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MAPPING AND CHARTING RESEARCH LABORATORY

A REPORT ON SOVIET CARTOGRAPHY

25X1

January 15, 1954

List of Abbreviations and Reference Keys Used in the Mapping and Charting Research Laboratory Technical Reports Dealing with Bibliographic Materials on Soviet Science.

- 1. DLC: AS262.A62 = Library Call Number at the Library of Congress

 prefixes other than "DLC" are those used in

 the <u>Union List of Serials</u>.
- 2. List No. = Refers to a numbered list of approximately

 300 Soviet, scientific serials and periodicals,
 for each of which a selected table of contents

 prepared for use by this project, is available.
- 3. M.F. No. Refers to the number of the OSU-MCRL microfilm on which the reference may be found.

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- #University", or "Bibliographic" card, etc.

 on which the reference data are recorded.
 - . Folder No. = Refers to photostated material of two types:

 (1) Folder No. Red 67 (R 67) for instance, is
 a reference photostated directly from an original
 manuscript or book, the original of which could
 not be made otherwise available to this Laboratory;

 (2) Folder No. Purple 67 (P 67) is a photostat
 printed from microfilm already available at the
 Laboratory.
- 6. SPSU "Serial Publications of the Soviet Union",
 published by the Library of Congress.

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SUMMARY AND CONCLUSIONS

Information contained in this report represents only the very minimum of possible Soviet cartographic achievement. In addition, it is fragmentary for several reasons:

- (1) Since 1945 the Soviets have banned the publication to the public of all mapping data considered to be of strategic or military importance.
- (2) Of the cartographic information published in large quantities in the Soviet Union, (theoretical, educational and technological) only a small percentage reaches the United States.
- (3) From this small percentage of available material, only those items considered to be of most significance have been analyzed for this report.

Despite the lack of adequate information, the following are in the nature of a summary of Soviet achievements in the cartographic field since 1919. (exclusive of geodesy and geodetic gravimetry) with most of the development taking place since 1935:

- (1) At least 50% of the area of the U.S.S.R. has been covered with aerial photography for mapping purposes.
- (2) The U.S.S.R. has been totally mapped on scales of 1:1,000,000, 1:2,500,000 and smaller.
- (3) About 60% of the total area is covered by topographic maps on scales of 1:500,000 or larger.
- (4) The Soviets, by 1950, had compiled and published geological maps on scales of 1:1,000,000 or larger covering approximately 85% of their total area.

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- (5) Soviet geological maps on the scale of 1:2,500,000 entirely cover the area of the U.S.S.R.
- (6) The number and variety of political-administrative and school maps of the U.S.S.R. appear to exceed by far the number of similar maps published in the U.S.A. (For the period between 1945 and 1952 alone, Soviet maps of this type numbered 12,000,000).
- (7) The Great Soviet Atlas (two volumes) is on a par in quality, content and design with most of the great European atlases and, without question, is far superior to any atlas published in this country.
- (8) The Soviet field of "mathematical cartography" is a striking example of the degree to which the Soviets have systematized and presented well-known facts which, for the most part, remain in a disorganized state in Europe and the U.S.A.
- (9) At least 18 major textbooks of cartography have been published by the Soviets since 1945, many of which if translated, would be useful to cartographic education in this country.

In quality, Soviet maps vary according to scale, area, compiling agency and time of compilation. On the whole, however, one can say that apparently they have not yet achieved the goals of standardization, uniformity, and quality that they have set for themselves. Small scale (1:1,000,000 and smaller) Soviet maps rank in quality on a par with those of other nations who utilize lithographic reproduction processes. Large scale Soviet maps

available in this country vary in quality and no over-all general statement can be made.

By combining the information contained in this report with that in other reports by this Laboratory dealing with the organization of Soviet cartography. Soviet cartographic education and Soviet photogrammetry, a picture of a rapidly-growing, dynamic and rather effective cartographic science evolves, - a science and technology which would be extremely dangerous to underestimate or overlook.

I. INTRODUCTION

Several factors must be considered in any attempt to systematize and analyze Soviet progress in mapping its own territory. The first, and perhaps best-known but least appreciated fact, is the enormous size of the area of the Soviet Union. Authorities diagrees on its exact measurements. Volkov, in his book, "Printsipy i Metody Kartometrii", gives a figure of 21,646,490 km² (1939 boundaries) and 21,827,000 km² (1940 boundaries); earlier measurements by de Tillo, Shokalskiy and Strel'bitskiy, are quoted as 21,540,000 km², and a 7th and 8th grade atlas of the U.S.S.R., published in 1951, gives the figure of 21,916,900 km², (1939 territory).

The second fact is that the Soviets release statistical data in several ways; in percentages or in terms of various other units of measurement.

Therefore, the first step in any analysis must be the reduction of all data to a standard unit of measurement.

The third fact is that Soviet cartographic data are fairly detailed and complete up to 1939. Information for the war years is fairly comprehensive but much less detailed and after 1945 specific data are almost entirely lacking except on small scale coverage and non-military topics.

The fourth fact to be considered is the complexity of the Soviet organization of scientific, technical and production facilities. (See the Mapping and Charting Research Laboratory Report on the "Organization of Soviet Geodesy and Cartography").

The fifth item of note is the fact that since 1945, Soviet mapping data have been classified as top secret and very little information has been allowed to "leak".

The sixth and final fact is that only a small percentage (about 10%) of technical and scientific periodicals, monographs and books on cartographic subjects is currently available in this country.

The present report attempts, except as noted in the text, to correlate basic facts selected from open source Soviet material only. No claim is made, however, that these facts represent all the information which can be obtained from such references because thousands of pages still remain to be studied. The list of references submitted at the end of this paper contains only those papers from which critical data have been taken. It is hoped that analysis of this partial coverage may serve as a basic picture of Soviet mapping against which covert data and additional open source information can be compared and evaluated at a later date.

Further, contents and conclusions of this report <u>must</u> be considered in conjunction with other reports on specialized fields of Soviet cartography prepared by this Laboratory (reports on photogrammetry, geodesy, education, organization, instrumentation, etc.) None is an entity in itself and each is dependent on all others in any attempt to acquire a really comprehensive picture of Soviet cartography - using the general term in the sense of the United Nations' definition.

Specialized fields of Soviet cartography selected for analysis were chosen for one or more of the following reasons:

- 1. For "intelligence" value (area of coverage and rate of development).
- 2. Because they represented fields of endeavor most emphasized by the Soviets as being of importance to their "national economy" or "development". (Atlases, school, geological and forestry maps).
- 3. Information in the particular field or fields was relatively abundant and available.

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Many phases of Soviet cartography have been almost entirely neglected.

Some of these fields are:

- Specifications for maps of various "series" omitted because studies have already been made in this field (NIS, JIB, etc.)
- 2. Military cartography because very little information is available in overt literature.
- 3. The tremendous field of techniques, procedures and instrumentation of map production - omitted because of lack of time and adequate personnel.

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II. AREA AND RATE OF DEVELOPMENT OF SOVIET MAPPING

A. Area of the Soviet Union Mapped on Scales Larger than 1:1,000,000. (1:500,000 and larger scales).

Prior to the revolution, the "topographic coverage of Russia did not exceed 10% of the total area of the country", (19) and "existed for about 2,326,000 km²". (30)

Nine sources provide statistical information pertaining to the total amount of area covered by Soviet maps on scales of 1:500,000 or larger. Numbers in parantheses refer to the list of references at the end of this report.

1. An unsigned editorial (27) published in 1940 gives the following:

For the period, 1918-1933 - 11.5% (covered by maps on scales

from 1:10,000 to 1:200,000) or approx
imately 2,489,350 km².

For the period, 1918-1938 - 18.1% or approximately 3,918,000 km².

2. Zakatov, (1) in 1939, quotes the figure for the period, 1918-1939,

as 4,141,900 km². Aerial surveying

for the period between 1933 and 1938

totalled 2,136,000 km² and the GGU

alone between 1919 and 1932, had covered an area of 818,731 km² with aerial

photography.

3. Yegorov, (2) in 1945, says that by the end of 1939, an area covering

1/5 of the total area was covered by

topographic surveys; - or, approximately

4,300,000 km².

- 4. Sudakov, (5) in an article published in 1944, makes the statement that in the period between 1920 and 1944 approximately 8,000,000 km² had been topographically mapped on scales of 1:25,000 to 1:200,000, of which 7,280,000 km² were on 1:50,000 and 1:100,000 scales (7,000 sheets) and 720,000 km² on 1:25,000, 1:10,000 and 1:200,000 scales.
- Sudakov, (30) in another article published in 1944, gives figures which are at variance with those above, probably because of the inclusion of some re-surveys and also because of the inclusion of maps on the scale of 1:500,000:

	Gosudarst. Geodez. Upravleniye (1:25,000 - 1:500,000).					
Area in	1919 to 1924	1925 to 1929	1930 to 1934	1935 to 1938	1939 to 1943	Total
Topographic Surveying	112,200	328,800 (325,800)		701,600	4,883,100* (4,383,100)	6,007,700 km²
Aerial Surveys	-	-	1,000,000	1,788,700	2,229,100	5,017,800
No. of topo- graphic sheets published	-	-	-	1,082	6,352	7.434

*Figures in parentheses represent area covered by new surveys; the larger figure includes re-surveys of some areas.

- 6. Baranov, (15) in 1943, says that the work of the topographic services totaled 1,208,000 km² (105% of the plan for that year) and that 1,414 topographic sheets were made ready for publication.
- 7. Garayevskaya's textbook of cartography, (19) published in 1952, states that for the period between 1945 and 1952, the area covered by triangulation and topographic surveys amounted to 4,000,000 km².

- 8. Chebotarev. (18) in 1948, stated that the government's postwar plan included the aerial surveying of an area of 1,000,000 km² per year.
- 9. An article by Krinchik and Zlatkin (29) published in 1939 says that for the period between 1931 and 1935, an area of 1,000,000 km² of territory had been surveyed by aerial methods and that in 1938, aerial photo coverage was 500,000 km².

Allowing for overlapping coverage caused by re-surveys and re-compilations, a conservative estimate as to the total area of the Soviet Union covered by topographic maps on scales of 1:25,000 to 1:500,000, up to 1952 would be 12,000,000 km² or almost 60% of the area.

Up to the end of 1943, aerial photographic coverage apparently was 5,017,800 km². Chebotarev's statement that 1,000,000 km² would be the plan for yearly completion of aerial surveys might appear to be somewhat unreasonably high. However, if we assume it to be a reliable average figure then something like 14,000,000 km² of aerial photo coverage existed in 1952 for the area of the Soviet Union.

B. Area and Rate of Compilation of Each of the Major Soviet Map Series.

1. 1:2,500,000 Map of the U.S.S.R.

- a. Planimetric map.
 - Salishev (12) and Ziman (17) describe this 32-sheet map covering all of the U.S.S.R. as being completed in 1939.
- b. Hypsometric map.

Zarutskaya and Zenkovich (13) report in 1951 that the hypsometric map of the U.S.S.R. was compiled and printed in the period between 1945 and 1949.

c. Geologic map.

A geological map, covering all of the U.S.S.R., was compiled and printed in the period between 1938 and 1940, according to Vereyn (28) in 1946. (Blue lines of this map are available at the Army Map Service).

2. 1:1,500,000 Map of European U.S.S.R.

a. Planimetric map.

Apparently there have been at least three editions of the planimetric version of the 1:1,500,000 map of European U.S.S.R. because Salishchev (12) says that a "revised edition" in twenty sheets was published in 1934. Ziman (17) says that there was also a 1938 edition published by the First Cartographic Factory in Leningrad.

b. Hypsometric map.

Salishchev (12) states that the hypsometric edition of this map was compiled and printed during the period between 1930 and 1941.

^{*} See the section on geological mapping in this report for additional information.



3. The 1:1,000,000 series.

Soviet cartographic literature	abounds in descriptions of and	
praises for this series		25 X 1
 	The notes that follow	25 X 1

are more or less in the nature of a summary of the rate of development of the series and a description of the many uses to which the Soviets have put these maps. This series is also of interest for other reasons; namely, because this is the largest scale map series compiled by the Soviets known to cover the entire territory of the Soviet Union and because the United States has enough of its coverage to enable us to evaluate the validity of many of the Soviet descriptions of it.

In this latter respect, their often-repeated statement to the effect that Soviet maps of "this series represents the largest and most uniform series ever contributed to the general system outlined for the International Map of the World" is only partly true. Soviet coverage does include the largest number of sheets compiled by any one nation, but their "uniformity" and "standardization" is obviously an exaggerated description, at least as far as can be judged from editions available here which number up to as many as eight per sheet in European U.S.S.R. In this connection, one very interesting and significant point might be made here. It is this: that even though Soviet literature is replete with descriptions of this series, and even though that literature emphasizes the use made of it by Soviet military forces during the war and describes a few reprints, no statistical data reported in the literature even approaches describing the actual conditions concerning the number of re-compilations, revisions and reprints that are known to exist - as evidenced from the character

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and number of Soviet sheets captured by the Germans and later re-taken by our own forces. This fact serves to emphasize and validate statements made in earlier reports of this Laboratory to the effect that data from open source material represent the very minimum measurement of Soviet development.

According to Salishchev, (12) work on this series was started by the VTU in 1918. (Two planimetric sheets which did not conform to the specifications for the International Map of the World). Work was carried on by the various agencies which later became the GUGK who, Salishchev says, compiled 80 sheets in 1932 and 50 in 1937. Zakatov (1) says that by 1937, 84.5% of the area of the Soviet Union had been covered with maps on this scale.

The year 1940 appears to have been critical in the development of this series. According to Ziman (3) the plans of operations in the topographic services included completion of a large proportion of the uncompiled sheets during this year. This emphasis, he says, was "very necessary because these maps are vitally needed in the development of national economy, for use as a general strategic map for the Army, are basic for both civil and military aviation, and as bases for soil, geological and botanical series."

To this end, according to Ziman, (6) all of the cartographic agencies within the structure of the GUGK, the VTS, the Academy of Sciences and several of its institutes, the Geographical Society,

^{**} For a description of the compilation of the 1:1,000,000 geological series, see the section on geological mapping in this report.



^{*} Ziman (17) states that the work of compiling the 1:1,000,000 soil maps of the U.S.S.R., was started in 1939 at the Pochvennyy Institut (Soil Institute) of the Academy of Sciences of the U.S.S.R., under the leadership of L.I. Prasolov.

the Mining geology groups, the Hydrometeorological Service and the Glavsevmorput' were asked to contribute compilation assistance for the years between 1940 and 1945. Salishchev (12) states that new specifications were issued in 1940, (presumably for the use of these several contributing groups).

The following data represent the available information concerning the activity of organizations compiling sheets of this series in 1940 or later:

- (a) Sukhodrev (8) says that 48 sheets were assigned in 1940 to the Leningrad, Moscow, Tbilissi, Tashkent, Sverdlovsk and Omsk map factories of the GUGK,
- (b) The GUGK completed 49 sheets in 1940, (7)
- (c) The Sverdlovsk map factory completed three sheets in 1940, (9) and
- (d) Baranov, (15) reporting on mapping activity in 1943, states that 62 sheets were compiled in 1942.

One of the most interesting quotations concerning these maps belongs to Salishchev, (12) who stated in 1944 that up to this time a total of 232 sheets had been compiled and that the series was now completed. This is in disagreement, of course, with announcements made in the Soviet press which reported completion of the 180-sheet series in 1948. There are at least two possibilities which might account for the "232-sheets". The first is that he included the many sheets known to have been compiled by the Soviets which covered areas outside the limits of their own territory. (31 sheets in Romania, Finland, Norway, Poland, Turkey, Iran, Afghanistan, China, Manchuria, Czechoslovakia and Mongolia alone). The second possibility is that

this figure includes re-compilations. The former explanation appears the more reasonable because the number of known re-compilations would total to a figure much larger than 232.

4. The 1:500,000 Series.

The chronological history of the development of the 1:500,000 series, as recapitulated from the open source literature consulted for this report, is much less complete or up-to-date than for the 1:1,000,000 series.

Salischev (12) says that the work of compiling this series was started in 1931, during which year 38 sheets were completed.

(Later reprinted during World War II for the Soviet Air Force.)

He continues by saying that in the period between 1932 and 1934,

57 sheets were completed; between 1935 and 1938, 88 sheets were done; and in 1938, 78 more sheets were compiled by the VTO and the GUGK - a total of 261 sheets.

Zakatov. (1) on the other hand, says that by 1937, 43.5% of the U.S.S.R. had been covered by sheets of this series and that the plan for 1939 included the preparation of 228 sheets to be compiled from field observations. Yegorov (2) says that in 1939 the coverage totalled 700 sheets (or coverage for slightly more than 1/2 of the area of the U.S.S.R.) The only available open source reference which gives information for later work on this series is that of Ziman (17) in 1939 in which he states that the plan of operation for the topographic services during the third 5-year plan included the attempt to complete this series before the 1:1,000,000 program. All available evidence points to either Soviet inability to accomplish this plan or to a change of program.

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5. The 1:200,000 Series.

Information available from open sources offers even less statistical date on the rate of development of this series.

A review of the work of the VTU published in 1927 (14) reports that this organization had been working on this series since 1923. Salishchev (12) continues the description of this work by the VTU and says that in:

1927 - 50 sheets were compiled which were later used as a base for a road map,

1931-1935 - 60 sheets (in 6 colors) were completed.

