FRANS VAN SCHOOTEN (May 15, 1615 – May 29, 1660)

by HEINZ KLAUS STRICK, Germany

Source: www.erfgoedleiden.nl

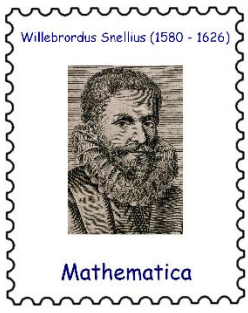
"If I have seen further it is by standing on the shoulders of giants," wrote ISAAC NEWTON in a letter to ROBERT HOOKE in 1676.

This metaphor of *dwarves on the shoulders of giants* was probably coined in the 12th century by the philosopher BERNARD OF CHARTRES. Since then, it has been used repeatedly by scholars who, in all modesty, wished to express how much they had benefitted from the achievements of their predecessors. One of these giants, on whose shoulders the brilliant ISAAC NEWTON stood, was the Dutch mathematician FRANS VAN SCHOOTEN (JUNIOR).

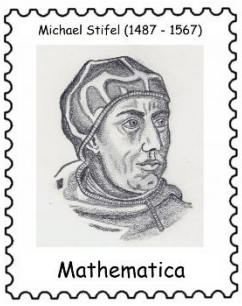
His grandfather was one of the Calvinist Protestants who had fled from West Flanders to escape Spanish troops because of the threat of persecution by the Inquisition and had settled in the university town of Leiden.

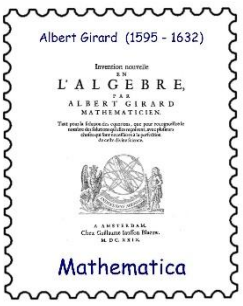
Around 1600, Prince MAURITZ OF NASSAU, the second eldest son of WILLIAM OF ORANGE and his successor as *stadtholder* of Holland and Zeeland, commissioned his friend and advisor SIMON STEVIN to found an engineering school within the University of Leiden, so that the newly founded confederation would have enough "practical mathematicians" such as surveyors, mapmakers, fortress builders, etc. at its disposal.

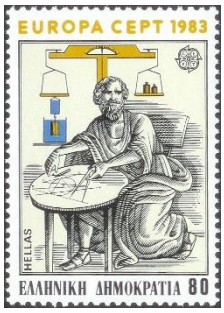
Among the school's first teachers was LUDOLPH VAN CEULEN (famous for calculating the circle number π to 35 decimal places). When he died in 1610, his student FRANS VAN SCHOOTEN (SENIOR) was chosen as his successor. Later, WILLEBRORD SNELL, among others, also worked there as a teacher and examiner.

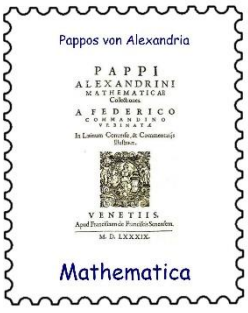


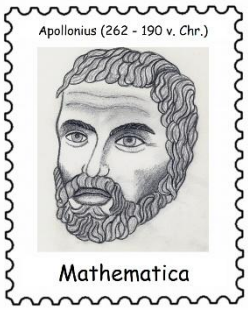
FRANS VAN SCHOOTEN (JUNIOR) was born in Leiden in 1615. Well prepared by his father (in both Latin and French), he was able to enrol at Leiden University at the age of 16. At the beginning of his studies he had already independently worked through LUDOLPH VAN CEULEN's *Arithmetic and Geometric Fundamentals,* MICHAEL STIFEL's edition of CHRISTOFF RUDOLFF's *Coss*, ALBERT GIRARD's *Invention nouvelle en l'algèbre*, STEVIN's *Arithmetique* and BONAVENTURA CAVALIERI's book on indivisibles. He was also familiar with all the writings of ARCHIMEDES, APOLLONIUS and PAPPUS that were known at that time.





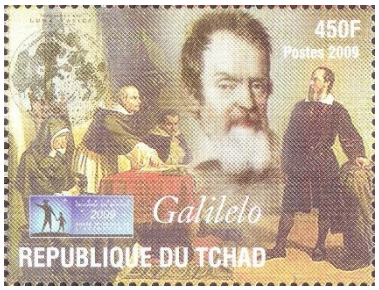


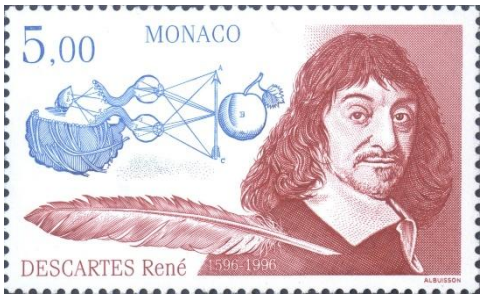




In 1635 – when he was just 20 years old – FRANS VAN SCHOOTEN completed his studies in the seven *artes liberales* (grammar, rhetoric, dialectic, arithmetic, geometry, music, astronomy) with the *liberalium artium magister* and immediately began teaching at the engineering school.

