Progress of Mathematics in the USSR During the Present Five-Year Plan

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IN A RECENT ARTICLE by Josef Brožek (*1*), an over-all survey of the current five-year plan for Soviet science was presented. It is the purpose of the present paper to give a quantitative analysis of the status of the plan in the field of mathematics and to indicate the fields in which the majority of the published works have appeared. A few intuitive qualitative facets of the problem were noted as by-products of the literature search. The data were collected by consulting *Guide to Russian Scientific Periodical Literature*,[1] *Doklady Akademii Nauk SSSR* ("Reports of the Academy of Sciences USSR"), *Monthly List of Russian Accessions*,[2] and *Mathematical Reviews*.

Our data represent the analysis and classification of 1,021 serial papers published from 1946 to 1949, inclusive. The compilation procedure was to consult the first three journals noted above to obtain as complete a bibliography as possible of the papers in the six leading Russian mathematical journals. We then used *Mathematical Reviews* to classify the papers as to subject. In many articles the subject matter was obvious, but in others the titles were ambiguous to the extent that it was impossible to determine the subject without reference to a standard, e.g., "Commentary on One of S. N. Bernshtein's Theorems." It was thought best to adopt the standard used by *Mathematical Reviews* when the paper encompassed two or more fields.

TABLE 1

	Doklady*		P. M. i M.†		M. Sb.‡		Steklov§		U. M. N.‖		Izvestia¶		Horizontal total		Horizontal % of total
	1948	1949	1948	1949	1948	1949	1948	1949	1948	1949	1948	1949	1948	1949	
Algebra	12	21	.....	.....	5	3	.....	1	1	3	7	3	25	31	7.7
Analysis	122	126	18	8	23	27	.....	11	6	18	20	18	189	208	54.2
Applied	12	10	41	54	.....	1	.....	.....	4	3	1	1	58	69	17.4
Geometry	24	25	.....	.....	4	4	.....	.....	2	2	.....	2	30	33	8.6
Group	10	17	.....	.....	5	8	.....	.....	.....	.....	1	2	16	27	5.9
Topology	6	25	.....	.....	4	5	1	.....	1	.....	1	3	13	33	6.2
Vertical total	186	224	59	62	41	48	1	12	14	26	30	29	331	401	100.0
Vertical % of total	56.0		16.5		12.2		1.8		5.5		8.0		100.0		

* *Doklady Akademii Nauk SSSR* ("Report of the Academy of Sciences"), **59–69** (1948–49).
† *Prikladnaya Matematika i Mekhanika* ("Applied Mathematics and Mechanics"), **12–13** (1948–49).
‡ *Matematicheskii Sbornik* ("Mathematical Compilation"), **22–25** (1948–49).
§ *Trudy Akademii Nauk SSSR, Matematicheskii Institut im V. A. Steklova* ("Proceedings of the V. A. Steklov Mathematics Institute of the Academy of Sciences USSR"), **24–26** (1948–49).
‖ *Uspekhi Matematicheskikh Nauk* ("Progress of the Mathematical Sciences"), **3–4** (1948–49).
¶ *Izvestia Akademii Nauk SSSR* ("Bulletin of the Academy of Sciences"), **59–69** (1948–49).

Table 1 indicates the quantity of papers published, both by journal and by subject in the years 1948–49. Several facts are immediately apparent. The fact that one journal carries the bulk of all the papers published (56 per cent) is perhaps the most striking. Second, the majority of the work is clearly in the field of analysis, with applied mathematics running a poor second. This is to be expected since analysis is, in general, the largest field in mathematics. The third most obvious result is that the majority of the work in applied mathematics appears in *Prikladnaya Matematika i Mekhanika* ("Applied Mathematics and Mechanics").

Since the majority of the articles were published in

[1] Published for the Atomic Energy Commission by the Information and Publications Division of Brookhaven National Laboratory, Upton, N. Y.
[2] Published by the Library of Congress, Washington, D. C.

one journal, and since several of the other journals are not available for 1946–47, it was decided to investigate only *Doklady Akademii Nauk SSSR* for the entire four-year period, to determine the quantity of papers written each year and whether any trend toward a given subject could be detected. The results are tabulated in Table 2.