He also reports that the Main Geodetic Administration did the following work on the series:

1933-1938 340 sheets

1938 approximately 100 sheets

Obviously, the above data are not sufficiently up-to-date or complete to warrant an estimate based on open source material only of current Soviet map coverage on this scale. Map coverage of this map currently available in this country, however, indicates that about as much of the U.S.S.R. was covered by 1941-42 by this series as was covered by the 1:500,000 series.

6. The Soviet 1:100,000 Series.

For many years the 1:100,000 maps of the Soviet Union have been called by them "the standard map". In recent years, information concerning work progress on this series has been highly classified and care has been taken to reveal as little specific information as possible about it. For this reason, an attempt has been made to collect all



possible statistical data on this series from open source references. for this report. Such data are often included in statistics along with information on other large scales and it is nearly always impossible to separate statistics for one from another. Results of our search are far from satisfactory but they are submitted for possible integration with covert information not available at this Laboratory or with statistical data appearing in NIS studies.

1919-1934	The VTS compiled 107 sheets. (12)
1923	Along with maps on the scale of
	1:25,000 and 1:50,000, chief work
	of the VTU. (12)
1923	Old system of measurements (versts)
	changed to the metric system (19)
1933-1937	VTU compiled 26 sheets (12)
1933 to 1945	About 7,000 sheets compiled (5)
1938-1944	The Northwest Aerogeodetic
	Establishment compiled 444 sheets
	covering an area of 424,500 km ² . (23)
1940	The Glav. Geod. Upravleniye (Main
	Geodetic Administration) issued new
	map specifications for the series. (12)
1940	Mazhmishvili (21) says that these speci-
	fications were very rigid.
1940	The GUCK started working on compilation
	of sheets of this series. The war
	necessitated a curtailment of this
	activity, however. (20)

1943

7,048 sheets of this series were

compiled.

1946

In this year an official order from the GUGK declared that the completion of the mapping of the U.S.S.R. on this scale was to be the most important work to be accomplished by them. (22) When this order was issued, the time necessary to complete this work was estimated to be ten to thirteen years, or 1956-57.

1948

The Northwest Aerogeodetic Establishment compiled <u>85</u> sheets, covering 96,273 km². (24) The East Siberian Aerogeodetic Establishment compiled sheets (approximately <u>40-45</u>) covering 50,802 km². (25)

It would appear that something of the order of at least 7,280 sheets of this series have been completed. The number of these sheets which are re-drafts or revisions is not known.

7. The 1:25,000 and 1:50,000 Series.

Detailed statistical data on these two map series are almost non-existent in open-source Soviet literature except as it is included in descriptions of other large scale map coverage. For the 1:50,000 series we find the following:

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1919-1934 725 sheets were compiled by the VTS (3 color editions)
1933-1938 473 sheets were compiled by the VTS (3 color editions)

(mostly planimetric)

Total 1,198 sheets (12)

For the 1:25,000 - the following:

1919-1934 215 sheets were compiled by the VTS (one color editions) (12)

Obviously, there is a large discrepancy between these data and coverage known to exist at the end of the war on these scales, covering as it does most of European U.S.S.R.

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III. STATISTICS ON SOVIET MAP PRODUCTION

Open source Soviet cartographic literature contains abundant statistical data on Soviet map production up to 1939. After this date production figures are either very vague or non-existent. However, some idea of the rapid growth of the technological phases of Soviet cartography can be obtained from a study of those figures for the years between 1918 and 1938, as follows:

Year	No. of copie of maps pro- duced		Sheets per 1,000 rubles	Cost in rubles	Rubles per worker	Average No. workers
1918	36,000,000	(2)				
1919	14,000,000	(2)				
1920	11,046,231	(2)				
1926	5,712,000	(16)				
1927	6,892,000					
1929	10,902,000	(15)	392			
1931	36,000,000	(16)		1,959,000		
1932	41,000,000	(16)		2,366,000	4,745	
1933	58,000,000	(16)		3,500,000	5.572	
1933	50,356,000	(15)	2,900			
1934	((16)			6,605	
1935	1	(16)	4,960		7,768	659
1936	((16)	11,178		16,208	690
1937	76,000,000	(16)	12,444	12,444,000	18,758	663
1938	135,000,000	(16)	25,247	25,247,000	42,369	596



Ziman (17) offers some revealing statistics on four years of work at the GUGK:

Year	No. of production workers	No. of sheet runs
1935	100	100,000,000
1936	118	144,000,000
1937	143	461,000,000
1938	187	561,000,000
1939 (plan)	242	636,000,000

^{*} Number of sheet runs times the average number of colors.

Pochebut (10) offers a brief glimpse of the composition of the First Map Factory in 1933:

Map compilation division	110	workers
Production-lithographic division	490	workers
Globe-making establishment	120	workers
Total	720	workers

Plan for 1934 1,021 workers

Still another interesting item concerning map production is contained in a paper by Krempol'skiy (11) written in 1938 in which he describes a "record" established at the Second Map Factory in 1938 when the 1:25,000,000 map of the Arctic compiled by the GUGSK was produced on three presses of the "Drukmaksont" type in 100,000 copies in a period of 60 hours.

Another interesting phase of Soviet map production concerns the output of Soviet, small-scale school maps.

Gandzha (4) says that one of the most emphasized items in the first five-year plan (1928-1932) was the need to produce school maps in quantity.

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No production statistics for this type of map appear in the sources examined for the first five-year plan (1928-1932) but apparently the plan was carried forward, especially in the period between 1935 and 1937 (the last three years of the second five-year plan) and continued at an every-increasing rate through the years of the third five-year plan until the war and, after the war, to the present time.

Incomplete statistics on this development are as follows:

Year	School Maps	Administrative Map	8
1935	395,000	32,000	(17)
1936	573,000	520,000	(17)
1937	1,639,000	567,000	(17)
(4-sheet maps in editions of from 300,000-400,000 copies)	7,287,000		(16)
400,000 copies	s) 8,161,261,000		(16)
	3,247,000	1,320,000	(17)
1939 (plan)	2,335,000	1,474,000	(17)
(In this year,	according to Ziman, (17	three-fourths of all	
Soviet map pri	inting facilities were en	ngaged in printing school	
maps for 47,00	00,000 students).		

1945 - 12,000,000 political-administrative and school maps were printed. to 1952

IV. NOTES ON SOVIET MEDIUM-SCALE TOPOGRAPHIC MAPS

A. 1:300,000 Soviet Map Series.

Standard topographic map series on scales ranging from 1:10,000 to 1:1,000,000, compiled and printed by the Soviet Union prior to World War II have become relatively well-known throughout the cartographic agencies of this country largely because of the variety and number captured by the Germans and subsequently recaptured by American and British forces.

Manuals and instructions for the compilation, editing and printing of most of these map series are also available. Since the end of the war, however, almost no Soviet maps on scales larger than 1:500,000, and only a few sheets of the 1:500,000 and 1:1,000,000 series compiled by the Soviets after 1942 have been received in this country. Up-to-date information as to Soviet activity in compiling sheets of all of their standard series must be gleaned in a piecemeal fashion from a large variety of sources from which all but the most innocuous statements are generally carefully deleted.

the news that the Soviets had embarked after the war on a program of compiling a new series of medium-scale topographic maps on the 1:300,000 scale.

Why the Soviets should prefer the rather awkward scale of 1:300,000 over the 1:250,000 is not obvious, unless they were governed by the need to produce fewer sheets at probably less cost to their budget. Whether the Soviets had copied the idea from the series on that scale compiled by German agencies (Deutsches Heereskarte) during the war or whether the idea was their own is not known. The two series, however, are quite different in several aspects; namely, nomenclature, grid, contour interval, etc. Apparently the Soviets have an ambitious scheme to compile what might be called a strategic planning

map and have selected this scale as the one most suited to their purpose (as against our series of this same type on the scale of 1:250,000). It is also quite possible that they plan to use this series for aviation purposes, again much as we use the 1:250,000 series compiled here in the United States.

Open so	ource literatu	re available at thi	is Laborato:	ry contains no :	infor-
mation on Sc	oviet progress	in compiling this	series.		25 X 1
נל	v 1947. 90 she	ets had been comple	eted.		25X1

Again, open source literature found to date offers only limited clues as to the exact extent or location of areas the Soviets plan to cover with compilations of this series. One such indication may be found in the description of the series which appears in a 1952 textbook on cartography written by Garayevskaya, (19) in which special treatment is recommended for specific areas including areas extending at least from the Carpathian Mountains on the west to the plains and mountain systems of Central and Eastern Siberia and from the Caucasus on the south to the northern (?) sections of European U.S.S.R. Garayevskaya's account is the most detailed description of this series yet found in open source material.

According to the author, this series will be used to "assist in terrain studies necessary in planning the peoples economy", to "assist in planning large engineering projects", to "aid district administrative and economic offices" and also "to be used in the compilation of maps of smaller scales". The following general specifications are contained in Garayevskaya's description:

(1) Projection, grid and nomenclature.

The projection used is that of Gauss, computed in six degree zones. Sheets are keyed to the International Map of the World nomenclature, nine of



these sheets covering the area of one of the 1:1,000,000 sheets. Each map covers an area 1°20' in latitude and 2° in longitude. North of 64° sheets are combined and are 4° in longitude. Sheets are designated by Roman numerals (I - IX), followed by the appropriate International Map sheet number (IV-K-38). The geographic grid has an interval of 20' along the parallels and 30' along the meridians. On combined sheets meridians are divided into 1° intervals. Mathematical features of the map consist, in addition to the geographic grid, of initial points and a system of coordinates of 10-kilometer intervals.

(2) Source Materials

Source materials used to compile sheets of this series consist of,

- a. Sheets of the 1:100,000 series.
- b. Sheets of the 1:200,000 series, where the 1:100,000 are not available.
- c. Catalogs of geodetic and astronomical control points and traverse determinations.
- d. Most recent maps available showing boundaries, roads and populated places.
- e. Hydrographic maps on the scales of 1:25,000 to 1:300,000.
- f. "Official reference books".

Additional information is obtained from special type maps, aerial photographs and geographic literature.

Other specifications for this rather detailed series are as follows:

(3) Drainage systems.

Drainage patterns are supposed to be represented in as detailed and legible fashion as possible. Representation of shorelines and other shore and off-shore features should be accurately drawn so as to represent their true type or characteristics. All islands, shoals and submerged rocks should be

depicted both in oceans and lakes. All lakes and water reservoirs having areas of more than .5 square millimeters (apparently at drafting scale) should be shown and symbolized according to the nature of its water (salt, brackish, etc.) Other lakes may be represented if they have some special significance in the area. Mineral springs and wells located beyond the limits of towns, cities and villages should be symbolized. All streams whose length exceed .5 centimeters (again, apparently at drafting scale) should be shown. Streams not meeting this specification may be shown if they serve to portray the terrain more accurately. Utmost attention should be paid to representation of the simuosity of river channels, shore characteristics, rapids and falls. Navigable portions of rivers and streams should be indicated. Irrigation canals and associated construction features are symbolized. Bathymetry of both oceans and lakes are symbolized by contour lines. Hydrographic features and facilities are labelled.

(4) Populated places.

Populated places are classified according to their type; i.e., whether industrial or agricultural, or of administrative importance, and on the number of inhabitants. The name of the capitol of the U.S.S.R. and those of the federated and autonomous republics, should be designated by special type. Names of other administrative centers are underlined.

All populated places should be shown. In those instances where the density of towns or cities is too great, names of the smallest centers should not appear.

(5) Communication network.

Special attention is given to alignment and classification of components of the land communication network.

All railroads and railroad construction features are shown. Gauge

of track is indicated by use of type. (Why this should be emphasized so strongly in the U.S.S.R. where gauge of track is so uniform is not obvious unless they plan to cover satellite countries with this series).

Roads are classified as (a) arterial highways (autostrade) and main-highways (magistral); (b) normal gravel (macadam) roads; (c) improved dirt roads (graded); (d) ungraded dirt roads; (e) winter roads and (f) pack trails and paths. (Again, why there should be so much emphasis on super-highways which are certainly few in the Soviet Union is not clear unless they plan to cover territories outside of the Union or to build more such roads).

Roads of the higher classifications are shown in as detailed a fashion as possible. In areas of difficult accessibility or in lightly populated regions all types of communications are shown.

(6) Relief representation.

Relief is represented by contour lines. The contour interval varies with the area; in European U.S.S.R., western Siberia, the plains of central Asia and certain other areas, it is 20 meters; in areas of medium relief with steep slopes such as the Carpathians, Kopet-Dag, the Yablonovyy Khrebet, the interval is 40 meters; for very high mountain areas such as the Caucasus, Pamirs, Tyan'-Shan' and Altay Mountains, the interval becomes 80 meters. Where the area permits and additional relief information is desirable, additional intermediate contours may be at 1/2, 1/4 or any arbitrary portion of the prescribed interval. For relief forms which can not be depicted to scale, such as karst, rock outcrops, talus slopes, etc., individual conventional symbols are employed.



(7) Soil and vegetation symbolization.

Soil and vegetation cover are indicated by conventional symbols. Such features as woods, scrub, vines, swamps, marshes, cane, bulrushes, salt pans, meadows, tundra, steppe, sands, salt flats, gravelled areas, gardens, vineyards, plantations, etc. fall into this category.

(8) Boundaries.

The following types of boundaries are symbolized: national, federated and autonomous republics, krays, oblasts, autonomous oblasts, national okrugs and all administrative boundaries.

(9) Landmark features.

The following landmark features are included on maps of this series: churches, mosques, Buddhist lamaseries and all historical monuments. In those areas of light population, individual tombs and cemeteries are shown.

Sheets of this series are compiled on the scale of 1:240,000, using what the Soviets call the "photo-mechanical method", (Color separation?). In this case, three manuscripts (pulls) are prepared.

The first includes populated places, the road network, boundaries, outlines for areas of the soil-vegetation cover, the grid, the neat lines of the map and the geographical names. (Black pull).

The second pull includes drainage symbols, - rivers, swamps, salt pans, contour lines and type used to designate these areas. (Brown and blue pull).

The third is printed in green symbolizing the "fill" for wood and vegetation covered areas.

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B. The Soviet 1:500,000 Series.

Garayevskaya's book also describes the 1:500,000 Soviet series in considerable detail. Since this series is well represented coverage-wise in this country (at least for those sheets published before and during the war) her description is of less technical interest than her summary of the 1:300,000 maps. However, certain elements of her description may be of some significance, as follows:

Her statement of purpose for the map (essentially the same as for the 1:300,000 series) is translated as follows: " - for preliminary planning of large industrial and transportation projects. In addition, the map serves as basic source material for special maps and maps of smaller scales". Later on in the description she states, "the maps should show....., isogonic lines and regions of magnetic anomalies. (Not generally needed for planning engineering maps but perhaps for "special" maps).

Still later, series symbolizations for roads and railroads and even relief, are outlined in far greater detail than those on the larger scale series at the 1:300,000 scale. And finally, she states in her concluding paragraph describing the 1:500,000 series, that the "isogonic lines and aerial navigation data (not previously mentioned) should be drafted on a separate board.

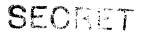
Other features of this series as described by Garayevskays apparently agree in general with symbolizations shown on less recent sheets available in this country.

V. SOVIET ATLASES

One of the most remarkable developments in Soviet cartography is the wide variety, number and excellence of Soviet atlases. Since the Soviets have made no secret of their intense planning for and establishment of educational facilities in all of the sciences, (See OSU report, "Soviet Education in Geodesy and Cartography") it is not surprising to find that geographic and cartographic education there has been abundantly supplied with such educational tools as atlases and their cartographic companions, educational wall maps. As much as an American cartographer dislikes to admit it, the obvious fact is that the Soviets have done a better job than we in this respect, probably due to the fact that the Soviets emphasize geography more. Soviet school atlases are well-designed for educational use, are graded as to detail, information and appearance for the lower grades, middle schools and, of course, for university and general uses the Great Soviet Atlas of the World in two volumes, is one of the finest in the world, comparing very favorably with the best English, French, German, Italian and other European atlases.

Several, more or less related, facts about Soviet atlases serve to emphasize the scope and intensity of Soviet activity in the cartographic-education field:

- (1) New editions of several school atlases are published every few years and educational, political and economic maps are re-issued and revised each year, or have been since the end of the war.
- (2) Editions are printed in many copies. For instance, the "Geograficheskiy Atlas dlya 7-go i 8-go Klassov Sredney Shkoly" (The
 Geographical Atlas for the 7th and 8th Classes of Middle School")
 was published in 1951 in 135,000 copies.



(3) This same atlas illustrates another point which is that candidates in the geographical sciences are often the people assigned to responsible positions in the planning and execution of such work. In this case the atlas was prepared under the direction of M.I. Nikishov, a candidate for a higher degree at the TaNIIGAik of the GUGK. Other instances which illustrate this point are the "Forestry Atlas" and the "Climate Atlas" which also were compiled as graduate theses or as a part of graduate work. These facts answer, in part, the question, "Have the Soviets been able to train younger people to replace "the old masters" or the "older, Tsarist-trained scientists"? Judging from the above two, widely different fields of cartography, the evidence is that in the realm of atlas production at least, the Soviets have been able to produce personnel who are capable of significant contributions.

