In Search of Shadows: The First Topological Conference, Moscow 1935

DARYA E. APUSHKINSKAYA, ALEXANDER I. NAZAROV, AND GALINA I. SINKEVICH

The First International Topological Conference took place in Moscow, September 4–10, 1935. In fact, it was the first truly international specialized topological meeting in the history of the world mathematical community (see [6]). The conference brought together many outstanding experts from ten countries. Moreover, it offered some “major breakthroughs toward future methods in topology of great import for the future of the subject” [32].

It should be emphasized that because of the political situation in the USSR, organizing this Moscow meeting was not an easy task. The conference was realized only thanks to the great efforts of Pavel Sergeyevich Aleksandrov. This was reflected, in particular, in Aleksandrov’s correspondence with Andrey Nikolaevich Kolmogorov (see [27]). Shortly after the Moscow meeting, the Iron Curtain was lowered, separating Soviet science from the world community for more than two decades.

There are several official publications, historical notes, and reminiscences devoted to this conference [4, 6, 8–10, 17, 18, 28, 31, 32, 35]. However, some data in these sources, such as the number of speakers and number of talks, diverge, sometimes contradicting each other. Based on the materials at our disposal, we offer here our own version of this story.

In our opinion, the most complete information is given in the survey by A. F. Lapko and L. A. Lyusternik [21, pp. 82–85], who provide the following list of talks:

1. James Waddell Alexander II (USA), “On the ring of a complex and the combinatorial theory of integration.”
2. Pavel Sergeyevich Aleksandrov (USSR), “Some problems in set-theoretic topology.”
3. Garrett Birkhoff (USA), “Continuous groups and linear spaces.”
4. Nikolay Nikolayevich Bogolyubov and Nikolay Mitrofanovich Krylov (USSR), “Metric transitivity and invariant measure in dynamical systems of nonlinear mechanics.”
5. Karol Borsuk (Poland), “On spheroidal spaces.”
6. Nikolay Konstantinovich Brushlinskii (USSR), “On continuous mappings of spherical manifolds.”
7. Eduard Čech (Czechoslovakia), “Accessibility and homology.”
8. Eduard Čech (Czechoslovakia), “Betti groups with different coefficient groups.”
9. Stefan Cohn-Vossen (USSR), “Topological questions of differential geometry in the large.”
10. David van Dantzig (Netherlands), “Topological algebra.”
11. Vadim Arsenyevich Efremovich (USSR), “On topological types of affine mappings.”
12. Hans Freudenthal (Netherlands), “On topological approximations of spaces.”
13. Israel Isaakovich Gordon (USSR), “On the intersection invariants of a complex and its residual space.”
14. Poul Heegaard (Norway), “On the four-color problem.”
15–16. Heinz Hopf (Switzerland), “New research on n-dimensional manifolds.” Two talks.
17. Witold Hurewicz (Netherlands), “Homotopy and homology.”
18. Egbert Rudolf van Kampen (USA), “On the structure of a compact group.”
19. Andrey Nikolaevich Kolmogorov (USSR), “Homology rings in closed sets.”
20. Kazimierz Kuratowski (Poland), “On projective sets.”
21. Solomon Lefschetz (USA), “On locally connected sets.”
22. Andrey Andreyevich Markov, Jr. (USSR), “On the free equivalence of closed braids.”
23. Stefan Mazurkiewicz (Poland), “On the existence of indecomposable continua in sets of dimension ≥ 2.”
24. Viktor Vladimirovich Nemyskii (USSR), “Unstable dynamical systems.”
25. John von Neumann (USA), “Integration theory in continuous groups.”
26–27. Jakob Nielsen (Denmark), Two talks on continuous surface mappings.
28. Georg August Nöbeling (Germany), “On the triangulability of varieties and main conjectures of combinatorial topology.”
29. Lev Semyonovich Pontryagin (USSR), “Topological properties of compact Lie groups.”
30. Georges de Rham (Switzerland), “On new Reidemeister topological invariants.”
31. Georges de Rham (Switzerland), “Topological aspects of the theory of multiple integrals.”
32. Julia Antonovna Rožańska (USSR), “On continuous mappings of elements.”
33. Juliusz Schauder (Poland), “Some applications of the topology of functional spaces.”
34. Wacław Sierpiński (Poland), “On continuous mappings of sets.”
35. Wacław Sierpiński (Poland), “On transformations of sets by Baire functions.”
36. Wacław Sierpiński (Poland), “On a projective set of the second class.”
37. Paul Althaus Smith (USA), “Transformations of period two.”
38. Marshall Harvey Stone (USA), “Mapping theory in general topology.”
39. Albert William Tucker (USA), “On discrete spaces.”
40. Andrey Nikolayevich Tikhonov (USSR), “On invariant points of continuous mappings of bicomponent spaces.”
41. André Weil (France), “Topological proof of Cartan’s theorem.”
42. André Weil (France), “Families of curves on the torus.”
43. Hassler Whitney (USA), “Topological properties of differentiable manifolds.”
44. Hassler Whitney (USA), “Sphere-spaces.”

