Prague, in its more than one millenium long history, became several times a privileged town of exact sciences. Learned visitors found here an intriguing and inspiring atmosphere, in this vibrant crossroad of nations, religions, and artistic or philosophical movements. The high tide of this tolerant atmosphere, favourable for the development of sciences, occurred during the reigns of Emperors Charles IV, Rudolph II, Maria Theresa and Joseph II, but also in the periods before and after the World War I. As the best illustration of this the names like Tycho Brahe, Johannes Kepler, Joseph Stepling, Christian Doppler, Ladislaus Weinek, Albert Einstein or Erwin Finlay-Freundlich can be mentioned, mixed with native scientists like Cristannus de Prachatitz, Thaddeus Hagecius, Marcus Marci, Bernard Bolzano, Ernst Mach and Jaroslav Heyrovský.

The next few pages intend to show you localities in Prague that are connected with the history of exact sciences, predominantly of astronomy. They are divided according to the banks of the Vltava River. From the objects with paid access, in the Old Town (Part A), worth a visit is the Baroque Astronomical Tower of the Clementinum College, on the bank of Lesser Town and Prague Castle (Part B) it is the Strahov Monastery. We wish you to enjoy the beauties of the Golden City Prague.

Part A A walk through the Old Town – Staré Město

A1	Prague meridian – The Old Town Square
A2	Astronomical clock, Town Hall of the Old Town
A3	Doppler House U obecního dvora 7
A4	Church of Our Lady before Týn, Brahe´s tomb
A5	Einstein´s memorial plaque, Old Town Square
A6	Bolzano´s memorial plaque, street Celetná
A7	Former house of Joost Bürgi, behind Pulverturm
A8	King Wenceslas College, Kepler´s tablet
A9	Former German Institute of Physics, E. Mach
A10	Charles University – main building Carolinum
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A15	The Kepler House, street Karlova No.4
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A17	Charles Square, Doppler´s memorial plaque
A18	Charles Square, building of the Technical University
A19	Street Viničná 4, Einstein´s memorial plaque
A20	Emmaus (Emauzy) Monastery, Kepler´s temporary residence
A21	Street Lesnická 7, Einstein´s bust

The Prague Meridian

The meridian line in the pavement of the Old Town Square indicated the noon shadow of the St Maria column that stood in the middle of the square since 1650. This almost 18 m high column was erected as a memorial of the end of the Thirty Years War, but people later connected it rather with the defeat of the Bohemian estates in the Battle on White Mountain in 1620. This was the reason why the column was destroyed on 3rd November 1918, a few days after the decay of the Austro-Hungarian Habsburg monarchy and birth of the independent Czechoslovak Republic. The place of the column – its ground plan - is marked by five stone squares in the pavement. The head of the St Maria statue, made by Jan Jiří Bendl, is preserved in the sculpture collection of the National Museum in Prague.

The modern metal line has been installed after thorough geodetic measurements in 1988. The metal plates bear Latin and Czech inscriptions

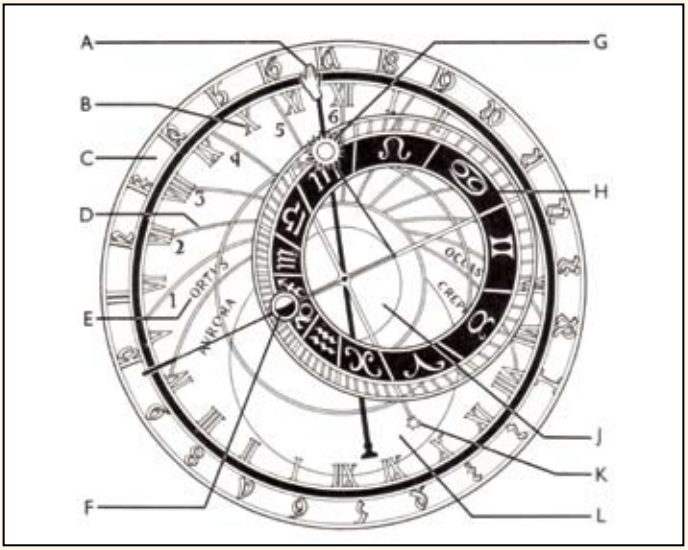
POLEDNÍK, PODLE NĚHOŽ BYL
V MINULOSTI ŘÍZEN PRAŽSKÝ ČAS
MERIDIANUS QUO OLIM TEMPUS
PRAGENSE DIRIGEBATUR

(Meridian that once determined the local time of Prague). However, since ca 1751, the local time of Prague was measured on the meridian equipment at the Astronomical Tower of the Clementinum College, the time difference between both places is about 1.5 sec.

The Astronomical Clock

The Astronomical Clock on the tower of the Old Town Hall was constructed in 1410, by clockmaker Mikuláš of Kadaň (Nicolaus of Kaaden, Erzgebirge). The design and computations of the astronomical dial were carried out by Jan Ondřejův, called Šindel (Ioannes Andreae, dictus Ssindel), professor of mathematics and astronomy at the Prague University. Some parts of the mechanism, e.g. the three main gears, are original and still working well.

The calendar disc was added in ca 1490 and showed the date, rotating around once a year. In 1866 it was replaced by a new calendar painted by Josef Mánes. The inspiration for 12 medallions was found in one medieval manuscript, they show typical rural labours of the month.



What the Astronomical Clock shows

The dial of the Prague clock represents a stereographic projection of the celestial sphere onto the plane from the north pole of the sphere, while astrolabe and almost all other astronomical clocks use the projection from the south pole. In this arrangement the outer circle on the dial is the Tropic of Cancer and so the Sun symbol moves in a large arc in summer, in winter only in a small one near the centre of the dial (this is the opposite to dials with projection from the south pole). The dial shaped as in Prague is common on astronomical clocks in the Baltic and North-Sea region, in ca 1390– 1490, mainly in the German Hansa-Towns (Lübeck, Rostock, Stendal, Doberan, Stralsund, Lund etc., but also in Strassbourg at that time).

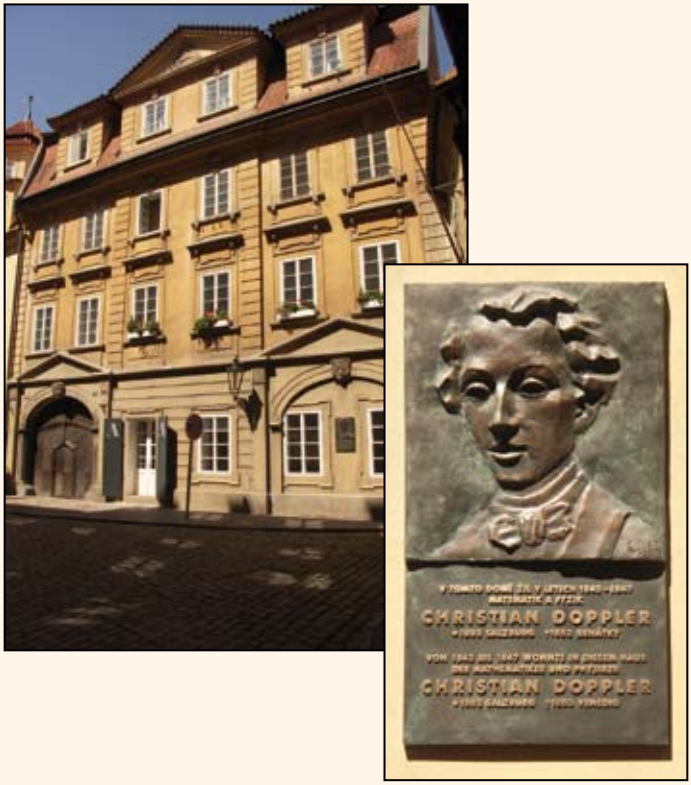
All circles on the sphere are projected as circles on the dial (with exception of the circles passing through the pole, which are projected as straight lines). Therefore, the outer circle of the dial is the Tropic of Cancer, the inner is the Tropic of Capricorn and the concentric circle between them is the equator. The other circles are the moving ecliptic (with zodiacal signs), the horizon of Prague (boundary between blue and brown area) and the circles dividing the astrological houses on the blue, day part of the dial. One can read ORTUS (sunrise) and AVRORA (day-break in Latin) on the left side of the horizon, OCCASUS (sunset)

and CREPVSCVLVM (evening twilight) on the right. The dark circle at the bottom of the plate displays the astronomical night (Sun is lower than 18° below horizon) and the brown area shows twilight; we can see that during some days in midsummer there is no astronomical night in Prague.

One axis and two concentric pipes move the pointers with symbols of Sun, Moon, and the zodiac circle is attached to the central axis. In the clockwork, there are three wheels of diameter ca 1,7 m with 365, 366 and 379 triangular teeth, moving the zodiac, solar and lunar pointers. All were driven by the same, long stave pinion. The zodiac axis rotates once a sidereal day, the solar pointer a mean solar day, and the lunar pointer is the slowest one, it rotates according to the mean apparent motion of the Moon. The symbol of the Moon is a hollow sphere with a hidden mechanism inside that shows the phases of the Moon; it was added probably in the beginning of 17th century.