The section entitled, "Atlas", in the Soviet Encylcopedia (31) lists many types of atlases which have been produced by the Soviets, some of which are not presently available in this country. This source states that the Soviets have compiled geological, soil, botanical, economic, political, natural resources, water power, industrial, agricultural, forestry, transportation, educational, linguistic, touring and military atlases. The following are mentioned by title:

A. Atlas SSSR (Atlas of the U.S.S.R.), published by the GUGK in 1947.

Senderova, (32) in an article printed in 1949, writes an interesting account of the development of pocket-type atlases in the U.S.S.R. and describes the history of the production of the Atlas SSSR in considerable detail. The

1947 edition appears to have been an outgrowth of the 1934 edition, edited by V.A. Kamenetskiy which included some 10,000 place names and the 1939 edition which had included only 6,000. The "new" (1947) edition, 14 x 22 cm. format, was revised primarily from the 1945 edition of the L;2,500,000 series of maps and included approximately 30,000 populated places on 44 multi-color maps. Personnel engaged in this work were N.I. Blinova, V.G. Brugger, I.I. Krimer, V.A. Safronova, A.A. Tsareva and V.I. Cheremnykh. N.N. Baranskiy and T.N. Gumbina were the scientific consultants. Revision and compilation work was accomplished in approximately 44 months. Reviews of the Atlas by Khursenko (33) and Driatskaya (34) provide detailed descriptions of its contents.

- B. Karmannyy atlas mira (Pocket Atlas of the World) 1940.

 Senderova's article mentioned above (32) describes a karmanyy (pocket) atlas of the U.S.S.R. but this apparently refers to the 1939 edition of the Atlas SSSR. Therefore, sources (31) and (32) are in disagreement.
- C. Klimaticheskiy atlas Rossii (Climate Atlas of Russia) published by the Glavnoye Geofizicheskaya Observatoriya (GGU). Pastuch (35) in 1946 published a paper which reviews the history and program of this atlas from its first edition in 1900 by the Glavnoye Fizicheskaya Observatoriya to its most recent compilation by the GGU between 1945-1949 as the first volume of the new atlas which covers the European part of the U.S.S.R. (Part II will deal with Aziatic U.S.S.R.). Climatic maps included in this volume are on the scales of 1:10,000,000, 1:15,000,000, 1:30,000,000 and, in those areas where terrestrial relief is significant to climate, on 1:5,000,000. Projections used are the equi-angular, conical and Gauss. The format of the atlas is 39 x 58 cm. and consists of 385 pages. Candidates of Science, Ye. P. Arkhipova, O.A. Drozdov, V.V. Orlova, N.F. Nakorenko, V.M. Mikhel', M.V. Zavarina and Ye. Ya. Sherbakova

at the GGO (Otdel Klimatologii) participated in the program. Scientific supervision was supplied by Prof. Dr. Ye. S. Rubinshteyn.

- D. Atlas promyshlennosti SSSR (Industrial Atlas of the U.S.S.R.) published in 1930.* This atlas is available at the Library of Congress.
- E. Atlas energeticheskikh resursov. (Atlas of Power Resources) published in 1933-1935 by Gosenergoizdat. (The date 1930 is given in the Soviet Encyclopedia). According to Cherdantsev (36) the proposal to compile this atlas was made in 1930 by G.M. Krzhizhanovskiy. Individuals responsible for the atlas were: supervising editors, A.V. Vinter, G. M. Krzhizhanovskiy and G.I. Lomov; the cartographic editor was, M. A. Tsvetkov, assisted by M.I. Kagan and Ya. S. Zenkis.
 - F. Atlas Sovetskikh Sotsialisticheskikh Respubliki.

 (Atlas of the Soviet Socialist Republics), published in 1928.
 - G. Atlas Moskovskoy oblasti (Atlas of Moscow Oblast') published in 1933.
- H. Atlas Leningradskoy oblasti i Karel'skoy ASSR.

 (Atlas of Leningrad Oblast' and the Karelian Autonomous Republic)

 published in 1935.
- I. Bol'shoy Sovetskiy Atlas Mira, (Great Soviet Atlas of the World), printed in 1937. (Too well known to require descriptive comment).
- J. Atlas Ofitsera, (Atlas for Officers), printed in 1947. No further information available.
- K. Semenov (37) and Isakov, (38) writing in 1951, provide descriptions of still another atlas and one of considerable significance, the Morskoy Atlas. (Marine Atlas) published in 1950.

^{*} Other sources, such as Tsvetkov, give the date as 1931; Garayevskaya, 1929.



This atlas is the only up-to-date marine atlas published in the world and, if available for American use, and if it equals Soviet descriptions, represents a really significant contribution to world cartographic knowledge and literature.

On the suggestion of Academician Yu. M. Shokal'skiy, plans to compile this work were initiated in 1939 and had been approved before World War II. Agencies cooperating in the effort were the Academy of Sciences, the War Department, the Navy Department, the GUGK, the All-Union Geographical Society, the Glavsevmorput' and the Hydrometeorological Service. Although work on it was interrupted by the war, it was continued afterward and the first volume, consisting of 420 maps and charts, was published in 1950.

Charts are divided into ten area groups, the Arctic Ocean, Far East, northern Pacific, etc. Each group contains a general map on the scale of 1:10,000,000 which gives a general picture of the coastlines and seas in the area. The charts following each general map show the same area but in greater detail. Each has an index which contains general information on ice conditions, currents, tides, and sea levels.

The atlas also includes charts of small areas that are not readily accessible for navigation on scales which range from 1:250,000 to 1:2,000,000.

Some of the charts included in this volume were compiled especially for this work and "were published for the first time here"; - Arctic, Antarctic, Southern Oceans and the Caspian Sea, (showing the new shorelines which resulted from the lowered sea level).

General charts in the atlas show submarine contours in coastal areas at 2, 5, 10 and 20 meters. Off-shore areas beyond the continental shelf are depicted by 1000-meter intervals. Oceanic deeps and submerged ridges and

^{*} The latest editions of the Philipp's Mercantile Atlas was in 1939.

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mountains are shown.

All terminology and transcription has been made according to a rigid standard. All names are shown in the Russian language and "several Russian geographical names which had been intentionally changed by foreign editors have been eliminated and names for bays, islands, etc., which were in reality discovered by our compatriots, have been given appropriate Russians names".

Prof. I.S. Isakov, L.A. Demin, V.I. Vorob'yev, K.V. Pavlov, A.N. Baranov, (Chief of the GUGK), S.A. Lukonin, V.P. Gerasimenko and V.A. Petrovskiy received the Stalin Prize, 1st class, for their work on this atlas. (37)

Isakov (38) Head of Voyenno-Morskaya Akademiya imeni Voroshilova since 1938 attributes the success of the first volume to the "cooperation of many scientific institutes and especially to the fact that it had been done under the supervision of several famous scholars: L.S. Berg, Academician A.A. Grigor'-yev, Academician V.V. Shuleykin, Professors I.A. Vitver, B.P. Orlov, K.A. Salishchev, N.N. Matusevich, S.V. Kalesnik, V.V. Kavrayskiy, V. Ye. Yegor'yev, N.N. Zubov, L. Ya. Ziman, Ye. Ye. Shvede and others.

The main work was done by the experts of the GUGK under the supervision of the GUGK and its chief, A.N. Baranov and by the Hydrographic Office under the supervision of V.F. Tributs.

Plans for the second volume include classifications for submarine relief, ocean deposits and shorelines. Individual maps will show earthquake and volcanic zones and the structure of the earth's crust. Climatological maps to be included will represent winds, atmospheric pressure, precipitation, etc., as well as maps showing seasonal currents and temperatures.

The third volume is supposed to involve matters of military and naval interest such as the naval history of the U.S.S.R.



- L. Solov'yev's, Atlas of Cartographic Projections, was apparently released after the publication of the third volume of the Encyclopedia because it was not mentioned in its article on atlases. (For details on this Atlas, see the section of this report on mathematical cartography).
- M. A much older, but interesting atlas not described in the Encyclopedia is the vegetation atlas described by Il'inskiy in 1934, (39)

 "Atlasa rastitel'nosti zemnogo shara", (Atlas of World Vegetation).

 This atlas is another illustration of major work done by graduate students
 because Il'inskiy prepared this atlas as his graduate thesis.

VI. MATHEMATICAL CARTOGRAPHY IN THE SOVIET UNION

A. History of Development under the Soviets.

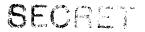
1. Projections.

Two references, one written in 1939 by Solov'yev, covering the period 1919-1939. (40) and the other in 1949 by Ginzburg, covering the period 1929-1949, (41) summarize the major events in the history of the development of civilian Soviet mathematical cartography. For the most part these descriptions refer to projections developed for the needs of civilian economy and contain few references to military applications. Ginzburg makes no reference to the role played by Russian mathematical cartographers before the Soviets came to power and Solov'yev passes over the Russian phase very lightly by saying that . . . "civil needs of Tsarist Russia relative to cartographic projections were so insignificant that to speak of serious development of mathematical cartography for economic needs in Russia is not possible", and he continues, "it can be asserted that the practical and theoretical inheritance received from Tsarist Russia in the field of cartographic projection construction came about almost wholly as a result of the experience of the pre-Revolutionary military service". Further, he attributes the accelerated development of this field under the Soviets wholly to expanded economic needs and ever-increasing demand for educational maps necessitated by Soviet aims toward better education for its people. On the other hand, A.S. Chebotarev. (18) in a paper published in 1948 credits the Russian scientists, P.L. Chebyshev and D.A. Grave, as the men who put Russian mathematical cartography on a solid foundation and says that "Soviet scientists have considerably enriched the content and have added its teaching engineering character".



The abbreviated chronological summary of steps in development of Soviet mathematical cartography considered by them to be of most significance, is derived from the two, above-mentioned sources and from miscellaneous sources published after 1949.

- 1922 F. N. Krasovskiy published a book, entitled "Novyye kartograficheskiye proyektsii" ("New Cartographic Projections"). Up to this time V.V. Vitkovskiy's book, "Kartografiya" ("Cartography") published in 1907, had been the standard Russian textbook on the theory of cartographic projections. Krasovskiy's book, published by the Vyssh. Geodez. Upravlen., analyzed the theoretical problems associated with the construction of those projections which would be best suited for 1:4,000,000 and 1:10,000,000 maps of the U.S.S.R., and proposed the use of two projections:
 - 1. Equi-distant, conical projections without area distortion but with a scale variation along the parallels in the central part of the zone.
 - 2. Equi-distant, conical projection without area distortion and which gives (a) the least square sum of the distortion along the outer parallels for any given country and (b) scale equality along the outer parallels.
- 1925 Professor Krasovskiy elaborated and improved the latter projection (42). The Soviets claim that this improved version is an original contribution and always refer to it in later literature as the "Krasovskiy projection".
- 1928 Geodezicheskiy Komitet Gosplana (Geodetic Committee of the Gosplan) set forth a resolution concerning the introduction of the use of the Gauss-Krueger plane rectangular coordinates throughout the Soviet Union. Up to this time there had been no uniform use of such coordinates although there had been some utilization of the Soldner rectangular coordinates.



1930 - As a result of the adoption of the Gauss-Krueger system, three major publications appeared. The first was prepared by Krasovskiy, Zvonov and Larin and gave tables, formulas and introductions to the computation of Gauss-Krueger coordinates for zones between 35° and 70° latitude. The second volume by N.N. Matusevich and Yushchenko appeared in the same year and included tables, formulas and computations for Gauss-Krueger coordinates. The third book was by N.I. Kell' and emphasized applications for Gauss-Krueger coordinates.

1932 - Special Chair of Mathematical Cartography established at the MIIGAik.

1933 - A. M. Virovets published tables of conversion of Gauss-Krueger coordinates. Prof. V.V. Kavrayskiy published his famous treatise, "Issledo-vaniya po matematicheskoy kartografii" (Investigations in Mathematical Cartography) in which he gave methods of obtaining constants for equi-distant, equal-angle and equal-area conical projections having minimum mean square distortions of distances. This work is considered as being of great practical significance for use on small scale maps of the U.S.S.R.

1934 - V. Kahan and other authors published tables for non-logarithmic computation of Gauss-Krueger coordinates.

V.V. Kavrayskiy published his textbook, "Mathematicheskaya Kartografiya" (Mathematical Cartography). This text was, and still is, considered by many authorities as being the most outstanding of its type written and published in the Soviet Union.

1935 - Prof. M.D. Solov'yev published his textbook, "Posobiye po teorii kartograficheskikh proyektsiy". (Guide to the Theory of Cartographic Projections). This book was written for use by students of cartographic-geodetic VTUZY.



Prof. N.A. Urmayev published his monograph, "Proyektsiya kart masshtabov 1:1,000,000 and 1:500,000 (A Projection for Maps on 1:1,000,000 and 1:500,000 Scales) and, with other authors, "Konicheskaya proyektsiya v primenenii k marshrutnym poletnym kartam (The Conical Projection Adopted for Use in Aviation Strip Maps).

1936 - Prof. V.V. Kavrayskiy published tables of rectangular coordinates on the Gauss-Krueger projection for pletting kilometer grids on topographic maps.

G.A. Ginzburg published his work, "Proyektsii dlya kart mira" ("Projections for World Maps"). This paper suggested some new projections and was his doctor's dissertation.

1937 - At the suggestion of the TaNIIGAIR, Prof. M.D. Solov'yev and Dotsent F.A. Starostin, made projection studies for a school, physical map of the U.S.S.R. on the scale of 1:22,000,000 to be included in an atlas for begineers' schools. This investigation led to the derivation of eight separate projections, the most significant of which was an oblique perspective-cylindrical projection proposed by Solov'yev which was later adopted for use in 3rd-and 4th-grade atlases and for the 1:5,000,000 political maps of the U.S.S.R. (1938). Shortly afterward Professors Solov'yev and Urmayev and Dotsent Starostin broadened their projection study to include maps ranging in scale from 1:5,000,000 to 1:20,000,000. Seven variations of the oblique perspective cylindrical projections resulted and the use of this projection became firmly established for use on small scale maps of the U.S.S.R.

The first volume of the Great Soviet Atlas of the World (BSAM) was published in which certain "new" projections were used; namely, the Eckert-Goode and a modified Goll projection.

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A paper presented by Soviet delegates to the VIII and IX conference of the Baltic Geodetic Commission entitled, "Nekotoryye issledovaniya v oblasti matematicheskoy kartografii" (Some Research in the Field of Mathematical Cartography), included the following papers:

- (a) *Sposoby vychisleniy kartegraficheskikh setok dlya aviatsionnykh marshrutnykh kart". (Methods of Computing Cartographic Grids for Aviation Strip Maps).
- (b) "Tablitsy proyektsii Gaussa-Kryugera dlya shirokoy polosy i eye primeneniye" (Tables on the Gauss-Krueger Projection for Broad Belts and their Application), published by the TsNIIGAik.

Solov'yev published, "Perspektivno-tsilindricheskiye proyektsii". (Perspective-Cylindrical Projections) and "Vidoizmenennyye formuly proyektsii Bonna (Modified Formulas for the Bonne Projection).

In this year, Solov'yev published his well-known textboo, "Kartograficheskiye proyektsii" (Cartographic Projections) designed for use of civilian students enrolled in cartographic-geodetic VTUZY.

Solov'yev (and others) published a paper entitled, "Issledovaniya primeneniya astronomicheskikh tablits v kartografii v tselyakh perekhoda ot geograficheskikh koordinat k koordinatam kosykh sistem". ("Investigations on the Use of Astronomical Tables in Cartography for Converting Geographic Coordinates to Oblique Systems*)

1938 - A. Dinchenko published a paper entitled, "Proyektsiya Chebysheva dlya Sovetskogo Soyuza" (The Chebyshev Projection for the Soviet Union).

The publication of ten school wall maps resulted in a series of investigations by the Tanligaik on various types of projections for specialized maps. Solov'yev worked on the problem of a suitable choice of projection for representation of the Arctic area. Solov'yev, Urmayev and Starostin worked



on the problem of projection for aviation maps, and suggested four possible choices. Other research by this group included studies for projections of world maps.

Ginzburg published an article, "Dve novyye proyektsii dlya kart mira"

("Two New Projections for World Maps") in Sbornik nauchnykh trudov Khar'kov-skogo inzhenerno-stroitel'nogo instituta, No. 4.

- G. N. Liodt published a monograph entitled, "Sravnitel'naya otsenka dostoinstva proyektsii Mol'veyde i Ekkerta dlya postroyeniya mirovykh kart" ("Comparative Analysis of the Value of the Molveide and Eckert Projections in the Construction of World Maps").
- V. Taich published a paper, "Ob odnoy serii ekvivalentnykh proyektsii" ("Concerning One Series of Equivalent Projections").
- Prof. B.P. Ostashchenko-Kudryatsev's paper, "Obshchaya teoriya ekvival-entnykh konicheskikh proyektsii", ("General Theory of Equivalent Conical Projections), appeared.
- A. Ya. Graur published his volume, "Matematicheskaya kartografiya" ("Mathematical Cartography").

Urmayev did intensive work on projections for maps on 1:500,000 and 1:1,000,000 scales.

1938-1939 - Urmayev and Starostin carried on extensive studies into projections to be used for world maps.

During this same period Kavrayskiy developed a general theory for elliptical, pseudo-cylindrical projections. Urmayev evolved conformal, pseudo-cylindrical projections and Ginzburg concentrated on investigating projections whose parallels were arcs of circles.

Volkov, Starostin and others of the staff of TsNIIGAik started work of compiling the "Atlasa kartograficheskikh proyektsiy" (Atlas of Cartographic Projections).

1939-1944 - TaniiGaik published, "Kartograficheskiye tablitay" (Cartographic Tables). These tables were the first to refer data to the Krasovskiy ellipsoid and most of the work was done by Solov'yev and Volkov.

1943 - Solov'yev, Volkov and Salmanova prepared cartographic tables which referred data to the TaniiGAik ellipsoid (43).

1944 - Work on the projection to be used on the political map of the world was accomplished at the TsNIIGAiK.

