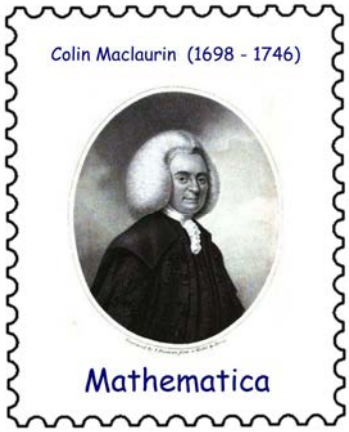
COLIN MACLAURIN (February 1698 –June 14, 1746)



by HEINZ KLAUS STRICK, Germany

COLIN MACLAURIN was born the youngest of three sons to a learned clergyman in a small community in western Scotland. When his father died six weeks after Colin's birth, his mother moved to Dumbarton near Glasgow so that her sons could have the opportunity to attend a good school there. His mother died when COLIN was nine years old, and an uncle, who also worked as a pastor, took care of the two remaining sons (the middle son had since passed away).

At the age of 11, COLIN was accepted as a student at the University of Glasgow - in those days the country's prestigious schools and universities tried to attract children and young people as early as possible and COLIN was one of the most talented. When the boy happened upon a copy of the *Elements* of EUCLID, he worked through the first chapters on his own. Supported by his mathematics professor ROBERT SIMSON, who later made a name for himself as the editor of annotated editions of the works of EUCLID and APOLLONIUS, COLIN MACLAURIN graduated as a *Master of Arts* at the age of 14 (more comparable to today's bachelor's degree).

He chose *On the power of gravity* as the topic for the public examination presentation, and he had no problem outlining the theories on gravity developed by ISAAC NEWTON.

MACLAURIN stayed at the university and started studying theology, which he broke off after a year. He spent the next three years in his uncle's parsonage and was enthusiastic about the beauty of nature and mathematics. And when a position for a mathematics professorship at *Marischal College* in Aberdeen was advertised in 1717, he prevailed over other, equally talented applicants.

In the next few years the young mathematics professor made two trips to London, where he met ISAAC NEWTON personally and was elected as a member of the *Royal Society* at NEWTON's suggestion.

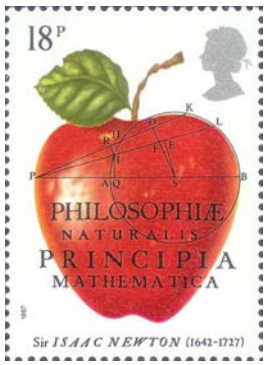
In 1720 MACLAURIN published his first comprehensive work: *Geometrica Organica* - on conics and curves of higher degree.

Then, in 1722, a memorable break in MACLAURIN's career followed: Lord POLWARTH, a senior diplomat in the service of King GEORGE II of England, wanted his son to take a grand tour of Europe, as was customary for the sons of the nobility, and he asked MACLAURIN to accompany his son. MACLAURIN saw the unique opportunity to be able to get in personal contact with mathematicians outside Britain and agreed. He arranged a replacement for his lectures, but failed to make a formal application for leave of absence to his university.

MACLAURIN did not respond to letters from the university asking when he was planning to return and took the opportunity to get in touch with French scientists. For a publication *Démonstrations des loix du choc des corps* (On the laws of physical impact) he received a prize from the *Académie des Sciences* in Paris in 1724. The journey ended abruptly in Montpellier when the pupil entrusted to him fell seriously ill and died a short time later.

MACLAURIN was allowed to resume teaching in Aberdeen, but due to his unexcused two-year absence, relations with the management of the university were rather strained. So he seized the opportunity to move when it was evident that a chair would shortly become vacant in Edinburgh.

He applied and received support from NEWTON. The latter agreed to give the University of Edinburgh £20 a year to pay MACLAURIN – until the professorship could be transferred to him. It is not known whether NEWTON's offer was taken up, but in fact MACLAURIN moved to Edinburgh in 1725.



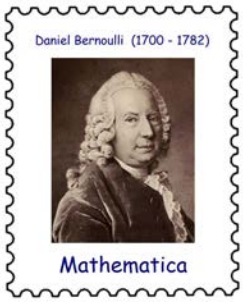
There he developed into the most respected teacher at the university, enthused his students with his friendly manner and the clarity of his lectures to such an extent that the study of mathematics became fashionable.

If he found in an examination that the examinee could not properly understand a problem, he did not blame the student, but took this as an opportunity to think about how he could better cover the topic. The subjects of his lectures ranged from classical geometry to the contents of NEWTON's *Principia* and the construction of fortifications.

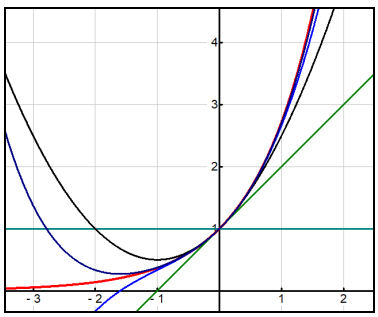
MACLAURIN was also active in other areas. For example, based on his calculations, death benefit funds were set up by pastors and professors to care for widows and orphans. He also conducted surveying work in the Orkney and Shetland Islands so that more accurate maps could be made.

