KARL FRIDERICH GAUSS ”PRINCEPS MATHEMATICORUM”

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ABSTRACT

The study has a documentary caracteristic, briefly presenting the life and activity of the one that has been surnamed ”princeps mathematicorum” - Karl Friderich Gauss

THE SHORT HISTORY OF THE LIFE AND ACTIVITY OF THE ONE THAT HAS BEEN SURNAMED ”PRINCEPS MATHEMATICORUM”

Until the beginning of the XIX century, geodesy and cartography have registered important steps in their evolution, and immense success, however a correspondent application of the majority of their theories had not yet been reached. Without mentioning the evolution of these two sciences accross time, if we looked back, we could see that in the XVIII century, some of those contributing to the progress of geodesy and cartography were: Leonard Euler (1707-1783), J. N. Delisle (1688-1768), M. V. Lomonosov (1711-1765), J. M. Lambert (1728-1777) and J. L. Lagrange (1736-1813).

As for the practice of geodesy and cartography, during the time, is was characterised by several works carried out in Russia, in the time span 1710-1719, as well as by the grounding, in the year 1725, of the Russian Sciences Accademy by Peter I. The state cartography of Russia was transfered to it; and in 1739, came also the grounding of the Geographic Department by the Russian Sciences Academy, in charge of the execution of all cartho-geographical works.

Also during this time, was registered the development of military cartography due to the impulse given by Petru I ; to this purpose, the Map Depot was constituted in 1797, with the aim of creating and editing all maps needed for the country. Romanian cartography is represented during this time by the following three major works:

- the map by the High Steward Constantin Cantacuzino, editated in the year 1700, the most detailed map of Moldova published until then;
- the map of Moldova, by Dimitrie Cantemir, created in the year 1716 and edited in the Nederlands;
-the military topographic map–known by the name “The map of Russian Marchall Bauer” of the year 1769 with the representation of Moldova.

In the year 1777 died J. H. Lambert, the one who had put the bases of the scientific theory of conform conic, cylindrical, and azimuthal oblique equivalent representations. The same year also registered K. Fr. Gauss, who will later become the living light in which the two sciences: geodesy and cartography will shine, during the first half of the XIX century.

Son of a day labourer from the town Braunschweig, and a woman without no education, but with a good memory and a sharp mind, K. Fr. Gauss was from an early age a child with an extraordinary sense for mathematics and a particular fondeness for calculus, which led to him later becoming a genious of sciences, mathematics, physics, geodesy and cartography.

Impressed by the abilities of the yound Gauss, the prince of Braunschweig, Ferdinand Karol Friedrich took him under his protection in the year 1791. Starting with the year 1792, he joined the Carolineum College, and in 1795, he became a student of the University of Gottingen.

In the year 1799, at the age of 22, he was given the title of Doctor, and in the year 1807 until his death in 1855 he functioned as a director of the Astronomic Observatory of Gottingen.

Outsiude his activity as a mathematician, he also studied astronomy during 1811-1820, and during 1820-1830, he managed geodesy and cartography, and after 1830 with different other works in the area of physics.

Geodesy ows K. Fr. Gauss the important passage from the simple land measurements, to the science based on mathematics, astronomy and physics.

His most important works in the area of geodetics and cartography have referred to studies on the conform representations and on research in the area of superior geodesy.

This research has been applied for the first time by the author himself, during 1821-1825, with the occasion of the execution of the geodesic triangulation of the German state of Hanover. He determined 3000 points of triangulation, for which Gauss has worked on the field for about 10 years personally conducting the majority of the measurements and calculations.

Subsecvently, in the year 1866, the geodetic engineer General Dr. Oskar Schreiber published the work ”The theory of the projection method of the traingulation from Hanover”, where he shows the whole Gauss theory in a detailed form, in which in order to obtain the projection equations he used the process of representation of the earth ellipsoid on a sphere, and after, of the sphere on a plan; the importance of this publication results from the fact that it is the first work published containing the theory of the representation according to Gauss.

