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### The researchers of the Melnikov Permafrost Institute of SB RAS as the basis for the modern «Arctic breakthrough»



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#### Abstract

Scientists at the Permafrost Institute of the USSR made a comprehensive research in the Arctic and the Arctic shelf in the 60-es of the XX century. For several decades monitored the unique natural phenomena inherent in the Northern Territory. On the basis of these data, as well as through the work of the Institute of the modern expeditions with foreign participants was possible to made 'Arctic breakthrough' and the construction of a powerful research station on the island Samoilovsky.

**Keywords:** *Permafrost Institute, the research in the Arctic and the Arctic shelf, academician P. I. Melnikov, Professor M. N. Grigoriev.*

The relevance of the studies of the Arctic today undisputed, moreover, constantly emphasized at the highest level. This is due to the geopolitical interests of Russia and other countries. Determine the future of the Arctic shelf of the world economy, as it is here focused abundant oil and gas. When it comes to the contribution of specific institutions in the study of the Arctic, it is found that the names of the first enthusiast and promoter of this study are slowly forgotten. Meanwhile, a number of institutes of the Russian Academy of Sciences for decades to accumulate data and to monitor the unique natural phenomena inherent in the Northern Territory. One of these institutions – is the Permafrost Institute named Melnikov Russian Academy of Sciences in Yakutsk.

Yakutian Research Station of the Permafrost Institute, Academy of Sciences of the USSR (YANIMS) was founded in 1941. Its task was including the study of the Arctic and the Arctic shelf by the expeditionary forces. YANIMS employee and director of the Northern Expedition N.F. Grigoriev recalled: "... the study of the permafrost in the Arctic was just beginning. Extremely interesting testing ground for the work in the direction of Lena's Delta. In the first field season in 1946 was held in the delta of the Lena River permafrost studies with manual drilling of the shallow wells, a description of the structure and the composition of the frozen ground, as well as their

temperature ". [1] In 1947 he conducted the second field season of the Northern experiments. The results showed that the work on the Lena River is very promising. In 1950, N.F. Grigoriev completed his thesis on "The role of permafrost and ice deposits in shaping the landscape of the delta of the Lena River," which he successfully defended at the Institute of Geography of the USSR.

In 1956 YANIMS was transformed into the North-East Branch of the Institute of Permafrost of V.A. Obruchev USSR. On the basis of the potential branch in 1960, was created in Yakutsk Permafrost Institute (IMZ), Academy of Sciences of the USSR. Director Melnikov been invited to Yakutsk experienced professionals and graduates of the central universities. Institute has become a leading research institution geo-cryological profile comprehensively study the problems of the Arctic. Research topics defined unique natural phenomena of Yakutia.

An important part of the work was the study of the evolution of IMZ permafrost in the coastal shelf zone of the Arctic seas. One of the "pioneers" in the study of a Doctor of Geographical Sciences FE ERA. His monograph "thermo variety of the marine shores" (Novosibirsk, 1980) is the world's generalization of the results of studies of fracture processes coasts composed of permafrost, and one of the most cited publications are now in the world on the development of the Arctic coast. [2]

Monograph by M.K. Gavrilova "The radiation of the Arctic Climate" in 1966 was translated into English and published in the USA. Since that time, M.K. Gavrilova is an indispensable party to the international forum and a member of the international scientific community studying the climate changes and its effects on the permafrost. Textbook of Doctor of Geographical Sciences MK Gavrilova "climate of the cold regions of the Earth" printed in the several editions. [3]

Academician P.I. Melnikov researched the Arctic as a testing ground for the large-scale research collaboration. In 1973, in Yakutsk, the II International Conference on Permafrost. The participants saw the unique permafrost "Mammoth Mountain" on the river Aldan, visited other natural features of the Arctic territory of Yakutia. The conference demonstrated the opportunities to bring together scientists from different countries to meet the challenges of the Arctic shelf, the environment of the North, the development of its rich natural resources. [4]

In the early 70's P.I. Melnikov came with the proposal in the USSR SCST the need to study the dynamics of the Arctic permafrost. Although the initiative was not supported by the Academy of Sciences of the USSR, the concept of monitoring permafrost IMZ Lena-AMGA realized in expeditions with the international participation. Yakutian Permafrost team has undertaken extensive research on the regional permafrost coast and shelf of the Arctic Ocean [5], which enabled the Institute to carry out a number of international events, including the International Symposium

"Geocryological research in the Arctic" (Yamburg, 1989). Academician P.I. Melnikov proposed the idea of an International Arctic Centre, the prototype currently in the force of the Northern Forum. [4] In his view, the function of this center was to be the development of the analytical information about the Arctic that promotes the adoption and the implementation of the political decisions with minimal risk. At the same time focus was to be the focal point of the integrated research, both domestic and international groups. Although the idea of Melnikov not then realized, joint research carried out at the beginning with their American counterparts, and then, in the mid 90's they were joined scientists from Germany and Japan.