The TsNIIGAik also worked out the projections for a pocket atlas, a school atlas for use in the "middle schools", a series of administrative maps of several krays and oblasts and a series of school maps.

1944-45 - The Laboratoriya Matematicheskoy Kartografii of the TsNIIGAik (Laboratory of Mathematical Cartography) under the directorship of Ginzburg, started work on a series of complex mathematical cartography problems. Among these was an intensive study of the theory and applications of azimuthal projections. Investigators working on this problem came to the conclusion that approximately two-thirds of the land areas of the earth's surface could be represented adequately by using azimuthal projections where $\frac{C}{K} = K \sin \frac{Z}{K}$ (when R = 1).

1945 - Krasovskiy and Izotov published tables of rectangular coordinates for the Gauss-Krueger projection (44).

1946 - Solov'yev published his textbook, "Kartograficheskiye proyektsii". (Cartographic Projections). (53)

The "Atlasa kartograficheskikh proyektsii", started before the war, was completed and published. Ginzburg gives a rather detailed description of this

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atlas which is of special interest because, in so far as is known, no copy is available in the United States. In consists of 70 schematic diagrams which illustrate various projections. Each type of projection is accompanied by descriptive text and a graphical representation of deformation. The Atlas also contains tables of rectangular coordinates for many points. Certain variations of major projections are given which illustrate the comparative differences between them. One section is devoted to the projections used to represent the U.S.S.R., its republics, the northern polar regions, the area of the Sevmorput', land areas, oceans and world maps.

1948 - Kell: (45) published a paper dealing with the use of azimuthal projections in photogrammetry.

1949 - Ginzburg (46) published a paper dealing with the selection of projections for hemispheric maps.

Kayrayskiy (47) prepared an article on the measurement of distances from maps on the Mercator projection.

1952 - Solov'yev (48) published a manual on mathematical cartography. This book apparently is intended to be a laboratory manual to be used to supplement Solov'yev's textbook on projections.

2. Cartometry

The cartographical science called "cartometry" by the Soviets apparently was not recognized either as an integral part of mathematical cartography or as an entity in the Soviet Union until after World War II. Ginzburg (41) says that the first significant cartometric work in the Soviet Union was performed by D.A. Larin in 1930. This study, the first of many, involved methods of precise measurement of the area of the U.S.S.R. The chief Soviet proponent of cartometric investigation, however, has been

N. M. Volkov who has published a long series of articles and at least one book dealing with various phases of cartometry. (See Volkov's papers on the precision of maps, (49) on a specific aspect of cartometry, (50) 1949 and on cartometry as an aid to geographers, (51) 1946). Volkov's book, "Printsipy i metody kartometrii", (Principles and Methods of Cartometry) was published by the Geographical Institute of the Academy of Sciences in 1950. (52) This volume represents an attempt to systematize all cartometric work done in the U.S.S.R. up to this time.*

Briefly, Volkov's work may be divided into five general categories:

The measurement of area, the measurement of lines, morphometric measurements and, to a lesser degree, an evaluation of the effects on map measurement of paper deformation, and of cartographic devices or instruments used in obtaining measurements from maps.

Volkov's analysis of line measurements (shorelines, rivers, boundaries, etc.) is of considerable interest and value to cartographers. However, the practical aspects of relationship of line measurement to lengths of degrees of meridians or parallels on various projections and the problem of measurement of distance of great circle routes are omitted from his text. Other applications, such as measurements for aero-navigation purposes are also omitted.

^{*} The author seems to avoid direct references to area-and line-measurement studies carried on under the Tsars or those by European cartographers.



B. Map Projections Used in the Soviet Union.

A list of projections used on maps of the Soviet Union, if complete, would be very extensive and varied and no attempt is made to accomplish this in this report. Certain projections, however, appear to be in general use for maps of various scales and purposes.

Projections used for the medium and large scale "series" maps of the GUGK are: (adopted in 1939)

1:1,000,000 - Modified polyconic of the International Map of the World.

1:500,000 - Gauss-Krueger

1:300,000 - Gauss-Krueger

1:200,000 - Gauss-Krueger

1:100,000 and larger - Gauss Krueger

Projections used for small-scale maps are, of course, more varied and depend on the size and location of the area covered and the purpose of the map being compiled. The 1:2,500,000 series, (geological, planimetric and hypsometric) is compiled on the Kavrayskiy conical, equidistant projection having a standard parallels at 47° and 62° North. The 1:1,500,000 map covering European U.S.S.R. is on the Krasovskiy equidistant, conical projection.

The Solov'yev oblique perspective cylindrical projection is widely used for educational, administrative and political maps of the U.S.S.R. on the 1:5,000,000 scale. It is a special adaptation of the Goll projection (cylinder tangent to the earth at the equator) and is derived from a cylinder which is secant and oblique and which divides the U.S.S.R. into two halves where the cylinder interests the parallel.

Projections used in atlases also vary considerably, -those most often used, however, are about the same as used by other nations for similar maps:

- the Lambert azimuthal, the Mollweide, Aitov, Eckert, Mollweide-Goode, Eckert-Goode, Goll, Postel, Sanson, Bonne and Grinten.

Naval and aviation maps are usually compiled on the cylindrical Mercator projection, although the oblique cylindrical projection has been used recently. (53) Urmayev also investigated the use of conic projections for aviation maps.

C. Contributions to Mathematical Cartography made by the Soviets.

There can be no doubt but that the Soviets have accomplished extensive research and development in the field of mathematical cartography. They have apparently done this work in an orderly and practical way; first, by examination of the problems and needs involved; secondly, by establishing scientific projects to determine possible solutions to those problems; thirdly, by collecting and systematizing world knowledge on the subject; fourthly, by planning a program of textbooks, manuals, atlases and other aids to a coordinated training program and lastly, they have succeeded in contributing a few productions in this field, which are non-existent in the cartographic literature of the rest of the world (Atlas of Cartographic Projections) and other valuable, though not unique productions. (Tables for computing various cartographic projections, as well as modified projections which are well adapted for maps of the U.S.S.R.)

The so-called "new" projections of Krasovskiy, Kavrayskiy and Solov'yev (Modified Goll) fall into this latter category. Basic rules for and types of projections are rather limited in number and the number of possible adaptations and combinations are very numerous. Therefore, to say that these projections represent absolutely original scientific contributions to mathematical cartography would be open to question. It can be said, however, that these projections

are or were "new" to Soviet usage and that they are well designed to depict the U.S.S.R. area.

One of the especially interesting and useful phases of Soviet research on map projections is the many studies that their scientists have made on deformation and distortions of area or of distance for numerous projections. The "Atlas of Cartographic Projections" by Solov'yev is described as containing many graphical representations of this feature and Gedymin's, "Cartography", available in this country contains two plates of this type included as a part of its supplementary volume

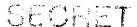
Comments of the same nature can be made concerning Soviet "cartometry".

The only "new" aspects are its name and its systematic approach. Volkov's work, "Principles and Methods of Cartometry" is definitely a contribution in the field of mathematical cartography because it describes and systematizes so many of the various phases of map measurement and makes them available in one volume. (52)

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VII. SOVIET GEOLOGICAL MAPPING

Russian and Soviet geologists and geologic mapping have, especially since the Revolution, been one of the most important factors in the rapid development of the Soviet economy. Statements by both Lenin and Stalin emphasized the necessity of industrial development and an ever-expanding economy. The 9th Congress of the RKP implemented this philosophy by declaring that the primary need was to develop the fuel and metallurgical industries. Initial steps taken to get this program underway included a reorganization of the industrial set-up, (Vysshiy Sovet Narodnogo Khozyaystva, which had included the Geological Committee, now changed the Committee into the Tsentral noye Upravleniye Promyshlennykh Razvedok) and an increase in the development of coal and ore areas. Here, field surveys were of primary importance and topographers, surveyors and geologists shared equally in the reconnaissance program, upon which the future of all industries depended. From 1920 onward, continuous pressure was exerted to develop mining and metallurgical resources. Reconnaissance and geologic mapping went on at an every-increasing pace, following a coordinated and well-planned scheme of development. Known deposits of critical materials were re-surveyed on larger scales and previously unexplored and unexploited deposits were found, mapped and developed. Thorough knowledge of geological mapping after the Revolution, then, offers one of the best sources of information and a measure by which it is possible to estimate the scope and rate of development of those natural resources available in the U.S.S.R., without which their rapid economic development could not have taken place.



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Scope and Rate of Development

Precise and detailed information concerning the rate and scope of Soviet geologic mapping activity is available up to 1945. After this date, open-source information is more fragmentary. Such information as is available in Soviet open source literature is contained in the stated aims of the last two, five-year plans. (Fourth, 1943-1948; and fifth, 1948-1953). Figure 1 is a graphical representation of the amount of area of the Soviet Union covered by geological maps. Figure 2 represents the rate of development of post-Revolutionary geologic mapping.

USSR area covered by geological maps

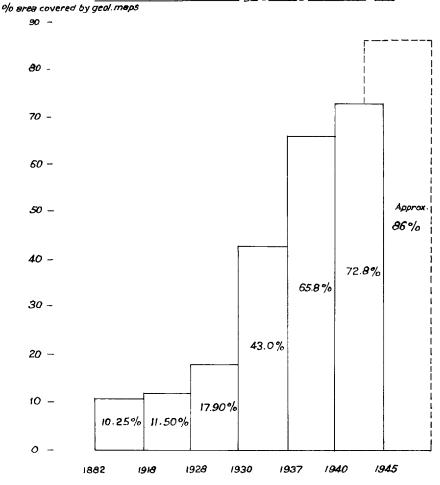
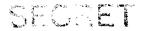


Fig. 1.



Rate of development of USSR geological mapping.

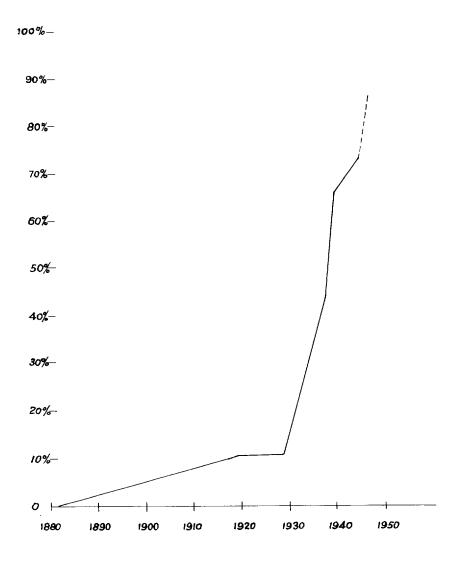


Fig. 2.



B. History of Development After the October Revolution.

Data used to produce the above figures were chiefly obtained from two references; the first, by V.A. Aprodov (54) and the second, by Ya. S. Edel'steyn. (55) Together these two sources present a rather detailed history of the more important stages of development of Soviet geological cartography. Other references, such as textbooks of cartography for mining engineers by Zvonarev and Popov, (56) (57) include further information of interest to students or workers in one or more of the specialized fields of geology. (See the List of References for additional sources). Since most of the significant progress in geological mapping has been made since the Revolution, (up to 1917, general geologic maps for the U.S.S.R., published on various scales, sheet lines, etc., had been prepared for only 10% of the area and another 0.45% with detailed geologic maps (54) no further mention will be made in this report of this earlier period.*

A fairly complete, itemized chronological list of developments in this field is included in Appendix II. This list may be of considerable interest and value to users in the specialized fields of geological mapping, and to cartographers and geographers wishing to obtain knowledge of map coverage of specific areas. However, an abbreviated and selective list of the following highlights in Soviet geological mapping development is considered sufficient for the purposes of this general report, as follows:



^{*} The Great Soviet Atlas, (5g) Vol. 10, page 503, 1952, states. "During the period between 1882 and 1918 about 10.25% of the territory had been mapped geologically."

- 1919-20 First significant attention paid to the importance of structural geology and mapping.
- 1922 Aerial reconnaissance used for geological observations and mapping on the Apsheronskiy Peninsula and in the Baku area.
- 1923-24 Electro-magnetic methods used in tracing sub-surface structures.
- 1925 Electro-magnetic methods widely used from this time on especially for locating oil deposits.

 First large scale (1:500,000) geological map of the Kuznetsk coal basin.
- Since this date, systematic use of aerial photo methods in compiling aero-topographic maps for geological purposes.
 - 1932 1:2,500,000 Quaternary deposit maps of European U.S.S.R., completed.

 Logachev makes first experimental, small-scale geological maps using aero-magnetic methods.
 - 1933 1:2,500,000 geological map of European U.S.S.R. (revised).
 - 1934 Added new courses in higher schools (VUZY) of geology.
 - 1935 Micro-magnetic techniques used for 1:50,000 scale geological mapping in western Siberia.
 - 1937 First volume of the Great Soviet Atlas published.
 - 1938 Decision to compile a 1:1,000,000 geological series covering the U.S.S.R.
 - Began systematic use of aero-transport and radio communication.
 - 1939 Began systematic use of automobiles in field work. (This greatly accelerated geological mapping).
 - 1:2,500,000 series of geological maps of the U.S.S.R. completed.

 "Electro-sond" methods used for identifying sub-surface structures
 for small scale surveys.



- 1946 1:5,000,000 VSEGEI map of the U.S.S.R., completed.
- 1947 97 of 174 sheets of the 1:1,000,000 geological series completed.
- 1950 Norms established for aero-geological work (SUSN). (59)
- C. Major Administrative Control of Geologic Mapping (1920-Present).

MINISTERSTVO GEOLOGII (Ministry of Geology)

- 1920 Vysshiy Sovet Narodnogo Khozyaystva (VSNKh) which included Geologicheskiy Komitet (Geolkom), reorganized into Tsentral'noye Upravleniye Promyshlennykh Razvedok (TsUPR).
- 1930 Glavnoye Geologo-Razvedochnoye Upravleniye (GGRU).
- 1931 Vsesoyuznoye Geologo-Razvedochnoye Ob#yedineniye.
- 1935 Glavnoye Geologicheskoye Upravleniye NKTP (GGU).
- 1939 Komitet po delam Geologii pri SNK SSSR.
- 1946 Ministerstvo Geologii.
- 1953 Divisions of Ministerstvo Geologii were distributed among five Ministries:
 - (1) Ministerstvo Metallurgicheskoy Promyshlennosti (Metallurgical Industry).
 - (2) Ministerstvo Ugol'noy Promyshlennosti (Coal Industry).
 - (3) Ministerstvo Khimicheskiy Promyshlennosti (Chemical Industry).
 - (4) Ministerstvo Neftyanov Promyshlennosti (Oil Industry).
 - (5) Ministerstvo Promyshlennosti Stroitel'nykh Materialov (Industrial Construction Materials).

Other Ministries under which geological mapping is done are the Ministerstvo Neftyanov Promyshlennosti (Ministry of Oil Industry) and Ministerstvo Chernoy - and Ministerstvo Tsvetnoy - Metallurgii (Ministry of Ferrous - and Ministry of Non-Ferrous Metallurgy) and several mining prospecting agencies.

D. Types of Geologic Maps Published by the Soviet Union.

Soviet geologic maps are of ten general kinds: (54)

- 1. Geologic-stratigraphic
- 2. Lithologic-petrographic
- 3. Structural-tectonic
- 4. Quaternary deposit maps
- 5. Environmental (fascies)-paleogeographic
- 6. Geomorphologic7. Hydro-geologic
- 8. Mineral resources maps
- 9. Engineering-geological
- 10. Various geophysical maps

Generally speaking, maps of each of the above types are prepared on scales determined according to the size and type of area being mapped. Several maps are of sufficiently large scale, have sufficiently standardized nomenclarure, sheet lines, sheet numeration and symbolization, and cover large enough areas to call them "series" type maps. Such series are on the scales of 1:1,000,000, 1:500,000, 1:100,000, 1:50,000, 1:25,000, 1:10,000, 1:5,000, 1:2,000 and 1:1,000.

The 1:5,000,000 and 1:1,000,000 maps are general geologic maps and are used to portray the geology of large areas such as countries. Regionaltype geological maps, portraying the general geology of parts of oblasts, krays and republics, are printed on 1:500,000 or 1:200,000 scales. Detailed geologic maps on scales of 1:50,000 to 1:100,000 are used to represent all types of detailed geological information of mining regions, water supply maps and other similar types of economic or industrial interest. Still larger scales of 1:1,000, 1:2,000 and 1:5,000 are prepared of detailed geophysical and geological maps of mineral deposits, mining and oil installations, hydro-geologic areas of importance, etc.



"Standardization" of Soviet Geological Maps.

As with so many other Soviet sciences, geologists and cartographers have made determined efforts in the last twenty or so years to effect complete standardization in their geologic mapping techniques and procedures in all phases of the work. Norms have been established for the composition procedures and work requirements of field parties (1) and for aero-geological groups. (59) as well as for many other specializations. Standard specifications have been established for all of the "series" geological maps and efforts have been made to assure that maps produced at one plant match in every respect those produced in every other establishment.

(1) One of the most interesting features of this standardization attempt is the emphasis which has been placed on the treatment of relief even on geologic maps (larger scales). This fact should be kept in mind because it is one of a group of more or less related features which, if properly correlated, indicate that the Soviets may have prepared what is known in Western terminology as military-geology maps. No positive direct evidence of this action is available to this Laboratory at this time from open source literature.

