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HISTORY OF SCIENCE

Expeditions of the Institute of Geography RAS During the 20th–21st Centuries (to the 100th Anniversary of the Institute)

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Abstract—In the lead-up to the 100th anniversary of the Institute of Geography RAS, we summarized the salient features and chronology of its field investigations into the country's nature and resources during the 20th–21st centuries. It is shown that the institute's history has embodied all stages of evolution of national geography: the traditions of the late 19th century with their departure from the perception of geography as a "descriptive" science and the development of genetic (V.V. Dokuchaev's) and chorological (A. Hettner's) approaches, the development of the sectoral specialization of science, the introduction of modern methods: remote sensing, navigation and geoinformation technologies, and the formation of the geography of the 21st century as a philosophical phenomenon and a synthetic discipline with profound prospects for a better understanding a rapidly changing world. This was all facilitated by the institute's continual expedition activity that began in the first years of its functioning and has continued to date. For the first time in the historiography of the national academic geography, we determined the vectors of field investigations at the time of change of the paradigm of its interaction with practice and the relatively poorly studied territory of the country. A brief history of the permanent stations operated by the institute is given as well as identifying the periods of its functioning according to the character of expedition work: the 1920s, 1930s, the period of the Great Patriotic War 1941–1945, 1946–1965, 1966–1990, and from 1991 till the present.

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INTRODUCTION

Over the last 100 years, the Academy's geography has gone through the cycles of birth, development and, in some cases, "dying away" of separate sciences, scientific hypotheses, concepts, new directions and discoveries. But what has remained unchanged, "opportunistic" in a good way is expeditionary research which has persisted as an integral part of the existence of the Academy's geography.

Each branch of geography pursued by the Institute of Geography has repeatedly experienced over the past century a major restructuring that changed the views of the subject and object for studies, and the perception of science as a social phenomenon. Some branches used to hold up the traditions and continuity (geomorphology, hydrology and climatology) whereas other branches, such as landscape science, biogeography, soil geography and evolution, evolutionary geography, and social and economic geography, have basically updated the methodology and realized a complete renewal of the points of view and approaches, building a new line of science. And still other branches (glaciology and historical, cultural and recreational geography) experienced during that centennial time span the formative and blossoming period which was accompanied by discoveries, the formation of the structure of the sciences themselves, the emergence of the first large generalizations, maps, thematic journals, etc. Cartography occupies a special place, and it is during the period under consideration that revolutionary leaps forward were accomplished, through wide use of aerial photography and interpretation first, and then through the advancements in space-based techniques and geoinformation technologies.

The historiography of the Academy's geographical institution, the first in the 20th century in Russian, is relatively extensive [1–8]. The book published on the occasion of the 90th anniversary of the institute offers detailed information regarding the personalia, outlines of the history of the laboratories and reminiscences about the establishment of the Academy's geography in this country [9]. Many important milestones in the life of the Institute of Geography at different periods were also pointed out in other books offering information on the institute and its staff members [10–12]. The

breadth and depth of historical analysis of the institute's centennial history are due to the well preserved archives and, more importantly, to the fact that each stage of its existence gave birth to its chroniclers: L. G. Kamanin, G. D. Rikhter and N.G. Fradkin [13], A. A. Grigoryev [14], L. S. Abramov, V. S. Preobrazhenskii, V. M. Kotlyakov, T. D. Aleksandrova and A. A. Tishkov. The sequence of the size of the institute's staff looks quite natural: from a dozen of enthusiasts standing at the origins and realizing the great idea of "returning" geography to the national Academy of Sciences, a series of renaming and a slow growth of the number of staff members by the end of the 1940s to its upsurge during the 1960s–1970s and staff reduction during the 1990s and the 2000s. And the institute's expedition activity retained its intensity, and only the vectors and extent of State support changed (from 2–3 in the 1920s to 30–50 expedition groups every year in the 1970s and in recent years).

There is yet another important line of historical analysis of the 100-year long existence of the Academy's institute: its personalia, generations of scientists who developed geographical science [9]. The early evolutionary stages of the Institute of Geography and its expedition research can be studied in books and papers [6, 12]. Books were also written about outstanding sciences who devoted their life to the Institute of Geography during 1940s–1970s as well as commemorative compendiums and articles [9, 12, 15–17].