The gilded solar hand A indicates the time on dials B (Central-European time, CET); in the diagram hand A shows 11.30 a.m. The black circle C is the scale for Old-Bohemian (or Italian) hours, counted from the sunset of preceding day. Scale C is moved from inside in such a way that its number 24 always coincides with the time of the actual sunset (at meridian 15°, formerly at Prague meridian). The difference between Prague local time (at Clementinum Astronomical Tower) and CET is only 140 seconds.

The ring of ecliptic H indicates by its rotation the rising, culmination and setting of the zodiac signs. The hand with the asterisk K which is affixed at the beginning of the sign of Aries points to the sidereal time on dial B. The symbol of the Sun G indicates the position of the Sun in the ecliptic as well as its rising and setting. These events happen whenever G crosses the horizon line. The same is valid for the symbol of Moon F; moreover, the half dark and half silvered Moon sphere rotates every synodic month and shows the phase of the Moon. J indicates the Earth. Circle L shows the area of the astronomical night. Arcs D divide the day area into so called unequal (planetary) hours, where the little Sun points to half past five. The asterisk between Pisces and Aries signs shows the sidereal time.



Christian Doppler House

U Obecního dvora 7/799, Praha 1

Christian Doppler spent the most fruitful period of his life as a teacher at Prague Polytechnic School, twelve years from 1835 to 1847. After some delays, he was appointed professor of practical geometry and elementary mathematics, a vacant position since the retirement of Adam Bittner in 1837. However, the number of students increased at that time rapidly and e.g. in July 1847, Doppler had to examine orally several hundreds of students (526 in mathematics and 289 in geodesy). Not only that Doppler had little time for his own scientific research, but also his health suffered badly by this work overload. Progressive tuberculosis forced him to change his appointment to the Mining Academy in Schemnitz (Banská Štiavnica in Upper Hungary, now Slovakia). From here he was called in 1851 to Vienna to the position of the first director of the newly established Institute of Physics.

V TOMTO DOMĚ ŽIL V LETECH 1843-1847
MATEMATIK A FYZIK CHRISTIAN DOPPLER
*** 1803 SALZBURG † 1853 BENÁTKY**
VON 1843 BIS 1847 WOHNTE IN DIESEM HAUS
DER MATHEMATIKER UND PHYSIKER CHRISTIAN DOPPLER
*** 1803 SALZBURG † 1853 VENEDIG**

The plague commemorates Doppler´s stay in this house from 1843 to 1847, it was dedicated on 10th March 2006.

The first announcement of what we call today "Doppler principle" took place at the meeting of the Royal Bohemian Learned Society on May 25, 1842 in the Patriotic Hall of *Carolinum*, which is the main building of the Charles University (*Ovocný trh 3, Praha 1*). The title "On the Coloured Light of Double Stars and Certain Other Stars of the Heavens" illustrated what has since been called the Doppler Effect. To an auditorium of 6 (!) colleagues he explained that the perceived change of frequency in light and sound waves was due to the relative motion of the source and the observer. The recommendation for publication was written by František Palacký, historian, whose portrait you can find on the 1000 CZK banknote. Doppler published his lecture later in "Abhandlungen …", the journal of the Learned Society. The Doppler principle has found an immense number of applications in astrophysics, physics, technology, medicine etc.


Ueber das
farbige Licht der Doppelsterne
Gestirne des Himmels.
Christian Doppler.

The tomb of Tycho Brahe in the Church of Our Lady before Týn

Chrám Matky Boží před Týnem, The Old Town Square – Staroměstské náměstí, Praha 1

This Gothic church was built in about 1365 as the third in a series of churches that have stood on this site. The original Romanesque church was founded by traders and merchants. Behind the church is Týn itself, more commonly known by its German name Ungelt; this small fortified courtyard hospice was a haven for medieval merchants who in return for a small fee would come under the King's protection.

The twin Gothic spires 80m high are a late 15th century addition. Much of the interior including the vaulting is a Baroque replacement of the original which was consumed by fire in 1689.

To the right you will find the tomb of Tycho Brahe, court astronomer to Emperor Rudolf II. During a banquet by Petr Vok on 13th October 1601, he was literally „dying for a wee'. Probably due to a problem with prostatic hypertrophy he was not able to urinate and suffered ten days filled by febrile convulsion, sleepless nights and delirium until he finally passed away on 24th October, exclaiming repeatedly: "Have I not lived in vain!" A long funeral procession led to the Týn Church on 4th November, a long funeral sermon was held by doctor Johann Jessenius, Tycho´s friend, by whom Tycho´s family lived in Wittenberg.

Since 14th century, the Týn church served as the religious centre of church reformation in Prague and also as the University Church. In the Period of Recatholisation during and after the Thirty Year War, the graves of non-catholic professors were removed. Fortunately, the tomb of Tycho escaped this purge and was found as late as in 1901. The grave was somewhat damaged by a collapsed vault due to the fire in 1689. It contained a male corpse with 8cm long red moustache that helped to

identify it as Tycho Brahe. In addition, a female corpse was discovered, possibly that of Tycho´s wife Kristine Barbara, who outlived him by a few years. The tomb was cleaned, investigated and closed again by a new stone plate. One sleeve, hat, stocking, shoe etc. of Tycho are now kept in the Prague City Museum; one part of the moustache is in the Archives of the National Museum in Prague and another part has been donated to the Kingdom of Denmark in 1991. The laboratory analyses discovered traces of poisonous mercury and arsenic balm by which the corpse was treated before the funeral ceremony. Already in 1901, green colouring by copper oxides was found around the nose opening on the skull. It confirmed the existence of a metal nose prosthesis that Tycho used to cover the missing part of his nose, the result of the duel in Rostock in 1566. In the light of all the findings, the rumour about poisoning of the astronomer seems to be false.

The Latin inscription on the tombstone "Non faces nec opes, sola artis sceptra perennant" means: "Neither power nor wealth, only Art and Science will persist".

Einstein plaque on the „Unicorn House“

Staroměstské náměstí 17/551, Praha 1

"Here, in the salon of Mrs. Berta Fanta, Albert Einstein, professor at Prague University in 1911 to 1912, founder of the Theory of Relativity, Nobel Prize winner, played the violin and met his friends, famous writers Max Brod and Franz Kafka." are the words on the plaque that was dedicated on 14th March 1998 by the Union of Czech Mathematicians and Physicists, celebrating the 120th anniversary of Einstein´s birth.

But returning to Einstein´s social life in Prague – he also liked to visit the Café Louvre (*Národní třída 22, Praha 1*), the meeting point for many interesting intellectuals, and discussed here astronomical news with Václav Heinrich, professor at the Astronomical Institute of the Czech University of Prague.

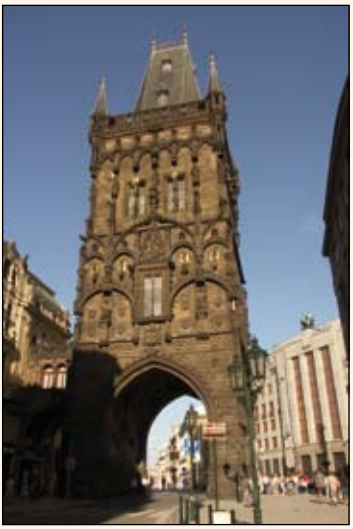
Bernard Bolzano House in Celetná street

Celetná 25, Praha 1

Bernard Bolzano (1781-1848), after studies of philosophy, mathematics and physics at Prague University, joined the faculty of theology and became a priest of the Catholic Church in 1804. Despite this he continued his mathematical investigations. Next year he was appointed to a firm position at Prague University and started to lecture in ethics, social questions and the philosophy of mathematics.

He was popular both among students, who appreciated his straightforward expression of his beliefs, and also among his fellow professors, who recognised his intelligence. In 1818, he was elected Dean of the Philosophical Faculty. However, the Austro-Hungarian authorities became displeased with his liberal views, suspended him from his professorship in 1819 and put him under police surveillance. Finally, in 1824, Bolzano was removed entirely from the university. He moved to the small village of Těchobuz , where he stayed until 1842. He then returned to Prague where continued philosophical and mathematical investigations until his death.

Bolzano was prohibited from publishing by the government, and so most of his writings existed only in manuscript. They were not published until 1962. One of his books deals with the paradoxes of infinite sets, in another book he tries to build up a universal approach to the whole of science ("Wissenschaftslehre"). Students of mathematics learn the Bolzano-Weierstrass theorem, a modern definition of a continuous function and the non- differentiable Bolzano function, or the Bolzano-Cauchy conditions. Bolzano is now considered as one of the pioneers of modern logic.



Former house of Joost Bürgi behind the Pulverturm

Now Hybernská street, Praha 1

Joost Bürgi (1552-1632), born in Switzerland, was an outstanding and famous mechanician and clockmaker of his time. He also made finest observational instrumentsfor Duke Wilhelm IV of Hesse-Kassel. Later Bürgi worked in Prague for the Emperors Rudolph II, and his successor Matthias (1603-1622). Bürgi, even if he lacked in school education, took a serious interest in computing. Close friendship with the young Johannes Kepler (1571-1630), then Imperial Mathematician, resulted in substantially improving Bürgi´s knowledge of mathematics. It seems to have been Kepler who persuaded Bürgi into writing up his work on logarithms (the manuscript of "Progress Tables" is largely in Kepler's handwriting). This work, printed in 1620, is different from that of Napier and was clearly invented independently.