In 1994 the project started between Russia and Germany to study the natural environment of the Laptev and East Siberian in oceanography, biology and climatology. His work was coordinated GEOMAR - scientific engineering company in Germany. The objective of the project was to study the Arctic, which would allow judging the natural mechanism of the formation and destruction of the ice complex, as well as changes in climate and physiographic conditions in northern Central Siberia, and in the coastal zone of the Arctic basin. [6]

The team of the scientists IMZ RAS studied the conditions for the formation of the underground ice complex of the Arctic lowlands and determined the speed of the modern destruction of the coast of the northern seas. Studies foot ice complex on the shores of the Laptev and the East Siberian possible to refine the data on the geological age of the complex. As a result of stationary observations at key locations around the coast of the Laptev and East Siberian identified the rate of destruction of the coastal zone. [7]

To the knowledge of the natural environment of the coastal zone of the Arctic branch connects Potsdam Institute of the Polar and Marine Research, Alfred Wegener, whose director G. V. Hubert since 2008 is the President of the International Permafrost Association. The interest of German researchers in the Arctic due to several factors: First, geopolitical, and secondly, scientific (in Germany there is no natural site for Arctic research.) First, work was carried out on the Taimyr Peninsula and the northern lands, and then in the Arctic region of Yakutia. In 1998 began to work the Russian-German expedition "Lena." Institutions-organizations are the Institute of Permafrost expedition named Melnikov RAS and the Arctic and Antarctic Research Institute of Roshydromet.

One of those expeditions was to study gas emissions from permafrost soils on the island Samoilovsky in the delta of the Lena River. There was a scientific station. However, the conditions of the expedition at the station "Samoilovsky Island" were cramped. First Station "lodged" in the house of Ust-Lena Reserve, and then placed in the extension of several rooms. Gradually, the station turned comprehensive studies of the environment, including climate, permafrost, geomor-

phology, micro-and macrobiotic, hydrological, and many other areas. Scientists working at the station Russian research institutes and universities in Moscow, St. Petersburg and Murmansk. Siberian Branch of the Russian Academy of Sciences institutes was: Permafrost, biological problems permafrost (Yakutsk), Forest (Krasnoyarsk). [8]

From IMZ in this project worked a group of the staff and of the graduate students under the direction of Doctor of Geographical Sciences M.N. Grigoriev. That he was in the Siberian Branch of RAS coordinator of the Russian-German Arctic expedition "Lena." A graduate of the Moscow State University (1981), a young scientist has grown into a major specialist cryogenic geomorphological processes in the coastal shelf of the Arctic region of the Eastern Siberia under the influence of his father's scientific interests of N.F. Grigorieva and the chief of cryogenic laboratory IMZ-F.E. Are.

M.N. Grigoriev published a monograph "Krio-morfogenez in the mouth area of the Lena River" (Yakutsk, 1993), co-authored several papers published in Germany. One of them – is the "expedition" Lena - Anabar 2003 "published in English in 2004. Her co-authors on the Russian side were M. Grigoriev and V. Kunitsky. The participant of the dozen Arctic expeditions M. Grigoriev developed a scientific concept of the development, the current state of the dynamics of the coastal shelf of the Arctic seas of the Eastern Siberia.

The international project largely relies on the reserve, which was established in IMZ in the previous years by many generations of the researchers. Lower reaches of the Lena River and the shores of the Arctic coast has been studied previously mentioned staff IMZ N.F. Grigoriev, F.E. Are, M. Grigoriev and Vladimir Kunitsky, who published a monograph "Kriolitology of the lower reaches of Lena" (Yakutsk, 1989). The data accumulated by the international expedition to the station "Samoilovsky Island" in 1998, will assess the state and the evolution of the natural environment of the Arctic zone of the Eastern Siberia in a changing climate. Results of the studies presented at international conferences and published in joint ventures with foreign researchers of the books.