While the total number of talks listed in [21] is only 44, the authors mention 45 talks, including 13 presented by mathematicians from the USSR, 10 from the USA, 7 from Poland, 4 from Switzerland, 3 from the Netherlands, 2 from France, 2 from Czechoslovakia, 2 from Denmark, 1 from Germany, and 1 from Norway. We guess that Lapko and Lyusternik calculated Bogolyubov and Krylov as separate speakers, despite the fact that they made a joint presentation.

Lapko and Lyusternik based their findings primarily on the official conference report [4]. Note that Aleksandrov claims in [4] that there were about 43 talks, while his report contains information on only 42 presentations. Unmentioned are the presentation by Gordon (number 13 in the above list) and the second talk by Whitney (number 44). Both those talks appear in the official conference proceedings published in [22].

We now consider these proceedings in greater detail. It contains information about 41 talks. Indeed, complete texts or extended abstracts are given for talks 2–5, 10, 12, 14, 19–21, 25, 30, 33–34, 37–38, and 42–44 in our list. Brief abstracts are provided for presentations 7, 17–18, 23, 32, 35–36, 39, and 41. For talks 8, 13, 15–16, 22, 24, 26–29, and 40 there are references to papers either already published or in press, while for talks 1 and 9, only the titles are given.

There are no indications in [22] on presentations 6, 11, and 31.

Notice that the content of the first presentation is given in [1] and [2], see also [3]. The contents of talks 11 and 31 are provided in [14] and [13], respectively. We guess that talk 9 is based on the paper [12]. Unfortunately, we could not find any information about the content of talk number 6.

Observe also that the titles of some talks in the proceedings [22] differ from those listed in the conference report [4] and survey [21]. For instance, the papers of Freudenthal, von Neumann, and Stone in [22] are titled “Expansion of spaces and groups,” “The uniqueness of Haar’s measure,” and “Applications of Boolean algebras to topology,” respectively. Also, in [22], the exact title “Topological invariants of the classes of surface mappings” of Nielsen’s presentation is provided.

—

Note that Cohn-Vossen is classed among the speakers from the Soviet Union. He was barred from lecturing in Cologne in 1933 under the Nazi racial laws. After spending a year in Switzerland, he immigrated to the USSR at the end of 1934. Up to his death from pneumonia in 1936, he worked at the Steklov Mathematical Institute, first in Leningrad, then in Moscow. See in this regard the talk presented by Cohn-Vossen at the beginning of his work in Leningrad [11].

The talk by Gordon is also mentioned in the report by Tucker [31] and in the reminiscences of Hopf [17], while Whitney in his historical note [32] points out that he gave two talks at the Moscow conference.

Nevertheless, there is a reference to the “abstract” of talk 1 in [29].