A relatively coherent historical outline of the Institute of Geography can be found in the chronology of publications. Since 1922 the institute's staff members published many tens of thousands of papers and hundreds of books. About 8000 of them, published in the last several decades, are included in the Russian Electronic Library integrated with the Russian Science Citation Index (RSCI). The 1930s were dominated by monographs on geomorphology (published by the Geomorphological Institute, the Institute of Physical Geography and the Institute of Geography): Kola Peninsula, West-Siberian Lowland, Zeya-Bureya Plain, Minusinsk krai, Polar Ural, Turan, etc. In the 1940s, many publications were devoted to Kazakhstan and the south of Siberia as the new agrarian regions, and the period of the 1950s–1960s saw the publication of economic-geographical characteristics of the economic regions of the USSR ("blue series"), a series of monographs on the economic regions of the USA and books on the geography of Italy, Great Britain and China. The 1970s saw the start of the publication of monographs in the series of "Problems of Constructive Geography" and the completion of the publication of regional studies in the series of "Natural Conditions and Natural resources of the USSR" which began in 1963-1964 with the volumes entitled "Western Siberia" and "Middle Siberia" and ended in 1971–1972 with the books entitled "The South-East of the European Part of the USSR" and "Ukraine and Moldavia". Volumes in the series "Game Animals of the USSR and Their Habitat", "Geomorphology of the USSR" and others were published in those years.

A logical and very "visual" historical picture of the 100-year long progression of the institute emerges from examining the geography of its expeditions and scientific permanent stations. In this case, it is possible to carrying out a retrospective stud of this issue. Almost none of those who investigated the history of Institute of Geography RAS tried to gain insight into the rhythm of expedition work of the Academy's geography, the State conjuncture that made geography imperative and relevant over the course of many decades for the description of newly developed lands, Siberia and the Far East, as well as for the new transport construction and the reclamation of virgin lands, and during the Great Patriotic War – also for mobilization of resources and the setting up of the evacuation center. The expeditions of the new time (in the late 20th and the early 21st centuries) may be figuratively called the "roads we choose", in contrast to the expeditions during the 1920s–1950s which were more likely the "roads which choose us". Therefore, the institute's researchers wrote dozens of books on its expeditions [18–28]. We now take the first step forward in the description of the history of its expedition research based on the data persisting in the archives (*see table*). The objective of this paper prepared on the occasion of the 100th jubilee of Institute of Geography RAS is to reveal the chronology, geography and the peculiarities of its expedition research in the 20th – early 21st centuries.

THE VECTORS OF THE INSTITUTE'S EXPEDITIONS IN THE 20th AND 21st CENTURIES

The history of the institute has embodied all development stages of national geography: from the traditions of the late 19th – early 20th centuries with their departures from the perception of geography as a "descriptive" science, the development of genetic an chorological approaches and the start of a sectoral specialization to the formation of geography of the 21st century as a philosophical phenomenon and a synthetic discipline with profound prospects for a better understanding of the rapidly changing world. Nowadays, Institute of Geography RAS is the country's oldest geographical research institution, holding the lead in theoretical, field and experimental investigations on basic and applied geography in Russia, a leading scientific powerhouse committed to fostering excellence among geographers, and a unique community of like-minded scientists.

Expeditions of the Institute of Geography in the 20th century to regions of North Eurasia (the first 50 years of existence of the institute)