It should be noted that in recent years, the foreign experts are increasingly active in the study of the Arctic, and international cooperation has reached a new level. The efforts of both Russian and international community implemented the major projects for the study of the Arctic shelf and Arctic seas, permafrost conditions, and other problems in the Arctic, and these projects have to allocate more financial resources. For a long time the projects were financed mainly by the foreign partners. However, in recent years, the cooperation is to study the Arctic on a parity basis. A striking example is the creation of a modern plant on the island Samoilovsky.

In August 2010, the Russian Prime Minister Vladimir Putin visited the hydro-meteorological observatory in the village of Tiksi and the research station on the island Samoillovsky. On the outcome of the years of work on the research station he was told, along with German colleagues employee IMZ M. Grigoriev and graduate A.A. Urban, A. Sandakov, A.M. Cherepanov. Vladimir Putin has been demonstrated the most striking results of the study of the Arctic zone of Yakutia. M. Grigoriev recalls: "During the tour of the island, we gave the prime minister some explanations, such as: how many hundreds of meters beneath our feet permafrost as polygonal form of education, etc. Then there was a long, about an hour, round table. Basically, on the theme of science, communication was quite alive - in its course and the question of the necessity of building a new station at Samoillovsky "[9].

The results of the work of the international expedition "Lena" was found to be very important, and their direction - promising. Following the visit of Vladimir Putin decided to build a new modern Russian-German research station (NICs) on the island Samoillovsky to strengthen the international efforts on the state and the evolution of the Arctic environment.

V.V. Putin also instructed the government of Sakha (Yakutia), with the participation of Russian Academy of Sciences to develop a program to revive the village of Tiksi, including the creation of a permanent Arctic research center for basic and applied research in the Eastern Arctic, and the definition of its main research directions, the implementation of which should be with the active involvement of the institutes of the Russian Academy of Sciences and other research institutions of Russia.

After the visit of Vladimir Putin's events began to move very rapidly. In order to the Government of the Russian Federation on October 18, 2010 Prime Minister Vladimir Putin ordered the relevant ministries in 2011 to provide the necessary financing for the plant on the island Samoillovsky and Spetsstroy Russia called for the design and construction of the station, with the participation of Sakha (Yakutia) and the Russian Academy of Sciences. Decree of the Presidium of the Russian Academy of Sciences on November 19, 2010 in the Siberian Branch established a commission headed by the Acting Chairman of the Presidium of the Yakutsk Scientific Center RAS corresponding member of AF Safronov. By IMZ it included PhD R. Zhang and M. Grigoriev [10]. The Commission agreed on the terms of reference for the design, and then the project of a new hospital. [11]

In December 2010, M. Grigoriev as the biggest expert on the international cooperation in the Arctic, addressed a meeting of the Presidium of the Russian Academy of Sciences in Novosibirsk, with a detailed report on "Dynamics of permafrost coastal shelf zone of the seas of East Si-

beria." He summarized and outlined prospects IMZ research on the topic, stressing that the institution is working in the Arctic, with the 60-ies of the last century. In discussing the report, the Bureau emphasized the importance of this work in connection with the inevitable in the near future, oil and gas output in the Arctic offshore and came to the conclusion that the formation of a unified program of Russian Academy of Sciences for the Arctic [12].

In early March 2011 (Yakutia) an official visit to the Vice-President of Russian Academy of Sciences, Chairman of the Siberian Branch of the Russian Academy of Sciences Academician ALAseev and the Deputy Chairman of the SB RAS, Director of the Institute of Petroleum Geology and Geophysics name Trofimuk (IPGG) SB Academician M. Èpov. When discussing the development of the scientific and technological capabilities with the management of Sakha (Yakutia), the parties have agreed that in August 2011, will hold another meeting to discuss the construction of a research station on the island Samoilovsky (based on hospital IMZ). It was also agreed to collaborate in the organization of the Center of advanced development of the Arctic zone of the Russian Federation in the village of Tiksi. [13]

March 21, 2011 the Resolution of the Government of the Russian Federation "On the implementation of the public investment in the design and the construction of a research station on the island Samoilovsky and its subsequent use." It prescribes the highlight of the federal budget in 2011-2012 half a billion rubles to organize the construction of the hospital and the necessary equipment. The resolution also contains an item on the transfer station built Sciences. However obscure the question remains: which institution Sciences planned to submit a new hospital and what means to carry out its current contents. [14] It seemed obvious that the work will be coordinated by IMZ RV as one of the main representatives of the Russian side in international projects implemented in the island Samoilovsky for many years. However, the events developed differently.

