

Topography, Cartography and Cadastre in Bulgaria at the End of 19th Century and in the Beginning of 20th Century – First Steps and First results

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SUMMARY

The topographical and cartographical activities performed on the Bulgarian territories during the 1877-1878 Russian-Turkish war and in thereafter are described. There was a Topographic Corps formed during the War with the Russian Army preparing for military actions on the Bulgarian lands with a task to improve the found triangulation network of European Turkey and to modernize the Russian "General Map". After passing the Danube River, however, it was established that there was no developed triangulation and that the "General Map", issued in 1829, was aged. Geodesy and cartography in our country developed in two main directions after the Liberation of Bulgaria from Ottoman Rule in 1878: for the needs of the Army and for economic purposes.

Up to year 1932 the State Geographic Institute to the Ministry of War was the only in the country institution for the performance of the main geodetic measurement works.

Special attention is devoted to the first printed editions for topography, military geodesy and cartography in Bulgaria in the period 1891-1920.

First applications of cartographical and geodetic products for the purposes of the statistics in the Principality Bulgaria in 1897 are presented.

The history and the development of the geodetic and cartographic activities in Bulgaria are in fact history of the military topography and cartography of Bulgaria. The scientific and the scientific applied contributions of the Geographic Institute to the Ministry of War and of the Bulgarian geodesists who worked in it and who left a bright trail in various spheres of military topography, higher geodesy, geodetic astronomy, cartography, photogrammetry, gravimetry and the other geosciences are incontestable, big and of great significance.

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1. INTRODUCTION

The history and the development of the geodetic and cartographic activities in Bulgaria are in fact history of the military topography and cartography of Bulgaria. They started at the end of 19th century and developed in the beginning of 20th century.

2. TOPOGRAPHIC AND CARTOGRAPHIC ACTIVITIES ON THE BULGARIAN TERRITORIES DURING THE RUSSIAN-TURKISH WAR IN 1877-1878 AND DURING THE FIRST YEARS AFTER IT

There was a Topographic Corps formed during the Russian-Turkish War in 1877-1878 with the Russian Army preparing for military actions on the Bulgarian lands with a task to improve the found triangulation network of European Turkey and to modernize the Russian “General Map”. After passing the Danube River, however, it was established that there was no developed triangulation and that the “General Map”, issued in 1829, was aged. Then the Command of the Russian Troops assigned to the Topographic Corpse managed by Colonel Lebedev the task to create new triangulation and to work out a topographic survey of the Bulgarian lands in conformity with the plane-table method in scale 1:42000. After overcoming enormous difficulties, the Russian military topographers and geodesists from the middle of year 1878 to the end of year 1879 succeeded in creating geodetic survey grids over an area of 155000 square versts with 1274 check points and to survey 133750 square versts in scales 1:42000 and 1:84000. It is known that: 1 Russian verst = 3500 feet = 500 sagues = 1.0668 km and 1 Russian old sagene = 3 arshins = 5 feet = 2.1336 m.

This topographic survey in conformity with the plane-table method served to draw up a number of topographic maps. These were the first comparatively exact maps of the Bulgarian lands where the relief was presented relatively correctly and by using the method of isohypses. The first Bulgarian editions in the sphere of topography came out after the Russian-Turkish War in 1877-1878. They became a necessity for Bulgaria as a state because of the training of its own managerial military staff. The officers and the so called then “non-commissioned officers” of Bulgaria had to know the military topography well and be able to read correctly the maps of the Bulgarian territories worked out and presented by the Russian military topographers. These maps were worked out by them simultaneously with the military actions undertaken by them during the Russo-Turkish War in 1877-1878.

The astonishment of the Russian military corps was great when they established that there were no maps of the Bulgarian lands worked out by the Ottoman Empire which ruled them

for nearly 5 centuries. The maps were drawn up with the Russian cartographic symbols, in the scales traditional for Russia and with the use of the Russian measures of length - verst, sagene, linear foot, linear inch, vershok and arshin. These hastily made Russian maps of the Bulgarian lands were not with a high precision. Further to during the War, they were also used during the so called Temporary Russian Governance of the Bulgarian lands from 1878 to 1891. Later on they could not serve even as a basis for the developed topographic and cartographic activities, implemented by the military specialists of Bulgaria because of their different metrics and insufficient precision. From 1878 to 1891, when the first independent Bulgarian measurement service was created – the Topographic Division to the Ministry of War, the needs of Bulgaria of maps and plans were satisfied through import from foreign states, private publishing houses and individual contractors (Kotseva, 2013).

