved to Smíchov (Švédská Street), where the provisional observatory was assembled in the garden. Despite attempts to find another place outside of the growing light pollution of the city, the institute stayed at Švédská Street. Gruss retired in 1914 and for several years the institute was led by provisional administrators. After 1920 the newly established Faculty of Natural Sciences of the *Charles University* planned to build new laboratories, but without any room for CzAI, because the plan did not allow construction of observatory technically. The plans were never fulfilled.

In 1919 V. V. Heinrich was appointed the Professor of Spherical and Theoretical Astronomy and became the director of the CzAI at Smíchov. The building and observatory had already been

obsolete. The mechanic from Frič's factory J. Brejla reconstructed old transit instrument and refractor, assembled Wolff photographic astrograph, new clock and new Graff photometer. Heinrich purchased some optics — 26 cm Zeiss visual objective, 17cm Zeiss photographic objective, and got larger mirrors for Schmidt reflectors — in Germany.

Heinrich was removed from the position of director after repetitive problems with his staff; in 1934 Professor of Theoretical Physics Václav Trkal was appointed the provisional administrator.

### August Seydler

August Seydler (1849–1891) was student and assistant of professors Ernst Mach and Karl Hornstein. Assistants at the *k.k. Sternwarte* were entrusted with magnetic and meteorological observations, time service, determination of position of asteroids, and calculations of orbits of planets and comets; these tasks Seydler fulfilled at best. His academic career started with doctorate in 1871 and continued by being appointed extraordinary professor of theoretical physics in 1872, of mathematical physics (1881), and theoretical astronomy and theoretical physics in 1885. His textbooks (3 bands) created the Czech terminology for both physics and astronomy. With his students he calculated orbits of asteroids 266 Aline, 281 Lucretia, 146 Asporina, 275 Sapientia etc., and of three comets.

### Gustav Gruss

Gustav Gruss (1854–1922) was also Karl Hornstein's student and since 1881 his adjunct at the *k.k. Sternwarte*. In 1892 he was appointed the Professor of Astronomy at the *Bohemian Charles–Ferdinand University of Prague* and director of the CzAI. He wrote a textbook on celestial mechanics in two bands — mainly methods of orbit determination, and a famous popular book “*From the realm of stars*”. His other publications included topics from mathematics, physics, meteorology, variable stars and then new field of spectral analysis.

### Václav Heinrich

Vladimír Václav Heinrich (1884–1965) graduated with the dissertation titled “*On the orbit of asteroid (617) Patrocla near Jupiter*” which reflected his scientific focus: the restricted three-body problem. He got the degree of associate professor of the theoretical astronomy at the *Bohemian Charles–Ferdinand University of Prague* in 1913 and in 1919 became the director of the CzAI. Since 1929 he was appointed the Professor of Theoretical Astronomy. In late 1920's Heinrich engaged in theory of secular resolution of star systems movements. But his disagreements with staff of the institute and other professors including František Nušl finally led to Heinrich's removal from the director position (Heinrich, 1934). He remained the professor at the *Charles University* until 1957, when he retired.

### Sources overview

Most of the primary sources of information included in this article are documents from archives where inventories are to be done (this is why we resigned on the detailed citations — it would exceed drastically the space allowed for the article). Some documentation from the archival resources *State Observatory* and archives in the *Astronomical Institute of the Academy of Sciences of the Czech Republic* in Ondřejov and *Archive of Charles University* were used as sources for our previous unpublished works Hyklová (2007) and Hyklová (2010), which we partially used as sources for this paper. As sources of biographical information we used Münzel (2001), Strouhal (1892), jubilee biographies and obituaries, which are mentioned in Resources. Most of these sources are written by professional astronomers and can be divided into two main groups: the first being written by colleagues and acquaintances, containing personal memories, and the second one are hindsight on the important personalities or brief history of the discipline (i.e., Grygar, 2000).

The documentation about the *State Observatory* since 1773 is available in the *Archives of the Academy of Sciences of the Czech Republic*. About 250 archival boxes contain observational diaries, correspondence, book-keeping and personal documents, inventories, lists of lectures, drafts of research papers, textbooks etc., it is the largest and oldest archive of a scientific institution in Czech republic.

Around two archival boxes and several personal folders connected with the *German University in Prague* and Tellnitz observatory are deposited in the *Archive of Charles University*. The *State Archives of Berlin* contain documentation mainly from World War II, including personal folders of the then German staff at Ondřejov.

## Conclusion

Further research in the archival resources of *State observatory*, is needed. Archives of the *Astronomical Institute of the UK* are to be inventoried and researched. A research visit to the *State Archives of Berlin* is needed. After summarizing the information, a comparison with other small astronomical institutes of European universities is intended.

## References

- Fischer K. A., Hibst, P. Die deutsche Astronomie in Böhmen und Mähren in den letzten hundert Jahren, Astronomical Observatory Prague-Podolí, Prague. 1983.
- Grygar J. (2000): Česká astronomie a astrofyzika ve XX. století, Co daly naše země Evropě a lidstvu, III. část, Evropský literární klub, 328–342, 2000.
- Heinrich V. V. (1934): Astronomický ústav Karlovy univerzity a můj tak zvaný disciplinární případ. Stíny autonomie, vlastním nákladem, Praha
- Hyklová, P. Disertační práce z astronomie, obhájené na německé Karlo–Ferdinandově univerzitě a na Deutsche Universität in Prag v letech 1882–1945, bachelor thesis at AÚ UK, MFF UK, 2007.
- Hyklová, P. Astronomický výzkum na Karlově univerzitě v Praze od roku 1882 do současnosti, master thesis at AÚ UK, MFF UK, 2010.
- von Klüber H. (1965): Erwin Finlay–Freundlich (obituary), Quarterly Journal of the Royal Astronomical Society **6**, 82–84
- Kopff A. (1960): Werner Schaub, Astronomische Nachrichten **285**, 199–200
- Kovář, L. Dějiny Astronomického ústavu Karlovy univerzity v letech 1889–1939, diploma thesis, MFF UK, 1983.
- Münzel G.: Ladislaus Weinek (1848–1913), Beiträge zur Astronomiegeschichte **4**, 127–166, 2001.
- Plavec M. Ondřejovská hvězdárna za druhé světové války, Ondřejovská hvězdárna 1898–1998: Sborník o české a moravské astronomii uspořádaný ke 100. výročí Ondřejovské hvězdárny a 650. výročí University Karlovy, Astronomický ústav AV ČR, Ondřejov, 130–134, 1998.
- Petr K. (1928): František Nušl (šedesátiletý), Časopis pro pěstování matematiky a fyziky **57**, 73–80
- Strouhal V. (1892): Dr. August Seydler I. Nástin životopisný, Časopis pro pěstování matematiky a fyziky **21**, 193–202
- Šolc M., Míšková, A. Czech and German Astronomers at the Prague University. Astronomy in and around Prague, Acta Universitatis Carolinae, Mathematica et Physica **46**, 249–250. 2005.
- Scheller A. (1914): Anzeige des Todes von Ladislaus Weinek, Astronomische Nachrichten **196**, s. 323