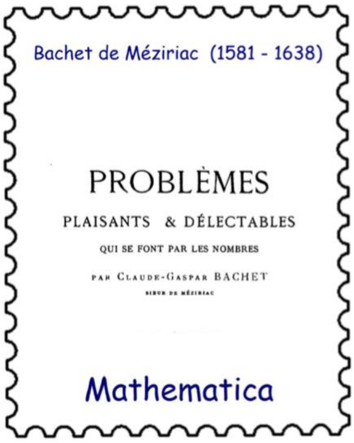
BACHET DE MÉZIRIAC (October 9, 1581 – February 26, 1638)

by HEINZ KLAUS STRICK, Germany



The eventful history of the Duchy of Savoy is also reflected in the family history of the BACHETS. CLAUDE GASPAR BACHET's paternal grandfather worked as an advisor at the court of the French King HENRI II, his father JEAN BACHET, SEIGNEUR DE MEYZERIAC, worked for the Duke of Savoy. The latter had chosen Turin as the capital after the repeated occupation of the country by French troops and had established Italian as the official language of the country.

CLAUDE GASPAR BACHET grew up on the family estate in Bourg-en-Bresse (halfway between Mâcon and the Swiss border). When he was six years old, both parents died shortly after each other and he was educated by members of the Jesuit order.

At the age of 20, BACHET temporarily joined the order, but then withdrew to his family's ancestral home in Bourg-en-Bresse, which in the meantime had become part of France. With the exception of temporary study visits to Paris and Rome, he remained there until his death. The income from the inherited estates enabled him to live a quiet and comfortable life. With his wife PHILIBERTE DE CHABEU, whom he married in 1620, he had seven children.

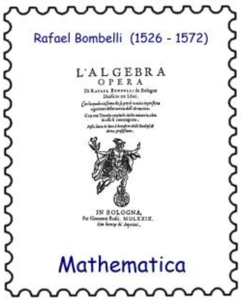
Together with a friend, CLAUDE FAVRE VAUGELAS, BACHET devoted himself mainly to literature, composed an anthology of French poems, wrote poems himself and translated Psalms and OVID's fictional letters (*Epistulae Heroidum*).

Around 1630 his rheumatism and gout worsened, so that he was unable to attend the founding ceremony of the *Académie Française* by CARDINAL RICHELIEU. Nevertheless, BACHET was one of the 40 members appointed for life in 1635, who could call themselves *the immortals*. VAUGELAS was one of the main authors of the first dictionary for the French language, the *Dictionnaire de l'Académie* (1637).

The fact that we repeatedly encounter the name BACHET in the context of mathematics – even today – has to do with two activities of the French scholar:

One is his annotated translation of DIOPHANTUS's *Arithmetica* (1621) into Latin. This became famous above all because PIERRE DE FERMAT noted on his copy of BACHET's translation that famous marginal note which occupied a large number of mathematicians throughout their lives ...

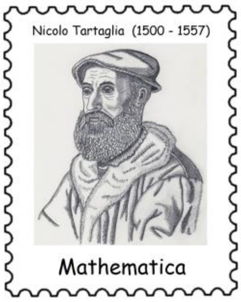
Even before BACHET, RAFAEL BOMBELLI had translated DIOPHANTUS's work, but had not published it, though he used its problems in his own algebra book (without citing the source). The Heidelberg scholar WILHELM HOLTZMAN, who published under the "Greek" name XYLANDER, had produced a Latin translation in 1575, which was available to BACHET, as was the French version of the first four books of DIOPHANTUS by SIMON STEVIN (1585).



BACHET's other activity has to do with a collection he published in 1612: *Problèmes plaisants et délectables qui se font par les nombres* (Entertaining and Delightful Problems Arising from Numbers). The subtitle of the work, which went through numerous editions until the 20th century, is: *Très utiles pour toutes sortes de personnes curieuses qui se servent d'arithmétique* (Very useful for all curious persons who make use of arithmetic), which modestly implies that BACHET sometimes used refined algebraic-arithmetic methods to solve the tasks set, to explain how a trick worked, or to demonstrate the possibility of generalising a problem.

In the extended edition of 1624 (i.e. after the publication of the DIOPHANTUS translation), for example, he was the first to describe the application of the EUCLIDean algorithm with the help of a continued fraction development.

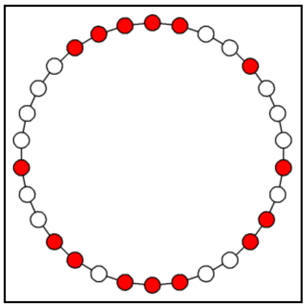
Some of the problems in BACHET's collection can already be found in works by mathematicians from earlier centuries (e.g. ALCUIN, FIBONACCI and TARTAGLIA). After BACHET, there was hardly an editor of a collection of problems for entertainment mathematics who did not make use of BACHET's problems.