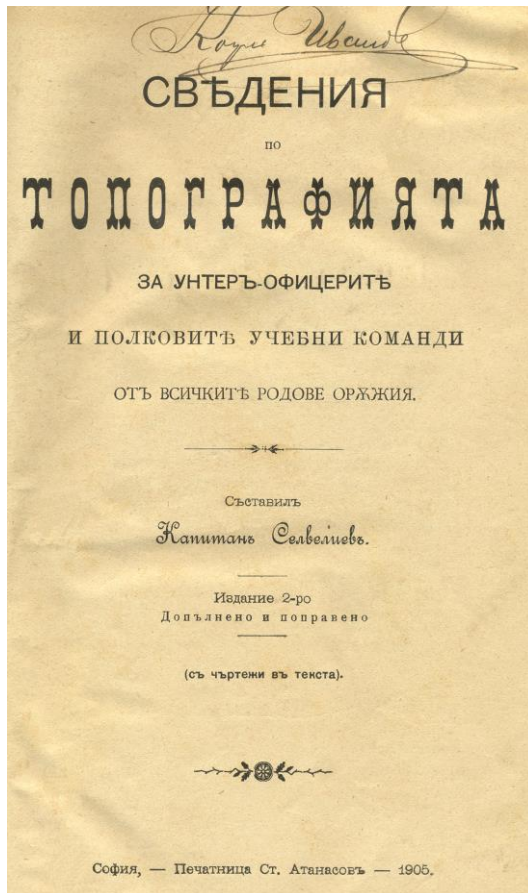
3. THE FIRST ORGAN IN TOPOGRAPHY IN BULGARIA IN 1892

The first organ in topography in our country was called “Manual for Reading Plans”. It was written by Lieutenant Hristo Selveliev and was published during the month of December 1892 in conformity with Order No 419 of 1892, issued by the Military Office of Bulgaria. The future noncommissioned officers and officers were then required to have some information on topography along with the other military disciplines. Hristo Selveliev was the Manager of the regimental command school of the young Bulgarian Army in topography then. He collected all the needed information about reading topographic plans, making active use of the Manual of Staff Captain Reshchikov. The metric system was adopted in Russia as early as in 1875. The metric or the decimal system was adopted in our country by a special law in 1892. The meter, which is equal to one ten-millionth part of the quarter of the terrestrial meridian, was adopted as the basis of this system.

Captain Selveliev himself prepared and the second supplemented edition of the first Manual of 1892 came out of print during the month of February 1905. It was called “Information about Topography for Noncommissioned Officers and the Training Commands from All the Kinds of Weapons” – Figure 1-a. Captain Selveliev indicated as literary sources for writing the Manual indicated hereinabove the titles of the following books whose spelling was preserved there as it was in the original of the book: Geodesy and Military Topography, H. G. Hesapchiev, first edition; Notes on Military Topography: Course for the First Special Class the Military of HIS ROYAL HIGHNESS School by Major Dankov; Textbook on Military Topography, for Divisional Training Commands by H. G. Hesapchiev; Military Ocular Photograph by Captain Pissinov; Complete Course of Military Topography (in Russian) by S. Belikov 5th edition; Lectures in Military Topography in Headquarters Officers’ Course in 1904 by Major Pissinov (Kotseva, 2013).

Captain Selveliev added to all the drawings drawn up in conformity with the used then in Bulgaria Russian cartographic symbols, the same drawings drawn up once again in accordance with the symbols newly adopted in our country. This was imposed by the consideration that all the plans and maps used by the then young Bulgarian Army were developed with the Russian cartographic symbols and the future plans and maps were to be

developed solely with the new Bulgarian cartographic symbols. The latter circumstances imposed the knowledge of both kinds of symbols.



a/

b/

Figure 1. a/ First page of the “Information about Topography for Non-Commissioned Officers and the Training Commands from All the Kinds of Weapons”, 1905, above is the signature of Kotsi Ivanov; b/ Kotsi Ivanov Markov (1881-1971) – military surveyor and grandfather of the author

I found the book of Captain Hr. Selveliev in the personal archives of my grandfather – Kotsi Ivanov Markov (1881-1971) – Figure 2-b. In the distant year of 1907 the 26-year-old then Lieutenant K. Iv. Markov trained as an officer-topographer in the Bulgarian Army. Making use of the acquired knowledge in topography, he actively participated in the mapping of significant parts of the Bulgarian lands, those of the White Sea included, predominantly as a participant in the three big wars – the Balkan, the Allied Forces and the First World War.

The content of the books was structured in 4 sections and 15 chapters: Section One – General Information: Concept for the locality and its military significance; Military topography and its designation; Plans and maps; Section Two: Reading plans and maps: Preliminary information; On the scales; Cartographic symbols; Unevennesses and methods for their

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depiction in a plan; Drawing and copying the plans and maps; Use of the plans and maps in the field and for the orientation in principle; Section Three: Military-ocular photograph: General concepts of the ocular photograph; General rules for taking the military ocular photograph; Taking the military ocular photograph; Examples for taking the military ocular photograph; Section Four: Military reconnaissance of the locality: General concepts of military reconnaissance; Various kinds of reconnaissance – of rivers and small rivers, of standing waters; of narrownesses; of individual peaks; of forests and of towns and villages.

