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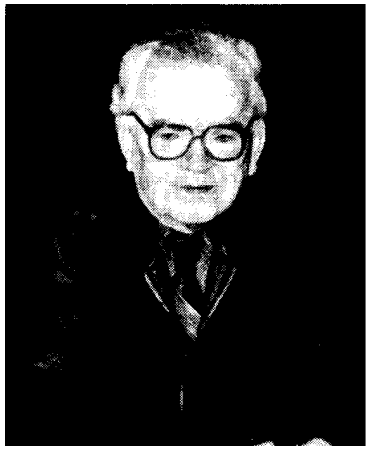
Mikhail Mikhailovich Postnikov (on his 70th birthday)

Mikhail Mikhailovich Postnikov became 70 years of age on 27 September 1997. He is a leading scientist at the Steklov Institute of Mathematics, professor of mechanics and mathematics of the Moscow State University (MSU), and a higher doctor of physical-mathematical sciences. One of the greatest achievements of the Moscow school of topology, the construction of the theory of "higher obstructions", is associated with his name (Postnikov systems).



Postnikov was born near Moscow in the town of Shatura (where his father worked as an engineer at an electric power station and his mother was a school teacher; in 1937 his father was arrested and executed, but he was later exonerated). Postnikov became a mathematics student during the war, immediately after finishing eight years of schooling in the city of Perm. He transferred to the Faculty of Mechanics and Mathematics of MSU in 1943; Sofia Alexandrovna Yanovskaya played a major role in this. In 1945 Postnikov became a Ph.D. student at MSU, and in the summer of 1947 he moved to the Steklov Institute and finished his Ph.D. there in 1949. While at MSU Postnikov passed exams in as many as 17(!) special courses. If this is not a record for the faculty of mechanics and mathematics, it is certainly very close. Since 1949 Postnikov has worked in the Steklov Institute.

Postnikov regards Lev Semënovich Pontryagin and Aleksandr Gennadievich Kurosh as his scientific teachers. The former was Postnikov's Ph.D. supervisor and drew him to work on the homotopy classification of continuous maps. In 1945 Pontryagin classified the maps from a 3-dimensional polyhedron into the 2-sphere. In his Ph.D. thesis, Postnikov classified the maps from a 3-dimensional polyhedron into a simply-connected space.

Further work of Postnikov in homotopy theory involved the construction of the theory which we have already mentioned above, the theory of "higher obstructions". In those days one talked about a theory of "natural systems", but now they are called "Postnikov systems". In some sense this theory gives a discrete algebraic description of geometric homotopy problems, thereby reducing the latter to purely algebraic questions. The significance of results of this type is that (as we began to understand around the 20s and 30s), a number of important geometric and even

analytical problems turn out to be homotopically stable, and thus can be answered in terms of the corresponding algebraic invariants.

The main problem of homotopy theory is to classify, up to homotopy equivalence, cell complexes and to classify, up to homotopy, continuous maps between them. Hopf and Whitney obtained the first results in this area. They described the set of homotopy classes of maps of an n-dimensional cell complex into an n-dimensional sphere. Roughly speaking, subsequent developments went in two interweaved directions. The first involved getting hold of concrete data on the homotopy groups of spaces (in the early stages, Pontryagin obtained several remarkable results closely connected with differential topology, which was subsequently developed). The second was the development of the theory of obstructions, and it was in this area that Postnikov worked. Soon after the work of Whitney, J. H. C. Whitehead remarked that Whitney's method allows the description of maps from an n-dimensional cell complex into an n-connected space. By 1945, thanks to the work of Pontryagin (who was the first to consider obstructions and difference cochains), Eilenberg and MacLane understood that these methods solve the problems of classifying maps from an arbitrary cell complex into an Eilenberg-MacLane space (a space which has just one non-trivial homotopy group, and up to homotopy equivalence, this space is uniquely determined by the group). Then Eilenberg, MacLane and Zilber solved the problem of the homotopy type of a space with two non-trivial homotopy groups. It turned out that these groups do not determine the homotopy type uniquely; an extra invariant is needed.

Postnikov generalized this problem as far as possible: given a cell complex with known homotopy groups, which invariants must be added in order to determine the homotopy type of this space? Such a system of invariants is called a "Postnikov system". We note that he anticipated Eilenberg and Zilber in this. The visit to the USSR of the outstanding English mathematician J. H. C. Whitehead (1952) played an important role in spreading Postnikov's ideas. Whitehead began his talk in Moscow by saying "... I will talk about the works of Postnikov, because they are the greatest achievement in algebraic topology in recent years".

Postnikov's results were formulated in the language of simplicial complexes, conveying information about the skeleton of the cell complex in a form convenient for algebraic and combinatorial calculations. H. Cartan and J.P. Serre reformulated these results in the language of fibrations. In generalizing these results Moore suggested representing a continuous map as a composition of fibrations whose fibres are Eilenberg-MacLane spaces.

Postnikov received the Lenin Prize in 1961 for his work in homotopy theory. Later he worked successfully with M. A. Evgrafov in another area – complex analysis and differential equations (the asymptotics of Green's functions of higher order parabolic equations, and properties of the embedding of a Teichmüller space into the Siegel upper half-plane).

Postnikov's role in Russian science is more than just that of a research mathematician. From 1954 until 1960 he lectured in the higher geometry and topology department at MSU. His brilliant lectures, once heard, were never forgotten. He produced a great many text-books in different branches of mathematics, mainly on algebra and geometry, but also including number theory. However, his principal teaching role was in algebraic topology. His algebraic topology research seminar

has been running in the faculty of mechanics and mathematics of MSU for about 35 years (for the past 20 years, jointly run with A. V. Chernavskii). Almost all Moscow-based specialists in this area, and some from other cities, are either students of Postnikov, or students of his students. His students include a Fields medallist and holder of the Lenin prize, academican S. P. Novikov, and also academician A. A. Bolibrukh, D.Sc.s A. F. Kharshiladze, Yu. B. Rudyak, A. V. Pazhitnov, N. Savel'ev, and a number of other scientists.

The interests of Postnikov are not restricted to pure mathematics. He has assembled a huge collection of puzzles and games. Postnikov's articles and television appearances concerning the reform of the education system have made a large impact on society at large.

Postnikov is celebrating his 70th birthday as an active research mathematician, admired by his grateful students, and held in respect by his colleagues. We wish him a long and creative future.

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