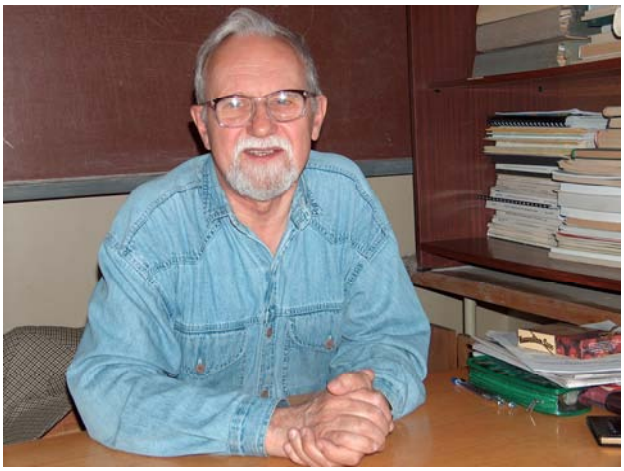
Professor Mikhail N. Koshlyakov

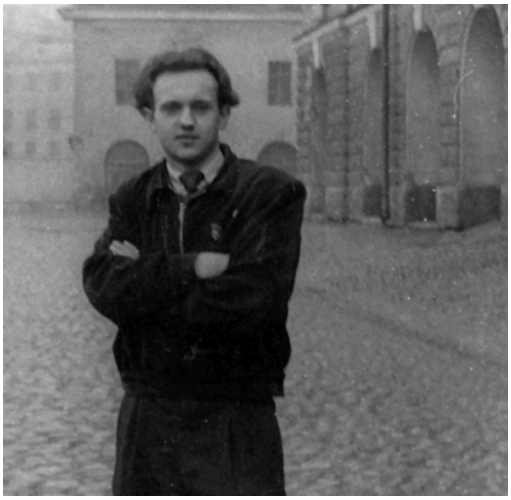


Professor Mikhail Koshlyakov in his office at the P.P. Shirshov Institute of Oceanology (Moscow, Russia, 2005).

Misha Koshlyakov was destined for a career in science from his early childhood. Born November 29, 1930, in Leningrad (St. Petersburg), Russia, into a family with a long history of scientific tradition, Misha was immersed in an atmosphere of teaching and science. His father, Nikolai Koshlyakov, a well-known Russian mathematician and author of several textbooks on partial differential equations, brought him up to admire the power of mathematics to explore natural phenomena. His grandfather, a prominent Russian historian, gave him an understanding of the importance of intuitive methods in studying complex systems. The research atmosphere, the eternal variability of the Baltic Sea, the sounds and smells of the port of Leningrad, and the novels of Jules Verne combined favorably in Mikhail's decision to be an oceanographer.

Mikhail as a boy with his father (second from left) at the May Day celebration in Leningrad (1940).

His way to becoming a scientist was not straightforward. At the age of ten, Mikhail's childhood was interrupted by the war. A few months after the German invasion in December 1941, Leningrad was besieged by the Nazis who brought cold and starvation to its inhabitants. But an even stronger blow hit the family when they were evacuated to Siberia in 1942; Mikhail's father was falsely accused of "political terror" and sentenced to death. Luckily, the sentence was replaced by 10 years at a Gulag camp in the Ural mountains. Nikolai Koshlyakov barely survived the war years. In September of 1945, he was transferred to the Gulag science camp (the so-called *sharashka*) as a labor force for military projects. Despite the hardships that he and his family experienced in Leningrad, and later in Siberia, Mikhail kept studying eagerly and graduated from high school with honors (gold medal) in 1948. That same year he entered the School of Geography of the Leningrad State University. In 1951, luck was with Mikhail's family again when his father was released from the *sharashka* before the end of his term, given the highest government awards, and eventually declared innocent of whatever crime that had caused his incarceration.



In the courtyard of the Leningrad State University (1952).

Meanwhile, Mikhail was a student assistant on his first expedition to the Sea of Okhotsk on board the famous R/V *Vityaz*. Two months of hands-on probing the rough sea gave Mikhail confidence in his choice of profession and addicted him to experimental field work for the rest of his life. In 1953, Mikhail graduated with honors from the Leningrad State University with a Master's degree in oceanography. His research was awarded first prize at the university competition of graduating diploma works. That same year the Koshlyakovs moved to Moscow, where Mikhail got a Ph.D. student position with Professor Vladimir Shtokman, a prominent Soviet geophysicist, who was a co-founder of the Shirshov Institute of Oceanology (SIO) of the USSR Academy of Sciences – the leading Soviet oceanographic institution. Mikhail was lucky to start his career under the leadership of Professor Shtokman, whose way of thinking, exceptional human qualities, and delicate style of scientific guidance provided Mikhail with high standards that he tried to keep through his whole life in science.