We emphasize that each conference talk in the proceedings is in one of the four languages English, French, German, and Russian. For the reader’s convenience, we give all the titles in English.
Every author of a conference paper who recorded reminiscences about the conference remarked on its significant scientific impact. Many presentations presented results that later became universally known named theorems. But of all the innovations that were offered at the conference, the birth of cohomology theory presented in the talks of Kolmogorov, Alexander, and Gordon occupies a special place.

We remark that Alexander and Kolmogorov, simultaneously and independently, arrived at the identical construction of the cohomology ring, while Gordon’s definition was slightly different.5

The second greatest mathematical achievement of the conference, in Whitney’s opinion [32], was the connection between the homotopy and homology theories given in the talk by Hurewicz, which became a basic result of algebraic topology. Whitney remarked that Alexander, Čech, and van Dantzig “also said that they had considered or actually used the definition of Hurewicz.”

The third remarkable result described in [32] in detail is the introduction of the Stiefel–Whitney classes presented in the talks by Hopf (who discussed the results of his PhD student Eduard L. Stiefel) and Whitney.6

The results and theories presented at the conference made a huge impact on neighboring fields of mathematics. Here we mention the celebrated Bogolyubov–Krylov theorem (dynamical systems theory), the Leray–Schauder fixed-point principle (nonlinear partial differential equations), and Markov’s theorem (braid theory).

Let us compare the list of talks actually given with that in the scientific program of the conference, a copy of which was discovered by Albert Nikolayevich Shiryaev in Kolmogorov’s personal archive during the preparation of the three-volume Kolmogorov commemorative edition; now it is available in [27].

The tentative list of speakers in [27, pp. 590–593] does not contain the names of Efremovich and Sierpiński. Also, only one talk, number 43, by Whitney was announced. On the other hand, the participation of A. W. Ivanovsky (USSR), Chaim (Herman) Münz (USSR), Maxwell Herman Alexander Newman (UK), and Kurt Werner Friedrich Reidemeister (Germany) was expected. Further, one more talk by Bogolyubov was planned, and the second talk by Hopf had a different title.7

Besides the scientific presentations, the conference program contains notice of the special meeting of the Moscow Mathematical Society (September 5) dedicated to the memory of the outstanding mathematician Emmy Noether (1882–1935), whose works highly influenced the development of topology (see Aleksandrov’s speech at this meeting [5]).

It should be noted that in September 1935, the Bulletin of the American Mathematical Society published an announcement of the conference with the names of the American mathematicians who expected to attend and take an active part [10, p. 615]. In addition to the nine individuals mentioned above, that list contains the names of David Vernon Widder and Oscar Zariski.

The presence of Widder at the Moscow conference is confirmed by his own reminiscences [34, p. 82], while Birkhoff mentioned in the memoir [8, p. 45] that Widder attended the conference “informally” (without giving a talk).

As for Zariski, his is a more complicated case. Tucker claimed in [31] that Zariski gave a conference talk on algebraic geometry. This apparent contradiction can be resolved from Zariski’s biography [23], in which we can read [23, p. 60] that “Weil and Zariski (who had not been an official delegate) were invited by the mathematical department at the University of Moscow to give a series of lectures.”

In [6, p. 331], Aleksandrov mentioned Bronisław Knaster (Poland) among the speakers, which contradicts all the other sources. Moreover, we have found no documentary evidence of Knaster’s presence at the conference.8

We also mention the report by Borsuk [9] in which the number of speakers by country (except the USSR) is given. These data correspond to ours given above.

There were many conference attendees who did not give a talk, well-known mathematicians among them. For instance, present at the opening ceremony was Academician Nikolai Nikolaevich Luzin (see, e.g., the report [35] by Kazimierz Zarankiewicz, who was a member of the official Polish delegation).

Leonid Vitaliyevich Kantorovich (later winner of the 1975 Nobel Memorial Prize in Economic Sciences) writes in his reminiscences [19, p. 250],

I even thought about including a supplementary report at the forthcoming conference on topology in Moscow in September, but apparently ...became quite seriously ill. Although I attended the conference itself, I was not strong enough to prepare a contribution at an appropriate level.