In early August 2011, according to the March agreements and by the President of the Sakha Republic (Yakutia), EA Borisova, in Yakutsk, a joint meeting of the Presidium of the Russian Academy of Sciences and the Government of Republic of Sakha (Yakutia). To participate in the meeting were invited leaders and leaders of the science centers in Novosibirsk, Tomsk, Kemerovo, Tyumen, Irkutsk, Krasnoyarsk, Ulan-Ude, Vladivostok, Moscow and other Russian cities, as well as Germany. [15] In Yakutsk's President of the International Permafrost Association and director of the Potsdam branch of the Institute for Polar and Marine Research Professor Alfred Wegener G.V. Hubert. At a round table was organized by a comprehensive discussion of the problems of the Arctic. In the free discussion and exchange of views was understood that the construction of the research vessel

"Island Samoilovsky" is necessary for the consolidation of research institutes of the organization of complex research in little-studied the East Siberian Arctic region, as well as perform basic and applied research. [16]

With the report on the characteristics of the islands and the surrounding area Samoilovsky delta of the Lena River, as well as the results achieved by the study of the Arctic using the previously of the existing station on the island Samoilovsky-the Deputy Director for Science IMZ MN Grigoriev. The roundtable participants recognized the uniqueness of the ongoing collaborative research expedition "Lena" a long-standing partner of the expedition, Professor G. V. Hubert looked forward to the continued participation of the Institute in the research on the new station with the appropriate share of the financing of operating costs.

Following the discussion of the problems of the Arctic Resolution of the Presidium of the Russian Academy of Sciences on August 8, 2011, which referred to the need to develop a program of the research in the Arctic, based on the research vessel "Island Samoilovsky" involving the regional branches, the Siberian and the central universities, and other interested organizations in the country. The aim was to finally establish jurisdiction Research Station RAS and determine its status, assign management of NIS, enter to the government with a proposal to target its funding costs since 2012. [10]

In September 2011, M. Grigoriev gave the interview to the Public Relations Center of the Russian Academy of Sciences, and told how it all began. He noted that the first joint expedition "Lena" was held in 1998 and that the island Samoilovsky - only part of the mission, which forces scattered the delta of the Lena River and the coast of the Laptev Sea. Members of the expedition, a large amount of data on the status and the evolution of the region's natural environment. Recent monograph on the work of the expedition – is the «System of the Laptev Sea and the adjacent Arctic Seas" (2009) and the "State of the Arctic coast" (2011) - in Russian and English languages. A database on the Arctic coast across the Arctic Ocean, which is available on the website of the Institute of Polar and Marine Research, Alfred Wegener. In this case, the scientist said that the station on the island Samoilovsky unlikely to play a role of a transit base for the expeditions and other groups which do not operate on the study of the problem is in the area. [9]

In October 2011, in Yakutsk held a meeting of the Presidium of the Russian Academy of Sciences and a round table with the participation of academics A.L. Aseev and M.I. Epova. Yakutian permafrost researchers told about the danger with the anticipated influx on the island Samoilovsky because its size is extremely small (2.5 x 2.8 km) and do not take time over two dozen people. Academician M. Èpov proposed to establish an international working group to develop a



common research programs in the Arctic, and the vessel "Island Samoilovsky" to develop those areas that are specific to this unique place, not bringing back human and technological changes. To provide year-round operation of NIS participants "round table" decided to seek additional financing to the Russian Ministry of Education, Bureau of Sciences and the Government of the RS (I) [14].

In December 2011, during the General Meeting of Sciences in Moscow, was held the meeting with the government and with the president of the Siberian Branch of the Sakha Republic (Yakutia) E.A. Borisov and they discussed the mechanisms for the effective utilization of the scientific capacity of the institutions of the Yakut Scientific Center of the Russian Academy of Sciences in the socio-economic development of the republic, and the erection of a new research vessel on the island Samoilovsky.].

