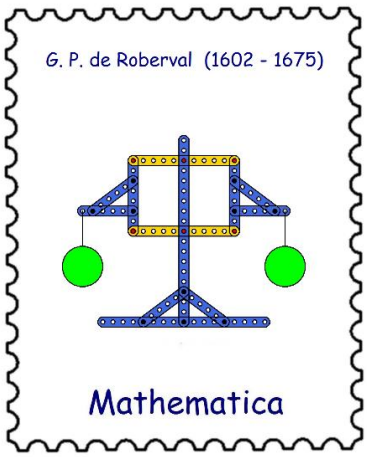
GILLES PERSONNE DE ROBERVAL (1602 – 1675)

by HEINZ KLAUS STRICK, Germany



The illustration of the Mathematica stamp on the right shows a so-called ROBERVAL balance, named after the French mathematician GILLES PERSONNE DE ROBERVAL.

The blue coloured components are each rigidly screwed together (indicated by the black filled circles), the yellow ones are rotatably connected to the blue coloured components (red filled connections).

If objects of different weights are suspended on the two sides of the scale, the blue-yellow rectangle changes to a parallelogram, with the blue sides remaining in vertical alignment.
At which point objects are suspended from the outer blue components (right or left) is irrelevant; the lever arm is the same on both sides, namely determined by half the length of the yellow-coloured components.

GILLES PERSONNE DE ROBERVAL's parents were PIERRE PERSONNE and JEANNE LE DRU and the family lived in Roberval, about 50 km north of Paris. At the age of 26, the young man decided to add the suffix DE ROBERVAL to his name, willingly accepting the possible misunderstanding that he was of noble origin. In this he was successful, since posterity quoted him with the chosen name ROBERVAL and not with the actual family name PERSONNE.

The PERSONNE family was a simple peasant family with many children who had a sufficiently large income to live on through their work. It is not known what schooling the young GILLES received, but it is known that one of the priests of the parish noticed the extraordinary intelligence of the boy. This priest, who was also the chaplain of Queen MARIA DE MEDICI, gave the boy lessons in mathematics and in the ancient languages.

No one knows how long this period of learning lasted. In any case GILLES set off one day and travelled through France – earning his living by teaching mathematics himself. In Bordeaux he met PIERRE DE FERMAT. In 1628 he arrived in Paris, added DE ROBERVAL to his name and made contact with the Pauline friar MARIN MERSENNE, who accepted him into his discussion group, the *Academia Parisiensis*. Among the participants was ÉTIENNE PASCAL, who was later joined by his son BLAISE.

ROBERVAL used the next few years to improve his knowledge of mathematics through self-study. At the age of 30, he achieved his next goal: he was employed as a teacher of philosophy (which included mathematics) at the *Collège Gervais* in Paris, an institution affiliated to the University of Paris.

There he moved into two sparsely furnished rooms, where he lived until the end of his life. ROBERVAL was known to be extremely difficult to deal with because of his irascibility and his fellow men also considered him to be a downright miser – which was confirmed when he died.

When ROBERVAL died in 1675, 43 years after he had moved into the two rooms, the only furnishings found in his flat were a bed, a table and a few chairs of inferior quality, neither pictures nor any ornaments on the walls.
The only other things were several books, from EUCLID and ARCHIMEDES to KEPLER, also Latin classics such as HERODOT and CICERO, and in addition an amount of cash corresponding to about eight times his annual income.

In 1634, his next wish came true: he successfully applied for the RAMUS chair, named after the philosopher PETRUS RAMUS (PIERRE DE RAMÉE, 1515-1572), who was murdered during the *Night of St Bartholomew*. What was special about this chair at the *Collège Royale* was that it was only filled for three years at a time, following a public competition.

This is probably the reason why ROBERVAL published only two treatises during his lifetime: having to reapply each time, it was of great advantage to a candidate if he could present new insights unknown to the other applicants. His behaviour was criticised by the other candidates, but ROBERVAL managed to get the job every three years – until the end of his life.

In 1655 he also won the GASSENDI Chair – named after the philosopher PETRUS GASSENDI, 1592-1655. Incidentally, GASSENDI was the first to write a biography of a scientist (namely of TYCHO BRAHE).

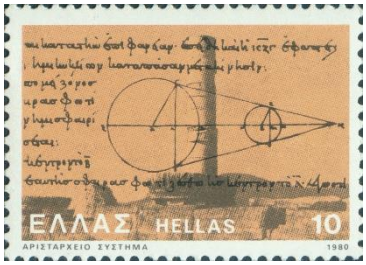
In the years 1648 to 1653, France was shaken by civil-war-like uprisings (the so-called *Fronde*). France's participation in the 30 Years' War and the additional war with Spain had led to ever higher taxes, against which the nobility as well as craftsmen and peasants fought when the king (LOUIS XIII) died, and the takeover of the crown by the designated successor (the 10-year-old LOUIS XIV) was not yet assured.