In the year 1912, Prof. Dr. Kruger elaborated the Gauss Theory and published the work: ”The Representation of the Terrestrial Ellipsoid in a Plan”, in which the author obtains the ecuations for the projection throught the direct representaiton of the terrestrial ellipsoid in the projection plan, without the auxiliary sphere.

One of the most important scientific books of Gauss, was the development of the Method of the Least Squares. Along with his work, “The Motus Theory” published in 1809, Gauss also published four more works in which he exprssed the classical method of calculating compensations.

Also in the domanin of geodesy and cartography, Gauss gave the following contributions:

-in the year 1827 he published the work of the theory of curved surfaces, in which he deals with several basic geodesy problems;

-in different other works he exposed the theory of parametric representaion of surfaces, and the introduction of fundamental measures of first category, the theory of polar geodetic coordination for the reduced length of the geodetic line, the method of resolving the ellipsoid traingles;

-he exposed the theory referred to the geodetic line based on which the two fundamental problems of geodesy can be solved; also he elaborated the formula of medium argument, one with wich the seconf fundamental problem of geodesy could be solved;

-he made studies with regards to the vertical curve, the orthometric correction, trigonometric levelling, atmospheric refraction.

During the years 1844-1847, he published his work by the title ”Research in the area of Superior Geodesy” in which he dealt with several problems of superior geodesy.

The elaboration of the theory of Gauss Potential has brought a huge contribution to determining the dimensions of the Earth.

Under the influence of the Russian geodetic and astronomer specialist Fr. Struve, the author of works of triangulation for the measurement of the great meridian arch between the Frozen Ocean and the Danube, Gauss conducted research in the area of

gradual measurement between Hanover and Danemark; along with these works, he also conducted measurements of the vertical deviation, as well as determining the differences of latitude between Gottingen and Altona. The majority of Gauss's creations have been successfully applied in geodesy and cartography works. The oldest application of Gauss Theory regarding the representation of the terrestrial ellipsoid on a sphere, we have the Hungarian triangulation work from 1857 to which the conform representation has been applied. Towards the end of 1817, Austria introduced the coordinates Gauss-Kruger, using as axial medians of the 3º spindle, the medidians with the longitudes of 28º and 34º.

In the year 1919, the German geodesy specialist C. Baumgart, made the following proposals regarding the application of the Gauss-Kruger coordinates for the spindle of 3º:

-adding the calue of 500 000.00 to the value of the coordinates with the purpose of having only positive numbers

-numbering the meridians in proportion to Greenwich;

-adding the the order number of the 3ºspindle to the value of the ordinate line.

The propositions, are taken one after the other in different countries among witch: Germany, Bulgaria, Finalnd, Sweden, Norway, Portugal and during the year 1950, also in Romania.

In the year 1928, the system of coordinates Gauss-Kruger was also adopted in the ex URSS, applied to the 6º spindle instead of 3º one, accoding to the frame of the international map to scale 1:1000000, considering the axial meridians of the spindles projected to Greenwich, the meridians 3º, 9º, 15º , 21º…etc in terms of East longitude.

In USA, following many research, the Gauss projection has also been applied, this is known in the American cartography as the „Universal Transverse Mercator", with the difference that the Americans considered the deviation of the axe meridian equal to 0.9996, instead of 1,0000.

Today, it is unanimousely accepted that the Gauss projection is the most adequate for the large areas, offering multiple advantages; among them we mention ony the fact that it is the only international projection in which the whole globe can be represented on areas from one pole to the other, using an international ellipsoid, making it possible to create tables of standardised coordinated, and obtaining a relatively small number of coordinate systems: 36 uniform systems, in case of the division in 6º spindles.

Due to his great admiration for this promoter of geodesy and carthography, the German geodesy expert Gerling was noting in his work regarding the Method of the Least Squares, which was dedicated to Gauss: "For someonw, like you, who spreads the fertile seeds, who would mostl likely want to see what rose from them...This is how one of these seeds has born fruits that we consider ripe enough to be offered to all."

Reflecting upon these words, we can consider that one of these seeds has indeed risen and is fully ripe, the Gauss-Kruger coordinates offered today to the all the international geodetic community.

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