Bürgi constructed excellent astronomical sextants for positional observing with naked eye (one is in the National Technical Museum in Prague, another in the Kremsmünster Stift in Austria). His other practical instruments were e.g. proportional compasses and triangulation instruments useful in surveying and mining.

Former King Wenceslas College

Ovocný trh 12/573, Praha 1

The house No. 12/573 stands on the place of the former College of King Wenceslas IV, founded in 1381. In 1604-1607, Kepler lived here with his family by Martin Bacháček, professor of mathematics and Prior of this College, as the tablet in the entrance passage of the house declares. For astronomical observations, Bacháček erected a wooden tower in the College garden, even Kepler and others although used to go to the observatory at Prague Castle. In 1603 and in the fall of 1604 astronomers and astrologers observed conjunctions of Mars, Jupiter and Saturn in the leg of Ophiuchus, through which the ecliptic passes between the constellations of Scorpio and Sagittarius. On 9th October 1604 Kepler observed the planets together with Imperial Chancellor Coraducius and other persons. Next night only young Jan Brunovský carried out the observations and found a bright new star near the planets. Due to the fog, the other saw the new star first on 17th October. It was as bright as the nova 1572 and was visible until the February 1606. Kepler published the observations and interpretations in a book De nova stella in pede Serpentarii … (Prague 1606). Another observation Kepler made together with Bacháček in 1605, they saw a large sunspot by the projection on a paper sheet under the hollow roof of the College, but believed that it was the transit of Mercury.

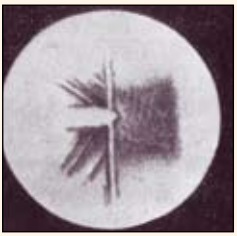
Kepler could not became a professor since he did not fulfil the requirement of celibacy, but he was all the time in frequent contact with students.

Former German Physical Institute

Ovocný trh 7, Praha 1

The physical laboratories of the Prague University were already built before the split of the University into the Czech and German parts in 1882, and after that they belonged to the German part under the leadership of Ernst Mach. Mach (1838-1916), born near the Moravian town of Brno, came from Graz to become professor of experimental physics at the Prague University In 1867. For three decades he influenced the development of physics here and educated at least two generations of Czech and German physicits.

The experiments on the Doppler effect, the supersonic velocities of gun bullets, and the electromagnetic waves generated by spark discharges in dipoles, were carried out in this building on square *Ovocný trh No.7.* Between 1873 and 1893 Mach developed optical and photographic techniques for measurement and recording of sound waves and wave propagation. The photographs of the conical shock wave of compressed air around the nose of bullets were made here using the light of electric discharge triggered by the supersonic bullet when it connected the contacts of the electric circuit. In 1887 he came to the conception of Mach number, the ratio of the body velocity in a fluid to the velocity of sound in that fluid. Mach's inertial theories were cited by Einstein as one of the inspirations for his theories of relativity.



Carolinum, main building of the Charles University of Prague

Ovocný trh 3, Praha 1

The foundation charter of Prague University is dated on 7th April 1348 and signed by its founder Charles IV, Emperor of the Holy Roman Empire. Prague thus became the first university city in Central Europe; mathematics and astronomy reached remarkably high level here, e.g. in the widely spread treatises "On the construction…" and "On the use of astrolabe" by Cristannus de Prachatitz (ca 1360-1439). Jan Šindel (1370-ca 1443), author of the concept of the Prague Astronomical Clock, lectured here and carried out observations from one tower of Carolinum. Thaddeus Hagecius (Hájek) (1526-1600) and Marcus Marci (1595-1667) were other well known representatives of exact sciences at the University. Johannes Kepler (1571-1630) took part in the life of the University, but severe rules on celibacy prevented him obtaining the professorship.

Mathematician and philosopher Bernard Bolzano (1781-1848), physicists Ernst Mach (1838-1916) and Albert Einstein (1879-1955), and astronomer Ladislaus Weinek (1848-1913) at the German University, physicist Vincenc Strouhal (1850-1922), physicist and astronomer August Seydler (1849-1891), mathematicians brothers Eduard (1852-1903) and Emil (1848-1894) Weyr at the Czech University, are only a few examples of many outstanding personalities at both Universities in the 19th century.

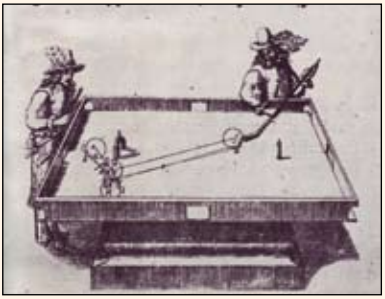
The three large round windows to the left from the entrance gate lead to the Patriotic Hall, where Christian Doppler, professor at Prague Polytechnic School, announced his principle on 25th May 1842 at the meeting of the Royal Bohemian Learned Society.

Ioannes Marcus Marci House

Melantrichova 12, Praha 1

Scientific interests and writings of Ioannes Marcus Marci (1595-1667), professor of medicine at the Prague University, addressed many problems of medicine, biology, mathematics, astronomy, mechanics and optics. They are commemorated at a plague on his house "U lípy" ("To the lime tree").

Marcus was appointed the „Physicus" of the Bohemian Kingdom, he was repeatedly elected to Dean of the Faculty of Medicine and was also Rector Magnificus of the university for one academic year. He took part in the defence of Prague against Swedish troops, and after the end of the Thirty Years War was appointed the personal physician of the Emperor Ferdinand III and an imperial councillor. He met the English physician William Harvey in Prague, the Jesuit scientist Athanasius Kircher in Rome, and he contacted Galileo by a letter. Unfortunately, the messengers to Prague with the invitation to the London Royal Society did not reach him alive.The book Thaumantias, liber de arcu coelesti (Prague 1648) contains description of the same experiments with light refraction by glass prisms that Newton carried out twenty years later. His experiments on elastic collisions of spheres, described in the book *De proportione motus* (Prague 1639 and 1648), led Marcus to the concepts of inertia and the conservation of momentum.Interest in the personality of Marcus Marci is also connected with the history of the famous Voynich manuscript, because Marcus owned it and sent it as a gift to Athanasius Kircher.



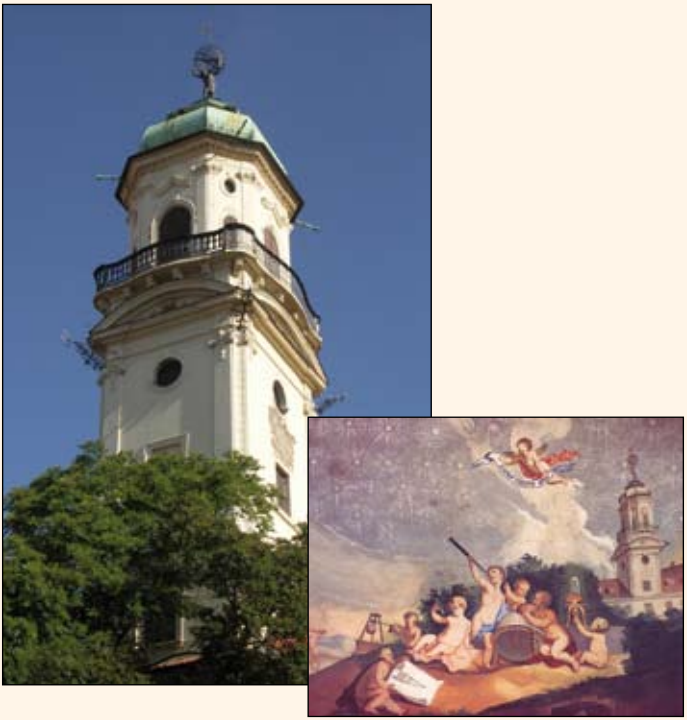
School of Týn Church and Cristannus de Prachatitz

Melantrichova ulice, Praha 1

In the courtyard between two passages to the streets Melantrichova and Michalská, fragments of Gothic arcs are preserved of the former parish church of St Michael, where Cristannus de Prachatitz became priest in 1405. Cristannus (ca 1368-1439) studied at Prague University and became bachelor in 1388, master in 1390 and soon thereafter professor of the university.

Cristannus belonged to the moderate Hussite movement and as a close friend of Johannes Hus, he tried to save him from the danger of being accused of teaching about reformation of the Catholic Church. However, during the Council in Konstanz, Hus was imprisoned and burnt, as a heretic, on the stake in 1415. Like Hus and Šindel, Christannus was also elected Rector Magnificus of the Prague University (four-times).

His scientific interests were divided between medicine, mathematics and astronomy. He wrote many medical treatises (also in Czech language), mathematical textbook *Algoritmus prosaycus, Computus cyrometricalis* about calendar computing, etc. A. Hadravová and P. Hadrava found that Cristannus was the author of the treatises *De composicione astrolabii* and *De utilitate (usu) astrolabii*, that were widely spread throughout the whole Europe and ascribed originally to Robert Anglicus or Prosdocimo de Beldomandi.



Clementinum College and its Astronomical Tower

Mariánské náměstí, Praha 1

The first Jesuits, invited to Prague by Emperor Ferdinand I in 1556, settled in a ruined Dominican monastery near the Old Town end of Charles Bridge. During two centuries of their building activities the large architectural complex of the Clementinum arose, the "Collegium ad St Clementem", the second largest complex in the town beside the Prague Castle. Jesuits opened several schools in Clementinum and by 1619 their Academy obtained the right to issue university degrees. Clementinum was later joined to the University and became the seat of the artistic and theological faculties; the medical and juristic faculties remained in Carolinum.