Years	European part	Asian part
1918	Southern Ural, Bol'shezemel'skaya tundra, Karelia, other areas of the North-West	Yakutia
1925–1926	–	Central Yakutia
1928–1931	Kola Peninsula, Lake Seliger	Cisbaikalia, Kulunda river
1932	Ural, Volga river, Lake Seliger, Kola Peninsula, Belorussian SSR, Tulono-Notozerskaya expedition	Kuzbass, Angara river, Eastern Siberia, Taimyr Peninsula, Kulundinskaya and Karabugazskaya expeditions
1933	Umba river, Lovozero district, Volg-Caspian expedition, Upper-Pechora geomorphological expedition	Kirgiz SSR, Western Siberia, Baikal-Amur expedition
1934–1935	Physical-geographical Murmansk detachment, Karelia expedition, Kola Peninsula	Turkmenia expedition (western Turkmenia), Karakum Desert, Uzboi, Far East, Lake Baikal, Angara river
1936	Southern Ural, Upper Svanetia (Georgian SSR), Northern krai, Karelia, Kola Peninsula	Complex expeditions of SOPS to Kamchatka, Altai and the north-west of Turkmenia
1938	North-West, Karelia, Crimea, Moscow oblast, Middle and Lower Volga region, Bashkiria	Republics of Middle Asia, Altai Nature Reserve, Middle and Southern Ural
1939	Complex expeditions of SOPS to Ural and across the East European Plain, North Caucasus, North-West, Transcaucasia; Komi Republic, Moscow oblast (Myagkovo)	Karaginskaya expedition, Talgarskaya expedition, high-mountain expedition, Karakum Desert, Krasnoyarsk krai
1940	Lower Volga region, Southern Ural, Crimea, Nenets Autonomous Okrug, Kola Peninsula, Moldavian SSR	Republics of Middle Asia
1941–1945	Kola Peninsula, Volga region, Ural, Caucasus, Komi ASSR, Central Black Earth region, Moscow oblast; Crimea, Belorussian SSR, Moldavian SSR, Ukrainian SSR (Donbass); complex expedition across the East European Plain	Republics of Middle Asia (Tian Shan), Altai, Kazakh SSR
1947–1949	Moscow oblast, Komi ASSR, Volga region, Transcaucasia; oblasts of the European part of th RSFSR, Crimea, Ukrainian SSR, Belorussian SSR (post-war restoration of the economy)	Republics of Middle Asia, Primorskii krai (expedition of SOPS), Western and Eastern Siberia, Tian Shan physical-geographical station (1948–1955)
1949–1951	Komi ASSR, Volga region, Transcaucasia; oblasts of the European part of the RSFSR, Crimea, Ukrainian SSR, Belorussian SSR, Moldavian SSR, Lithuanian SSR, Southern Ural	Far East (Joint Tea Expedition), republics of Middle Asia and Kazakhstan, Aral-Caspian expedition of SOPS, Yakutia
1952–1954	Karelo-Finnish ASSR, north of the European part, Moldavian SSR, Transcaucasia (Complex Tea Expedition), Zakarpattia, Crimea, Volga region, Polar Ural, Komi ASSR, Baltic republics, Caspian expedition, Moscow oblast (st. Goretovka)	Republics of Middle Asia (including Pamir expedition), Far East, Complex Mongolian, Angara-Lena and Yakutia expeditions (in collaboration with SOPS), south of Siberia
1955–1958	Arctic, Antarctic – International Geophysical Year (1957–1958), International Polar Year (1957)	
	Franz Josef Land, Novaya Zemlya, Komi ASSR, Baltic republics, Volga region, North Caucasus and Transcaucasia, permanent station at Zagorsk (Moscow oblast), Polar Ural expedition, Russian Plain, south of the European part	Altai, Yakutia, Buryat-Mongol and Krasnoyarsk complex expeditions of SOPS, Middle Asi, Pamir expedition, Westrn Siberia, Far East, China (1956–1959)
1959–1964	Polar Ural expedition, Komi ASSR, Ukrainian SSR, Belorussian SSR, Crimea, Moldavian SSR, Baltic republics, North Caucasus, republics of Transcaucasia, Volga region, permanent station in Central Black Earth Nature Reserve (1961, Kursk field station), North-West and north of the European part	Western Siberia, Amur, Kamchatka and Transbaikalia complex expeditions of SOPS, Far East, Amur area, Yakutia, republics of Middle Asia, west of Kazakh SSR, Altai Nature Reserve, Transbaikalia, Sakhalin
1965–1968	Spitsbergen Archipelago (Norway)	
	Polar Ural, Central Black Earth region, North-West, North Caucasus, Crimea, Volga region, Baltic republics, South-East, Russian Plain	West-Siberian complex expedition, republics of Middle Asia and Kazakhstan, Eastern and Western Siberia, Lake Baikal, Primorskii krai, Mongolian People's Republic

Note. Prepared using N.A. Kirpichnikova's material (Archives of Institute of Geography RAS).

In the early 20th century, the institute was actively involved in the study of the territory of Russia and its resources. It should be remembered that many regions of the country remained not only unexplored but they had no detailed presentation on maps. As was pointed out by I.P. Gerasimov [29, p. 3], by the beginning of the 20th century "…more or less accurate maps covered only one-fifth part of the entire area of pre-revolutionary Russia". The mapping of Cherskii Range in the north-east of Siberia that was done by the expedition of S.V. Obruchev and K.A. Salishchev in 1926, the discovery in this region of the Yukagir, Alazeya and Anadyr highlands and Pekul'nei Range, and the creation of the map for the Yana, Indigirka and Kolyma interfluves during the 1920s–1930s is only a very short list of geographical discoveries in the north-east of Siberia. According to reports prepared by the institute's researchers in those years, the map incorporated the previously unknown mountain ridges, lowlands and rivers, and the Kolyma itself changed its outlines on the geographical map.

A large number of other discovering, including with the participation of researchers of the Institute of Geography, were made on the territory of this country in the pre-war and post-war years: the largest geyser cluster was discovered on Kamchatka – the valley of the Geizernaya river; a number of mountain ridges were discovered between the Bureya mountain ridge and the Amur valley, and the heights of many mountain summits in Transbaikalia were updated.