We would now like to present the greatest curiosity related to the conference. In [32, pp. 96–97], Whitney provided a group photo of the participants with an (incomplete) description; see Figure 1. The man standing fifth from the right in the back row is identified as the Russian-American mathematician Jacob David (Yakov Davidovich) Tamarkin. This identification is repeated in Whitney’s collected papers [33] and in some other publications, such as the monograph [18] and until recently, the online archive of ETH Zurich [15].

We claim that this is a mistake. Tamarkin was a prominent analyst, but he never worked in topology and related fields (see [16]). Furthermore, Tamarkin left the Soviet Union in December 1924 illegally, crossing the border through the frozen Chudske Lake with the help of

---

5Freudenthal later proved that these constructions are isomorphic.
6In [32], Whitney explained that he decided to give “two shorter talks” under the influence of Hopf’s presentation.
7We emphasize that the number of talks announced in the program is also equal to 44.
8Prof. Jerzy Mioduszewski, a former student of Knaster, guesses that Knaster may have attended the conference informally.
smugglers (see [26]). Thus, it is highly unlikely that the Soviet authorities would have allowed the emigrant Tamarkin to enter the country. Moreover, as a former Menshevik (social democrat) who had opposed the Bolsheviks, Tamarkin would surely have been targeted by the Soviet secret police. Furthermore, as one who had feared arrest as far back as 1924, Tamarkin would not willingly have traveled to the USSR in 1935.

Note as well that Tamarkin was 47 years old in 1935 and was corpulent (see [30, p. 115] and Figure 2, left), whereas the man in the group photo, as shown in Figure 2, right, looks much younger and thinner. In addition, if one looks at two well-known photos of Tamarkin (Fig. 3 of 1914 and Fig. 4 of 1941), then the mistake in [32] becomes obvious.

Finally, as we have learned, Tamarkin participated in the meeting of the American Mathematical Society at Ann Arbor (September 10–13, 1935), and in particular, he gave a speech at a joint dinner of the AMS, the Mathematical Association of America, and the Institute of Mathematical Statistics on September 12 (see [24, p. 755] and [25, p. 32]). Obviously, at that time it was impossible to get from Moscow to Ann Arbor in several days.

**Figure 1.** First International Topology Conference in Moscow, 1935. First row, seated, left to right: K. Kuratowski (1896–1980), J. P. Schauder (1899–1943), S. Cohn-Vossen (1902–1956), P. Heegaard (1871–1948), J. A. Róźańska,9 J. W. Alexander (1888–1971), H. Hopf (1894–1971), P. S. Aleksandrov (1896–1982), P. A. Solov'yov (1906–1993).

Second row, standing, left to right: E. Čech (1893–1960), H. Whitney (1907–1989), K. Zarankiewicz (1902–1959), A. W. Tucker (1905–1995), S. Lefschetz (1884–1972), H. Freudenthal (1905–1990), F. I. Frankl (1905–1961), J. Nielsen (1890–1959), K. Borsuk (1905–1982), D. M. Sintsov (1867–1946), L. A. Tumarkin (1904–1974), M. A. Nikolaenko,10 V. V. Stepanov (1889–1950), E. R. van Kampen (1908–1942), A. N. Tikhonov (1906–1993).

**Figure 2.** Left: Jacob David Tamarkin. Right: This is not Jacob Tamarkin.

9Julia A. Róźańska was a topologist. A student of P. S. Aleksandrov, she was an associate professor at Moscow State University and a member of the Moscow Mathematical Society.

10Maria A. Nikolaenko was a geometer, an associate professor at Kharkov University.