Another interesting item of note is the fact that, although the Soviets have established standard contour intervals for depicting relief on their geologic maps, they have also provided for a certain elasticity in this respect by allowing upper and lower limits for contour intervals depending on the type of terrain being mapped and upon the geomorphological type of area. For instance, 1:1,000,000 scale geologic maps may have a contour interval of between 10 and 20 meters in the plains type of terrain* and between

^{*} The Soviet term "ravnina" means not only the American term, "plain", but also means any lowland or flat terrain such as plateau - any area of little relief. SEC

50 and 100 meters in mountainous country; 1:50,000 scale maps may have a contour interval of from five to ten meters in plains country and of 25 to 50 meters in mountains; for 1:25,000 scale maps, compilers may use a contour interval varying from two to five meters in plains country and from ten to 25 meters in mountainous areas; and on 1:10,000 scale maps, contour intervals may vary between one and five meters in plains country and from five to 25 meters in the mountains. This feature of Soviet mapping is decidedly desirable from a geomorphological point of view and also means that military users, especially those in engineering divisions, would find such maps of more value than they would otherwise.

- (2) A second phase of the Soviet's standardization attempts deals with what they call "nomenclature". This term includes the American terms, "Sheet numbering" and "Sheet referencing system", (sometimes referred to as "indexing system".) Since the Soviet system is so well-known, a detailed description will not be included here. Suffice to say that the International Map of the World sheet numbering system forms the basis of their nomenclature, with larger scales being numbered in the sam way as standard topographic series. The only, and very insignificant, departure from this system occurs in the fact that certain of their northernmost 1:1,000,000 sheets have been combined in several ways, decreasing the number in the series from 180 in the topographic series to 174 in the geological series."
- (3) A third, and probably the most important feature for us to recognize in the Soviet standardization plan deals with their utilization of colors and symbolization. (Figs. 3, 4, 5 and 6) illustrate differences between Soviet and American geologic maps.

^{*} An index to the 1:1,000,000 geological series of the U.S.S.R. appears in reference No. 1 as Appendix No. 6 (Aprodov). (54)

Fig. 3

Comparison Between the Legends of

American and Soviet Geologic Maps

Sedimentary Rocks (Osadochnyye porody)

Quaternary system (Chetvertichnaya sistema) U.S.A. U.S.S.R. Quaternary. Chetvertichnaya Ochra orange Q Baby blue undifferentiated neraschlenennaya Continental Qc Ochra orange Marine Qm Volcanic Lemon yellow Qv Tertiary system (Tretichnaya sistema) Tertiary. Yellow ochre N Neogen Lemon yellow undifferentiated Note: If there are two or more forma-Pa Paleogen Deep chrome tions in the same system, they may be distinguished by different patterns of straight parallel lines of the same color. Cretaceous system (Melovaya sistema) Cretaceous, Melovaya K Olive green Cr Emerald undifferentiated neraschlenennaya Jurassic system (Yurskaya sistema) Jurassic, Yurskaya Blue-green Sea-green undifferentiated neraschlenennaya Triassic system (Triasovaya sistema) Triassic, Triasovaya marine and Light peacock-Lilac neraschlenennaya continental Permian system (Permskaya sistema) Permian. Permskaya Pm Baby blue Yellow ochre marine neraschlenennaya

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Fig. 4

Sedimentary Rocks

U.S.A.

U.S.S.R.

Carboniferous system (Kamennougol'naya sistema)

Carboniferous, undifferentiated

Blue

Kamenougol naya neraschlenennaya Light, or medium grey

Devonian system (Devonskaya sistema)

Devonian

Grey purple



Devonskaya

Terracotta

Silurian system (Siluriyskaya sistema)

s Silurian

Purple

Siluriyskaya

Chromium green

Ordovician

No Equivalent in U.S.S.R. Included in Silurian System as Lower Series

Cambrian system (Kembriyskaya sistema)

• Cambrian

Brick red



Kembriyskaya

(Lilac) Mauve

Pre-Cambrian system (Do-kembriyskaya sistema)

ρε Pre-Cambrian

Buff

1

Do-kembriyskaya

Brick red

Metamorphic Rocks (Metamorficheskiye porody)

Metamorphic rocks are designated by short dashed symbols, irregularly spaced. These dashes may be in black ink or in color over a basic tint of lighter shade.

M

Metamorficheskiye porody

Olive

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Fig. 5

Igneous Rocks Magmaticheskiye porody

U.S.A.

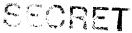
U.S.S.R.

Note	Colors for igneous rocks are more brilliant than those used for sedi- mentary series. No particular										
	colors are prescrib				Neraschlenenmyye (Undifferentiated)	Carmine					
Qv	Quaternary volcanic	Lemon yello	wc		Shchelochnyye (Alkaline)	Cadmium orange					
MV	Miocene volcanic	Apricot	وي	*	Kislyye i sredniye (Acidic & neutral)	Bordeau red					
	Tertiary intrusive	Carmine	intrusive		Osnovnyye (Basic)	Italian blue					
Kib	Cretaceous basic intrusive	Nile green	1	6	Ultraosno vnyy e (Ultrabasic)	Cobalt blue					
18	Carboniferous volcanic	Lilac	effusive	E	Neraschlenennyye (Undifferentiated)	Geranium (light)					
	Carboniferous Devonian granite	Lilac			Kislyye (Acidie)	Geranium (dark)					
ep€i	Pre-Cambrian granite & gneiss	Tile red	Cenozoic	ß	Osnovnyye (Basic)	Nile green					

Morskaya i flishevaya (Marine and "flysch") Kontinental naya i lagunnaya (Continental & lagoon) Uglenosnaya (Coal-bearing) Metamorficheskaya (Metamorphic) Vovo Neraschlenennaya (Undifferentiated) Kislyye effuzivy i ikh tufy (Acidic effusives and their tuffs) Cosnovnyye effuzivy i ikh tufy (Basic effusives and their tuffs)

Fatsiy (Facies):

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Sample Legend

of a Soviet Geologic Map-Scale, 1:1,000,000

(Southern Urals)

	Q2	Contemporary Quaternary rocks	Baby blue	S ₂	Upper series	Chromium
Devonian System Carboniferous Syst. Permian	N		Baby blue 5	s,	Lower series (Ordovician)	green
	Cr2	Cretaceous system Upper division	Emerald 5	Cm2	Upper series	(Lilac)
	Pikg	Kungur series	Yellow ochre	(ett)	Lower series	Mauve
	Pjø	Artine series. Undifferentiated		5-M	Metamorphic, Lower Paleozoic & Pre-Cambrian	Olive
	<i>c</i> ₃	Upper series	Light, or	Proterozolic	Upper series	Brick red
	°c _g	Middle series	medium grey		Lower series	
		Lower series	Terracotta	δ	Gabbro, gabbro-diorite	Blue
	03	Upper series		μδ	Intrusive diorite	Baby blue
	4	Middle series		(196)	Peridotite	Cobalt blue
		Lower series		- way	Fault lines	

Note: Practice is not uniform as to colors used in the U.S.S.R. and other countries and each geological map is usually accompanied by an index and a color legend.

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Several features are noteworthy here, of which the most outstanding is the difference between the colors used to show formations of various geologic periods. The difference between the
symbols used in depicting lithologic characteristics of rock formations is not as great as the differences in color, but it is a
feature which is more or less standard in this country and one
with which American geologists should be acquainted should the
occasion arise that they might need to use original Soviet geologic maps. Recent geologic maps of the U.S.S.R. are not available
in sufficient quantity to allow complete analysis of their "standardization" and individual legends should always be consulted.

F. Geomorphological Mapping.

Russian literature is replete with references to textbooks, monographs and periodical articles dealing with the geomorphology of the U.S.S.R. The argument as to whether geomorphology is a geographical or geological subject goes on apace there just as it has done and still is in other countries, and their arguments appear to be those used by other scientists in this field. The preponderance of the research and social and economic emphasis, however, seems to be on the geographical side, probably because this type of work fits so well into the Soviet theme of "control of nature".



In general, it may be said that the Soviets employ two types of approaches in their geomorphological mapping. The first may be termed the area approach and the second is based on classification of landforms. Illustrations of this statement are innumerable but two volumes appear to be among the best illustrations of these approaches:

- 1. Geomorfologicheskoye Rayonirovaniye SSSR (60) (Geomorphological Regions of the U.S.S.R.) Akademiya Nauk SSSR, Trudy komissii po yestestvenno-istoricheskomu rayonirovaniyu SSSR, Tom II, Vyp. 1, 1947 (illustrating the first approach):
- 2. A.I. Spiridonov, Geomorphologicheskoye kartografirovaniye (61) (Geomorphological Mapping), Gosudarstvennoye izdatel'stvo geograficheskoy literatury 1952 (illustrating the second approach).

The first references uses 16 geographical areas as illustrations of types of geomorphological regions, analyzes the characteristics of each and discusses in detail the various types of geomorphological mapping used to depict the unique features of each to the best advantage.

Spiridonov, on the other hand, divides all types of geomorphological maps into several categories:

(1) morphographic, (2) morphometric, (3) maps divided according to various categories of relief forms, (4) maps showing the genetic types of relief, (5) age of relief and (6) similar kinds of maps compiled on a basis of their connection with two or three sets of characteristics.

VIII. FORESTRY MAPS OF THE SOVIET UNION

A study of Soviet forestry maps and cartography is useful for several reasons. First, forestry is one of the major items emphasized in Soviet economy; secondly, the degree of development of such a specialized field of cartography illustrates the importance of the subject to planning and development; thirdly, such a study reveals and re-emphasizes the degree of coordination exercised by the Soviet government between its economic, technical, research and educational branches.

A. Development of Soviet Forestry Cartography.

Time or space do not permit a complete history of the development of Soviet forestry cartography. Readers interested in this subject will find that a book written by M.A. Tsvetkov in 1950 is very complete and informative. (62) The following notes more or less summarize information of most interest for purposes of this report.

According to Tsvetkov no general, up-to-date (1950) relatively large-scale forestry maps exist which cover the entire territory of the U.S.S.R. Such maps as do cover the entire area may be found in three atlases:

(1) the Atlasa promyshlennosti SSSR, (Industrial Atlas of the U.S.S.R.)

Vyp. 4, 1931, compiled by the Upravlen. les. Narkomles RSFSR, containing 18

sheets (1:7,000,000 - 1:20,000,000) pertaining to forestry or the forestry

industry in several areas of the Union; (2) In 1934 the Narkomat Tyazheloy

Promyshlennosti (Ministry of Heavy Industry) published an industrial atlas,

Promyshlennost' SSSR na nachalo 2-y pyatiletki, (The Industry of the

^{*} This book contains a remarkable amount of information on the organization of agencies, institutes, commissions, etc. and their abbreviations - engaged in forestry and forest cartography. There are also many references to other economic and industrial establishments and organizations.



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U.S.S.R. at the Start of the Second Five-Year Plan) which contained four tables referring to various phases of the forestry industry; (3) the BSAM, Vol. 1, printed in 1938, also contained four, small scale forestry maps (1:7,500,000 to 1:30,000,000).

The first, larger-scale, general forestry map to be compiled by the Soviets appeared in 1923. This map was the "Karta lesov Yevropeyskoy chasti RSFSR", printed by the Vyssheye Geodezicheskoye Upravleniye VSNKh (predecessor of the GUGK) on the scale of 1:4,000,000. This map was followed by a succession of general, area-type maps on various scales and published by various agencies:

- (1) European U.S.S.R., 1:6,800,000, Byuro Lesnoy Statistiki i

 Kartografii Tsentral'nogo Upravleniya Lesami NKZ RSFSR. (1924-26).
- (2) European U.S.S.R., 1:6,300,000, Upravleniye Lesami NKZ RSFSR (1926).
- (3) European U.S.S.R., 1:2,520,000, Tsent. Upravl. Lesami (1926)
 (Used a VTO base map).
- (4) Asiatic U.S.S.R., 1:10,000,000 (1926-1929).
- (5) Forestry Industry of European U.S.S.R., 1:1,500,000,
 Tsent. Uprav. Lesani NKZ RSFSR (1929).
- (6) Aziatic U.S.S.R., (Industrial Map, showing forests)
 1:5,000,000, Tsent. Uprav. Lesami NKZ (1931).
- (7) European U.S.S.R., 1:1,800,000, Otchet.-ekon. sektor PEU Narkomles. (1931)
- (8) Western-Siberian Area, Buryat-Mongolian ASSR, Tuvinsk Republic and Eastern Siberia kray, 1:2,000,000, Promles Zapsiblestrest (1932).

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Regional forestry maps published between 1921 and 1946 were compiled on many scales and by several agencies. Most maps of this classification, were schematic and generalized. Areas so mapped included the Urals, the Central Volga area, Baykal, Primor'ya, the Tatar ASSR, the Trans-Caucasus region, Yakutia, the Chuvash ASSR, north and south Sakhalin and Siberia.

B. Purpose of and Requirements for Soviet Forestry Maps.

Methods of compiling forestry maps in the Soviet Union are geared to the particular use for which they are devised, such as forestry management, economic planning, etc. A study of problems associated with the compilation of maps showing various phases of forestry development and geography was carried out by a special commission of the Forestry Institute of the Academy of Sciences of the U.S.S.R. In January of 1945 this commission set forth the following general requirements for forest maps:

- (1) Forestry management and the lumber industry needs a uniform forest map of the U.S.S.R.
- (2) Forestry maps are most needed to provide information on forest resources, management and lumbering. It is also necessary that tracts be mapped and allotments for taxation be established. In addition, the economic functions of forestry measurements, construction of woods roads, lumber yards and "mechanization stations", should be undertaken.
- (3) Forest maps are also needed for routine planning and management.
- (4) Forestry maps will aid in establishing look-out posts for fire protection, shipping points, permanent lumber yards, workers' camps and the exploitation of new forest areas.



- (5) Such maps are necessary for over-all planning in the lumber industry and forest management of the entire U.S.S.R.
- For (2) and (3) large scale maps, such as surveyors sheets, aerial photographs, photo mosaics and forest plats may be used.
- For (5) general maps of small scales covering all or large parts of the U.S.S.R. are recommended.
 - For (4) regional maps of medium scale are suggested.

Other suggestions included the "use of the 1:1,000,000 nomenclature and sheet lines, and the customary break-down into 1:500,000, 1:200,000 and 1:100,000 scales".

"Forest maps should also be designed for educational purposes. Therefore, they should be so designed that woods symbols do not obscure those of
other features".....

"The problem of compiling forestry maps of the U.S.S.R. involves the preparation of

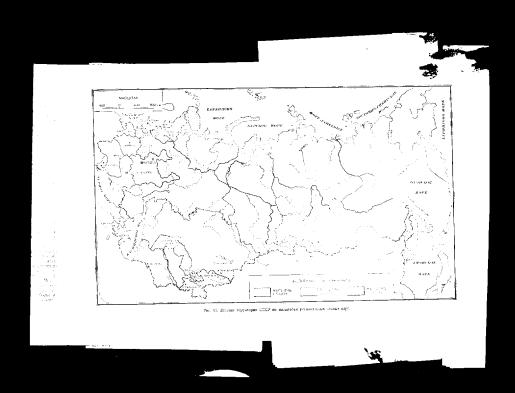
- (1) General forest maps of the U.S.S.R. and of its large forest areas,
- (2) Regional forest maps,
- (3) Atlases of forest maps.

C. Choice of Projection for Forestry Maps.

The projection selected for use in compiling the forestry map for all of the U.S.S.R., is that of Kavrayskiy having standard parallels at 47° and 62° north. (Same as used for the 1:2,500,000 State series). For forestry maps covering only the European part of the U.S.S.R., the Krasovskiy projection with standard parallels at 73°28'44" and 39°48'24" north is recommended. Other, larger scale maps are to be compiled using the same projection as the State series maps published by the GUGK.

Two chapters in Tsvetkov's book are of possible interest to U.S. government agencies. The first is an extensive description (Chapter II) of the forestry cartography of the satellite nations of Poland, Romania, Czecho-Slovakia, Bulgaria, Austria and Albania. The second (Chapter III) discusses the forestry maps of capitalistic countries (U.S.A., Canada, Germany, France and its colonies and Sweden.

Tsvetkov's book also includes two plates of interest, the first (reproduced as Fig. 7 of this report) is a map showing scales recommended for use in the compilation of forestry maps in various areas of the U.S.S.R. and the second is a proposed symbol sheet, in color, to be used in the compilation of general forestry maps (4 types of areas) and regional forestry maps.



Declassified in Part - Sanitized Copy Approved for Release 2012/11/01 : CIA-RDP79-00201A00010001-6

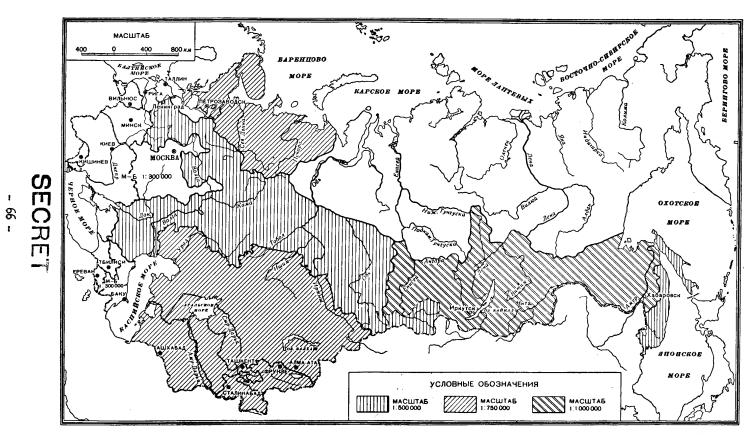


Fig. 7 - Divisions of the U.S.S.R. according to scales for regional forestry maps.