About 1200 pupils, students, Jesuit fathers and other staff members lived in the walls of Clementinum, and beside it there was an academic

printing office, theatre, libraries, apothecary, fountain with running water, waste water drainage etc.

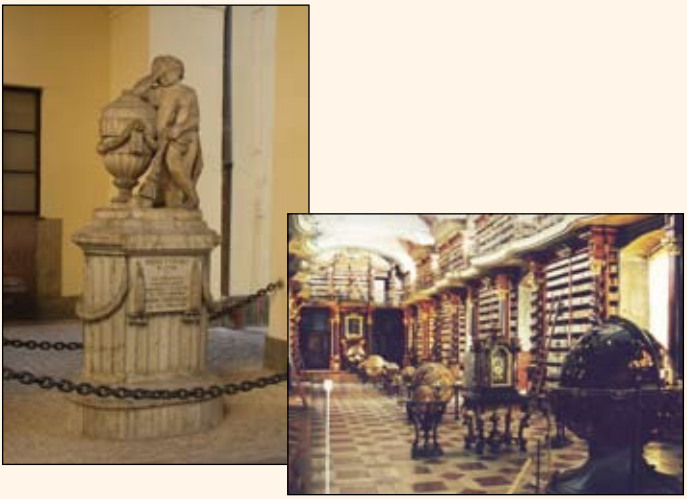
Remarkable are the 15 wall sundials, ceiling paintings in the Old and New Mathematical Halls (incl. the picture of extrasolar planetary systems from ca 1756), astronomical clocks, globes etc.

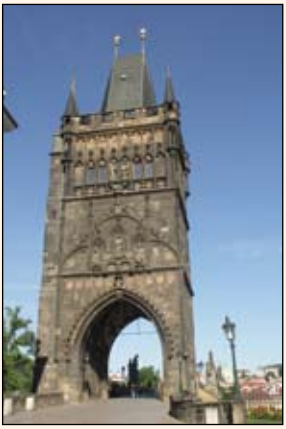
The Astronomical Tower was erected in 1722 and reconstructed in about 1750 to enable better observations. The Baroque Library Hall, the heart of the Clementinum, was finished by 1727.

After the Suppression of the Jesuit Order in 1773 the observatory became state a institution and the library, owned by the University, was opened to the public. Nowadays, Clementinum is the seat of the National Library.

Almost four hundred years of astronomical research and education at Clementinum are summarized in the book by Z. Šíma Astronomy and Clementinum, Prague 2006. It reports about Jesuit missionaries – astronomers and mathematicians Valentin Stansel (1621-1705) author of a lunar chart, Karel Slavíček (1678-1735), Jakub Kresa (1648-1715); about Caspar Pflieger (1665-1730) - first custodian of Museum mathematicum, Joseph Stepling (1716-1778) founder of the observatory – memorial monument against the entrance to Astronomical Tower, his mechanician Jan Klein (1684-1762), Antonín Strnad (1746-1799) - regular meteorological measurements since 1775, Ladislaus Weinek (1848-1913) – co-discoverer of the polar motion, author of the first photographic atlas of Moon based on pictures from the Lick Observatory etc.

Both the Astronomical Tower with its nice view on Prague and the Baroque Hall are open for public visitors (opening hours daily 14–19, Sat+Sun 10-19).





Charles Bridge, Old Town Tower

Charles Bridge (originally called only the Stone Bridge) replaced the narrow, damaged Romanesque bridge of Queen Judita. The concept of the Bridge itself deals much with astronomy (or astrology) as it was intended by its founder, Emperor Charles IV. In the time of summer solstice, the last rays of the Sun pass through the windows of a small tower above the crossing of the main nave and transept of the St Vitus Cathedral, if you observe the sunset from centre of the tower gate. The light connects thus the place of St Vitus grave with the Bridge of which St Vitus is the main patron and protector; and this happened formerly exactly on St Vitus day, on 15th June. (Before the Gregorian reform of calendar, the Latin mnemonic help for students of astronomy claimed "Vitus et Lucia, due sunt solsticia".)

The east facade illustrates the medieval cosmology by its division into zones that correspond to the cosmic spheres of Aristotelian structure of the World. The terrestrial sphere begins at the pavement and ends by the consoles of the Gothic arch of the gate, which are decorated by allegories of human sins (e.g. a nun helps the knight to search under her dress). 28 stonemason decorations (28 was the lunar number) on the arch and the statue of St Wenceslas that stood on a column in the middle of the gate represented the next, higher lunar sphere (the statue was moved to the corner of nearby church of Knights of Holy Cross with Red Star). St Vitus statue as a symbol of solar sphere takes up the central position of the east facade, standing on the model of the Bridge. To the left is a sitting statue of Emperor Charles IV and to the right the statue of his son, King Wenceslas IV.

And perhaps, the next zone with statues of St Adalbert and St Sigismund represents the stellar sphere.

The date and time of the founding service may also have a symbolic meaning – 1 3 5 7 9 7 5 3 1 – 1357 is the year, 9 and 7 is the day and months and the rest could be the time. Explanation of other stonemason decoration in terms of a horoscope to the time of founding act seems to be less probable, but not impossible.

Kepler House in Karlova street

Karlova 4, Praha 1

For his last years in Prague (1607-1612) Kepler lived in this house with Renaissance arcades in the courtyard, but the exact location of his flat is not known. In this period the Kepler´s fundamental works appeared. *Astronomia nova* (prepared in Prague, published in Heidelberg 1609) contains the first two laws of planetary motions, the result based on Brahe´s thorough positional observations of Mars motion. However, Kepler was convinced about elliptical orbits already by 1606 while living at the University Wenceslas College. Another remarkable publication was *Dissertatio cum Nuncio sidereo*, published in Florence 1610, only a few weeks after the publication of Galilei´s *Nuncius Sidereus* (Starry Messenger) reached Kepler in Prague. Kepler continued to study optics of lenses and within one year completed *Dioptrice* (1611), one of the most important works in the development of optics. Those studies led him also to the invention of the astronomical telescope.

In 1634, four years after Kepler´s death, the most provocative and innovative work *Somnium seu Opus posthumum de Astronomia Lunaris* about flight to the Moon was published by his son Ludwig Kepler, then a candidate for a doctorate in medicine.

In 1611, Kepler published a short treatise Strena seu de nive sexangula examining the planar hexagonal symmetry of snow flakes.

However, the year 1611 was full of disaster. Kepler´s wife Barbara died and Rudolph II lost the throne so that Kepler remained without means. He accepted an invitation to teach at high school in Linz and subsequently left Bohemia.

Two plaques and a nice little fountain commemorate Kepler´s stay in this house.

Prague Polytechnic in Husova street

From Karlova street we turn to the right to Husova street and after ca 200 m we get to the main building of the former Prague Polytechnic School, that belongs today to the Technical University of Prague. A memorial plaque left of the entrance announces that this school originated as Institute of Engineering Education in 1705 and in 1803-1806 František Josef Gerstner transformed it into Prague Polytechnic School, following the model of l'Ecole Polytechnique de Paris. At that time Prague Polytechnic was the only school of higher technical education in the Austrian empire.

After studies at Prague University, Gerstner started his career as an assistant at the Clementinum Observatory, but later was charged to solve more practical problems (e.g. the conception of the horse-powered rail-

way Budweis-Linz, built in 1826). Christian Doppler, Professor of mathematics and practical geometry from 1837 to 1847, taught and examined here the crowds of students until he moved from health reasons to Schemnitz (now Slovakia), to teach at the Mining Academy.

If we turn to the right on the next crossing, we get to the Bethlehem square, dominated by the Bethlehem Chapel. Nowadays the Chapel is used for solemn occasions by the Technical University, but pictures on the inner walls commemorate its Hussite history from early 15th century.

Behind the Chapel, on the corner of Liliová street, a small house of learned scholar Simeon Hagecius stood, the father of Thaddeus Hagecius. Copernicus´ writings were read here already before the book "De revolutionibus" was published. This house of white colour can be found on the paper model of Prague, constructed by Antonín Langweil (starting in 1826), which is on display in the Prague City Museum (Metro station Florenc, lines B and C).

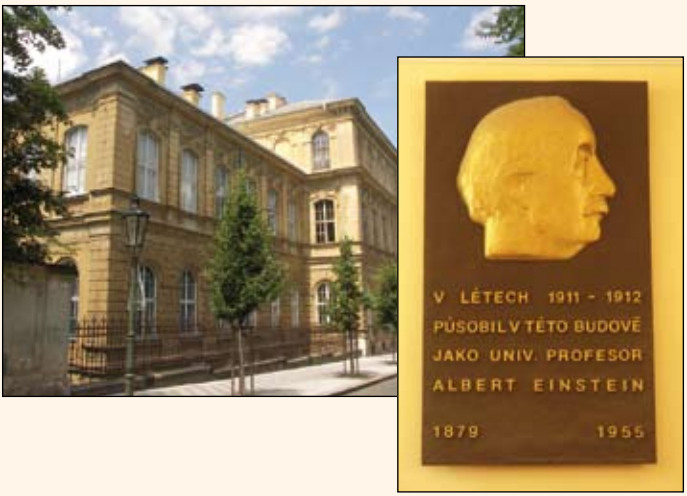
Doppler plaque, Karlovo náměstí No. 20

Now we can return back to Husova street and continue to the crossing with Národní street, where we see the Café Louvre, Einstein´s favourite restaurant. Through Spálená street we come after 500 m to the Charles Square. The old plaque commemorating the former Doppler residence before 1840 is on the wall of the courthouse, about 50 m from the corner.