So who is the mystery man in the group photo? To answer this question, we need to turn to the history of the Moscow
school of topology. The leader of Moscow topologists in the 1930s was Pavel Sergeyevich Aleksandrov. One of his favorite students was the talented Lev Abramovich Tumarkin (1904–1974), who established some fundamental results in dimension theory. In 1935, he became the dean of the Mechanics and Mathematics Faculty at Moscow State University. Thus, it seems rather natural to see Tumarkin among the conference participants as a hospitable host, even without having given a presentation.

Unfortunately, we do not have a photograph of Tumarkin from that time. But comparing the image from the group photo with the portrait of Tumarkin at the age 60 (see Fig. 5), we see that it could very well be the same person. Therefore, we conclude that Whitney was misled by the similarity of the surnames Tamarkin and Tumarkin.

In conclusion, we note that in Whitney’s description of the conference photo there were also three unknowns: in a private communication, Prof. Lech Maligranda identified these individuals as geometers from Kharkov: D. M. Sintsov, M. A. Nikolaenko, and P. A. Solov’yov. We can now provide a complete description.

ACKNOWLEDGMENTS

We are grateful to Lech Maligranda, who pointed out earlier unknown names from the conference photo and provided us with the paper [35]. We also would like to thank Jerzy Mioduszewski, Roman Duda, and Galina Smirnova for useful discussions, and Semën S. Kutateladze, Ignat Soroko, David Kramer, and the anonymous referee for valuable comments. The first author was partly supported by the “RUDN University Program 5-100.”

Darya E. Apushkinskaya
Saarland University
Saarbrücken, Germany
Peoples’ Friendship University of Russia (RUDN University)
Moscow, Russia
e-mail: darya@math.uni-sb.de

Alexander I. Nazarov
St. Petersburg Department of Steklov Institute
St. Petersburg State University
St. Petersburg, Russia
e-mail: al.il.nazarov@gmail.com

Galina I. Sinkevich
St. Petersburg State University of Architecture and Civil Engineering
St. Petersburg, Russia
e-mail: galina.sinkevich@gmail.com

REFERENCES

[1] J. W. Alexander. On the chains of a complex and their duals. Proc. Natl. Acad. Sci. USA 21 (1935), 509-511.

11In some sources, Tumarkin’s year of birth is erroneously given as 1901. We follow the information given in [7].
12More information about these persons can be found in [20].
[2] J. W. Alexander. On the ring of a compact metric space. Proc. Natl. Acad. Sci. USA 21 (1935), 511–512.

[3] J. W. Alexander. On the connectivity ring of an abstract space. Ann. of Math. (2) 37:3 (1936), 698–708.

[4] P. S. Aleksandrov. First international congress on topology. Uspekhi Mat. Nauk 1 (1936), 260–262 (in Russian).

[5] P. S. Aleksandrov. In memory of Emmy Noether, Uspekhi Mat. Nauk 2 (1936), 255–265 (in Russian). English translations in A. Dick. Emmy Noether: 1882–1935, pp. 153–179. Birkhäuser, 1981.

[6] P. S. Aleksandrov. Pages from an autobiography. II. Russian Math. Surveys 35:3 (1980), 315–358.

[7] P. S. Aleksandrov and A. N. Kolmogorov. Lev Abramovich Tumarkin (on his 60th birthday). Russian Math. Surveys 19:4 (1964), 161–163.

[8] G. Birkhoff. Mathematics at Harvard, 1836–1944. In Mathematics in America, Part II, pp. 3–58. Amer. Math. Soc., 1989.

[9] K. Borsuk. Międzynarodowa Konferencja Topologiczna w Moskwie. Wiadomości Matematyczne 41 (1936), 134–137.

[10] Notes. Bull. Amer. Math. Soc., 41:09 (1935), 615.

[11] St. Cohn-Vossen. A speech of S. Cohn-Vossen at the beginning of S. Cohn-Vossen’s USSR career. Available at www.mi.uni-koeln.de/Geschichte/COHN-VOSSEN,Stefan/PersonalRemarks.pdf.

[12] St. Cohn-Vossen. Bending of surfaces in the large. Uspekhi Mat. Nauk 1 (1936), 33–76 (in Russian).