IX. SOVIET TRANSLITERATION AND TRANSCRIPTION OF GEOGRAPHICAL NAMES

Soviet maps compiled before World War II give very little evidence of the use of a standardized system of transcription of geographical names. Cartographers here in the United States become well aware of this situation whenever they attempt to determine correct spellings of geographical features and place names. Situations frequently occur where as many as four or five variations in the spelling of city or town names appear on Soviet map sources. Whenever this condition is further complicated by the well-known Soviet habit of changing the name of a city or town, the situation becomes a significant cartographic problem.

The reason for the wide discrepancies in place name spelling, especially on those maps compiled during the first twenty years of Soviet control, becomes readily apparent when one realizes that prior to 1935 the Soviets had failed to establish either a facility or regulation to govern transcription. Up to this time sole responsibility in this matter, even on official government maps, had been assigned to the responsible cartographer or editor of the map. The accuracy of place names, then, depended entirely on the personal experience, knowledge and training of the individual responsible for the entire compilation.

Efforts to change this hit-or-miss system began to appear about 1935 according to Vinogradov ⁽⁶³⁾ when the Otdel Transkriptsii of the GUGSK NKVD (Transcription Division of the GUGSK) was established. This division was officially given the responsibility of providing correct place names to be used by all cartographic agencies. It is interesting to note that Soviet authorities had made an extensive study of the American Board of Geographical



and the same

Names before recommending that a single agency be established to perform this work for the Soviet Union and their action appears to have been patterned almost entirely on American experience.

At about the same time the Nauchno-Issledovatel'skiy Institut, Bol'shoy Sovetskiy Atlas Mira--NII BSAM-- (The Scientific-Research Institute of the Great Soviet Atlas of the World) prepared and published a list of rules and specifications to be used in the transcription of place names appearing on the maps included in the two volumes of the Atlas.

Adrianov, (64) writing in the <u>Geodezist</u> of 1937, briefly describes similar scientific research done by the Academy of Sciences of the U.S.S.R. in the field of toponymy and says that their work utilized data obtained by the NII BSAM and the NT Otdel of the GUGSK described above. The end product of the Academy's research was the compilation of a Soviet Dictionary of Geographical Names.

Up to 1940 other agencies of the Soviet government who participated in research of this type included the Gosudarstvennyy Gidrologicheskiy Institut (State Hydrological Institute) which undertook the standardization of place names in the Barents Sea area, including Novaya Zemlya and Spitzbergen, the Articheskiy Institut (The Arctic Institute), the Glavsevmorput' (Main Administration of the North Sea Route), the Narodnyy Komissariat Voyenno-Morskogo Flota (NK VMF) (People's Commissariat of the Military-Marine Fleet) and the Nauchno-Transkriptsionaya Chast' (Scientific Transcription Section) (NTCh) - formerly called the NT Otdel of the GUGK.

As of 1940 the NTCh was the sole authority responsible for correlating results obtained by all cartographic groups and for decisions on the final standardization of place names. Apparently preliminary attempts in this direction had not been too successful up to this time because Kudritskiy (65)

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in 1940 describes a comparative study of the place names appearing on four of the most important Soviet cartographic compilations produced in the period between 1935 and 1940, in which wide divergencies in name treatment appeared:

- (1) 1:2,500,000 Linguistic Map of the U.S.S.R. (1939).
- (2) BSAM atlas sheets (1937).
- (3) NTCh list of geographic names.
- (4) 1:5,000,000 Hypsometric Map of the U.S.S.R. (1940)

During and immediately after World War II, several agencies published numerous articles dealing for the most part with studies of transcription of names and terms peculiar to specific areas of the U.S.S.R. A paper by Murzayev published in 1946 (66) illustrates the type of work done in this field and describes special comparative toponymic studies made on land from terms used in various parts of the Union (Kazakhstan, Turkmen, Kirgiz, Mongolia, Eastern Siberia, the Soviet Arctic and the Caucasus).

One of the most recent toponymical studies published by the Soviets is a paper by Zaychikov ⁽⁶⁷⁾printed in 1951 dealing with the toponymy of Korea. This article contains a short historical description of the derivation of Korean names and the method to be used in transcribing Korean place names and geographic features. Two appendices, the first of which lists approximately fifty Korean geographic terms and Russian equivalents and the second, listing and showing approved transcription of approximately seventy-five Korean populated places, may be of considerable interest to cartographers using Soviet maps of Korean territory.

Positive evidence as to the success or failure of Soviet cartographers and geographers to standardize and systematize Soviet place names and geo-

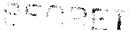


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graphic terminology is difficult to obtain since a mere handful of small-scale maps represents the total collection of Soviet maps compiled after the war available to us. Study of these maps, however, indicates that a certain amount of confusion still exists although definite improvement is indicated. Soviet literature points to the fact that considerable effort and study has been expended in this field during the past few years.

In general, Soviet practice is to use the best possible phonetic transcription for all place names (tribal or otherwise) in the Soviet Union and, for cities in areas outside the U.S.S.R., (on hemisphere, atlas or world-maps) transliterated equivalents for place names approved by the nation or nations concerned. This practice agrees, in general with that employed by our own Board of Geographical Names.

Up to this time, we have been unable to find in Soviet scientific literature any Russian-English transliteration table specifically designed for the use of Soviet cartographers. The table which follows is the only one located to date and may or may not be standard for mapping purposes. (68)



THE LATIN ALPHABET (ЛАТИНСКИЙ АЛФАВИТ)

Source: Lyëkhina, I. V. and Prof. Petrova, F. N., editors - Slovar' Inostrannykh Slov.

Third Edition. Moscow, Gosudarstvennoye Izdatel'stvo Inostrannykh i Natsional'nykh Slovarey, 1949, p. 802.

English Letters Typewritten	Russian Transcription Typewritten	Additional Remarks
Aa Bb	а б	1. Ligatures Æ æ, Œ œ (Russian Transcrip-
Cc	к/ц	tion = 3 e).
Dd	. A .D	·
Ee	э/e	2. Digraphs
Ff	Ф	2. Digraphs au ch ⁶ eu ph ⁶ qu rh ⁶ th ⁶ авх эвф квр т
Gg	r	🚛 авх эвф квр т 🕽
Hh	$_{\mathbf{r}^{1}}$	- •
Ιi	и	3. Bifurcations
Jj	∺ 2	c = ц before æ, e,i, œ, y;
K k	ĸ	otherwise - K
<u>Ll</u>	л	gu = rB before vowels; other-
Mm	M	wise = ry
Nn	H	s = 3 between vowels; other-
<u>0</u> 0	0	wise = c^7
$\mathbf{P}_{\mathbf{p}}$	п	tI = UN before vowels, but not
କୃଦ	ĸ	after s-, t-, z-; otherwise = TH;
Rr	p,	in Greek words always = ти
Ss	c/s	ex = экз before vowels; other-
Tt	т/ц	wise = okc.
Uu V	У	
Vv	в в	
Ww ~		
Xx V-r	кс/#3 и4	
Yy 7 .	35	
$\mathbf{Z}\mathbf{z}$	3.7	

 l_{Gg} = Russian literary r (sonorous κ); Hh = Ukrainian r (aspiration). 2The syllables ja, je, jo, ju = s, e, \ddot{s} , κ .

3Not found in Latin; Germ., Fr. = B; Eng. close to Russian y.

4y = Germ. u.

 $5z = contracted \ \pi a.$

6In Greek words. The old pronunciation was: ch, ph, th = aspirated к, п, т, (like the final letters in Russian как, поп, тот; rh = voiceless (?) р (Пётр, ртуть). The combinations ae, oe (- ae, oe) were ай, ой, became ä, в.

7The combinations ls, ns, rs may be transcribed also by лз, нз, рз, for example суспензорий but суспенсия (equal to -ns- in Latin: suspensorium, suspensio).

Fig. 8

X. "AUTHORSHIP" IN SOVIET CARTOGRAPHY

One of the most important phases of the analysis of Soviet capability in the cartographic fields in the evaluation of their cartographic personnel. Since no up-to-date Soviet counterpart of "Who's Who" or "American Men of Science", is available, information about Soviet scientists, their activities, education, scientific affiliations, etc. must be obtained in round-about ways. The field of Soviet cartography is no exception.

One of the methods which may be used is to study designations of "authorship" frequently found on Soviet maps and atlases. The translation which follows was made from a paper by K.A. Salishchev (69) printed in 1946. It is submitted as a part of this report because it appears to be the best written and most informative description of the term "authorship" available in Soviet literature and also because it may be of service to American cartographers using this method to obtain biographic intelligence.

The fact that the Soviets use the device of authorship as encouragement and incentive for better work is also of considerable interest because American practice, especially in the military agencies, has been to omit this feature. Private organizations have occasionally credited the work of compilation or editing, and the U.S. Geological Survey has credited the work of topographers but by and large, individuals designing, compiling and editing maps and charts have received little public recognition here in the United States.



A geographical map as a product of a creative idea, resulting in a new depiction of the landscape, is considered a production of the author. Therefore, the laws of the U.S.S.R. permit circulation of geographical maps under the author's copyright.

Who is considered the author of a map? An inexperienced person would give a conventional answer such as: the person or persons whose signature appears on the map. Unfortunately, names are absent on some maps, while others carry the signatures of a group of specialists participating in the creation of the map; that is, compilers, draftsmen, editors, and employees who put the map into its final form. In this way, names sometimes appear on the map which in no way represent authorship of the map. Thus, on official maps of Canada only two names invariably are printed; that of the Home Secretary of Canada and his assistant. Certain Soviet topographic maps of 1918—1920 carried only names of individuals who were participating in that edition of the map; that is, the printer who traced the contour lines or the pressman who printed the contour lines.

But for us authorship is not determined by a conventional question. It is the stimulus of a huge and perpetual creative force. We are sure that full and correct use of the term "authorship" can be extremely effective in cartography.

Who should be considered the author of a map? There is no doubt concerning authorship of an original map when it is produced from beginning to end by one man. However, the determination of authorship is somewhat complicated when the map results from collective work.



The production of a map's original is a complicated process, difficult, variegated and dissimilar in its individual parts. The scientific activity of a map's compilation demands extensive knowledge and keen creative sense. This must be combined with technical capacities of a specialized technical character. Cartographers working in this area require comparatively modest training defined by an accepted combination of methods and operations in the field of cartography. Therefore, the creation of a map by one person from its inception to its completion represents a rather rare occurrence at the present time.

The present trend is to get the maximum production of a map and yet reduce expenses and shorten the time of production while still striving to attain highest quality. This necessitates a division of labor and distributes the operations among many workers according to the various stages and phases of map compilation.

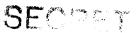
In the first place, it is expedient to set aside consideration of the work whose purpose is the preparation of secondary editors' originals. Copying work which requires competency in high quality tracing is essential in this stage of map creation. It is reasonable to give this work to those cartographers of limited training, but possessing a mastery of cartographic tracing.

In an earlier stage of map making, which is the production of the compiler's original, a cartographer of more significant and profound training
is needed. He must also posses scientific training in order to facilitate
the selection and generalization of those elements of a map which reflect
the fundamental features and peculiarities of maps in reference to depiction
and scale.

This stage is closely associated with the preliminary editorial work. For this reason, it is often the custom in contemporary cartographic production to credit the design of an original map to various persons. The first person, that is, the designer of the map, is usually called the editor, but the cartographers who produce the original are called the compilers of the map.

Similar division of labor is necessitated by the significant volume of unit technical work connected with the compilation of a map. Also, there is a desire to free most highly trained specialists from this type of work in order to shift their experience, first to that stage in the creation of a map which requires creative genius, scientific ideas and the skill and training of the cartographer editing the work, and secondly to enlist the cartographer's skill in guiding operations in the total production of the map. Especially significant is the division of labor in the production of series maps. This is true when the volume of collected works greatly surpases that of edited works, as well as when a large number of cartographers participate simultaneously in the production of a map. In this case, a greater division of labor is possible by giving to the secondary technical worker the responsibility for purely technical production (such as plotting of grids) in the making of an original. Division of labor is the most effective means of using the skills and strengths of specialists in different fields, all of whom are working toward a certain goal or standard in the preparation of a map.

Naturally, the question arises: is it possible to give all participants in the production the title of "author"? If not, then which of them can be credited with the title? As a rule, the first question must be



answered in the negative. As we have seen, this division of labor directs the activities of some cartographers into channels of scientific and technical areas, while others fall into more limited areas with duties strictly stipulated by documents, instructions, forms, outlines, technological projects, etc. Cartographers whose work falls in the latter category cannot claim authorship. It is evident that in order to be able to form an opinion about the authorship of a map which represents the result of collective effort, the total must be divided into individual phases and each of these must be evaluated independently according to the degrees of creative capacity necessary for its successful accomplishment.

This division of work helps in the apportioning of the author's work among the various participants in the compiling process. Let us examine the typical interpretations of the author's task:

- (1) There is the editor who designs the map using his own initiative for the project. In this case the editor is actually the author of the map, although the graphic work in the production of the original is done by another cartographer. This work, however, is limited by its technical aspects.
- (2) There is the editor who prepares the design and directs the compilation. In this interpretation the role of the highly qualified cartographer is such that he determines the content and form of the map as well as the plan and methods of its production. In order to assure high quality map making as indicated in the design for the original, it is necessary for the editor to share in the work of map compilation. In literary production the person who prepares and arranges the contents of an edition is called the editor. Likewise, in cartography it is customary to call such a person the editor of a map. The tasks are very similar, for the editor assumes the

responsibility for the author's work as well as the many technical operations involved in map creation. The editor of a map is likened to a "general" to whom are subordinated all types of "cartographic weapons". If they are driven, at his command, on the right course, they arrive at the designated target. In like manner, the selection and generalization of the contents of a map are the responsibility of the compiler. Thus, the compiler is directly responsible for any part of the creative work, such as the author's original. Because of this, he has the right to claim partnership in the authorship of the map. In the field of literature this is typified by the inscription usually found on such an edition, "written by X in collaboration with Y".

- arrangement and supervision of the whole production, while the detailed outlines of the individual sheets are done by various compilers. This is similar to such literary productions as dictionaries, encyclopedias and other cooperative publications which are compiled by a group of authors under the supervision of one person, the editor. The compiler of each sheet in the series is similar to the writer of each literary article for which he can claim authorship. The responsibility for the supervision and direction of the entire literary edition is assumed by the editor to whom is credited the copyright of the edition.
- (4) In the creation of a map, usually of a special type, the participants are the author, the editor and the compiler.

The first of them evolves the plan or design and makes the original, the second checks the original and directs the production of the map, while the third carries out the technical tasks stipulated in the original. In

such a production, the "authorship" belongs unreservedly to the originator of the map, while the editor of a map is similar to a literary editor*, although the field is broader.

VARIANTS IN THE TERMINOLOGY NOW USED IN CARTOGRAPHIC PRODUCTION

PROPOSED TERMINOLOGY

- Editor directs the map production while following the content of the original.
- 2. Editor prepares the content
 and directs the compilation of
 a map, but the selection of content and representation of content is the responsibility of
 the compiler.
- 3. Editor of a series map makes all general arrangements and directs the whole project, but the detailed contents of the individual sheets are done by compilers.
- 4. In the creation of a map of a special type the participants are: the author, the editor, and 7 the compiler. The first prepares the design and the original, the second checks the original and directs the production, and the third performs the technical duties.

- For the planner of the program and original compilation - author of the map.
- 2. For the planner of the program and the supervisor of the operation - author of the map.
- 3. For the person responsible for the original compilation - compiler of the map.
- 4. For the planner of the program and supervisor of the operation scientific editor of the map.
- 5. For producers of individual sheets compilers of sheets.
- 6. For the author of the program and the originator of the design – author.
- 7. For the controller and director of production responsible editor.

^{*}No person editing any type or work acquires the right of authorship except in cases described in the third variant.

The above described variants in terminology demonstrate that the meaning, "the editor of a map", in contemporary cartographic production is not precisely defined. This meaning is used for the person carrying out duties similar to those of a literary editor, with the exception of the last variant described above which is indrequently used to describe the practical author of a map. Thus, the existing terminology needs to be defined with greater precision as it applies to the final project.

- (5) When the cartographer completes the task of graphics and coloring in the final operation of map making, thus contributing to its novelty
 and originality, he has the right to qualify as co-author of the map by
 virtue of his contribution to the final production.
- (6) An appraisal of the work must be studied with special care in topographic, large scale surveys when the cartographer not only organizes the production, but supplies the methods of production. This applies when he furnishes the original data and determines in detail the content of a map and the production techniques, using instructions and directions. A cartographer of this type of production is entitled to claim authorship.

The question of authorship in cartography demands attention not only because of the lack of clarity in definition, but also because a custom has grown up which tends to forget the author.

The moral right of a cartographer, which is being violated at every turn, is to affix on a map and subsequently on the public consciousness, the fact of his authorship. Even in the Soviet State many maps of exceptional individuality in content and final form are published without the author's name. That means that authorship, a stimulus of tremendous and eternal force, has not yet been genuinely set into motion.

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Raboty Yakutskogo Aerogeodezicheskogo predpriyatiya. (Work of the Yakut Aerogeodetic Establishment) Sbornik NTPS, Vyp. XIV, pp. 62-80, 1946. ACIC.

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 maps).
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 Avtorstvo v kartografii
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APPENDIX I

NOTES CONCERNING PERSONALITIES TAKING PART IN VARIOUS CARTOGRAPHIC FIELDS IN THE SOVIET UNION.