The 1950s and 1960s were the golden years of field oceanography, when new discoveries were awaiting scientists at virtually any point of the World Ocean, and governments were just starting to pour money into oceanographic research. During these years Mikhail was deeply involved in the SIO expeditions aboard the R/V *Vityaz*. Among the most challenging of his experiments were studies of the large-scale circulation of the equatorial Pacific, the investigation of the New Guinea coastal current, and tasting kava[1] with a tribal leader on the Fiji Islands. Mikhail's Ph.D. thesis dealt with a diagnostic analysis of the wind-driven and geostrophic currents of the Pacific Ocean. By the end of the 1950s and in the beginning of the 1960s, observational oceanographers started to accumulate evidence to contradict the general view of the World Ocean as a system of deterministic large-scale currents. Moored observations, repeat sections and floats revealed open-ocean variability at scales of several tens of kilometers and periods of 3–10 days, but the three-dimensional (3-D) structure of these features was largely unknown. As an observational oceanographer, Mikhail Koshlyakov became a proponent of the idea that mesoscale eddies were the dominant component of the open ocean currents. He was one of the most active organizers and participants of the SIO expeditions to the Arabian Sea (1967) and Tropical Atlantic (POLYGON-70). These unique projects conducted synchronous multi-ship hydrographic surveys and *in situ* moored velocity measurements that enabled scientists to directly map mesoscale eddies and estimate their dynamical parameters. Soon after that, as a lead expert in the mesoscale eddy survey, Mikhail participated in the Mid-Ocean Dynamic Experiment (MODE) on board of the U.S. research vessels *Chain* and *Researcher* (1973). A few years later, he was on the organizing and scientific steering committees of the joint U.S.–Soviet POLYMODE experiment, and headed one of the flagship expeditions of the Soviet component of the POLYMODE in the Sargasso Sea (1978).

Field studies of mesoscale eddies became the major focus of Mikhail's research in the next decade. He was one of the organizers and participants of massive multi-ship expeditions to the Tropical Atlantic (Mesopolygon-85) and mid-latitude Pacific (Megapolygon-87). Operating in accord with each other, the research vessels deployed large mooring arrays (70–120 moorings) and conducted a series of coordinated hydrographic surveys of the regions that documented the complex 3-D structure and evolution of the mesoscale eddy fields, revealing details of their dynamics and interactions with jets, fronts and other eddies. Polygon's observations of mesoscale eddies provided the first observational evidence of open-ocean Rossby waves, their statistics and the peculiarities of their behavior in highly non-linear regimes. With a team of co-workers that he assembled in his group, which later transformed into the Laboratory of Marine Currents, Mikhail Koshlyakov obtained a significant number of fundamental scientific results, related to the formation and dynamics of the eddies, their interaction with the large-scale oceanic circulation, and their properties in the light of the theory of quasi-geostrophic turbulence. Mikhail Koshlyakov is a co-author of the book "*Mesoscale Eddies in the Ocean*", whose several editions were published in the USSR and abroad. He is a contributor to the fundamental encyclopedia "*Oceanology*", whose ten sizable volumes provided the most complete overview of achievements in all branches of oceanology by 1978. Mikhail is also the author and co-author of more than 100 scientific papers.

Frisbee tossing during a break in the POLYMODE planning committee meeting (Moscow, 1975). From left to right: A. Sarkisyan, V. Kamenkovich, V. Kuksa, M. Koshlyakov, unidentified person, W. Simmons, F. Webster.

