NICOLAS DE CONDORCET   (September 17, 1743 – March 19, 1794)

by HEINZ KLAUS STRICK, Germany

MARIE JEAN ANTOINE NICOLAS DE CARITAT, MARQUIS DE CONDORCET, came from a long-established family of the lower nobility from the Aisne (northern France). After his father's early death, his mother tried to keep him from worldly influences through a one-sided religious upbringing.

He was only allowed to attend school after the intervention of an uncle at the age of nine, first the Jesuit college in Reims, then the *Collèges de Navarre* and *Mazarin* in Paris. His special talent for mathematics did not remain hidden: JEAN-BAPTISTE LE ROND D'ALEMBERT personally took care of the young marquis, who soon fulfilled the hopes placed in him:

At the age of 22, CONDORCET published his first mathematical work *Essai sur le calcul intégral* (Contribution on the integral calculus). This was followed by *Du problème des trois corps* (On the three-body problem) and *Essaie d'analyse* (Contribution to analysis), so that he was elected as a member of the *Académie Royale des Sciences* at the age of 26.

In 1774, King LOUIS XVI appointed the young mathematician *Inspector General of the Royal Mint* - at the suggestion of ANNE ROBERT JACQUES TURGOT. He was the general controller of finances, but was dismissed again in 1776: with his liberal ideas he had made an enemy of the privileged and estate owners and had attempted to curb the court's addiction to waste, especially that of Queen MARIE ANTOINETTE. CONDORCET held the post of Inspector General of the Royal Mint - albeit reluctantly - until 1791.

CONDORCET also continued to deal with mathematical problems. Above all, however, he wrote on social and economic-political as well as legal questions (e.g. on the establishment of land registration, fair taxation, freedom of the press, equality for women, the abolition of slavery). In 1776 he was appointed permanent secretary by the *Académie Royale des Sciences*.

French philosophers DENIS DIDEROT and D'ALEMBERT won him over as a co-author for the Encyclopedia project (*Dictionnaire raisonné des sciences, des arts et des métiers*), for which he wrote 24 articles on mathematics.

In 1782 CONDORCET was elected to the "Society of 40 Immortals", the *Académie Française*.

In several publications from 1781 to 1785 he dealt with the question of a just, democratic electoral system against the background of the probability calculation. This document, the 200-page essay *Sur l'application de l'analyse à la probabilité des décisions rendues à la pluralité des voix* (An attempt to apply analysis to the probability of majority decisions), dealt with a paradox that today named after CONDORCET: In paired voting on alternative proposals (factual or personnel decisions) it may happen that no decision is possible.

For example, the situation may arise in which a majority prefers a candidate (or application) A over a candidate B and a majority over candidate B over a candidate C, but also a majority over the candidate C over A. CONDORCET recognized that a voting procedure could be manipulated if you only voted on alternatives A and B as well as B and C and then failed to vote on alternatives A and C because of the supposed transitivity.

There was only - as they say - a "CONDORCET winner" if the pairwise comparison shows a winner who can decide *all* votes in his favour. As a way out of the dilemma, he suggested that the voting result that achieved the smallest share be dropped, because in his opinion this share was most likely to have been erroneously achieved. And if this did not lead to a decision (which is possible with more than three alternatives), possibly also further rounds of votes.

CONDORCET's contribution from 1785 was the answer to an essay by another member of the *Académie Royale des Sciences*, the marine engineer and naval officer JEAN CHARLES DE BORDA.

BORDA, four years earlier in his *Mémoire sur les élections au scrutin* (On elections by secret ballot), had questioned that majority decisions actually always have the majority opinion, and instead proposed a system in which the individual candidates were given ranks, for example in the form of points. Then the one who has scored the most points was considered elected (he did not address the possible case of equal points).

(BORDA's reflecting circle, a surveying instrument)

Incidentally, the BORDA method had already been proposed 350 years earlier by NICOLAUS VON KUES (CUSANUS, 1401–464) in *De Concordantia Catholica* (On the all-encompassing concord) as the most appropriate method for the choice of the emperor in the Holy Roman Empire of the German Nation.

However, BORDA may not have known the CUSANUS paper – it was only rediscovered in the 20th century.

CONDORCET's criticism of the BORDA procedure: It can happen that a candidate received the most points, but nobody placed him in first place, or that someone would win every two-man vote, but could not find a majority of ranking points according to the BORDA procedure. And: The electoral process is only fair if there are no strategic voting; because if unwanted competitors are deliberately placed at the bottom of their own ranking, their chances of winning are reduced.

The very complex two-vote procedure proposed by CONDORCET was also not new:

The Catalan scholar RAMON LLULL (RAIMUNDUS LULLUS, 1232–1315) recommended it for the election of abbots, bishops and popes.

In the *Artifitium Electionis Personarum* (Method of Person Selection), the latter explains that whoever won the most paired votes must, according to God's will, be the most worthy for the office.

In his writing, CONDORCET also addressed the problem of the probability of a correct decision by a jury.

If a jury has to vote between two options and the probability p for a correct decision for each individual jury member is greater than 0.5, then the probability for a correct majority decision of a jury with n members (n odd) increases with increasing n. If $p < 0.5$, it decreased with increasing n.

After the outbreak of the French Revolution, CONDORCET had an impact on political events.

Elected as a Member of the *National Legislative Assembly*, he even became its President. He particularly advocated a state education system without class differences and a strict separation of church and state.

As a member of the National Convention, he increasingly came into confrontation with the radical Jacobins under ROBESPIERRE. The draft constitution that he primarily developed was opposed by them. His criticism of their design, in turn, led them to arrest them when they gained power. CONDORCET was warned and hid from friends.

In the underground, he wrote his political legacy *Esquisse d'un tableau historique des progrès de l'esprit humain* (Draft of a historical account of the progress of the human spirit), one of the most important writings of the *Age of Enlightenment*:

Man is inherently good and in principle empowered to perfect his intellectual and moral dispositions; hence progress in science will also be followed by social progress.

When he no longer felt safe in his hiding place, he fled from Paris, but was caught after a few days. Whether his death while in custody due to poisoning was caused by the regime's officials or whether it was suicide will never be clarified.