Information contained in this appendix concerns miscellaneous	25X1
items concerning a few Soviet cartographers or scientists from assoc	_ 25X1
iated fields who have participated in Soviet cartographic activities. Gene	r-
ally speaking, these data include references to affiliation with one or mor	e
of the Soviet cartographic agencies or establishments or to the award of pr	izes
or other forms of recognition for outstanding contribution in several field	.8
of cartographic endeavor.	
	25 X 1



SECRET

A. GLAVNOYE UPRAVLENIYE GEODEZII I KARTOGRAFII (GUGK).

1. AKOPOVA, Knarik Sergeyevna.

Cartographer at the Tbilisi Map Factory. Awarded the Order of "Mark of Honor" in 1948 for fulfilling government assignments.

2. ANISIMOVA, Mariana Sergeyevna.

Senior Editor of Upravleniye Kartograficheskoy Promyshlennosti. Awarded the Order of "Mark of Honor" in 1948 for fulfilling government assignments.

3. BARANOV, Aleksandr Nikiforo-

Head of the Glavnoye Upravleniye Geodezii i Kartografii pri Sovete Ministrov SSSR. Awarded the "Order of Lenin" in 1948. Stalin Prize 1st Class held jointly with a staff of eight for scientific work in preparing "The Sea Atlas" Vol. 1, "Navigational-Geographical Charts", published in 1950.

4. BELOGLAZOVA, Ol'ga Aleksandrovna.

Engineer of a map factory of the Glavnoye Upravleniye Geodezii i Kartografii pri Sovete Ministrov SSSR. Stalin Prize 2nd Class for scientific work on the "Hypsometric Map of the U.S.S.R." on the scale of 1:2,500,000, published in 1950 in collaboration with four co-workers).

5. DOBOSHINSKAYA, Irina Borisovna. Senior Scientific Co-worker. Also associated with Tsentral'nyy Mauchno-Issledovatel'skiy Institut Geodezii, Aeros yenki i Kartografii (TsNIIGAik) (Central Research Institute of Geodesy, Aerial Surveying and Cartography). Awarded the medal, "For Labor Valor", in 1948 for steadfastness in the fulfillment of government assignments.

6. KOS'KOVA, Yevgeniy Mikhaylovna.

Head of the Division of "Maintenance" Maps ("Nachal'nik Otdela Dezhurnykh Kart GUGK"). Associated with the Tsentral'nyy Kartografo-Geodezicheskiy Fond (Kartgeofond) (The Central Cartographic-Geodetic Foundation). Awarded the medal, "For Labor Valor", in 1948 for steadfastness in the fulfillment of government assignments.

7. KOVALENKO, T.P.

Cartographic Technician. Associated with Severo-Zapadnoye Aerogeodezicheskoye Predpriyatiye (Northwestern Aerogeodetic Establishment). Contending for title of "best cartographic technician" in 1948, with an average production rate of 238% of the quota with excellent quality of work.

8. LAPSHINA, Tat'yana Mikhaylovna. Cartographer. Methods Editor. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments. Published a short paper in Geodezist in 1940 which indicated her association with the 1:1,000,000 mapping program in the Soviet Union.

9. LARIN, Dmitriy Aleksandrovich.

Cartographer. Senior Editor. Awarded the "Order of Labor's Red Banner" in 1948, and singled out for outstanding work in fulfilling government quotas.

10. MARKOVA, Lyubov Il'inichna.

"Responsible" Editor of Omskaya Kartograficheskaya Fabrika (Omsk Map Factory). Awarded the Order of Lenin in 1949.

11. MEL'NIKOVA, N. Ye.

Cartographic Engineer. Omskaya Kartfabrika (Omsk Map Factory). Contending for title of "Best Cartographic Engineer" in 1948, with an average production rate of 167% of the quota with a high quality of work.

12. NECHAYEV, Aleksey Konstantinovich.

Printer at the Omsk Map Factory. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

13. NECHAYEV, Vladimir Konstantinovich.

"Copier" - "Draftsman", (Kopirovshchik). Omskaya Kartfabrika (Omsk Map Factory). Awarded the medal, "For Labor Valor". in 1948 for steadfastness in the fulfillment of government assignments.

14. NEMTSEV, Sergey Vasil'yevich.

Crew Foreman. Associated with Moskovskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetic Establishment). Awarded the Order, "Mark of Honor", in 1948 for immediate practical participation in surveying of areas previously unstudied.

15. NIGMETOV, Khatiy.

Aerial Surveyor. Associated with Moskovskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetic Establishment. Contending for title of "Best Aerial Surveyor" in 1948, with an average production rate of 222% of the quota with high quality work.

16. OGANESYAN, Aykush Khristoforovna. Cartographic Engineer. Associated with Tbilisi Map Factory. Awarded the Order, "Mark of Honor", in 1948, for fulfilling government assignments.

17. PLYUSHINA, Ol'ga Nikolayevna.

Head of the Map Compilation Section of the Omsk Map Factory. Awarded the "Order of Labor's Red Banner" in 1948 for outstanding work in fulfilling government quotas.

18. SEYPUL'NIK, Mariya Konstantinovna. Head of the Drafting Section, Omskaya Kartfabrika (Omsk Map Factory).

Awarded the medal, "For Labor Valor", in 1948 for steadfastness in fulfillment of government assignments.

19. SHUVALOV, Dmitriy Yakovlevich

Associated with Omskaya Kartfabrika (Omsk Map Factory under GUGK). Formerly - Offset Printer of Omsk Map Factory, now (1949) Shop Foreman of Preparation of the Final Drafts of the Scientific-Editing Map Compilation Section. Awarded the "Order of Lenin" for printing maps of excellent quality, as reported in 1949.

20. SOLDATOV, Sergey Nikolayevich.

Cartographer. Senior Editor. Nauchno-Redaktsionnaya Kartosostavitel'skaya
Chast' GUGK (Scientific-Editing Map
Compilation Section of GUGK). Awarded
the Order, "Mark of Honor", in 1948
for fulfilling government assignments.
Author of an article in Geodezist, 1940,
which indicates participation in the
Soviet 1:1,000,000 mapping program.

21. SOLINA, Varvara Vasil'yevna.

Transfer technician ("Probist-perevod-chik"). Omskaya Kartfabrika (Omsk Map Factory). Awarded the medal, "For Labor Valor", in 1948 for steadfastness in the fulfillment of government assignments.

Senior Editor. Tbilisi Map Factory. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

22.

SUZDAL TSEVA, Nina Antonovna.

23. SVINARENKO, Mariya Ivanovna.

Senior Engineer. Upravleniye Kartograficheskoy Promyshlennosti (Administration of Cartographic Industry). Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

24. VERESHCHAGINA, Iraida Konstantinovna.

Cartographic Engineer. Omak Map Factory. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

25. YAKIMOVA, Muza Aleksandrovna.

Responsible Editor, ("Otvetstvennyy Redaktor"). Omsk Map Factory. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

26. ZARUTSKAYA, Irina Pavlovna.

Cartographer. Senior Editor. Awarded the "Order of Labor's Red Banner" in 1948 for outstanding work in fulfilling government quotas. From at least 1938 to 1951, published articles all referring to work done in the field of relief representation on small-scale maps.

27. Zhudro, Aleksandra Nikolayevna. Senior Technological Engineer. ("Starshiy Inzhener-tekhnolog"). Upravleniye Kartograficheskoy Promyshlennosti (Administration of the Cartographic Industry). Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

28. KROTKOVA, N. S.

Draftsman. Moskovskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetic Establishment). Contending for title of "Best Draftsman" in 1948 with an average production rate of 254% of the quota with high quality work.

29. ARBUZOVA, Anna Terent'yevna.

Cartographic Engineer. Scientific-Editing Map Compilation Section of the GUGK. Awarded the Order, "Mark of Honor", in 1948, for fulfilling government assignments.

30. DOLGOVA, Antonina Ivanovna.

Cartographer. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

31. DUKHNOVSKIY, Aleksey Vasil'yevich.

Geodetic Engineer. Head of the Middle-Asian Aerial Geodetic Establishment.

Awarded the "Order of Labor's Red Banner" in 1948. Cited as one of a group making outstanding contributions to mapping in the U.S.S.R. by his direction of topographic-geodetic work in areas of difficult physical and geographical accessibility.

32. GOROKHOV, Ivan Grigor yevich.

Senior Editor. Upravleniye Kartograficheskoy Promyshlennosti (Administration of the Cartographic Industry). Awarded the medal, "For Labor Valor", in 1948 for steadfastness in the fulfillment of government assignments.

33. GUNBINA, Tat'yana Nikolayevna.

Senior Editor of the Administration of the Cartographic Industry. Awarded the "Order of Labor's Red Banner" in 1948, for outstanding work in fulfilling government quotas.

34. KLYAGINA, Klavdiya Sergeyevna.

Final Form Designer of Maps ("Oformitel' Kart"). Scientific-Editing Map-Compilation Section of the GUGK. Awarded the medal, "For Labor Valor", in 1948 for steadfastness in fulfillment of government contracts.

35. KOZLOV, Filipp Matveyevich.

Cartographer. Editor. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order. "Mark of Honor", in 1948 for fulfilling government assignments.

36. KRESLIN, Yekaterina Reyngold'downa.

Cartographic Engineer. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

37. SPIRIDONOVA, Yelena Nikolayevna.

Polygraphic Engineer. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order. "Mark of Honor". in 1948 for fulfilling government assignments.

38. TEPLOVA, Sofiya Nikolayevna

Cartographer. Senior Editor. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order, "Mark of Honor", in 1948. for fulfilling government assignments. 39. TRET'YAKOVA, Lidiya Yefimovna.

Cartographer. Editor. Scientific-Editing Map-Compilation Section of the GUGK. Awarded the Order, "Mark of Honor", in 1948 for fulfilling government assignments.

40. KIRILLOV, V.K.

Transfer-Printer ("Probist-pechatnik"). Contending for title of "Best Prober Printer" in 1948 with an average production rate of 224% of the quota.

41. MOROZOV, V.A.

Chief Engineer. Omskaya Kartograficheskaya Fabrika (Omsk Map Factory). Proposed a method of preparing mechanically printed forms by a deep offset process, employing a transfer of the drawing onto the offset machine from the original printed forms.

B. MISCELLANEOUS ASSOCIATIONS, OR ASSOCIATION NOT GIVEN.

1. BOBROV, Ivan Valdimirovich.

Director of Donetskiy Nauchno-Issledovatel'skiy Ugol'nyy Institut (Donets Coal Scientific Research Institute). Awarded the Stalin Prize 2nd Class, together with six co-workers, for his work in the compilation of a geologicalcoal, chemical map of the Donets Basin.

2. BOL'SHAKOV, Dmitriy Nikolayevich.

Awarded the Stalin Prize, 3rd Class, March 13, 1952, for "development of a geographical map along with 14 other people. A.P. Makovkin was leader of this project.

3. CHERDANTSEV, G. N.

Corresponding Member of Akademiya Nauk Uzbekskaya SSR. Specializes in the economic-geographic aspects of cartography and was apparently associated with the Soviet, "Atlas of Power Resources".

4. DEMIN, Leonid Aleksandrovich.

Engineer-Captain 1st Rank. Awarded the Stalin Prize 1st Class, jointly a staff of eight for their scientific work on "The Sea Atlas", Vol. 1, Navigational-Geographical Charts, published in 1950.

5. DVUZHIL' HAYA, Nina Mikhaylovna. Senior Scientific Co-worker of the Donetskiy Ugol'nyy Institut (Donets Coal Institute). Awarded the Stalin Prize 2nd Class, together with six co-workers for work in the compilation of a geologicalcoal, chemical map of the Donets Basin.

6. KAMENETSKIY, V.A.

Professor, Chairman of Compilation and Editing of Maps, Moskovskiy Geodezicheskiy Institut, 1936. Author of article, published in 1934, dealing with map classification.

7. KONOVALOV, Yevgeniy Nikolayevich.

Awarded the Stalin Prize 3rd Class, March 13, 1952 for "developing a geographical map" along with fourteen other people. A.P. Makovkin was the leader of this project.

g. KOSLOVSKIY, Anton Ivanovich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.



9. KUSHCH, Paul Porfir yevich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

10. KUSTOV, Vasiliy Grigor yevich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

11. MAKAROV, Aleksey Ivanovich.

Awarded the Stalin Prize 3rd Class. March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

- 12. MAKAROV, Aleksandr Klavdiyevich. Awarded the Stalin Prize 3rd Class. March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.
- 13. MAKOVKIN, Aleksandr Pavlovich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

14. MALOVICHKO, A.K.

Associated with the Novosibirskiy Institut Inzhenerov Geodezii, Aerofotos"yemki i Kartografii (Novosibirsk Institute of Engineers of Geodesy, Aerial Surveying and Cartography). Published "Sposob Analiticheskogo Prodolzheniya Gravitatsionnykh Anomaliy (Method of Analytical Extension of Gravity Anomalies) and has also published an article on map projections.

15. MEL'NIKOV, Aleksandr Sergevich. Awarded the Stalin Prize 3rd Class, March 13, 1952 for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

16. PARIYSKIY, N.N.

Associated with the Seysmologicheskiy Institut Akademii Nauk SSSR (Seismological Institute of the Academy of Sciences of the U.S.S.R.) Author of several articles on problems of deformation of the earth's crust, gravity, and preparation of maps showing gravity anomalies.

17. POKHVALENSKIY, V.L.

Author of "O Starenii Topograficheskikh Kart" (Aging of Topographic Maps). Candidate of Technical Sciences in 1951.

Associated with the Moskovskiy Institut Inzhenerov Geodezii, Aeros" yemki i Kartografii (MIIGAiK) (Moscow Institut of Engineers of Geodesy, Aerial Surveying and Cartography). Cartographic Faculty, 1949.

Author of: "Organizatsionno-Metodicheskiye Voprosy Proizvodstvennogo Obucheniya Studentov, Obzor Statey, "(Organizational and Methodological Questions of Production Training of Students, A Survey of Articles).

18. POLETAYEVA, Sh. S.

"Assistent" at Moskovskiy Institut Inzhenerov Geodezii, Aerofotos" yemki i Kartografii (Moscow Institute of Geodesy, Aerial Surveying and Cartography). Author of: "Osobennosti Sostavleniya Morskikh Navigatsionnykh Kart" (Peculiarities of Marine Navigation Charts). 1951.

19. PRASOLOV, Leonid Ivanovich. 1875-

Member of Akademiya Nauk SSSR in 1935. Awarded the Stalin Prize for work in the geography and cartography of soils, 1945 (?). Director of Pochvennyy Institut, (Soil Institute) of the Academy of Sciences, U.S.S.R., and author of many articles on soil cartography, 1934-1949.

20. RAYZER, P. Ya.

Associated with the Leningradskaya Voyenno-vozdushnaya Inzhenernaya Akademiya (Leningrad Military Aeronautical Engineering Academy). Author of an article on aerial surveying, photogrammetry and cartography in the U.S.S.R. for the period 1934-1949.

21. ROMANOVKA, K.V.

Cartographical Engineer. Associated with Moskvoskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetical Enterprise). Noted in 1949 for outstanding work.

22. SOLOV'YEV, M.D.

Professor, Dr. of Technical Sciences, Chairman of Mathematical Cartography, Moskovskiy Geodezicheskiy Institut (Moscow Geodetic Institute), 1936. Author of many books and monographs on mathematical cartography. 23. SUKHOV, V.I.

Professor. Doctor of Technical Sciences. Associated with Moskovskiy Institut Inzhenerov Geodezii, Aeros" yemki i Kartografii (MIIGAik) (Moscow Institute of Geodesy, Aerial Surveying and Cartography). By competition (1948 or 1949) elected to the vacated post of Chairman of the Kafedra Sostavleniya i Redaktirovaniya Kart of MIIGAik, (Chair of Compilation and Editing of Maps). Author of: "Analiticheskiy Metod Generalizatsii" (Analytical Method of Generalization), "Izobrazheniye naselennykh punktov SSSR na topograficheskikh kartakh (Representation of Populated Places in the U.S.S.R. on Topographic Maps), etc.

24. TSVETKOV, K.A.

Professor, Doctor. Associated with Moskov-skiy Institut Inzhenerov Geodezii, Aeros"-yemki i Kartografii (MIIGAiK) (Moscow Institute of Engineers of Geodesy, Aerial Surveying and Cartography), 1947. Same connection, 1936, Chairman of Astronomy. Represented MIIGAiK at 2nd Latitude Conference, Moscow, November 16-17, 1949. Chair of Astronomy, MIIGAiK; joined staff in 1897.

 SILENOK, Aleksandr Ivanovich. Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing of a geographical map" along with 14 other people. A.P. Makov-kin was the leader of this project.

26. SVETOVIDOV, Dmitriy Fedorovich.

Awarded the Stalin Prize 3rd Class, March 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

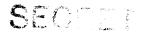
27. TOKAREV, Arkadiy Romanovich. Awarded the Stalin Prize 3rd Class. March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

28. TRUSHNIKOV, Vasiliy Mikhay-lovich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.

29. VASILEVSKIY, Viktor Ignat'yevich.

Awarded the Stalin Prize 3rd Class, March 13, 1952, for "developing a geographical map" along with 14 other people. A.P. Makovkin was the leader of this project.



30. YEGOROV, Aleksandr Stepan-ovich.

Aerial Surveyor. Moskovskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetic Establishment. Awarded the "Order of Labor's Red Banner" in 1948. Praised as one of the oldest and best-known aerial surveyors in the U.S.S.R. and as outstanding in the amount and quality of work.

