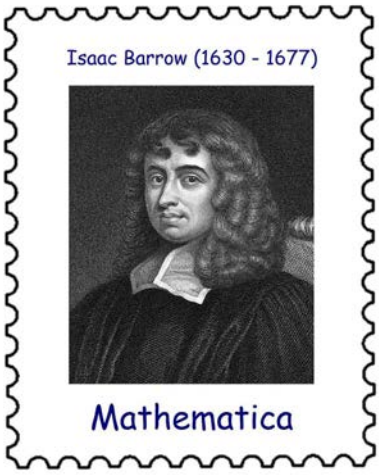
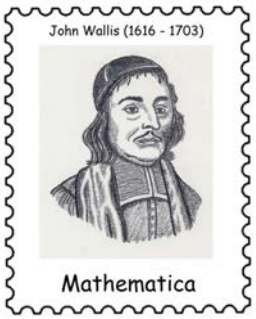
ISAAC BARROW (October, 1630 – May 4, 1677)



by HEINZ KLAUS STRICK, Germany

Unlike many of his ancestors and close relatives, THOMAS BARROW – after a dispute with his father – did not embark on an academic career, but worked his way up in London to become linen merchant to the court of King CHARLES I of England. His first marriage produced a son; his wife died when the boy with the first name ISAAC was four years old. The child was given to the grandfather, who spoiled the boy beyond measure.

His father, who remarried after two years, soon enrolled ISAAC at *Charterhouse School*, an elite boarding school founded in 1611 which still exists today, and paid double the school fees – in the expectation that the boy would then receive special support.



This was not the case, however, and ISAAC soon acquired a reputation as a bully. So the father tried another boarding school, the *Felsted School* in Essex, founded in 1564, which JOHN WALLIS had also attended. At this school, education and the strict observance of rules were very important. Now, at last, the boy's talent became apparent; he made good progress in the core subjects of Greek, Latin, Hebrew and logic.

As a result of the bloody clashes between the Catholic population and the Protestant settlers in Ireland (the *Irish Rebellion*), his father lost his fortune and could no longer pay the school fees. But ISAAC did not have to leave the school, as the headmaster of the *Felsted School* had recognized his talent and was willing to support him further.

In 1643 ISAAC BARROW was accepted as a scholarship student at *Peterhouse*, the oldest college of the University of Cambridge, probably also because an uncle worked there as a teacher. Then his uncle lost his post because of wrong political views, and ISAAC moved to Oxford, where his brother had settled as the *Royal Linen Merchant*.

But he could not stay there for long either as Oxford was occupied by OLIVER CROMWELL's troops during the Civil War.

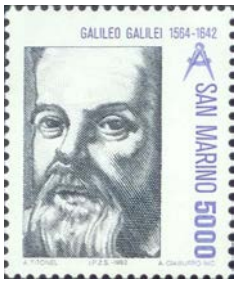
After a temporary stay in London, the destitute 15-year-old ISAAC BARROW finally enrolled at *Trinity College* in Cambridge. In return for board and lodging he was forced to serve wealthy fellow students. His Greek professor JAMES DUPORT waived the fees that BARROW would actually have to pay to him as a student. BARROW attended lectures in old and new languages (Greek, Latin, Hebrew, French, Spanish, Italian), literature, history, geography and theology. By the time they reached the Bachelor's examination, students in Cambridge knew little about mathematics.

After the examination, BARROW successfully applied for a scholarship to continue his studies, which he completed with a Master of Arts (MA) degree in 1652. The scholarship required him to attend lectures in theology. As part of his preoccupation with church history, he also dealt with the question of which world view is valid (geocentric or heliocentric). And so he delved into the basics of astronomy, which in turn led him to geometry.

Almost independently, he worked out the *Elements* of EUCLID and published a simplified version in Latin (turn of the year 1655/56). This book as well as its translation into English was still in print decades later.

In the meantime, the political conditions in England changed dramatically: OLIVER CROMWELL had seized power and was ruling without a parliament; fanatical puritans were cleaning up the universities. Thus JAMES DUPORT also lost his professorship. BARROW applied for the position, but because of his royalist attitude he had no chance. So in 1655 he decided to leave the country and applied for a travel grant from the university, which was granted for a period of three years.

The journey led first to Paris. Whether he met CHRISTIAAN HUYGENS or GILLES DE ROBERVAL there can no longer be determined. His report to *Trinity College* shows that he was disappointed with the state of mathematical research in Paris. After ten months he left for Florence, where he spent most of his time in the MEDICI library, also studying their coin collection. He used this knowledge of coins to improve his financial situation by arranging the purchase of rare coins for wealthy English merchants.



From his meeting with VINCENZO VIVIANI, GALILEO GALILEI's last pupil, he learned a lot about the so-called *Mathematics of the Indivisible* of EVANGELISTA TORRICELLI (1608–1647) and BONAVENTURA CAVALIERI (1598–1647) – the basis for his later publications.