In 1733 MACLAURIN married the daughter of the Crown Prosecutor for Scotland; five of the seven children from the happy marriage survived their father.

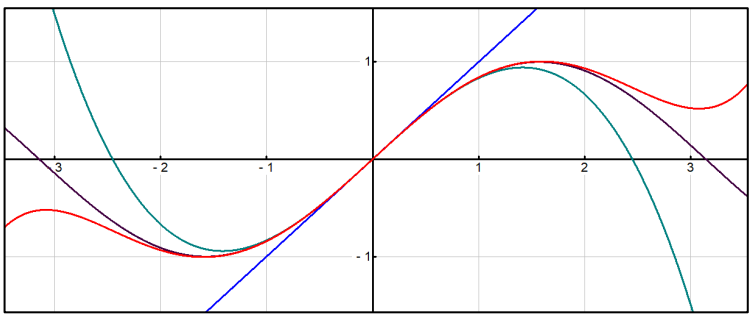
In 1740 Maclaurin received a second prize from the *Académie des Sciences* – together with DANIEL BERNOULLI and LEONHARD EULER – for a work on the origin of tides (*De Causa Physica Fluxus et Refluxus Maris*).



In 1742 MACLAURIN published his two-volume main work *Treatise of Fluxions*, in which he specified the theoretical foundations of NEWTON's calculus and went into numerous applications such as the determination of maxima and minima. He also examined the series expansion of functions at the point $x = 0$: $f(x) = f(0) + x \cdot f'(0) + \frac{1}{2!} \cdot x^2 \cdot f''(0) + \ldots$



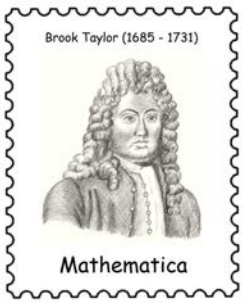
$e^x = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \ldots$



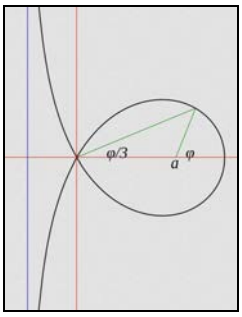
$\sin(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \ldots + \ldots$

These special TAYLOR series are still known today as the *Maclaurin series*.

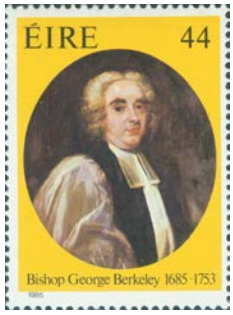
He further developed formulas for the approximate calculation of certain integrals (*Euler-Maclaurin formula*) and discovered a curve for the *trisection of angles* (The *Trisectrix*).



(drawing © Andreas Strick)



(Trisectrix, source: Wikipedia)



In the 763 pages of the work he confronted the critics of the fluxional calculus, especially the harsh criticism of the Irish philosopher and theologian GEORGE BERKELEY. In 1734, in his treatise *The Analyst: or a Discourse addressed to an Infidel Mathematician*, the latter had admitted that NEWTON's calculus delivered correct results, but the justifications were illogical, or at least doubtful.

In connection with the proof of the product rule, for example, BERKELEY had criticized the fact that NEWTON first introduced the increment "*o*" as a small positive quantity, but at the end of the calculation he set it to zero and omitted it:

> *And what are these fluxions? The Velocities of evanescent Increments? And what are these same evanescent increments? They are neither finite quantities nor quantities infinitely small, nor yet nothing. May we not call them the Ghosts of departed Quantities?*

To this day the term "*ghosts of departed quantities*" is used as a catch phrase to argue against the notion of "*infinitely small increments*".

With his treatise MACLAURIN was able to remove some of the ambiguities of NEWTON's calculus; but it was only through the work of CAUCHY and WEIERSTRASS that exact theoretical foundations of analysis were created.

The title of BERKELEY's book also contained an attack on *NEWTONian mechanics*, which he suggested was used by "infidel free spirits" who questioned the work of God.

As part of the *Glorious Revolution* in 1688/89, JAMES II of the House of Stuart was driven from the English throne. Afterwards, his descendants made several attempts to assert their claims to the throne by military means. In 1745, the young CHARLES EDWARD STUART, who came from France, landed in the north of Scotland, gathered battle-ready troops from Scottish clans and marched towards Edinburgh. COLIN MACLAURIN organized the digging of trenches and the building of barricades to stop "BONNIE PRINCE CHARLIE" – in vain. The city was taken, only the castle itself remained in the hands of the supporters of the English crown.

MACLAURIN, who had exhausted himself completely during the work, was forced to flee. On the way to York, he suffered serious injuries when he fell from his horse. After the defeat of the insurgents, he was able to return to his family, but he never recovered from the hardships he had suffered and died a few months later.

After his death, two more works appeared: *Treatise on Algebra*, in which, among other things, general methods for solving linear systems of equations with up to three variables were developed, and *An Account of SIR ISAAC NEWTON's Philosophical Discoveries.*

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https://www.spektrum.de/wissen/colin-maclaurin-1698-1746/1534869

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