[13] G. de Rham. Relations entre la topologie et la théorie des intégrales multiples. Enseign. Math. 35 (1936), 213–228.

[14] V. A. Efremovich. Topological classification of affine mappings of the plane. Sb. Math. 42(1) (1935), 23–29 (in Russian), 30–36 (in German).

[15] ETH-Bibliothek Zürich, Bildarchiv. Photograph of the First International Topological Conference is available at http://ba.e-pics.ethz.ch/index.jsp?locale=en#1559595297206_2.

[16] E. Hille. Jacob David Tamarkin—his life and work. Bull. Amer. Math. Soc. 53 (1947), 440–457.

[17] H. Hopf. Einige persönliche Erinnerungen aus der Vorgeschichte der heutigen Topologie. Centre Belge Rech. Math., Colloque Topologie, Bruxelles 1964 (1966), 440–457.

[18] I. M. James, editor. History of Topology. North-Holland, Amsterdam, 1999.

[19] L. V. Kantorovich. My journey in science (proposed report to the Moscow Mathematical Society). Russian Math. Surveys 42:2 (1987), 233–270.

[20] On the Kharkov geometrical school. www.univer.omsk.su/omsk/Sci/HkGS/hkgs3.html (in Russian).

[21] A. F. Lapko and L. A. Lyusternik. Mathematical sessions and conferences in the USSR. Uspehi Mat. Nauk 12:6(78) (1957), 47–130. (in Russian).

[22] The First International Topological Conference, September 4–10, 1935. Sb. Math. 1(43):5, 1936.

[23] C. Parkh. The Unreal Life of Oscar Zariski. Springer, New York, 2009. Reprint of the 1991 original.

[24] R. G. D. Richardson. The summer meeting at Ann Arbor. Bull. Amer. Math. Soc., 41:11 (1935), 753–763.

[25] K. Ross and J. Tattersall. Meetings of the MAA. Available at www.maa.org/about-maa/maa-history/celebrating-the-century/maa-meetings.

[26] T. Shaposhnikova. Three high-stakes math exams. Math. Intelligencer 27:3 (2005), 44–46.

[27] A. N. Shiryaev, editor. Kolmogorov. Commemorative edition in three books. Book 2. The braid of these running lines...Selected passages from the correspondence between A. N. Kolmogorov and P. S. Aleksandrov. Moskva: Fizmatlit “Nauka,” 2003 (in Russian).

[28] G. S. Smirnova. The First International Topology Conference. Moscow 1935. In Proceedings of the International Conference Analytical and Computational Methods in Probability Theory and Its Applications, pp. 187–191. RUDN, Moscow, 2017 (in Russian).

[29] F. Toenniessen. Topologie. Ein Lesebuch von den elementaren Grundlagen bis zur Homologie und Kohomologie. Heidelberg: Springer Spektrum, 2017.

[30] E. Tolsted. Reminiscences about Professor Ya. D. Tamarkin. Istor.-Mat. Issled. (2) 1:36, part 2 (1996), 108–118. Publication translation and notes by N. S. Ermolaeva (in Russian).

[31] A.W. Tucker. The topological congress in Moscow. Bull. Amer. Math. Soc. 41:11 (1935), 764.

[32] H. Whitney. Moscow 1935: Topology moving toward America. In A Century of Mathematics in America, Part I, volume 1 of Hist. Math., pp. 97–117. Amer. Math. Soc., 1988.

[33] H. Whitney. The Collected Papers of Hassler Whitney, volume I of Contemp. Mathematicians. Birkhäuser, 1992.

[34] D. V. Widder. Some mathematical reminiscences. In A Century of Mathematics in America, Part I, volume 1 of Hist. Math., pp. 79–83. Amer. Math. Soc., 1988.

[35] K. Zarankiewicz. Międzynarodowa Konferencja Topologiczna w Moskwie. Matheesis Polska 10:5–6 (1935), 114–116.

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.