Koshlyakov discussing red-hot POLYMODE data with (left to right) Curt Collins, Vitaliy Titov (beside post, background), Abram Yampol'skiy, and Allan Robinson on board the Soviet research vessel Akademik Vernadskii *(Philadelphia Harbor, 1978).*

In the 1980s and in the beginning of the 1990s, Mikhail's scientific interests shifted to the Southern Ocean – a large body of water that even nowadays, in the era of satellite oceanography, is relatively unexplored. In 1982, he organized and headed the expedition that supplied hydrographic and current meter data proving the complex multi-jet structure and strong temporal variability of the Antarctic Circumpolar Current in the segment between Africa and Antarctica. In 1991–92, Mikhail headed a large World Circulation Experiment Expedition (WOCE S4) to the Pacific sector of the Antarctic. The expedition faced many logistic problems since it was held at the time of collapse of the Soviet Union. Despite these difficulties and severe weather conditions on the late return from Antarctica, the observational part of the cruise was

[1] *kava – a soporific drink made from the root of a plant related to the pepper tree. Kava root is chewed into a pulp by women, spat into a container and then drunk.*

successful. However, bad luck came again in the form of a heavy storm on the way to New Zealand, where Mikhail severely broke his hip after a monster wave hit the side of the ship. Fortunately, the urgent and sophisticated surgery he experienced at a Wellington hospital was successful.

Heading the 1983 New Year party in the expedition to the Southern Ocean, 52.30°S, 25.00°E.

Perestroika brought a lot of problems to fundamental research in Russia, and many of Mikhail's co-workers either moved abroad or quit oceanographic research. As a true patriot of Russian science, Mikhail is working to maintain the high standards of scientific research at the Shirshov Institute of Oceanology. Being a Professor at the Department of Ocean Thermohydromechanics of the Moscow Institute of Physics and Technology, he lectures in general oceanography and supervises a new generation of students. Over the decades his brilliant courses lured hundreds of young people, many who were seeking subjects for their life's work, into becoming dedicated oceanographers. After the collapse of the Soviet Union, he organized a new team of young researchers with a passion for observational work in the rough waters of the Southern Ocean. In recent years they have obtained a number of important results on hydrology, dynamics and climate of the Southern Ocean, that include discovery and quantification of the transport in the Pacific–Antarctic cell of the global conveyor belt and the mechanism of formation of the Antarctic Intermediate Water.

Despite a total of four and a half years spent at sea, Mikhail enjoys the rare good fortune of true family happiness. Natalia Evgenievna, his spouse and closest friend for 47 years, is proud of Mikhail's mission in science and is doing her best to fence him from routine problems of everyday life. She is known and loved by all students, friends and colleagues of Mikhail. Her open mind and sincere compassion combined with the simple pragmatism of a former construction superintendent, and fringed with her outstanding culinary art, make visits to their home unforgettable. Mikhail and Natalia are very proud of their son Evgeniy, and look forward to every meeting with their beloved grandson.

Mikhail Koshlyakov and his wife Natalia (St. Petersburg, 2004).

Mikhail Nikolaevich Koshlyakov gave 53 years of his life to the Shirshov Institute of Oceanology, its development and its activities. He was especially active in promoting international collaboration and served as a member of many working groups in the Scientific Committee of Oceanic Research (SCOR), within the World Climate Research Program (WCRP), WOCE, CLIVAR, POLYMODE, and others. For his contributions to the understanding of the ocean, Mikhail Koshlyakov was awarded the Makarov Prize (the highest Russian oceanographic award), the State award "Honored Scientist of Russian Federation", Academy award for outstanding publications, and others. Results of Mikhail's work on mesoscale eddies in 1967–1970 were qualified as a discovery by the USSR State Committee for Discoveries and Inventions.

Mikhail never used political tools to build his career; among his colleagues he is known as an honest, friendly, open-minded and helpful person who never rejected fulfilling routine work, be it the edition of the POLYMODE Atlas, providing assistance in a culinary contest with Allan Robinson, taking responsibility for logistics of a large expedition, or helping Henry Stommel to get rid of an old stump from the back yard. As a true altruist, Mikhail has a passion for working with students: dozens of Master and seven Ph.D. theses were defended under his guidance. Many of his former students are now working in the oceanographic laboratories around the world but keep in touch with their teacher, remembering him as an extremely warm, generous, tactful and responsive person. At the age of 75, Mikhail Koshlyakov keeps active in science. His curiosity, original way of thinking, and delicate manner of scientific guidance are among his best qualities highly appreciated by colleagues. There is no doubt that Mikhail Nikolaevich Koshlyakov will continue to make important contributions to the research at SIO and the oceanography community in general.

This article was the result of a collaboration by the following contributors: A. Groto (Shirshov Institute of Oceanology), N. Maximenko (University of Hawaii), D. Nechaev (University of Southern Mississippi), G. Panteleev (University of Alaska), T. Sazhina (Newspaper "Vedomosti", Moscow), A. Shcherbina (Woods Hole Oceanographic Institution) and M. Yaremchuk (University of Hawaii).