Here is a small selection of his now "classic" tasks:

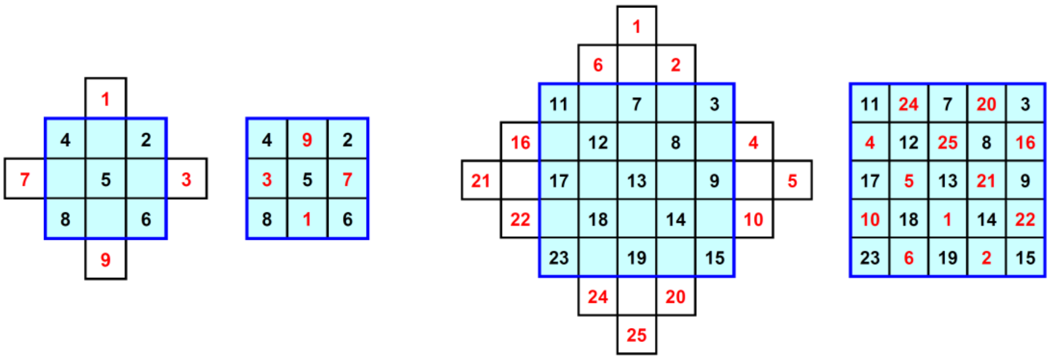
- *Number guessing*: Person A thinks of a number and person B gives instructions as to which arithmetic operations A should perform. How can B deduce the original number from A's feedback?
  - Person A thinks of a number, triples it and multiplies it by the original number. If the result is even, A should halve the product, if odd, first add 1 and then halve. Then A should multiply the intermediate result of the calculation by 3 and finally tell how many times the number 9 is contained in the result (without taking the remainder into account).
  - Person A thinks of a number that is smaller than 60 and tells B which remainders remain when the number is divided by 3, 4 and 5 respectively.
  - A man bequeaths 1 *ecu* and one seventh of the remaining property to his eldest child, the second eldest child receives 2 *ecu* and one seventh of the remaining property, and so on. It turns out that all the children inherited the same amount. How many children did the man have? What amount did he leave behind?
  - Person A thinks of an odd number of numbers; e.g. five. A then has to tell B what the sums are of each of the pairs of neighbouring numbers $(n_1+n_2, n_2+n_3, n_3+n_4, n_4+n_5, n_5+n_1)$. B is then able to work out what these five numbers are. (The trick also works with an even number; however, at the end A does not have to add the last number back to the first, but to the second).
  - We are looking for a number that leaves a remainder of 1 when divided by 2, a remainder of 2 when divided by 3, a remainder of 3 when divided by 4, ..., a remainder of 5 when divided by 6 and a remainder of 7 when divided by 7.

- *Weighing problem*: What is the smallest number of weights needed to weigh out objects with an integer weight between one and forty pounds (inclusive) if you are allowed to use only one scale pan or, respectively, if you are allowed to use both scales of a balance?
- *Transferring liquids*: A quantity of liquid of 24 volume units (VU) is to be divided into three equal parts; however, containers are only available for filling 5, 11 and 13 VU.
- *JOSEPHUS problem* (named after the Jewish historian FLAVIUS JOSEPHUS): A ship whose crew consists of 15 Christians and 15 Turks gets caught in a storm from which there is only one escape if the ship's cargo and half of the crew are thrown overboard. The 30 crew members line up in a circle, and from a certain place, one in nine is chosen for certain death in the sea by counting down. How must the 15 Christians line up in the circle so that none of them dies in this way?



- *Arranging playing cards*: Place an ace, a king, a queen and a jack in each of four rows so that there are no two cards of the same type or value in each row and column and in the diagonals. Additional question: In how many ways is this possible?
- *Guessing a pair of playing cards*: Player A is to choose one of the ten pairs (1;2), (3;4), (5;6), (7;8), (9;10), (11;12), (13;14), (15;16), (17;18), (19;20) of cards. Player B then lays out the cards as shown on the right. If player A names the one row or the two rows where the cards of the pair now lie, player B can determine the selected pair of cards.

- *Strategy game*: Starting with a starting number that is less than 30, the two players take turns adding a natural number between 1 and 10. The winner is the first player to reach 100.
- *Magic squares*: BACHET describes a simple method to create magic squares of odd order: The numbers in the upper and lower outer squares move down or up into the more distant free squares, then correspondingly the numbers from the outer squares on the left and right.



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Translated 2022 by John O'Connor, University of St Andrews

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