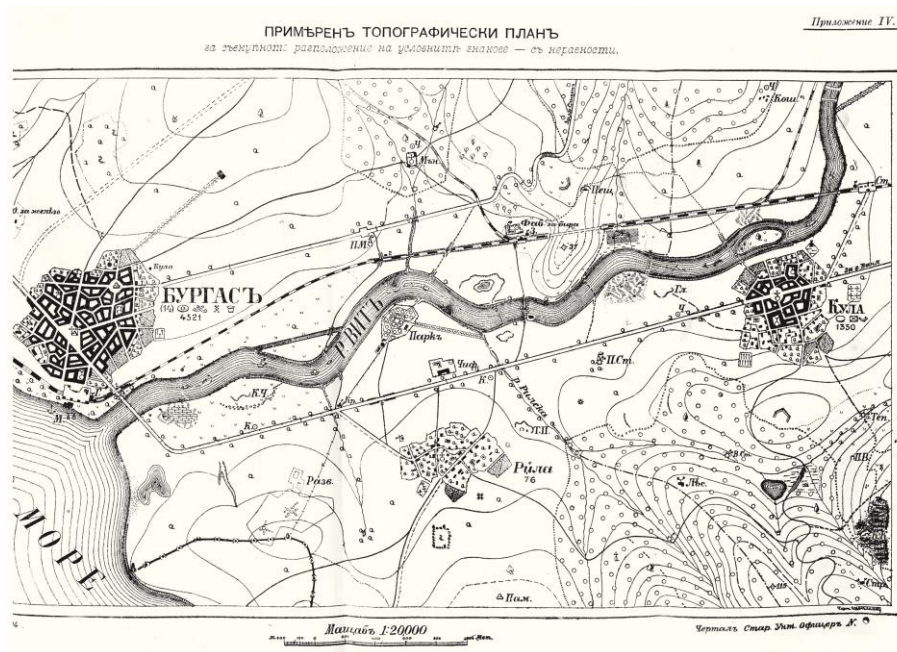


Figure 2. Exemplary topographic plan for the “aggregate arrangement of the cartographic symbols – with unevennesses” 1:200000

In 1911, the then Major Ivan Valkov (1875-1962) wrote and published the first textbook in military topography as a course of the Military School in Sofia. He was a lecturer at the same school up to year 1919. This was the first published in Bulgaria complete training course in military topography with a volume of 243 pages, 100 drawings in the text, problems and 13 attachments.

4. THE FIRST TOPOGRAPHIC DEPARTMENT TO THE HEADQUARTERS OF MINISTRY OF WAR

The first Topographic Department to the Headquarters of the Ministry of War was created on 27 December 1891 (according to the Gregorian calendar) by Decree No 176 of Prince Ferdinand I and it was repeatedly renamed: in 1898 – Statistic Topographic Department to the Headquarters; in 1900 – Cartographic-Topographic Part to the Staff of the Army; in 1906 – Military Cartographic Institute with the Staff of the Army; in 1916 – Cartographic Division to the Operating Department with the Staff of the Acting Army. By a Decree of 17 January 1906 of Prince Ferdinand I the Cartographic-Topographic Part to the Staff of the Army adopted the name “Military Cartographic Institute” and in 1919 it was renamed to

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Geographic Institute. In 1930 the Geographic Institute was called State Geographic Institute to the Ministry of War. In 1935 it was again renamed to Geographic Institute. Later on, in 1950 it grew up into Military Topographic Service and after the accession of Bulgaria to NATO it was renamed to Military Geographic Service to the Ministry of Defense. Because of the bombing in Sofia for a brief time period, during the Second World War, the Geographic Institute was dislocated to the town of Popovo and the village of Govedartsi, region of Samokov. A Military Topographic Service was created by Order No 258/26.05.1950 of the Ministry of National Defense with a Department to the Headquarters of the Bulgarian People's Army, a direct successor of the Geographic Institute. From its foundation in 1919 to 1923 Colonel Ivan Valkov was the Director General of the Military Cartographic Institute to the Staff of the Army. The first in its kind Yearbook of the Geographic Institute for year 1922 came out in 1923, which was published in one volume, at that in two languages: Bulgarian and French for the facilitation of the international contacts of the Institute. It provided description of the history, the structure, the personnel composition and the activity of the Geographic Institute for the first time. The Yearbook for 1922 was written by the Director General of the Institute, Dipl. Eng. Ivan Valkov, and was translated into the French language by him in person (Kotseva, 2013).

The first scientific-theoretic and scientific-practical works of our most prominent geodesists, astronomers, cartographers, gravimmetrists and computists who worked in the Institute: Hristo Kalfin, Acad. Dr. Vladimir K. Hristov, Colonel Branyakov, Dipl. Eng. M. Mirkov, Colonel Anton Ganev, Grozdan At. Grozdanov, Georgi Ivanchev, Captain First Rank Boris D. Rogev, Dr. Ivan Krastev Mirski, Prof. Dipl. Eng. Vasil Peevski and others were published in the next 10 volumes of the Yearbook of the State Geographic Institute as well. The publication of the Yearbook continued up to year 1945.