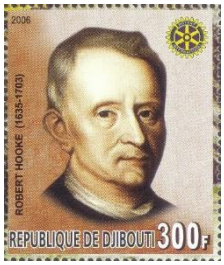
After the rebellions were put down, the situation returned to normal. ROBERVAL bought a large estate in Ménerval (situated between Rouen and Amiens), which he let – mainly – be cultivated by members of his family and he himself travelled there only occasionally.

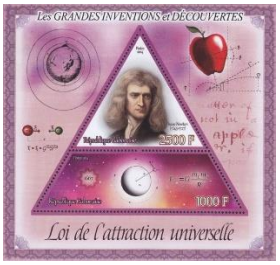
ROBERVAL's two published writings deal with fundamental physical considerations:

In *Traité de mécanique des poids soutenus par des puissances sur des plans inclinés à l'horizontale* (1636), he dealt with the question of what causes the weight of a body and developed the idea of a gravitational force (some years before ROBERT HOOKE and ISAAC NEWTON).

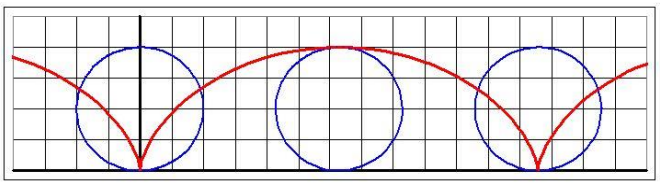
In the treatise *Le système du monde d'après Aristarque de Samos* (1644) he dealt with a rediscovered writing of ARISTARCHUS, who – 1800 years before COPERNICUS – was convinced of a heliocentric solar system.







In 1615, MERSENNE had carried out investigations on cycloids, i.e. the curves on which a point on a circle moves when the circle is rolled (e.g. along a straight line). In 1634, ROBERVAL presented a method (using the indivisibles method of ARCHIMEDES) with which he could determine the area under this curve drawn in red:



- If *r* is the radius of the rolling circle, then $A = 3 \cdot \pi \cdot r^2$ is the area under an arch that we are looking for.

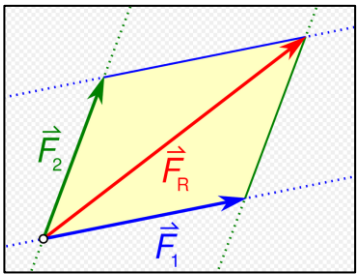
With his presentation, ROBERVAL impressed the jury, which therefore appointed him to the RAMUS chair (see above).

In the consciousness of the mathematical community, however, EVANGELISTA TORRICELLI was considered – at least temporarily – to be the first to have determined this area, since he published his calculations closer to the time of his discovery while ROBERVAL's collected works were not published by the *Académie Royale* until 1693, long after his death.

Similar "priority problems" also existed with BONAVENTURA CAVALIERI and with BLAISE PASCAL. Nevertheless, ROBERVAL cooperated with PASCAL and with TORRICELLI when it came to the question of whether a vacuum was possible. His arguments with RENÉ DESCARTES, on the other hand, often ended in mutual personal insults.

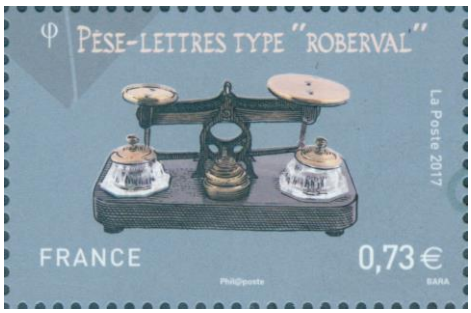
ROBERVAL's contributions to the integral calculus are impressive: in 1640 he determined the volume of a body formed by rotating a cycloid about an axis and then he succeeded in determining the area under the graph of the sine function and, with the help of this "integral", determined the arc length of cycloids and ellipses. With regard to the tangent problem, he develops a *méthode cinématique* (moving points) – comparable to NEWTON's *fluxions*.

ROBERVAL's contributions to mechanics are also worth mentioning:



Among other things, he discovered the principle of the decomposition of forces (1636). Whether he actually completed a work on mechanics announced to be eight volumes cannot be clarified; only parts of a manuscript were found in his estate.

ROBERVAL was one of the seven scientists who founded the *Académie Royale des Sciences* in 1666; the famous painting on the left shows Finance Minister COLBERT presenting the members of the *Académie* to the King.



At one of the meetings in 1669, ROBERVAL presented the balance he had invented, the basic construction of which (a parallel guide) is still used today.

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https://www.spektrum.de/wissen/gilles-personne-roberval-entdecker-der-schwerkraft/1670218

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