In 1348, Charles IV founded The New Town on a grand-scale. The central position was given to the largest square in the town with the intention to display here the imperial crown jewels publicly to the Prague citizens and pilgrims from the whole empire. This really happened regularly every year in the time around Easter. An octagonal Chapel of the Corpus Christi was later (1393) built for this purpose in the middle of the square, resembling the octagonal structure of the Palatine Chapel of the Dom in Aachen in Germany, the " Imperial Cathedral", which was the most beloved church of Charles IV. The architecture of the Palatine Chapel combined Classical, Byzantine and Germanic-Franconian elements and corresponded to the important function of this monumental building: for 600 years, from 936 to 1531, the Aachen cathedral was the church of coronation for 30 kings of the Holy Roman Empire, including also Charles IV himself. The Corpus Christi Chapel was intended and used also as a burial place for professors of the Prague University. Due to new traffic regulations, the chapel was destroyed in 1791.

Technical University building

If we turn back and continue in the original direction (south), we get soon after 200 m to another building of the Technical University. The Czech Astronomical Society, founded here in a nearby lecture hall in 1917, organised the meetings and public lectures here, since its president František Nušl (1867-1951) was professor at this school. Foucault pendulum hangs in the entrance lobby, and observatory of Emil Buchar (1901-1979), professor of geodetic astronomy, remains still on the roof.



Einstein plaque in Viničná street

Viničná 7, Praha 2

From the opposite corner of Charles Square we walk up in east direction about 300 m, between hospitals on both sides, to the crossing with Viničná street.

Concerning his stay in Prague, Einstein wrote in the preface to the Czech translation of his popular book on relativity: "I'm pleased that this little book in which the main thoughts of the theory of relativity are portrayed is now published in the national language of the country in which I found the necessary composure to give the basic thought of the general theory of relativity (1908) step by step a more definite shape so it could be realized. In the quiet rooms of the Theoretical Physical Institute of the Prague German University in the Viničná street I discovered in 1911 that the equivalence principle demands a refraction of the rays of light at the Sun of a value that can be observed without knowing that more than a hundred years before a similar conclusion out of the Newtonian mechanics in connection with Newton's emission theory of the light was drawn. Also the still not really confirmed consequence of the red shift of the spectral lines I discovered in Prague."

The memorial plaque is in the entrance hall of the building.

Emmaus Monastery, another place where Kepler lived

We return back to Charles Square and continue down to the Vltava River. We pass by the Emmaus monastery and the Palacký monument, continue across the Palacký bridge and on the other bank turn to the right. The opposite bank of Vltava offers nice panoramic views from the Dancing house to the modern concrete spires of Emmaus monastery, in the complex of which Kepler lived before 1604.

Lesnická is now the second street to the left. Thus, we have repeated Einstein´s every days walk home from his office in Viničná street. And this is the end of walk A through the Old and New Town.

Einstein memorial bust in Lesnická street

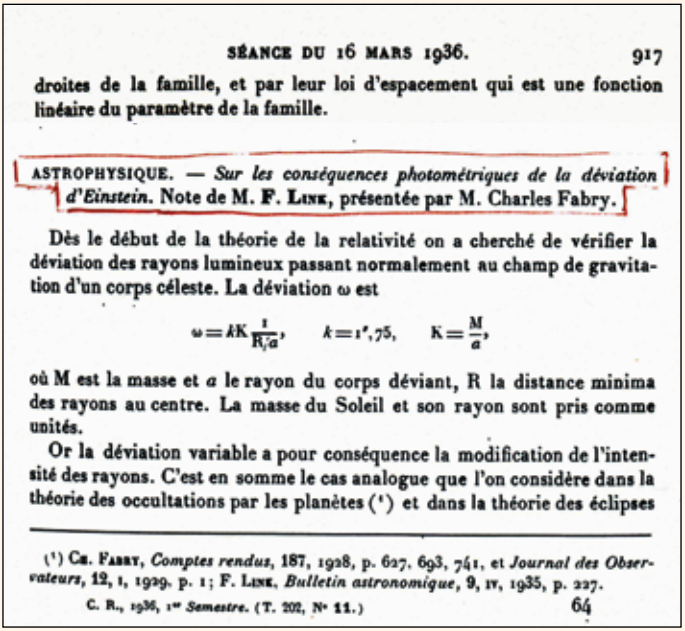
Lesnická 7, Praha 5

Albert Einstein (31) came to Prague with his family - his wife Mileva (36) and with his two sons Hans Albert (7) and Eduard (1). They took a new flat in the district Smíchov. Even if the Einsteins had, as was normal in these days, a maid, Mileva suffered much sorrow. She had great difficulty in adapting since she didn't like the stay in Prague as much as she had hoped. Furthermore there were ever greater arguments in the marriage.

In the middle of the year 1912 Einstein quit his teaching profession at the German University of Prague. This resignation was officially permitted by emperor Franz Joseph I. Einstein received a nomination as full professor

to the Swiss Technical College (ETH) in Zurich. The whole family, especially Mileva, were pleased about the return to Switzerland. They moved from Prague to Zurich on 25th July 1912.

After studies, Einstein worked at the Patent Institute of Switzerland in Bern and devoted himself to physics at the same time. The first full professor position was offered to him by the German University of Prague. During a 18 month stay in Prague (1911-1912) he published 11 papers including the first treatise on general relativity, which dealt with light deflection in the solar gravitational field. Einstein's computations in his Prague notebook, dated to 1912, reveal that he examined the possibility of gravitational lensing already three years before completing the general theory of relativity. Later he repeated and published the same results in December 1936, in response to an impulse given to him by a Czech amateur R. Mandl. Independently, the same effect was published some month earlier by another Czech astronomer František Link in a French journal Comptes rendus (1936), p. 917.



SÉANCE DU 16 MARS 1936. 917

droites de la famille, et par leur loi d'espacement qui est une fonction linéaire du paramètre de la famille.

ASTROPHYSIQUE. — *Sur les conséquences photométriques de la déviation d'Einstein.* Note de M. F. Link, présentée par M. Charles Fabry.

Dès le début de la théorie de la relativité on a cherché de vérifier la déviation des rayons lumineux passant normalement au champ de gravitation d'un corps céleste. La déviation ω est

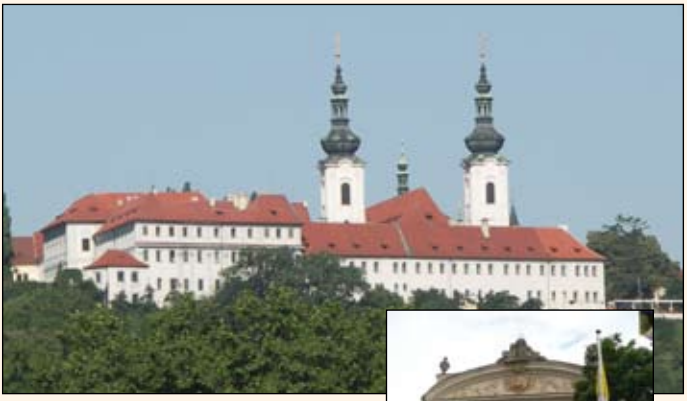
$$\omega = kK\frac{1}{R/a}, \qquad k = 1'',75, \qquad K = \frac{M}{a},$$

où M est la masse et a le rayon du corps déviant, R la distance minima des rayons au centre. La masse du Soleil et son rayon sont pris comme unités.

Or la déviation variable a pour conséquence la modification de l'intensité des rayons. C'est en somme le cas analogue que l'on considère dans la théorie des occultations par les planètes (1) et dans la théorie des éclipses

(1) Ch. Fabry, *Comptes rendus*, 187, 1928, p. 627, 693, 741, et *Journal des Observateurs*, 12, 1, 1929, p. 1; F. Link, *Bulletin astronomique*, 9, IV, 1935, p. 227.

C. R., 1936, 1er Semestre. (T. 202, N° 11.) 64



Strahov Monastery

Strahovské nádvoří 1/132;
118 00 Prague 1

Library: 9 a.m.–12 a.m.; 1 p.m. - 5 p.m.
(except 25 December and Easter Sunday)
Picture Gallery: 9 a.m.–12 a.m.; 12.30 p.m.–5 p.m.
(Tuesday – Sunday)

This Royal Canonry of Premonstratensians was founded in 1143, twenty three years after foundation of the Order. Despite damage by fire, the Hussite Wars, religious wars, and the Communists regime, the monastery survived and serves its original purpose until now. In 1627, the relics of the Order's founder, St Norbert, were translated from Magdeburg to Strahov. St Norbert became one of Bohemian patron saints, and Strahov has thus an exceptional position among Premonstratensian order houses.

The most valuable parts of the monastery complex are the Library (the origin of this unique library dates back to 1143), Basilica of Our Lady (Mozart improvised on the organ there in 1787), and the Picture Gallery (established in 1836). The Strahov library contains approximately 200,000 volumes, mainly those printed between 1501 and 1800, over 1500 volumes of incunabula (firstprints) and ca 3000 sheaves of manuscripts.