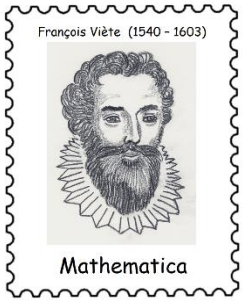
In 1632, through the mediation of his mathematics professor JACOB GOOL, FRANS VAN SCHOOTEN had already met the philosopher and mathematician RENÉ DESCARTES, who was living in exile in the Netherlands. GALILEO's experiences with the Inquisition in Italy had caused DESCARTES to leave his French homeland.





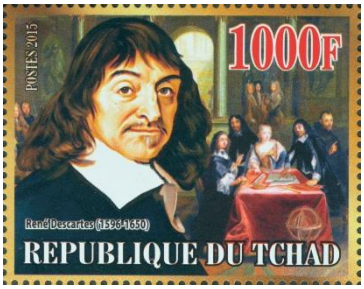
When DESCARTES returned to Leiden in 1637, the work on his seminal treatise *"Discours de la méthode"* was nearly complete – only the appendix "*La Géométrie*" was still missing drawings. These graphics were created by the young VAN SCHOOTEN. (Incidentally, one of the few portraits of DESCARTES was created around this time, also by the artistically gifted VAN SCHOOTEN.)

Through DESCARTES, VAN SCHOOTEN came into contact with MARIN MERSENNE, by whom VAN SCHOOTEN – despite their religious differences – was warmly received in Paris in 1641. There he took the opportunity to read manuscripts by FRANÇOIS VIÈTE and PIERRE DE FERMAT. His journey, which lasted several months, then continued to England and Ireland, where he also made numerous professional contacts.



In 1648, after the 80 Years' War, the *Republic of the Seven United Netherlands* finally gained its independence from Spain (*Treaty of Münster*) – and a *golden age* of intellectual and artistic freedom began. The printing houses in Leiden, Amsterdam, and Utrecht produced uncensored scholarly books for all of Europe. For example, VAN SCHOOTEN commissioned *Elsevier* in Leiden to publish an annotated complete edition of the writings of FRANÇOIS VIÈTE, which he had obtained through his contacts with MERSENNE and had them printed. (*Opera mathematica, in unum volumen congesta, ac recognita, opera atque studio Francisci Schooten*) In his adaptation, he chose better notations than VIÈTE, which made the texts more readable. Publishers, however, showed no interest in FERMAT's writings, since a jealous DESCARTES had previously ensured that they were *not considered particularly important* (which was certainly not the case).

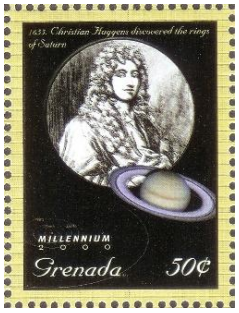
In 1645, FRANS VAN SCHOOTEN JUNIOR took over his father's chair after his death. In 1649, he published a Latin translation of DESCARTES' *La Géométrie.* This may have been against DESCARTES' will, but at the time of publication, DESCARTES was on his way to Stockholm, following an invitation from the young Queen CHRISTINA of Sweden, where he died on February 11, 1650.

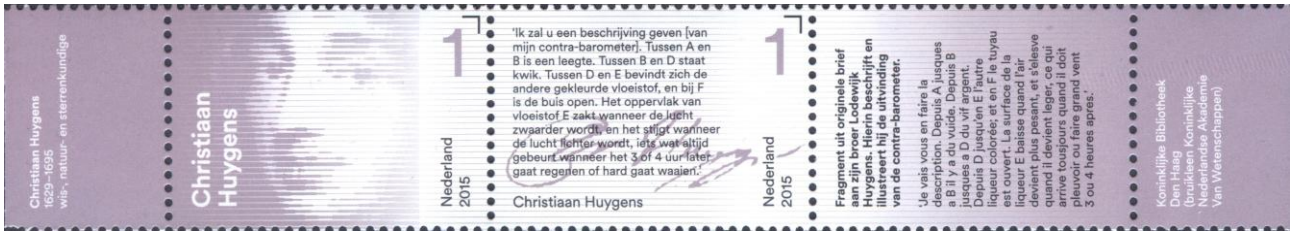


DESCARTES' original work was difficult to understand, and some of the terminology used was poorly chosen. Furthermore, it was written in French — not a widely used scientific language at the time. VAN SCHOOTEN was one of the first to recognise the revolutionary insight contained in *La Géométrie*: geometric problems could be reduced to algebraic problems and thus solved using algebraic methods. LEIBNIZ commented on this in a letter in 1676: " VAN SCHOOTEN made DESCARTES readable — and taught Europe to think with equations."