As early as in the distant year of 1922 the Geographic Institute had as its task to execute all the geodetic, topographic and cartographic works for satisfying the needs not only of the Ministry of War but of all the remaining Ministries in the country. Further to that various kinds of training and special maps, atlases and aids for the needs of the schools, the scientific institutions and the army were made in it. Private orders were also executed there. In 1922 the Institute consisted of an administration and 3 departments: Geodetic, Topographic and Cartographic. The Geodetic Department consisted of 4 units: Triangulation, Astronomic, Leveling and Computing. The Cartographic Department had 2 units: Cartographic and Technical. The Topographic Department consisted of 3 units: Topographic Unit; Topographic Section; Phototopographic Unit. The training of the personnel needed both for the geodetic and for the other works in the Institute commenced under the management of Prof. Dipl. Eng. Ivan Valkov as early as in 1919 in the Special Unit with the Military School of His Majesty and was completed in the School of Geodesy with the Institute in 1921. The former building of the State Geographic Institute is shown in Figure 3 and now it is the Central Military Library and Club of Veterans of the Wars.



a/



b/

Figure 3. The building of the former Geographic Institute to the Ministry of War in Tsar Osvoboditel Blvd. in Sofia located in the proximity of the Central Military Club: a/ in 1930; b/ photo from April 2013 by Iveta Nikolova – daughter of the author

The following significant activities were implemented for the time period 1920-1932: design, intelligence, stabilization, signalization, measurement and adjustment of the main triangulation of Bulgaria. The length of the 4 bases of the triangulation were built up and measured with high precision: those of Sofia, Lom, Ruse and Yambol. The measurement of the Main Leveling of the Country started from 1920, and simultaneously the two Black Seaside mareographs were built up and commissioned in Varna and Burgas. The introduction of both photogrammetric methods: terrestrial and aerial photogrammetric (contour-combined) method commenced in 1930. The first aerial photo-surveying was made within the area of the village of Bozhurishte. In 1934 the State Geographic Institute formed three groups for

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terrestrial photogrammetry. These groups also made the first experimental terrestrial photogrammetric ground survey on a territory with an area of about 80 km², located to the south of the village of Krichim. Later on groups were formed for aerial photogrammetry as well and significant territories of our country were photographed from an airplane.

In 1932 the 33rd Ordinary National Assembly at its second regular session adopted the Central Council on Measurement in Bulgaria, which defined its composition and tasks. Thus in 1933 the Central Council on Measurement was created to the State Geographic Institute in Bulgaria with scope of business control and coordination of the topographic and geodetic activities in our country. From its incorporation to the termination of its activity in 1943 the Central Council on Measurement under the management of the Director General of the State Geographic Institute contributed to the implementation and the deployment of the geodetic measurement activities in our country. Magnetic and gravimetric measurements, hydrographic works and enormous scientific activity of important practical significance for the development of the geo-sciences in our country, of their application in industry, agriculture consolidation and warfare were made during this 10-year time period. The entire territory of Bulgaria of about 111000 km² was covered in total from 1932 to 1952, of which: Plane-table geodetic survey–20 %; ground photogrammetric geodetic survey–17 %; Contour combined geodetic survey–37 % and Stereophotogrammetric geodetic survey–26 %.

5. FIRST APPLICATIONS OF CARTOGRAPHIC AND GEODETIC PRODUCTS FOR STATISTICAL PURPOSES IN BULGARIA IN 1897

At the end of the 19th and at the beginning of the 20th centuries mapping of the statistic data as well as their presentation with various kinds of diagrams was called in Bulgaria “geometric statistics” or “graphic statistics”. The published in 1897 “Statistical Collection of the Principality of Bulgaria” was drawn up by Captain I. Atanasov. It contains exceptionally interesting color topographic maps of the border regions of the Principality of Bulgaria, as well as color cartograms presenting various statistic data collected during the first census made on 01.01.1893 within the scope of then counties and regions of the Principality. The first applications of cartographic and geodetic products used simultaneously for the purposes of the statistical and geographic research in the then Principality of Bulgaria are shown in it. They are a unique scientific-applied work of the Statistical-Topographic Division and of the Cartographic Institute to the Headquarters of the Army to the Ministry of War.

In the Preface of “Statistical Collection of the Principality of Bulgaria” Captain Atanasov particularized that the works for the elaboration of the collection commenced at the beginning of year 1891 and were completed at the end of year 1896, i.e. it was the result of a serious 6-year work. It was also noted down that this work was prepared for the needs of the Army and more precisely of the officers in it. This book contains exceptionally interesting color topographic maps of the border regions of the Principality of Bulgaria, as well as also color cartograms presenting the various kinds of statistical data collected during the census made on 01.01.1893 within the scope of the then counties and regions of the Principality.

It is indispensable to provide here some facts about the state structure, the territory, the state borders and the population in conformity with the first census on 01.01.1893. The objective is to understand more easily the geodetic information about the polygons and depiction of the situation and the relief on the topographic maps of the border regions of the Principality of Bulgaria. These descriptions are needed to facilitate the perception of the mapped statistical information. In 1897 Bulgaria had monarchy as its state structure, hereditary in conformity with a straight descending male line, and constitutional, with People's Representation in accordance with the "Constitution of the Bulgarian Principality", voted and adopted on 16.04.1879 in the town of Veliko Tarnovo. The then Ministry of Agriculture and Trade consisted of three divisions: Agriculture, Trade and Arts Division; Forests Division; Mines Division, and two inspectorates: For Agricultural Funds and for «horse-breeding». The following were within the jurisdiction of the Ministry of Agriculture and Trade: State Printing House and Bureau of Statistics. In 1897 the Principality of Bulgaria was divided administratively in 22 counties, 85 regions and 1858 municipalities, of which 78 were urban and 1780 rural municipalities. All the maps were in scale 1:200000. The following were preliminarily entered with 2 kinds of linear cartographic symbols in conformity with relevant selected grounds: the administrative and territorial division of Bulgaria, the limits of the counties and the regions.