31. GINSBURG, G.A.

"Candidate" of Technical Sciences. Associated with the TsNIIGAik (Tsentral'nyy Nauchno-Issledovatel'skiy Institut Geodezii, Aeros" yemki i Kartografii (Central Scientific-Research Institute of Geodesy, Aerial Surveying and Cartography). Publications include: "Psevdotsilindricheskaya Proyektsiya TsNIIGAik), and "Dve Novyye Proyektsii Dlya Kart Mira" (Two New Projections for a Map of the World), and other articles dealing with map projections.

32. AGOKAS, N.N.

Associated with the TsNIIGAik (Tsentral'nyy Nauchno-Issledovatel'skiy Institut Geodezii, Aeros"yemki i Kartografii) (Central Scientific-Research Institute of Geodesy, Aerial Surveying and Cartography). Publications include: "K Voprosu o Primenenii Tsvetnoy Mongosloynoy Plenki v Poligrafii" (The Question of Use of Color Multi-Layer Film in Polygraphy).

33. SADCHIKOV, S.F.

Supervisor ("Rukovoditel"). Otdel' kartograficheskoy poligrafii TsNIIGAiK (Cartographic Polygraphy Section of Central Scientific-Research Institute of Geodesy, Aerial Surveying and Cartography). The cartographic polygraphy section worked out a method of preparing mechanically printed forms by means of a deep, off-set process.

34. NAZAROV, Ye. A.

Lecturer ("Dotsent"). Author of the book, "Kurs Chercheniya", (A Course in Drafting).

35. YENDRZHIYEVSKIY, _...

Brigade Leader ("Brigadir"). Severozapadnoye Aerogeodezicheskoye Predpriyatiye
(Northwestern Aerogeodetic Establishment).
Geodezicheskiy Otryad No.37 (Geodetic Detachment No. 37). Brigada Chertezhnikov
Kartograficheskogo Tsekha (Drafters Brigade
of the Cartographic Shop). Noted for outstanding work in 1949.

36. BLOM, G.I.

Author of, "O Markiruyushchikh Gorizontakh i Stratigrafii Tatarskikh Otlozheniy Gor'-kovskogo Povolzh'ya" (Marking Contours and Stratigraphy of the Tartar Deposits of the Volga Region Near Gor'kiy).

37. BRATSLAVSKIY, Ya. L.

Head of a shop, shop foreman, Moskovskoye Aerogeodezicheskoye Predpriyatiye (Moscow Aerogeodetic Establishment). Nauchno-Redaktsionnaya Kartosostavitel'skaya Chast' (Scientific-Editing Map-Compilation Section). Noted for outstanding work in 1949.

38. GAMALEYEV, Nikolay Yakovlevich Awarded the Stalin Prize 3rd Class, March 13, 1952, for "development of a geographical map" with 14 other people. A.P. Makovkin was the leader of this project.

39. EDEL SHTEYN, A.V.

Publications include: "Za Luchshuyu Proizvodstva i Novuyu Tekhnologiyu" (Improvement of Production and New Technology) and other articles dealing with map production and printing problems.

40. ADRIANOV, V.N.

Lecturer "Dotsent". Chairman of the Final Drafting and Publishing of Maps ("Oformleniye i Izdaniye Kart"), Moskovskiy Geodezicheskiy Institut (Moscow Geodetic Institute), 1936. Author of several articles dealing with map standardization and cartographic type.

APPENDIX II

OUTLINE OF HISTORICAL DEVELOPMENT OF GEOLOGICAL MAPPING IN THE SOVIET UNION

Note: Numbers in parantheses; (54) - refer to corresponding items in the bibliography.

- (54) 1919-1920 Studies of open pit and mining geology began. First significant attention paid to structural geology.
- (54) 1920 9th Congress of RKP(B) pointed out need for enlarging the fuel and metallurgy industries.

 The Vysshiy Sovet Narodnogo Khozyaystva (VSNKh), which included the Geological Committee (Geolkom), organized the Tsentral'noye Upravleniye Promyshlennykh Razvedok (TsUPR) which started to develop coal and ore areas.

1:42,000 geological map of the Donbas, (Donetsk Coal Basin) by L.I. Lutugin.

- (54 and 55)

 1:420,000 compiled, composite geologic map of the
 Donbas area. Additional field work in the Kuzbas, Yakut
 and other coal areas.
- (55) 1921 1:1,000,000 map of the stratigraphy and structure of the Caucasus area.
- (54) 1922 1:4,200,000 (2nd Edition) map of Aziatic U.S.S.R.

 Revised stratigraphy, and continental and marine deposits shown.

1:10,500,000 - General outline map of the geology of Aziatic U.S.S.R.

- (55) 1:6,300,000 Geological map of European U.S.S.R. (Revised later in 1926).
- (54) 1923 V. N. Veber published the first Soviet manual of geological mapping.
 - 1922-1923 S. R. Zuber, used aerial reconnaissance to make geological observations in the neighborhood of the Apsheronskiy Peninsula and Baku. His work "proved validity of aerial reconnaissance for locating and mapping folds, faults and other tectonic structures".

(54)	1924	13th Congress of the RKP(b(emphasized necessity for rapid development of their metallurgy industry. Planned
		survey of the Urals begun and surveying of other mining areas was increased.
(54)	1924	Geolkom, Moskva otdel (Moscow division) of the Geological Committee started work on symbolization for geological maps of Quaternary (Post Tertiary) deposits. Two schemes were proposed; the first, prepared by A.M. Zhirmunskiy, used stratigraphic principles; the second, proposed by G.F. Mirchink, utilizes petrographic — genetic divisions.
(54)		P.M. Leontovskiy's textbook, "Prakticheskiye kurs gornoy geometrii", ("Practical Textbook of Mining Geometry"), published.
(54)		Electro-magnetic methods began to be used as aid in tracing sub-surface contacts.
(55)	1925	1:4,200,000 geological map of the Aziatic part of the U.S.S.R., revised from the first edition of 1917, was issued.
		1:500,000 - first "large"-scale, detailed geological map of the Kuznetz Coal Basin. "Proved the value of representing on a map the structure of all similar coal basins in the U.S.S.R."
(54)		Since 1925 - magnetic methods have been widely used. In 1925, the use of these methods in discovering oil-bearing salt domes in the Emba region were successful.
(54)	1926	Plenary session of the TsK VP(b) again emphasized the need to expand the output of metals for industry. The Geolkom (Geological Committee) was merged with the TsUPR (Central Administration of Industrial Prospecting.
		15th Conference of the VKP(b) demanded an increase in the output of non-ferrous metals and of fuels.
(54)		Since 1926, systematic use of aerial photography in compiling aero-topographic maps for geological use.
(54)	1927	Beginning of wide-spread prospecting and surveying of Eastern Siberia, Central Asia and the Caucasus.
(54)		Pamir Expedition, under leadership of D.V. Naliokin.
(54)		First geological map of the Kuzbas on a scale of 1:504,000 completed.

(54)		V.A. Obruchev published a manual for geological
()47		mapping entitled, "Polevaya Geologiya" (Field Geology). This book used as a text for many years.
(54)	1927	P. K. Sobolevskiy applied the device of using geometric representation of ore bodies for use in mining and estimating of mineral and ore reserves.
(55)	1927	1:680,000 geological map of Turkestan.
(55)		First volume of the famous, "Ocherki po geologii Sibiri", published.
(54)		Chertvertichnaya Komissiya, Akademiya Nauk (Quartenary Commission of the Academy of Sciences) organized.
(54)	1928	S.F. Malyavkin proposed that three types of geological maps should be compiled from geological surveys:
		 a. Stratigraphic b. Lithologic c. Post-Tertiary deposits (both stratigraphic and lithologic).
(54)		Vsesoyuze Geolog. Shyezd reported that a 1:2,520,000 geological map of the Quaternary deposits would be prepared covering all of European U.S.S.R. and that larger scale maps of this type would be prepared for some sections in the area.
(54)		A.A. Polkanov started to derive methods for the mapping of intrusive structures.
(54)		N. K. Razumovskiy worked out method of depicting actual dips of rocks from apparent dips using the Vul'f (Wolfe) stereographic projection method.
(54)		By October 1, 1928, 11.5% of the territory of the U.S.S.R. had been geologically mapped.
(54)		Decision that the existing geological maps on the scale of 1:420,000 were inadequate and that larger-scale, more detailed maps were necessary.
(54)		Electrometric, magnitometric and seismic methods used for geologic mapping (Apsheron Peninsula and Kabristan).
(54)	1929	Aerial photographic survey of some 440 km ² in Central Asia searching for coal deposits.

(54)	1929	Extensive program of detailed geological mapping started.
(54)	1930	17.9% of the territory of the U.S.S.R. geologically mapped. Aerial phote survey of the Fergana Valley covered 800 km2 area.
		16th Congress of VKP(b) demanded even greater expansion in geological mapping. As a result, the Glavnoye Geologo-Razvedochneye Upravleniye (GGRU) (Main Administration of Geological Prospecting) was created.
(54)		1:1,000,000 geological maps of the Urals and of the Caucasus Source (55) says that these Ural maps were published in 1931.
		V.A. Obruchev published a book on the geology of the goldbearing areas of Yakutiya, which included a 1:12,000,000 geological map of the area.
(55)		The Neftyaney Institut (Oil Institute) published a 1:750,000 geological map of the eastern shores of Northern Kamchatka.
(54 and 55)	1932	Second International Conference of the Association on the study of the Quaternary Period in Europe. "Soviet Geologists demonstrated that Soviet geological maps of Quaternary deposits are superior to all others". (54)
(54)		1:2,500,000 Quaternary deposit maps of European U.S.S.R. Used 15 divisions, genetic types.
(54)		17th Conference of VKP(b) issued instructions for the Second Five-Year Plan, emphasing the role of the Geological Administration.
(54)		A.A. Legachev made the first experiments in using aero- magnetic methods for small scale geological mapping.
(54)		Textbook by A. Ye. Gutta, "Kurs gornoy geometrii", (A Textbook of Mining Geometry).
(54)		1:2,500,000 geological map of the Uzbek SSR.
(54)	1933	Systematic compilation of "synoptic") outline geological maps of the U.S.S.R. began. More than 30 such published during this year, including
		(a) Kola Peninsula and Kareliya(b) Kazakhstan(c) European U.S.S.R.

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(54)		Ye. V. Melanovskiy published his work entitled, "Geologicheskiye Karty, ikh chtemiye i postroyeniye". (Geological Maps, Their Interpretation and Compilation).
(54)		K. P. Kalitskiy published a work on structural mapping in the field of oil geology called "Pozzemnoye Kartire-vaniye". (Sub-Surface Mapping).
(55)		1:2,500,000 geologic map of European U.S.S.R., revised from the 1915, 60-verst map.
(54)	1934	17th Congress of VKP(b) approved the second five-year plan and gave emphasis to need for prospecting for new mineral resources.
(54)		New "composite" (compiled from all sources) geological maps prepared:
		 (a) Geologic-petrographic map of the Armyanskaya SSR. (b) Geologii map of the Kirgiz SSR (c) Geologii map of the Western Sayan area, etc.
(54)		Many new courses in all higher schools (VUZ) of geology given in the U.S.S.R.
(54)		A.A. Polkanov published a work entitled, "Geologicheskiye issledovaniya v rayonakh magmaticheskikh i metamorficheskikh pored" (Geological Investigations in Areas of Magmatic and Metamorphic Rocks). This book included a short description on methods of structural mapping in igneous rock areas.
(54)		Aero-photographic surveying in the vicinity of Bol'shoy Balkhan, produced "exceptionally valuable results for mapping exposed, folded structure".
(54)	1935	Tsentral'nyy Institut Aeros" yenki (Central Institute of Aerial Surveying) organized an expedition to Turkmen to study geologic structures from the air and to determine the feasibility of this method of geological mapping.
(54)	1935	1:1,500,000 compiled geologii map of the Ukraine.
(54)		I. Ya. Furman published a textbook dealing with bering techniques in oil drilling and included descriptions of their representation in cross-sections, diagrams, maps, etc.
(54)		P.A. Yeliseyev published a book entitled, "Strukturnyy analiz intrazivnykh massivov", (Structural Analysis of Intrusives).

(54)		West Siberian Geological Trust started detailed geologic mapping on a 1:50,000 scale and employed at this time micro-magnetic techniques.
(55)	1936	1:200,000 geological map of Altay Okrug by TsNIGRI.
(55)		1:2,000,000 geological map of Kareliya.
(54) and (55)	1937	17th International Geological Congress, I.M. Gubkin, chairman. At this Congress the new and complete 1:5,000,000 geological map of the U.S.S.R. was shown.
(54)	1937	Leningradskiy Gornyy Institut (Leningrad Mining Institute) organized experimental aero-surveying of the river basins of the Vishera and Kolva rivers in the northern Urals. These surveys demonstrated the feasibility of using this method for geological mapping even in tayga (forest) areas.
(54)		43% of the U.S.S.R. geologically mapped - "four times more area than in 1917".
		A.A. Predtechenskiy proposed the "isoline" method of structural geology mapping.
(55)		1:1,000,000 geological map of Leningrad Oblast;
		1:200,000 geological map of Allay-Yun.
(55)		First volume of the Great Soviet Atlas of the World published in which a new tectonic map, a map showing the Quaternary deposits, and a schematic map depicting geomorphology and mineral resources of the U.S.S.R. were included.
(54)	1938	Third five-year plan started, increasing amount of work in detailed geologic mapping.
(54) and (55)		All-Union conference on the 1:1,000,000 geological map of the U.S.S.R. decided to start compilation of this series (174 sheets)*.
(54)	1938	VSEGEI made micromagnetic surveys in Gornaya Shoriya and Stepnoy Kazakhstan, establishing that vertical geological contacts could be located by this method.

^{*} Using in general the International Map of the World sheet lay-out but combining certain sheets. See Appendix 6 of Reference (54).

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(55)	1:2,500,000 geological map of the Soviet Arctic.
(54)	Aero-transport and radio communication used from this time on.
(54) 1939	18th Congress of VKP(b) emphasized further need for additional work locating raw materials.
	Glavnoye Geologicheskoye Upravleniye was reorganized, to become the Komitet po delam Geologii pri SNK SSSR. (Committee for Geological Affairs).
(54) and (55)	Geological maps covering large areas of the U.S.S.R. compiled:
	(a) Urals (51° - 61°03' N. Lat.) - showing several petrographic types within each system "A big step ahead".
	(b) Southern U.S.S.R., 1:1,500,000 geological map, showing petrographic details of intrusive and metamorphic rocks as well as Tertiary deposits.
(54)	B.V. Orlow - aerial geologic reconnaissance of the Tyrnyauzskiy ore district of central Caucasus. His work more or less set the standard for aero-photographic geologic mapping.
(54)	Use of automobiles in geological reconnaissance and mapping started in this year. Important because its use greatly accelerated mapping.
(54)	A. V. Pek prepared a book entitled, "Treshchinnaya tektonika i strukturnyy analiz", (Tectonics of Fracture and Structural Analysis) which established methods of structural analysis of igneous rocks.
(54) 1940	1:2,500,000 series of geological maps of U.S.S.R., completed.
(54)	"Several sheets of the 1:1,000,000, completed"
(54)	V. A. Malyutin, investigating the Khabarnin Serpentine massif in the Urals, worked out a "new grapho-analytical method to investigate rock fracture by the aid of stereographic grids.
(54)	Depth "electro-sond" methods used in several areas in conjunction with small-scale geological surveys.
(54)	65.8% U.S.S.R. covered by geological maps.

(54)	1941	Marked by the beginning of compilation of detailed, "larger-scale" structural geology maps:
		(a) 1:1,000,000 - Urals
		(b) 1:1,000,000 - Caucasus
		"PATRIOTIC WAR"
		New resources found and industry moved eastward.
(54)	1942	Geologic map compilation started in 1942 for newly developed areas in Kazakhstan, Urals, Altay, Eastern Siberia and Central Asia.
		A.A. Logachev and A. Ye. Kulugin improved geophysical mapping methods.
(54)	1945	Geological map of the Caucasus Lithological map of the Kirgiz SSR Quaternary Deposits of the Ukraine SSR, etc.
		72.8% geological map coverage of the U.S.S.R. (7% during war years!)
(54)	1946	Fourth five-year plan called for geological mapping of an area of 3,000,000 km ² of which 1,300,000 km ² were to be mapped on 1:200,000 scale. 100,000 km ² , to be mapped on 1:50,000 scale.
(54)		The Komitet po delam geologii pri SNK SSSR was re- organized into Ministerstvo Geologii (Ministry of Geology).
		1:1,500,000 VSEGEI geological map of European U.S.S.R., (Originally planned to be on a 1:2,500,000 scale) completed.
(54)	1947	97 of the 174 sheets of the 1:1,000,000 geology map of the U.S.S.R., completed.

- 1948 Kollegiya of the Ministerstvo Geologii decided to begin large-scale operations in aero-geological mapping.
- 1950 Reference book of norms for all kinds of geological work issued. (Ukrupnennyye smetnyye normy, (SUSN) issue VIII. (59)
- 1953 After Stalin's death, all functions and facilities formerly under the jurisdiction of the Ministry of Geology, were distributed among five ministries as follows:
 - (a) Ministerstvo Metallurgicheskiy Promyshlennosti (Ministry of Metallurgical Industry).
 - (b) Ministerstvo Ugol'noy Promyshlennosti (Ministry of the Coal Industry).
 - (c) Ministerstvo Khimicheskiy Promyshlennosti (Ministry of the Chemical Industry).
 - (d) Ministerstvo Neftyanoy Promyshlennosti (Ministry of the Oil Industry).
 - (e) Ministerstvo Promyshlenn. Stroitel nykh Materialov.
 (Ministry of Industrial Constructional Materials).