CHRISTOPHER CLAVIUS (March 25, 1538 – February 2, 1612)

by HEINZ KLAUS STRICK, Germany

Whether the original name of CHRISTOPHER CLAVIUS was once CHRISTOPH CLAU or CHRISTOPH SCHLÜSSEL (*clavis* is Latin for *key*) will probably never be clarified. The only thing that is certain is that the young Franconian, who joined the Jesuit order at the age of 17, at some point adopted the Latinised name.

From Bamberg in Franconia (now Germany) he went to Rome and then on to study at the Jesuit College at the venerable university in Coimbra (Portugal).

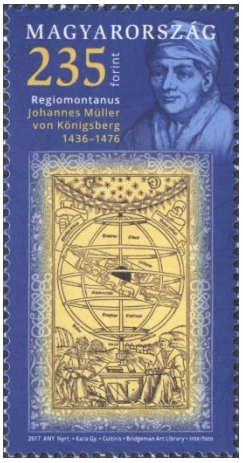
In his mathematics courses, his special talent for the subject was noticeable, and through his teacher PEDRO NUNES, one of the most important mathematicians of his time, CHRISTOPHER CLAVIUS received an excellent education.

The impressive experience of a total solar eclipse in August 1560 also awakened his special interest in astronomical questions.

In *Collegio Romano* he continued his studies in theology. From 1564 he worked as a mathematics lecturer at this Jesuit college. In 1567, for the second time in his life, he witnessed the moving natural spectacle of a total solar eclipse.

In 1570 CHRISTOPHER CLAVIUS described these two experiences in detail in a commentary on the *Tractatus de Sphaera* by the English mathematician and astronomer JOANNIS DE SACRO BOSCO (JOHN OF HOLYWOOD, 1195-1256), who taught at the University of Paris.

Until the 17th century, the treatise of JOANNIS was compulsory reading for students of astronomy at all universities in Europe. Before 1472, numerous manuscripts of the work circulated before it was printed for the first time and went through over 200 editions by 1650. JOANNIS DE SACRO BOSCO had also written a critique of the existing *Julian calendar* in 1235, including a proposal for a change in the leap year system. But it took 350 years before his ideas were taken into account in the *Gregorian calendar* reform.



Heavy criticism of the existing *Julian calendar*, i.e. of the calendar regulations laid down for the Roman Empire by JULIUS CAESAR in 45 BC, was also voiced by NICHOLAS OF CUSA (latin: CUSANUS, 1401-1464) and REGIOMONTANUS (1436-1476), until at the Council of Trent (1563) the pressure on the Pope became so great that he appointed a reform commission under the leadership of the Spanish astronomer ALOISIUS LILIUS (1510-1576).

At the time of JULIUS CAESAR, astronomers assumed that a solar year, i.e. the time between two spring equinoxes, lasts exactly 365¼ days, so that a 365-day year must be extended by one leap year day every four years. In fact, however, a solar year lasts on average only 365 days, 5 hours, 48 minutes and about 45 seconds. (Today we know that the time between two vernal equinoxes – due to irregularities in the Earth's orbit – can vary by several minutes).

In 325, the *Council of Nicaea* had determined that the vernal equinox should fall on 21 March and that the date of Easter should be calculated from this day.

When the Commission met, the discrepancy had already grown to 10 days. CLAVIUS had the draft reform printed and sent to the Christian rulers and universities for comment.

The stamp in the center of the Vatican souvenir sheet shows CLAVIUS presenting the final version to the Pope.

After only a few proposed changes were received, Pope GREGORY XIII put the calendar reform into effect on 24 February 1582 with the bull *Inter gravissimas*. (Papal decrees are quoted by their opening words, this one begins thus: *Among the most important duties of our pastoral office is ...*)

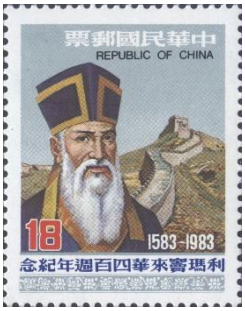
From this, the day following 4 October 1582 would be given the date 15 October. In future, if at the change of century the century number was not divisible by 4, 29 February was to be dropped as a leap day (e.g. in the year 1700). The month of October was chosen for the change of the calendar because it had the least number of saints' days of remembrance and thus the course of the regular church year was only slightly disturbed.