The mapping of the various statistical parameters was per counties and regions. The following were described in detail in the collection: the geographic situation, the kind, the state borders and the area of the Principality of Bulgaria. Bulgaria was stretched between $44^{\circ}12'30''$ (at the mouth of the Timok River into the Danube River) and $41^{\circ}37'30''$ north latitude (in the central part of the Western Rhodopes to the town of Chepelare and the village of Hvoyna – Ruchos region) and between $46^{\circ}16'31''$ (the Black Seaside coast to Shabla Lake) and $39^{\circ}52'33''$ (mountain peak Pataritsa, where the three borders join: the Bulgarian, the Serbian and the Turkish ones) east longitude with regard to the Island of Ferro, which is one of the Canary Islands – an archipelago in the Atlantic Ocean. The country then comprised $2^{\circ}35'$ in latitude and $6^{\circ}24'$ in longitude, as a consequence of which it was likened to a rectangle located between the 44^{th} and the 42^{nd} parallels of latitude and between the 40^{th} and the 46^{th} meridians with regard to the island of Ferro. In 1897 Bulgaria bordered: on Romania to the north; on the Black Sea to the east; on Turkey to the south and on Serbia to the west. The border lines were established in conformity with the Act of the European Delimitation Commission of 1879 and the Protocols of the Bulgarian–Romanian Commission of 1886. The border points were: basic (point terminus), connection (point d'atache), secondary and so on. They were described with the distances between the points measured in meters with precision of up to 1 cm, and with the angles formed from the incoming and the outgoing direction of the border line in the points measured in old degree division.

In total the borders of the Principality were with length of 1980 km. An area of 48 km^2 was due to each 1 km of border, and an area of 320 km^2 was due to each 1 km of the coast line of the Black Sea, the so called now "shelf zone" only along our sea border. These facts were of significance from the point of view of the active influence of Bulgaria over the neighboring states, and militarily – also from the point of view of the passive defense of the country. The longer the borders of a state were, the more twisted their delineation was and the more easily

they were passable through, the more convenient they were for the development of the active influence of the Principality of Bulgaria over the neighboring states and, vice versa, the more difficult they were for its passive defense. These general terms referred also to the land borders and to the sea borders of Bulgaria and of the Balkan countries over 115 years ago.

Detailed orographic and hydrographic surveys of the territory of the Principality were made in the first “Statistical Collection of the Principality of Bulgaria”. The orographic survey was focused onto Rila Mountain where rivers Maritsa, Mesta and Iskar rise in, as well as onto the Rhodopes, Vitosha, the Balkan Mountain and Osogovo Mountain. Three cross-sections of the territory of the Principality of Bulgaria were developed: Section I: Western section–Demir Kapia–Sofia–Vratsa–Oryahovo or from south to north: Rila–Vitosha–Sofia Field–the Balkan Mountain–Danube-Romania; Section II: Midline section–Chepelare–Plovdiv–Sopot–Sevlievo-Svishtov or from south to north: the Rhodopes–Plovdiv Field–the Balkan Mountain–the Danubian Plain-Danube-Romania; Section III: Eastern section–Mustafa Pasha-Kavakli–Shumen-Silistra or from south to north: Turkey–Odrin Field–Sakar–Yambol Field–Strandzha–the Kamchiya River–the Ticha River– Shumen Plateau-Deliorman. A fast and authentic visual idea of the silhouettes of the relief of the Principality of Bulgaria in its three main sections is obtained from the three sections indicated in Figure 4.