In March 2012 in Yakutsk again arrived Academician A.L. Aseev and M. Èpov who informed the President of Sakha (Yakutia) E.A. Borisov about the decision of the Presidium of Russian Academy of Sciences: as the station goes to the jurisdiction of the Siberian Branch, it will make the balance holder Novosibirsk Institute of Petroleum Geology and Geophysics name Trofimuk. In this case, the Director of the Institute, Academician M. Èpov assured the President of Sakha (Yakutia), which further station, has to become subordinated Yakut Scientific Center of the Russian Academy of Sciences, "a station on the balance of the Institute of Petroleum Geology and Geophysics - this is just an intermediate step. We plan to submit it to the jurisdiction of the Yakut "[17].

At the General Meeting of the Siberian Branch of the Russian Academy of Sciences in April 2012, Chairman of the SB RAS A.L. Aseev said: "The new research station on an island in the delta of the Lena Samoilovsky built on the direct instructions of Vladimir Putin. This place is in the distant Arctic is very important for the various observations of the aquatic environment, the atmosphere, the ionosphere, the wildlife, the environment, etc. Here we have an important outpost for research in the Arctic, and hope that such stations in the range of the Siberian Branch of the Arctic coast will be a few more. Work is currently underway on the station by the Permafrost Institute, and the Institute of Petroleum Geology and Geophysics, "[18].

New site for the Arctic researchers on the island Samoilovsky erected in the record time for the northern regions. The station is a convenient and spacious building: its four areas - laboratory, residential, food and recreation, conference room - combine warm galleries. The hospital is equipped with the most modern scientific equipment and commissioned in the fall of 2012. Leaders of the Siberian Branch of the RAS, and plans to build more stations, which will support research network in the Arctic [19].



Currently, the scientific community is determined to the work plans on the island Samoilovsky. The Siberian Branch prepared the Arctic research program, its full title - "Integrated research on the state and the evolution of the natural environment of the Siberian Arctic, using the research station (NIS)" Island Samoilovsky "(coordinator - Academician M. Èpov), to participate in a filed more than 50 project proposals from institutes of the Russian Academy of Sciences. Its main areas include the study of the hydrosphere, atmosphere, biosphere, land surface and subsurface of the Siberian Arctic.

The participation in the program was devoted to other organizations International Russian-German Workshop on the evolution of the environment in the Arctic region of Siberia (Novosibirsk, May 2012). In the course of this seminar were made important decisions.

First, the participants emphasized that the resulting of the international expedition "Lena» the scientific results on the state and the evolution of the natural environment of the Arctic zone of the Eastern Siberia in a changing climate conditions is considered unique because of the complexity of the research and continuous nature of the observations (the results of studies reported at more than one hundred international conferences).

Second, it is agreed that the Arctic program is open. It will be attended by Siberian and the Far Eastern Branch of the Russian Academy of Sciences, Ust-Lensky Nature Reserve (in its territory is an island Samoilovsky) the Arctic and Antarctic Institute (AARI) Hydromet, Russian and the foreign universities, the research centers in Germany. Subsequently, the program can join the other participants.

Third, the international status of approved NIS. Created the International Coordination Council for the development and the scientific support of the Arctic as part of the Deputy Chairman of the SB RAS Academician M.I. Epova, the President of FEB RAS Academician V.I. Sergienko, AARI Director, Doctor of Geographical Sciences I. Frolov, Scientific Director of the Institute for the Polar and marine Research Alfred Wegener (AWI) professors G.V. Hubert and C. Viltshire.

Fourth, identified the main foreign partner in the Arctic program-AWI. Academician M.I. Èpov and Professor G.V.Hubertenom signed a separate memorandum of the cooperation with the Russian Academy of Sciences and the AWI [20, 21].

On the seminar with the report "frost-geo-morphological studies in the delta of the Lena River: main results and prospects" was made by the Officer IMZ Doctor of Geographical Sciences M.N. Grigoriev. He reminded the participants that the IMZ – is a unique institution because it is the only country engaged cryo-litho zone of the permafrost and its modifications [20]. Those scientists who have long been familiar with the research IMZ, bewildering fact that the members of

the International Coordinating Council of the Arctic were not representative of the scientific establishment.

In connection with the development of the Arctic shelf interest of the international scientific community to the phenomenon of the permafrost continues to grow, as evidenced by the representative international congresses and conferences taking place not only in Russia but also abroad. Increasingly are proposals to study the regions with the natural factor with a network of the modern biosphere stations, and one of the first of these stations was the research vessel "Island Samoilovsky." It seems very important that the results of the "pioneers" comprehensive study of the problem of the permafrost received adequate assessment in the modern annals of the Arctic exploration.

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