Over 18,000 volumes are stored in the Baroque **Theological Hall**, beside a rich collection of globes, both sidereal and terrestrial. Some of

them come from the workshop of the Rotterdam-based family Blaeu, which specialised in manufacturing maps, atlases, and globes over several generations in the 16th and 17th centuries. Wilhelm Janssonius Blaeuw spent some time in 1601 with Tycho Brahe in Prague.

In the late 17th century donations and bequests of books began to be made to the Strahov library, along with entire libraries that belonged to church officials and lecturers at the University of Prague. In 1756, a new catalogue of the library raised the number of books to 12,000 volumes. It was thus felt necessary to design a room to house the new acquisitions and this led to the creation of the charming **Philosophical Hall**. The dissolution of the monasteries of Bohemia by Emperor Joseph II resulted in a flow of books to Strahov Library that had to be sold at humiliatingly low prices. Among more than 42,000 volumes in this hall, disciplines which were taught at universities in the scope of courses on philosophy like astronomy, mathematics, history, philology, etc., represent the majority of books.

The **Cabinet of Curiositie**s comprises natural science collections, mainly with sea fauna, complemented with collections of insects, minerals, and wax replicas of fruit. A valuable part of it is a xylotheca, a collection of wooden slabs from various trees, a "dendrology library".

Al Sufi, Persian astronomer, published his famous „Book of Fixed Stars" in 964. Beside stars, it contains pictures and descriptions of several "foggy stars" as e.g. „A Little Cloud" in Andromeda, which is actually the Andromeda Galaxy M31. Charles IV ordered in Italy (ca 1370) a richly illustrated copy of this atlas. It passed through hands of many astronomers (e.g. Stepling) before it enriched the Strahov collections. The library is proud of several autographs by Tycho Brahe.

The pictures show the monastery from the east, the entrance to the Philosophical Hall and constellation Cetus (Whale) from the Al Sufi atlas.

Monument of Tycho Brahe and Johann Kepler

Keplerova street, Praha 5

The double statue of Tycho Brahe and Johann Kepler, created by Czech sculptor O. Vajce, was erected on a plinth in front of Kepler´s Gymnasium in the year 1984. The tablet in the entrance to the Gymnasium (street *Parléřova 2, Praha 6*) announces that Tycho and his family lived here from June 1599 until his death on 24th October 1601. The Renaissance house owned formerly by vice-chancellor Jacob Kurz (Curtius), that Tycho intended to rebuild into an observatory, was destroyed later and the remains, excavated in 1901-1903, are now hidden under the Gymnasium building and its courtyard. Tycho and Kepler made some observations here.

Former Inn "Zum goldenen Griffin"

Nový svět 1, Praha 1-Hradčany

A long but easy descent trough steps from Keplerova street leads down to the pictoresque street Nový svět, that ends by the "Golden Griffin". A memorial tablet from 1901 commemorates the stay of Tycho´s family here during the reconstruction of the nearby Curtius house (the location of which was not known at that time). If we continue to the east we get after 200 m to the square *Hradčanské náměstí*.

Schwarzenberg Palace

Hradčanské náměstí 2, Praha 1 - Hradčany

This Renaissance palace on the south side of the square was built by Johann de Lobkowitz from 1545 and completed including the rich sgraffito plaster in 1567. The next owner Georg de Lobkowitz fell into disfavour with Rudolph II and his confiscated palace was granted to Petr Vok of Rosenberg, in exchange for the Rosenberg palace situated inside the fortification of the Castle. Even the palace bears the name of Schwarzenberg, the Rosenberg five-leaf roses are preserved in many places of the decoration. It was Petr Vok who invited Tycho Brahe to the banquet on the evening 13th October 1601, where Tycho´s fatal illness originated. The nice sundial on the south wall of one chimney is the oldest one preserved in Prague. The palace belongs to the National Gallery but now is closed and waits for reconstruction.

Ball Hall in the Royal Gardens

Míčovna; Pražský hrad - Královská zahrada

Open daily, April - October 10 a.m. - 6 p.m. (free access)When walking further to east through Mathias gate from square Hradčanské náměstí to the courtyards of the Prague Castle, we can see only a few glimpses of the former glory of astronomy and astrology at the courts of the Emperors Charles IV and Rudolph II. The Mathematical Tower, originally part of the Romanesque fortification of the Castle, exists now only on old engravings of Prague, where it dominated the panorama of the Castle. It was used for astrological observations, but above all, for rich fireworks visible from the whole town. The round powder tower **Mihulka** in the north fortification wall, near the famous Golden Lane, harboured the alchemist laboratories of Rudolph II. The workshop of mechanician Joost Bürgi, the place frequently visited by Johannes Kepler, stood also close to the Rudolph´s seat. If we turn now to the bridge across the moat Jelení příkop and continue to the Royal Gardens on the other side of it, we get to the Renaissance building of **Ball Hall**, richly decorated by sgraffito representations of Mannerist symbols of wisdom and sciences. It was built by Bonifaz Wohlmuth and Ulrich Avostalis in 1567 – 69. The personifications of four elements (Terra, Aer, Ignis, Aqua), seven virtues (Prudencia, Temperencia, Charitas, Spes, Fortitudo, Justitia, Fides) and seven liberal arts (Astronomia, Geometria, Musica, Rhetorica, Aritmetica, Gramatica, Dialectica) were supplemented in ca 1950 by an allegory of agriculture and industry in the central arch, a symbol of the first socialistic Five Years Plan (as a by-product of the reconstruction of damages from the World War II).

Royal Summer Palace

Královský letohrádek
Pražský hrad - Mariánské hradby, Praha 1

Exhibitions and garden open daily 10 a.m. – 6 p.m., except of Monday

This unique pavilion was known by several names—the Royal Summer Palace, Queen Anne's Summer Palace (*Letohrádek královny Anny*), Belvedere for the open and nice view to the south, to the City, or Observatorium. Emperor Ferdinand I started to build it for his wife Anne the Jagiellonian in 1538, he commissioned the Genoese architect Paolo della Stella for the project. After an interruption due to fire of the Lesser Town and Castle in 1541, the pavilion was completed in 1563 by Bonifaz Wohlmuth who built the first floor and copper roof in the shape of a reversed keel of a ship. At that time the roof was painted in red and white strips and decorated by coats of arms of the Bohemian Crown Lands. Sand-stone toscana heads of 36 columns, 114 reliefs and the ornamental and figural frieze around the whole building are masterpieces of stone masonry by Paolo della Stella. The ground floor consisted of luxurious living rooms, the 1st floor contained a dancing hall and exhibition gallery. The Singing Fountain (Zpívající fontána, 1573), nearby in the garden, produces a melodious sound of water cascading into the fountain's metal bowls. The Royal Summer Palace is now an art gallery and exhibition centre.

Rudolph II placed here his collections of almost everything – sculptures, botanical, zoological and mineralogical exhibits, various curiosa, mechanisms, automatons and astronomical instruments, including those confiscated in the house of Tycho Brahe immediately after his death. Astronomical observations were carried out from the terrace and the frequent participants were the Emperor himself, Brahe and Kepler. The inventory listed, among others, 18 (!) telescopes, but only two of them allowed reasonable observation. Rudolph II lived here after he lost the throne in 1611 and died in 1612. His successor, brother Mathias, started to transfer the collections piece by piece to Vienna. All that remained was plundered by Swedish troops in 1648.

Wallenstein Palace

Valdštejnský palác,
Valdštejnské náměstí 4,
Praha 1-Malá Strana

Albrecht Valdštejn (Wallenstein, 1583–1634), the wealthy, powerful but remorseless generalissimo of the Habsburg imperial army, built this first Baroque monument in Prague in years 1624-1630. The building manager Giovanni Pieroni, the pupil of Galileo Galilei, invited astrologer Séni and Johannes Kepler as consultants in order to fulfil particular demands of Wallenstein, who was a fiery adherent of astrology.

Through the left gate in the 60 m long main frontage to the square Valdštejnské náměstí, you get into the first of the five courtyards. The facade in front of you is divided into seven vertical window axes that correspond to seven planets (incl. the Sun and Moon) in the decoration of a unique Astrological Corridor, that is hidden behind the windows in the 2nd floor. Fresco decorations were designed by Pieroni, mathematician and astrologer, who demonstrated here early telescopic discoveries. The crescent-like image of planet Venus hangs above the head of Goddess Venus, planet Jupiter is depicted together with its four Galilean moons and Saturn has two moons on opposite sides of the planet, because the imperfect telescopes of that time were not able to display properly the Saturnian rings. Symbols of twelve zodiac constellations and personifications of four continents complete the decoration.

Wallenstein Palace is now seat of the Parliament´s Senate, and the Astrological Corridor, used by the Senate Chancellery, is closed for public visitors. Nevertheless, nice frescoes by Baccio del Bianco in other rooms can compensate for this limitation: Mythological Corridor devoted to Ovid´s Metamorphoses just below the Astrological Corridor, the ceremonial Knights' Hall with a fresco of the Apotheosis, the palace chapel, decorated by scenes from the legend of St Wenceslas, or the Wallenstein's cabinet.