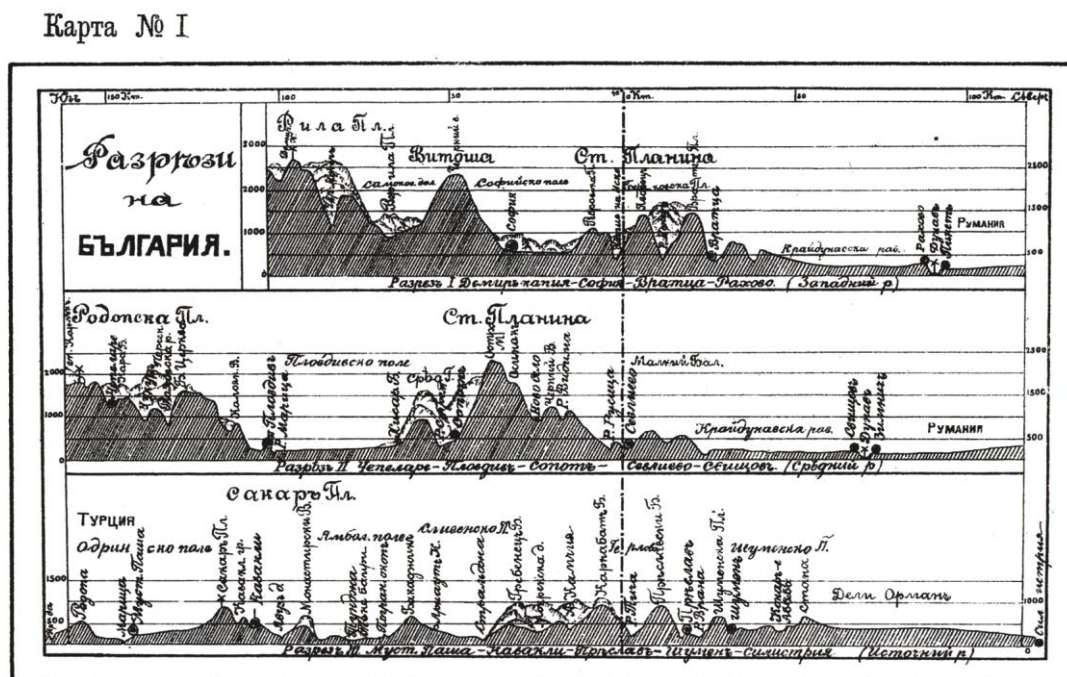


Figure 4. Three cross-sections of the territory of the Principality of Bulgaria

The hydrographic survey included two basins: Black Sea and Aegean (White Sea). Climatically the Principality was divided into 4 belts: Danube – Northern Bulgaria; Thrace belt; Mountainous belt and Black Sea belt. The Principality of Bulgaria had an area in 1889 prior to the entry into force of the Administrative Division Act in 1889 in km², as follows: Northern Bulgaria– 62139.9; Southern Bulgaria-33564.6; Total-95 704.5.

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The first map of the Principality of Bulgaria was issued as a result of executed geodetic and topographic works by the Russian Headquarters after the Russo-Turkish War in 1877-1878. There was a topographic measurement of Dipl. Eng. T. I. Karakashev, who later on, in 1909, was Chief Inspector with the Directorate of Railways. This measurement was published about 1894 in the book «Collection for People's Mind Creations etc. etc.», issued by the Ministry of Public Education as well as in the «Bulgarian Almanac» for 1892 (Kotseva V., 2013).

There was also another geodetic measurement, made by the Staff of the Army with the Ministry of War in 1890, i.e. after the voting of the Administrative Division Act of the Principality adopted during the month of December 1889. The last topographic measurement was made by an official institution, which there was a special Statistical-Topographic Division in, created in 1895, dealing with geodetic measurements and other topographic works. This measurement was made on the grounds of the same map for both parts of Bulgaria: Northern and Southern, at that after the issuance of the Administrative Division Act. This topographic measurement was with bigger authenticity and precision than the measurements of Karakashev.

The mapping of the state borders in “Statistical Collection of the Principality of Bulgaria” with the three neighboring states of the Principality – Romania, Turkey and Serbia and with the Black Sea was after the development of polygons, one of which is presented in Figure 5-a in scale 1:300000. The topographic maps of the border zones are within the same scale in Figures 5-b and 6. The high polygraph quality of the maps worked out makes an impression, at that in several colors, which was a great achievement for the printing technology in the distant year of 1897. The maps were formed as separate attachments, in paper of quality, with various dimensions depending on the situations of the individual border zones, and they were folded and taken out of the text part of the statistic collection. The northern direction was depicted with a special cartographic symbol on each of the maps, with observation of the rules for inscribing the towns and villages with orientation to the north.

There are quite a lot of Turkish names of towns and even a bigger number of Turkish names of villages in it. The fonts of the inscriptions here also play the role of cartographic symbols, characterizing some qualitative and quantitative particularities of the sites they refer to. Similar to the cartographic symbols themselves, the fonts used on the sections, the polygons and the topographic maps, presented partially in Figures 4, 5 and 6, differ in: shape (drawing, kind of the font); size (height of the letters); orientation (straight or italicized font); structure (ratio of the thickness of the main and the connecting elements of the letters); depending on the use of uppercase and lowercase letters. The fonts are only black, without raster reproduction of the inscriptions and without a change of the width of the clearance of the internal letters. The location of the inscriptions adequately reflects the regularity in the arrangement of the relevant sites in nature, for instance the differences in the density of the towns and villages on the territory of the Principality of Bulgaria.