A planned onward journey to Rome failed because the plague had broken out there, and so he joined a ship to take him to Constantinople. This ship was attacked by pirates on the way. The crew succeeded in repulsing the attack with the active cooperation of BARROW. The damage to the ship, however, forced a stopover in Smyrna (today: Izmir), where BARROW stayed for seven months with the English consul. After extending his travel grant, he stayed in Constantinople for over a year, using his time to study the theology of the Orthodox Church.

His return journey was no less dramatic. When his ship docked in Venice, it caught fire and BARROW's few belongings were lost. He returned to his homeland by land at the end of 1659.

There, with CHARLES II as king, the monarchy had been reinstated. BARROW was ordained a priest of the Anglican Church and successfully applied for the still vacant post of professor of Greek.

However, he could not make a living from this, as there were too few students; in addition, he accepted a professorship of geometry at *Gresham College* in London. In 1662, he was appointed one of the 150 founding members of the *Royal Society*, but did not become active in the *Society*, and at times his exclusion was even considered.

In 1663 the politician and clergyman HENRY LUCAS endowed a chair at the University of Cambridge, the *LUCASian Professor of Mathematics*, the first holder of which was ISAAC BARROW.

When the lectures *Lectiones Geometricae* and *Lectiones Opticae* were published in the next few years, a student was involved, whom BARROW expressly thanked for his contribution and ideas in his foreword.

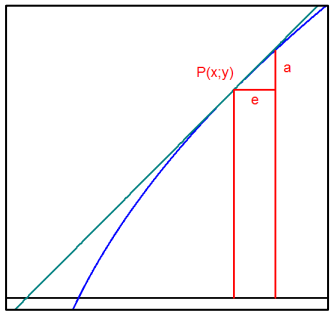
This was ISAAC NEWTON.

After BARROW's resignation, NEWTON became his successor in the LUCASian chair in 1669. Certainly BARROW sensed the superiority of NEWTON.

But the reason for his resignation was his concern for his own salvation. He was appointed *Royal Chaplain* and in 1673 he became head of Trinity College. At this time CHARLES II described him as *England's greatest scholar*. His sermons and theological writings were reprinted until the 19th century.

At the age of 46, BARROW died suddenly after a feverish illness, which he tried in vain to cure with a method he had developed himself, a mixture of fasting and opium consumption.

Following the works of EUCLID, BARROW also published commentaries on some writings of ARCHIMEDES and APOLLONIUS in the 1670s. Particularly noteworthy, however, are his contributions to analysis. Inspired by FERMAT's ideas, he developed a method for determining tangents to a curve. In doing so he considered implicitly defined functions of the type $f(x,y) = 0$ whose graphs he regarded as composed of infinitesimally small pieces of straight lines.



Starting with $f(x,y) = f(x+e,y+a) = 0$ he dealt with this by zeroing the quadratic and higher powers of a and e and derived a condition for the slope of the tangent to the curve.

He also used geometric methods to determine the sizes of the enclosed surfaces for a series of curves. Examining the curve that describes the respective increase in area when a point travels along a given curve, he discovered that its tangent gradients coincided with the values of the original function. i.e. In principle this is the property that corresponds to the statement of the *fundamental theorem of differential and integral calculus*.

Although NEWTON and LEIBNIZ were able to formulate this relationship explicitly, ISAAC BARROW is rightly regarded as one of the most important pioneers of this insight.

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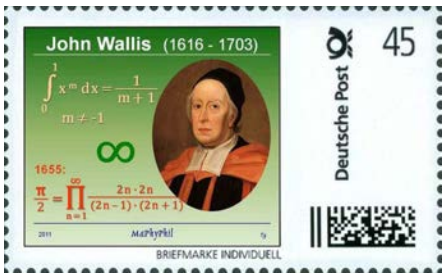
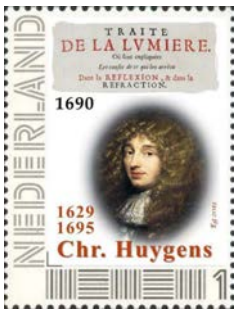
Here an important hint for philatelists who also like individual (not officially issued) stamps. Enquiries at europablocks@web.de with the note: "Mathstamps".


John Wallis (1616 - 1703)
$\int_0^1 x^m\,dx = \frac{1}{m+1}$
$m \neq -1$
∞
1655:
$\frac{\pi}{2} = \prod_{n=1}^{\infty} \frac{2n \cdot 2n}{(2n-1)\cdot(2n+1)}$
Deutsche Post
45
BRIEFMARKE INDIVIDUELL


NIEDERLAND
TRAITE
DE LA LVMIERE.
1690
1629
1695
Chr. Huygens
1


NIEDERLAND
EVANGELISTA
TORRICELLI
1608 - 1647
$y = \frac{1}{x}$
$V = \pi \int_1^{\infty} \frac{1}{x^2}\,dx = \pi$
$A = 2\pi \int_1^{\infty} \frac{1}{x}\,dx = \infty$
1


Gottfried Wilhelm
Leibniz
1646 - 1716
85
Liechtensteinische Post AG
Infinitesimalrechnung
Differentialkalkul
Fluxionsmethode
OPTICI
TREATI
LIGH
PRINCIPI
85
Liechtensteinische Post AG
Isaac Newton
1643 - 1727
85
Liechtensteinische Post AG