TABLE 2

	1946	1947	1948	1949	Horizontal total	Horizontal % of total
Algebra	2	15	12	21	50	7.1
Analysis	67	110	122	126	425	60.9
Applied	12	17	12	10	51	7.3
Geometry	8	15	24	25	72	10.3
Group	10	17	10	17	54	7.7
Topology	5	11	6	25	47	6.7
Vertical total	104	185	186	224	699	100.0
Vertical % of total	14.9	26.5	26.6	32.0	100.0	

Table 2 indicates a definite increase in productivity during the period. The greatest advances were made in 1947 and 1949. Analysis holds an undisputed lead over the other fields of mathematics, with geometry a poor second. It must be noted, however, that the majority of the work done in the applied field is published in another journal (*Prikladnaya Matematika i Mekhanika*). The results, therefore, are somewhat misleading in that respect. From the results in Table 1, it is fairly certain that the applied field would take second place from geometry. When consideration is given to the presumably large quantity of confidential research done in connection with nuclear energy and guided missile projects, and other military activities, it is highly probable that the applied field would approach analysis or even surpass it, if complete information were available.

An interesting trend which substantiates Dr. Brožek's conclusions is that shown in the fields of algebra, geometry, and topology, which have increased at a much higher rate than did the total number of papers for the period.

The following observations were made in addition to those already mentioned:

1. There seems to be an increase of Germanic names among the authors. This, of course, would indicate that certain German mathematicians are working in Russia, either voluntarily or otherwise. The mechanical difficulty of transliteration makes it virtually impossible to give more than an impression in this respect. With numerous different systems of transliteration in effect in the various scientific journals, one is never sure that what was transliterated into Russian is what comes out upon return to the Latin system.

2. The work seems to be of the same general quality as that found in American journals.

3. Certain authors seem to be particularly prolific, turning out as many as ten papers in a two-year period, a fact that suggests the research mathematicians have no other occupation, such as teaching, to divert their efforts from research.

4. No more politics are injected into the journals than one would expect to find in those published in America.

5. Several papers were noted that deal with the development of electronic calculators. This may indicate that they have developed, or are in the process of developing, calculators of the type in use in America.

With the increased activity shown in the field of mathematics in the Soviet Union, it is more than probable that, before many years, a reading knowledge of the Russian language will be required for research mathematicians. It would be of interest to know the language of publication for all the papers in the various fields of mathematics during the past ten years. In the field of organic chemistry the Russian language has taken third place behind English and German but is only 0.1 per cent behind German in the papers abstracted by *Chemical Abstracts* (*2*) in 1949.

The complete bibliography used in the compilation of data for this paper is on deposit at Regis College Library and is available for use through the Bibliographical Center for Research, Rocky Mountain Region, The Public Library, Denver, Colorado.

This paper is one of a series projected by the authors and others to attempt a strategic evaluation of the accomplishments of the USSR in science during the present five-year plan (*2*).

References

1. BROŽEK, J. *Sci. Monthly.* **70**, 390 (1950).
2. BOIG, F. S., and HOWERTON, P. W. *History and Development of Chemical Periodicals in the Field of Organic Chemistry, 1877 to 1949.* Presented before joint meeting Divisions of History of Chemistry and Chemical Literature, 118th Natl. Mtg., Am. Chem. Soc., Sept. 3–8, 1950, Chicago, Ill.

The **University of Houston** will hold its first Mathematics Institute July 20–August 2. Professor Esther F. Gibney, University of Houston, Houston 4, Texas, will supply further information.

In cooperation with the UN Technical Assistance Administration, the **Canadian Bureau of Statistics** will aid in the Burmese Census to be taken next year by making available the services of Nathan Keyfitz, its senior research statistician, for a three-month planning period.

Louisiana State University will hold its second annual Mathematics Institute June 24–30. There will be study groups for elementary and high-school teachers and groups on enrichment materials and the slow learner. H. T. Karnes, of the Mathematics Department, will supply further information.