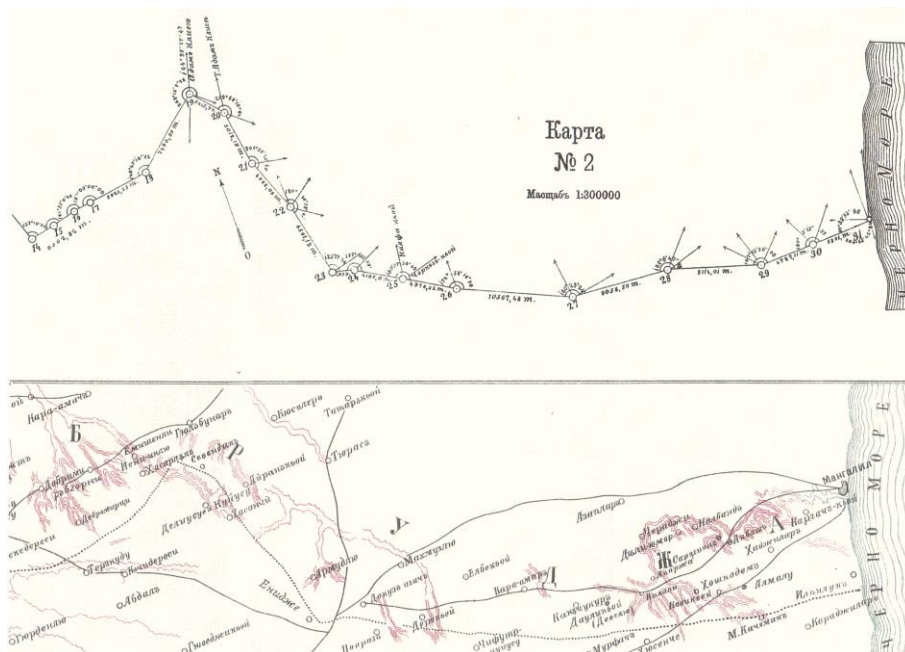


Figure 5. a/ Part of the geodetic polygon – Map No 2, 1:300000; b/ Part of the topographic map in 1:300000 of the border zone in Dobrudzha between Bulgaria and Romania in 1897

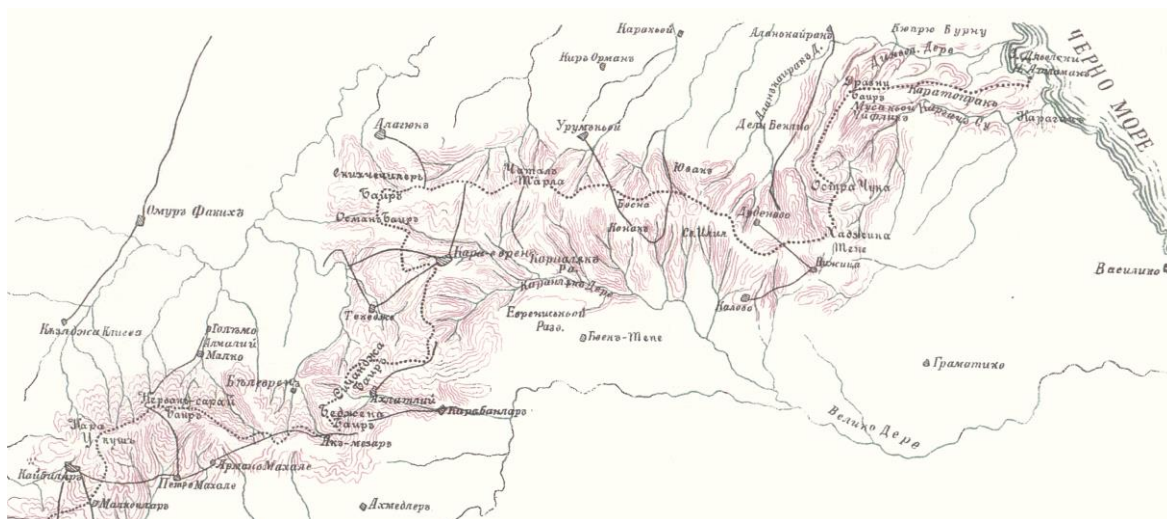


Figure 6. Part of the topographic map in 1:300000 of the border zone between Bulgaria and Turkey in 1897, reaching the Black Sea

The mapping of the Statistical Data from the First Census on 01.01.1893 in the Principality of Bulgaria was performed by different cartographic methods, which were used in “Statistical Collection of the Principality of Bulgaria” during the preparation of the cartograms in about the composition of the population in gender, religion, mother tongue and actual growth as well as of the cartograms with the relations of the cattle, the horses, the sheep, the goats and the swine with regard to the population in the Principality of Bulgaria in conformity with the data from the census conducted on 01.01.1893. In fact, from the point of view of modern

cartography these are maps which were worked out in accordance with two main cartographic methods: of the quantitative background and of the cartograms.

The method of the quantitative background was used for sub-division of the territory in conformity with a certain quantitative indicator or with regard to a complex of indicators characterizing the level of the economic development of the territory. Two manners for mapping are possible with this method: 1/ Preliminary division of the territory in conformity with relevant selected grounds (in the event under consideration with regard to regions), determination for each region of the value of the mapped indicator (for instance, composition of the population per gender, mother tongue and so on) or of the complex of indicators and finally, referral of the sub-divisions to their corresponding degrees of the scale; 2/ Determination of the values of the quantitative indicator along the entire area of the map and after that determination of the limits of the sections, which refer to the various degrees of the scale. The formation in mapping in conformity with the method of the quantitative background is similar to that in the method of the qualitative background but the depth of the color or the intensity of the shading of the degrees of the scale reflects the growth of the indicators, which are available at hand also here with regard to the analyzed maps.