The reform was implemented in many countries with Catholic rule in accordance with the papal decree. Protestant-ruled countries initially resist accepting an "instruction" from Rome. In many cases, the changeover in these countries did not take place until the 18th century, which explains why numerous treaties from this period are dated twice (*Julian* and *Gregorian*).

In the years after 1582, CLAVIUS had to justify himself again and again for the necessity of the calendar reform. The common people felt deprived of ten days of their life by the Church and in Frankfurt there were even riots because of this. In 1588 he wrote the justificatory treatise *Novi calendarii romani apologia*. In 1603, a detailed justification followed once again in *Romani calendarii a Gregorio XIII P. M. restituti explicatio*.

It would be wrong to reduce the importance of CLAVIUS only to the calendar reform for which he was ultimately responsible. He was a gifted teacher of mathematics. In 1574 he published an extensively annotated and supplemented version of the *Elements* of EUCLID, which is why he is referred to by posterity as *the EUCLID of the 16th century*.

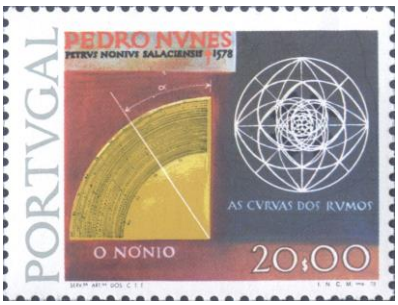
His most famous pupil, the Jesuit MATTEO RICCI, even took the work to China for missionary work and translated it into Chinese in collaboration with XU GUANGQI.



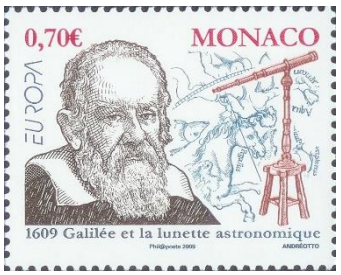
In classical logic, the method of *consequentia mirabilis* (wonderful deduction) is also called CLAVIUS's law. CLAVIUS used this method of inference, which is related to the *reductio ad absurdum*, in his EUCLID commentary: The validity of an assertion can be proved from the invalidity of the negation, in formal notation: $(\neg p \rightarrow p) \rightarrow p$.

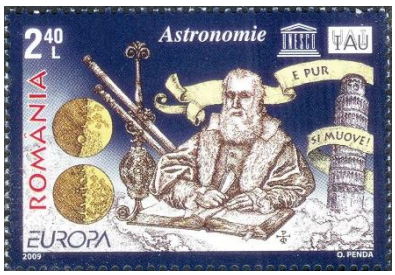
Whether CLAVIUS was actually the "inventor" of the decimal point (separation of the integer part of a decimal number from the tenth) will probably never be clarified. What is certain is that this notation became generally accepted after he consistently used it in the astronomical tables he published in 1593. His algebra book from 1608 was widely distributed and was even appreciated by LEIBNIZ and DESCARTES. His suggestions for the teaching of mathematics were implemented as a compulsory curriculum in the numerous Jesuit schools that were being founded.

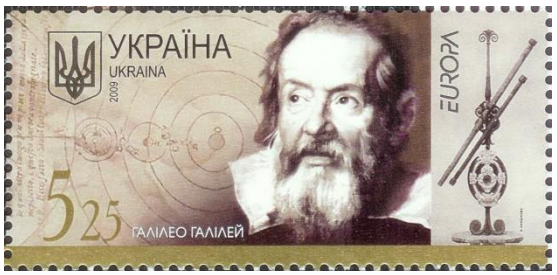
CLAVIUS also worked on improving measuring techniques and he further developed an idea of his teacher PEDRO NUNES (Latinised: NONIUS), which led to the invention of the vernier scale by the Frenchman PIERRE VERNIER in 1631.



CLAVIUS maintained friendly contact with GALILEO GALILEI. In the new edition of the commentary on the *Tractatus de Sphaera* from 1610, he mentioned GALILEO's writing *Sidereus Nuncius* and confirmed his sensational observations, including the discovery of four moons of Jupiter. The fact that GALILEO's observations of Venus showed that it did not shine itself, but received its light from the sun, was a cautious reminder for him to reconsider previous ideas about the planetary system. Nevertheless, he rejected the *Copernican world view* until his death in 1612.







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