The Italian garden includes a sala terrena, a grotto, an aviary and an artificial lake. The bronze statues were created by Adrien de Vries (c.1545-1626) who worked already for Rudolph II. The adjoining stable was turned into exhibitions rooms of the National Gallery, with access from the garden at Metro station Malostranská (line A).

Former House of Profession

Malostranské náměstí 25, Praha 1

The Jesuit Houses of profession served for accommodation and work of the top-ranking members of the Order – for "patres professi quattuor votorum". Patres from the overcrowded Clementinum College started to build a complex adjoining the churches of St Wenceslas and St Nicolaus at Lesser Town in 1627, soon after the defeat of the Czech estates in the Battle on White Mountain in 1618. The building was completed in 1691 and the new Baroque St Nicolas Church became dominant in Lesser Town in 1752.

The former House of Profession belongs now to **Faculty of Mathematics and Physics** of Charles University, but the "genius loci" of exact sciences resided here already much earlier. A school, where Ioannes Ssindel taught, formerly stood here. Following the direction of Emperor Ferdinand II, stimulated by his confessor Jesuit Guilliemo Lamormaine, Wallenstein confiscated the library of Heinrich Ranzau (1526-1598), a friend of Tycho Brahe, transported it from Germany to Prague and stored it in this House. More than 4000 volumes, mainly of natural sciences, represented the largest library of its kind at that time; the remains of it are preserved in the National Library in Clementinum. Jesuits liked natural sciences and so little angels, that amuse themself with sundials and telescopic observations, can be found on the ceiling fresco of the refectory, which is now under reconstruction into a ceremonial hall.

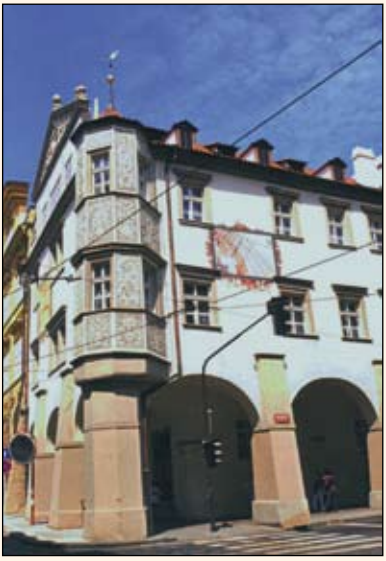
Other places of interest in Lesser Town

Jacob Curtius (Kurz) (+1600) vice-chancellor of Rudolph II, was buried in the St Thomas church of the Augustinian monastery at Lesser Town (near Malostranské náměstí, Malá Strana). This mathematician and astronomer, friend of Tycho Brahe, invented a method of dividing scale of the instrument for measuring angles. After his death, Rudolph II purchased his house to accommodate here the family of Tycho Brahe.

Franz Gansneb Tengnagel of Camp (1576-1622), Westphalian nobleman and assistant of Tycho Brahe, who married his daughter Elisabeth in 1601. Kepler had to make considerable efforts to get the observing books from Tengnagel, who intended to keep them for his own later astronomical work. He is buried in the Church of Our Lady under Chains (Velkopřevorské náměstí, Malá Strana).

Nostitz Palace (Maltézské náměstí 1, Praha 1)

Early Baroque large palace, attributed to Francesco Caratti. Family of Nostitz strongly supported arts and used to own it. The manuscript of Copernicus book "De revolutionibus …" was in the posession of the Nostitz library until 1953, when it was donated to the Polish republic. Jan Amos Comenius (1592-1670), after finishing studies at the university of Heidelberg, purchases the manuscript from widow of a Heidelberg professor. Since he spent his savings in such a way, travelled back to Prague and Moravia on foot. Later he became a Protestant Bishop, reformed the educational system and wrote many popular textbooks. The Copernicus manuscript remained in his possession for decades.



The two sundials on the picture belong to the corner house of the Malostranské náměstí and Tomášská street.

Astronomy in Jewish Town

Prague Jewish Town in Josefov was located between Old Town Square and river Vltava already in 13th century, but its present appearance dates back to 1893 - 1913. Only a few most significant building survived of the former Jewish quarter - six synagogues, cemetery and Town Hall with its clock going in counterclockwise sense. The Old Jewish Cemetery was established in the first half of the 15th century, today it contains about 12 000 tombstones. The most prominent scholars buried here are Judah Loew ben Bezalel, known as Rabbi Loew (d.1609), and natural scientists Gans and Delmedigo.

David Gans (1541-1613) was born in Westphalia (Germany) in a family of rich moneylenders. After studies in Bonn and Cracow he moved to Prague (1564) where he came into contact with Kepler and Tycho Brahe. This mathematician, historian and astronomer wrote among others a textbook on mathematical geography "Nechmad ve naim" – "Lovely and pleasant" – in which he described Tycho´s observatory in Benátky nad Jizerou.

Joseph Delmedigo (1591-1655), was born in Crete, and studied medicine at the University of Padua and astronomy under Galileo. In his pursuit of knowledge he traveled to Cairo, Constantinople, Poland, Amsterdam, Frankfurt, and Prague, engaging in the study not only of science but also of Kabbalah. Important work among his numerous writings is a textbook on mechanics.

Štefánik Observatory Petřín

Petřín 205, Praha 1
http://www.observatory.cz/

Štefánik Observatory has a central position in Prague, it is situated in gardens of the Petřín Hill. The best way to reach the observatory is to go there by a funicular from the street Újezd, near the opposite river bank to the National Theatre. The observatory was incorporated into the „Hunger Wall" which was constructed during the reign of Charles IV in the 14th century. The observatory was designed and built by the Czech Astronomical Society and opened on June 24th, 1928. A full-scale reconstruction after half a century of operation gave the building its current appearance and it was reopened for the public in 1976. Since 1979, the Štefánik observatory is a part of the joint institution Observatory and Planetarium of Prague.

A double Zeiss astrograph named after the Viennese selenographer König is placed in the main dome (bought in 1928) and a Maksutov-Cassegrain telescope has been installed in the western dome in 1976. The eastern dome of the observatory is reserved for scientific observations and since 1999, it is equipped with a 40 cm mirror telescope by Meade.

Milan Rastislav Štefánik (1880-1919), whose bronze statue is situated before the concrete sundial, was born in Slovakia. He studied astronomy at the Prague University and then entered the staff of the Paris observatory under the supervisor professor Janssen. Štefánik undertook several expeditions to the Mont Blanc observatory in order to observe the fotometric phenomena in the atmosphere. He travelled to the Pacific to observe the solar eclipse and was charged to establish on Tahiti the radio connection for the time service. During the World War I he organised an aeronautical meteorological service for the army. The French Republic has promoted Štefánik to the rank of general and named him Chevalier de la Legion d' Honeur. T. G. Masaryk, E. Beneš, and M. R. Štefánik are regarded as founders of the Czechoslovak Republic in 1918. Štefánik died tragically in 1919, due to a crash landing in Slovakia.

Planetarium of Prague

Královská obora 233, Praha 7
http://www.planetarium.cz/

The Planetarium building, with a large mechanical projector by Zeiss, was opened on November 20, 1960. Later this projector was replaced by a planetarium device called "Cosmorama" (again by Carl Zeiss - Jena). The main hall, a circular room of 23,5 m in diameter and a projection dome - an artificial sky - vaulted to a height of 15 m, can accommodate 210 visitors. The projection screen is the biggest one in the Czech Republic (843 sq.m.). The dome is equipped with modern audio-visual technology, including the several large projectors and laser systems. The performances are pre-programmed and can run automatically. Since 1979 it belongs to the "Observatory and Planetarium of Prague".

Observatory Ďáblice

Pod hvězdárnou 768, Prague 8
http://www.planetarium.cz/DABLICEOBS

The observatory on the north border of Prague was built in 1956 on a rock peak with a nice, wide panoramic view in all directions. It is used for lectures, and public observations . The west dome is equipped with a refractor of diameter 19 cm and photographic reflector 30 cm, the east dome contains a coudé reflector of diameter 40 cm.

Vyšehrad

Soběslavova 1/14, Prague 2
at a walking distance from the Congress Centrum (10 min)

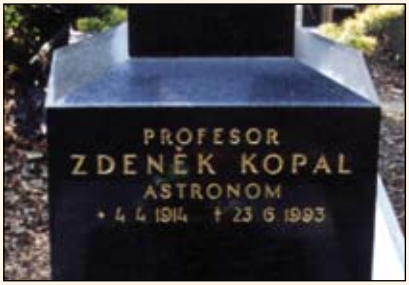
Vyšehrad, the rock above river Vltava offering a nice panorama, is a mysterious site bound up with legends. The fabulous Princess Libuše (asteroid No. 264 Libussa, discovered by C. H. F. Peters on December 22, 1886 in Clinton, New York) pronounced here a prophecy about the glory of Prague that will reach the stars. Vyšehrad became the residence of Premyslid (Přemysl) princes` in the last half of the 11th and in the 12th century, then they moved to Prague Castle. Main sights of Vyšehrad are the Neo-Gothic church of St Peter and Paul, Romanesque rotunda of St Martin, and cemetery, where over 600 outstanding personalities of culture, science, arts and education are buried, including composers Antonín Dvořák and Bedřich Smetana.

Perhaps the oldest man-made witness of ancient times is a stone column, broken into three pieces, originally probably a gnomon.