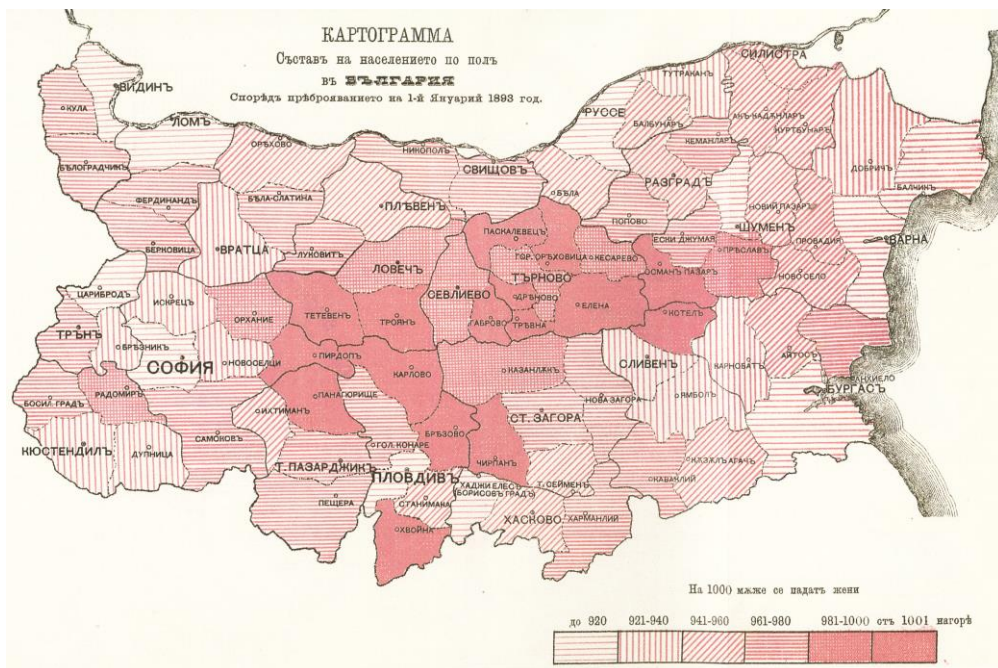


Figure 7. Cartogram of the population per gender in Bulgaria in conformity with the census on 01.01.1893

The method of the quantitative background was used at the elaboration of all the maps in the book for sub-division of the territory of Bulgaria in conformity with certain defined quantitative indicators of demographic nature in conformity with the census on 01.01.1893 such as: Composition of the population per gender in Bulgaria – Figure 7; Composition of the population per religion in Bulgaria; Composition of the population per mother tongue (native, Bulgarian language) in Bulgaria; Actual increase of the population in Bulgaria.



Figure 8. Cartogram of the ratio of the horses to the population in Bulgaria in conformity with the census on 01.01.1893

The method of the quantitative background was used for sub-division of the territory of Bulgaria with regard to certain quantitative indicators from stockbreeding in conformity with the census on 01.01.1893 such as: the ratio of horses to the population in Bulgaria – Figure 8; the ratio of the cattle to the population in Bulgaria; the ratio of the sheep to the population in Bulgaria; the ratio of the goats to the population in Bulgaria; the ratio of the swine to the population in Bulgaria. The limits of the counties were drawn up with a thick black line and the limits of the regions – with an interrupted and thinner line. Respectively the names of the county towns were written down with bigger and thicker letters than the names of the regional towns which are smaller and paler. Further on a dotted cartographic symbol was adopted for the county towns with a filled up small circle and for the regional towns – a small empty circle. The value of the mapped indicator, for instance, the actual increase or reduction of the population was defined for each territorial sub-division. The determination of the values of the quantitative indicator was made over the entire area of the map of Bulgaria, after the limits of the counties and the regions were determined as well as the various degrees of the scale through various kinds of shadings: one-color and two-color; vertical, left and right inclined, horizontal, diamond-shaped, square, shadings with various density and thickness, solid background. The depth of the color or the intensity of the shading for the degrees of the scale reflects the growth of the indicators. The maps were colored and in the same scale 1:2000000. Each map individually was in only one or in two colors at the most. Pale tone and various kinds of shadings were used, i.e. area cartographic symbols differing in their brightness, structure, kind, density and orientation of the shadings were applied; they are with increasing intensity of the colors in compliance with the intensity of the mapped statistical indicator. The maps were drawn up per regions, with gradation in a different

number of degrees (from 5 to 8 degrees) depending on the intensity of the relevant statistical indicator, which is seen from Figures 7 and 8 included.

6. CONCLUSIONS

The scientific and the scientific applied contributions of the Geographic Institute to the Ministry of War and of the Bulgarian geodesists who worked in it and who left a bright trail in various spheres of military topography, higher geodesy, geodetic astronomy, cartography, photogrammetry, gravimetry and the other geosciences are incontestable, big and of great significance.

REFERENCES

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BIOGRAPHICAL NOTES

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Associate Professor in General, Higher and Applied Geodesy in Department Forest Management of the University of Forestry from 1996 up to date. Author of over 130 scientific articles and reports in the general, higher and applied geodesy, 40 of them in foreign editions, two editions of textbook in Vertical Planning in Development and Landscaping of the Towns and Villages, two monographs, 3 books, English-Bulgarian and Bulgarian-English Terminological Dictionary of Geodesy”, 120 popular articles.

Emphasized interest in research dedicated to the history of geodesy and cartography. Member of the Chamber of Graduated Surveyors. Chairperson of the Committee of Professional Ethics to it. Expert in the Committee of Economic Policy in the 38th National Assembly from 1997 to 2001. Member of the Supreme Statistical Board to the National Statistical Institute from 1998 to 2008. Member of the Management of Section Technical Sciences with the Union of Scientists in Bulgaria since 1997 up to now. Member of the Management Board of the Union of Bulgarian Geodesists and Land Managers since 1995 up to now.

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