DESCARTES was not the inventor of the *Cartesian coordinate system*, which was later named after him. Rather, he considered only a single axis and a variable length measured relative to that axis. It was VAN SCHOOTEN, in his translation, who introduced the pair of axes we know today.

Among VAN SCHOOTEN's pupils were JOHANN HUDDE, JOHAN DE WITT, HENRY VAN HEURAET and CHRISTIAAN HUYGENS. He maintained a lively correspondence with them for many years. They reported to him on their current research topics and the discoveries they had made, and VAN SCHOOTEN passed this information on to the others. HUDDE, for example, worked on techniques for determining tangents and finding maxima and minima, while HEURAET investigated methods for determining the length of curves.

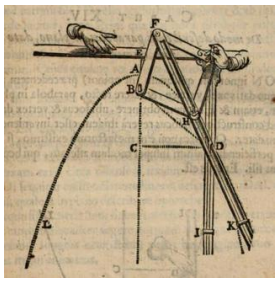
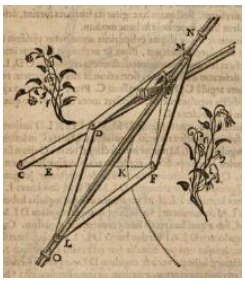
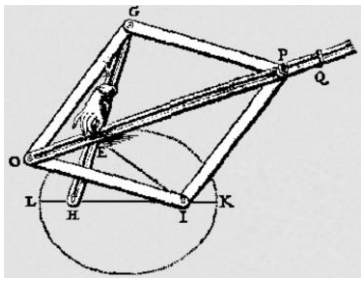
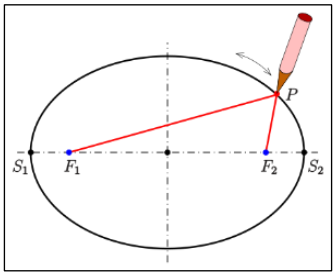




VAN SCHOOTEN also oversaw a second edition of DESCARTES' *Géométrie*, supplemented by contributions from his students, published in two volumes (1659/61). HUDDE'S contributions, in particular, contributed to NEWTON and LEIBNIZ'S discovery of the general principles of differential and integral calculus.

In the meantime (1657), VAN SCHOOTEN's main work had been published: *Exercitationes mathematicae libri quinque*. The five volumes, each with over 100 pages, covered the following topics: Volume 1: Arithmetic and elementary geometry, Volume 2: Constructions using only a ruler (including the possibility of making marks on the ruler), Volume 3: An attempt at a reconstruction of the writing *De locis planis* (Plane Places) by APOLLONIUS OF PERGA (according to the descriptions of PAPPUS), Volume 4: Mechanical drawing of conic sections, Volume 5: Combinatorial counting methods.

The parabolic, hyperbolic and ellipse compasses invented by VAN SCHOOTEN were intended to be used to draw conic sections exactly (in the latter case as a replacement for the common inaccurate gardener's construction of an ellipse drawn with two pegs fixed at the foci F_1 and F_2 and a rope of a fixed length).

VAN SCHOOTEN also supplemented this work with the contribution of one of his students. CHRISTIAAN HUYGENS had given him a treatise of only 14 pages entitled *Van Rekeninghen in Spelen van Geluck* which VAN SCHOOTEN translated into Latin and thus made accessible to the scientists of the time: *De Ratiociniis in Ludo Aleae* proved to be one of the most important texts for probability theory, a new branch of mathematics.

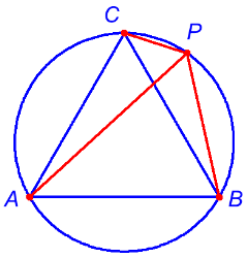
Through the publication of the works of VIÈTE, the translation and editing of DESCARTES' *Géométrie* and his own *Exercitationes,* the humble and knowledgeable scholar contributed significantly to the progress of his science.

VAN SCHOOTEN, who only lived to be 45, married Margaritgen Wijnants, his housekeeper from Meppen, at the age of 37; the couple apparently had no children of their own.

Addition:

A theorem from triangle geometry is named after FRANS VAN SCHOOTEN :

Given an equilateral triangle *ABC*, then the following applies for every point *P* lying on the circumcircle between points *B* and *C*: $|PA| = |PB| + |PC|$.



The proof of the theorem follows directly from PTOLEMY'S theorem on cyclic quadrilaterals.

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https://www.spektrum.de/wissen/frans-van-schooten-der-wahre-erfinder-des-koordinatensystems/2283409

Translated by John O'Connor, University of St Andrews

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