Josef and Jan Frič were sons of Josef Václav Frič, revolutionary from 1848, who lived in exile in Paris. Jan studied technology and Josef natural sciences. After return from exile they founded a small factory producing fine mechanical instruments and optics. At the same time they started to construct astronomical instruments, take photographs of celestial objects and study astronomy and think about own observatory, influenced by their older friend Jan Neruda (1834-1891), Czech journalist and poet. Jan died early in 1897 and since that time, Josef used the name Jan along his own Josef. He bought two neighbouring graves because he wanted to lay here with Neruda side-by-side. On the first anniversary of his brother´s death Josef Jan purchased grounds for the Ondřejov observatory.

Jaroslav Heyrovský (1890-1967), founder of electrochemical polarography and Nobel prize winner in 1959.

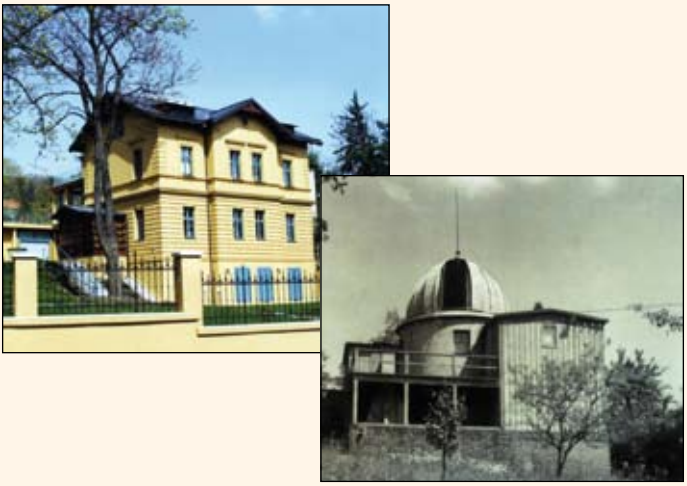
Zdeněk Kopal studied astronomy at Charles University in Prague and continued with Arthur Eddington and Harlow Shapley. After the World War II he remained in USA and later moved to Manchester, having been appointed Head of the University astronomical institute. Kopal started his professional career by solving the problems of close double stars and continued in lunar and planetary research. His grave is in a third row behind the Smetana tomb.



Faculty of Mathematics and Physics, Karlov

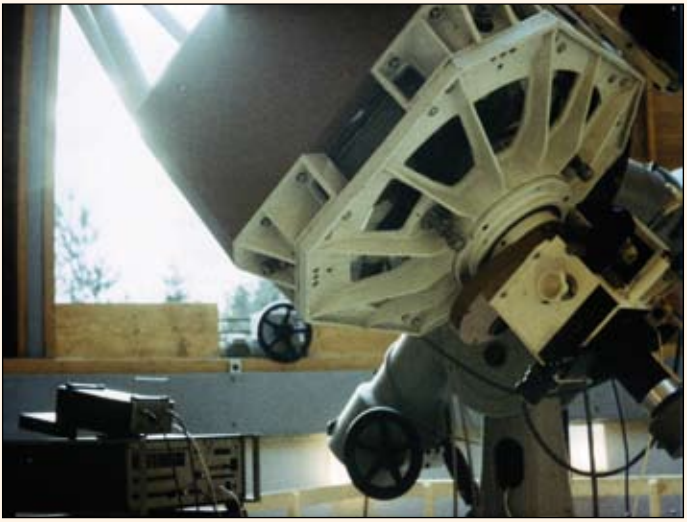
Even if the Faculty of Mathematics and Physics originated from the Faculty of Natural Sciences in 1952, the buildings in the street Ke Karlovu are older, from the beginning of 20th century. When the Prague University was split into the independent Czech and German parts in 1882, professors Vincent Strouhal founded Czech Physical Institute in 1884 and August Seydler the Astronomical Institute in 1886. Strouhal began to collect means for support of those institutes. The Physical Institute found its harbour in building Ke Karlovu 5 in 1908, Astronomical Institute – after several years – was moved to Švédská street on south slope of the Petřín Hill, now Prague 5, where it resided until 1997. The

building Ke Karlovu 3, finished in 1911, former Mathematical institute, is now seat of the Deans Office, library and several physical institutes and laboratories.



The observatory of the Astronomical Institute in Švédská street (the black and white picture is from about 1930) was abandoned in 1949 and a new mirror telescope of diameter 65 cm was constructed at the Ondřejov observatory.

From those times at least astronomers Vincenc Nechvíle, Václav Heinrich, Josef M. Mohr should be mentioned.



Ondřejov

The founding date of the Observatory was on 28th January 1898 when Jan Josef Frič purchased the grounds in Ondřejov, small village located about 35 km SE of Prague, for building the observatory. The oldest buildings were designed by Josef Fanta, architect of the main railway station of Prague. A verse from the poem "Cosmical Songs" by Jan Neruda was used to decorate the walls of the villa. Frič started to collaborate with František Nušl (1867-1951), professor of mathematics at Technical University of Prague and later professor of astronomy at the Charles University. Nušl, repeatedly elected president of the Czech Astronomical Society, officer of the IAU, became the director of the observatory with exception of World War II, during which it was lead by Werner Schaub, professor at the German University of Prague. In 1928, Frič donated his small private observatory to the Czechoslovak Republic represented by Charles University in Prague. Nušl and Frič developed several unique instruments, in particular the circumzenital for exact positional measurements of stars. They made also regular photographic observations.

After the Czechoslovak Academy of Sciences was established in 1953, the Ondřejov observatory was merged with the State Astronomical Observatory of Clementinum, tranferred in the meanwhile to a living house in Budečská street (district Praha-Vinohrady). The newly created Astronomical Institute developed scientific work in solar, stellar, and meteoric astronomy; the time laboratory continued the precise time-keeping and broadcasting and studies of upper atmosphere started to develop, too. The Zeiss 2m-telescope was inaugurated in 1967, during the 13th General Assembly of the International Astronomical Union.

A small museum of astronomical instruments, that bears the name of Vojtěch Šafařík 1829–1902, was opened in 1998 on the occasion of the centennial anniversary of the observatory. Šafařík, patron and adviser of brothers Frič, was a Czech chemist, specialised in inorganic chemistry, observer of variable stars, and finally professor of astronomy at Charles University in Prague.

Benátky nad Jizerou

Benátky nad Jizerou is a small town about 40 km NE from Prague. The Renaissance castle, built by the Donín family, was bought by Rudolph II and offered to Tycho Brahe. After staying with Jan Jessenius in Wittenberg, Tycho accepted the invitation of Rudolph II and moved to Prague in June 1599. On 20th August he continued to Benátky where he settled in the castle and started to adapt it for observations. First of all he determined the geographical latitude and fixed a meridian at one window in 2nd floor, the remains of which were found by the recent reconstruction. He invited also Kepler from Graz, who arrived on 3rd February 1600. Even if Kepler was not delighted with the position offered him by Tycho, there remained nothing else then to accept it because, in the meanwhile, protestants were forced to leave Graz. However, Tycho was ordered to return to Prague in July 1600 and so the period in Benátky came to an end.

The witness of the life, astronomy, observations and instruments in Benátky was written by Jewish scholar David Gans who visited Tycho several times.

A Museum of Benátky resides in rooms of the 2nd floor where Tycho lived, the 1st floor is reserved for the municipal office of Benátky. New Tycho Brahe exhibition was opened in May 2006.

Národní muzeum

Václavské náměstí 68, Praha 2 (Metro station Muzeum, lines A and C)
www.nm.cz
Collection of old astronomical instruments incl. one astrolabe, old astronomical prints, Stambuch of Tycho Brahe´s son

Národní technické muzeum

Kostelní 42, Praha 7
www.ntm.cz , closed due to reconstruction
The largest Czech collection of astronomical instruments from former Clementinum Observatory, sextants by Joost Bürgi and Erasmus Habermel, collection of telescopes, sundials, demonstrating planetaria etc.

Muzeum hlavního města Prahy

Na Poříčí 52, 180 00 Praha 8 (Metro station Florenc, lines B and C)
www.muzeumprahy.cz
Langweil model of Prague from 1826, textiles from the grave of Tycho Brahe, old engravings of Prague, some globes and maps

Uměleckoprůmyslové museum v Praze

ulice 17. listopadu 2, Praha 1 (near Metro station Staroměstská, line A)
www.upm.cz
Collection of transportable sundials and some other astronomical instruments

Villa Amerika - Museum of the composer Antonín Dvořák

Ke Karlovu 20, Praha 2 (near Metro station I. P. Pavlova, line C)
http://www.nm.cz/mad/
Baroque villa built by K. I. Dientzenhofer; ceiling fresco by Ferdinand Schor, professor at the Prague Polytechnic School, is devoted to sciences and shows e.g. Archimedes, Vitruvius etc.

Prague sundial trail

http://astro.mff.cuni.cz/mira/sh/sh.php?article=prague_trail

Part B A walk through Lesser Town and Prague Castle

B1	Strahov monastery
B2	Tycho Brahe and Johannes Kepler monument
B3	Former Inn "Zum goldenen Griffin"
B4	Ball Hall in Royal Gardens
B5	Summer Royal Palace "Belveder"
B6	Wallenstein Pallace
B7	House of profession
N	Nostitz Palace
P	Štefánik Observatory on Petřín Hill

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Prague, July 2006 *Martin Šolc*