The soviet period of progression of the Academy's geography was characterized, as pointed out above, by an intimate linkage of research with demands of the practice. Thus, the institute's researchers participated in the exploration and prospecting of the railroad routes (Northern Railroad, BAM, and others), locations for the construction of hydroelectric power stations (Volkhov, Svirsk, on the Volga, Angara, Yenisei, Vilyui, Kolyma, etc.) and carried out detailed studies of the inland waters in connection with the construction of hydroelectric installations, the construction of navigable and irrigation canals and projects of the flow diversion of the northern and Siberian rivers. Furthermore, soil-botanical expeditions ere organized in order to assess land resources of the country's arid regions. Special investigations were carried out in connection with the reclamation of wetlands and the creation of new cities.

Remarkable discoveries were made by researchers of Institute of Geography USSR AS in the 20th century, such as the discovery of new glacier areas on the territory of this country [30]. The first glacier on Polar Ural was detected in 1929. Within the framework of the 2nd International Polar Year (1932–1933), the Ural glacier expedition was organized, and its member, the geographer L. D. Dolgushin, discovered a further several glaciers. And later in the time interval from 1939 to 1953, he discovered on Ural more than 40 hitherto unknown glaciers and determined the patterns of their alimentation. Northern and Polar Ural accounted at that time for 143 glaciers with the total area of 28.66 km^2.

In 1956, within the program of the International Geophysical Year, Institute of Geography USSR AS organized the expeditions to Franz-Josef Land and Novaya Zemlya, and the Polar-Ural expedition. And each of them gathered new unique data on glaciation of the arctic territories of the country [31, 32].

In 1937, the institute's staff member D. M. Kolosov discovered the centers of modern glaciation in the inner part of Koryak Range. Significant areas of recent glaciation were discovered in the east and north-east of the USSR in the post-war years. V. S. Preobrazhenskii was the first to explore the Kodar glacial area of the Stanovoi Uplands in Transbaikalia in 1958–1959. It should be noted that some of the glaciers received corresponding names, such as the Soviet Geographers and Preobrazhenskii glaciers, the Institute of Geography USSR AS (IGAN) and Dolgushin glaciers on Polar Ural, and the Kotlyakov glacier in Trans-Ili and Dzhungar Alatau.

Logically, after such an "explosion" of geographical discoveries the territory that was "altered" through new knowledge required new approaches and methods of investigations. Thus, in February 1957, IGAN set up the Department of Glaciology that has been studying the mountain and polar glaciation of Russia and the world for 60 years now [33, 34]. The result of the institute's expedition research that had different vectors became the fact that removing blank spots on the country's map and studying the changing world, the geographers altered essentially the concept of it.

THE CHRONOLOGY OF THE INSTITUTE'S EXPEDITIONS IN THE 20th CENTURY

Since the institute's early years its researchers were engaged in expedition investigations. It is the idea of "…an extensive industrial-geographical study of Russia" that was highlighted as the key mission at the time of establishing the institute [9, p. 12].

The table provides the chronology of the main expedition trips in the 20th century. In the 1920s, expedition trips were initiated to Southern Ural. The Bol'shezemel'skaya tundra, Karelia and other areas of the North-West, to Yakutia, Ukraine, Polesye as well as to the Valdai Hills. In 1925–1926, the institute's researchers carried out integrated investigations in Central Yakutia, and starting in 1928, under the guidance of Academician A. E. Fersman, they participated in a comprehensive study of the natural environment on the Kola Peninsula. The expeditions

included A. A. Grigoryev, S. F. Egorov, G. D. Rikhter, N. V. Polonskii, and Yu. D. Tsinzerlin. At the same period, but now with L. G. Kamanin, investigations were made of the Onega-Dvina watershed divide.

With the reorganization of the Section of the Commission on the Study of Natural Productive Forces of Russia (Russian acronym: KEPS) into the Geomorphological Institute, its staff was expanded. In the early 1930s, for the participation in the investigations on the north of the European part of the USSR, Middle Asia and Kazakhstan and Siberia, the institute recruited to its staff S. Yu. Geller, A. D. Doskach, P. S. Makeev, B. A. Fedorovich, A. V. Guzhevaya, N. D. Dumitrashko, K. K. Markov, E. M. Murzaev, P. I. Koloskov, E. E. Fedorov, and others. With the financial support from Lengidroproekt, the Murmansk Railroad, the Committee on Chemicalization and other designing organizations, the institute carried out impressive large-scale investigations of the water bodies of the Kola Peninsula and Northern Karelia, assessed the sapropel reserves on Lake Seliger and on the lakes of Belorussia, studied the topography of the Kulunda depression, the valley of the Pechora river, and th lower reaches of the Yenisei and Lower Tunguska. Within the framework of the 2nd International Polar Year the institute's scientists investigated southern Taimyr, carried out comprehensive investigations of the Amur-Zeya Plain, Cisbaikalia and Transbaikalia, and studied the deserts of Middle Asia. Furthermore, IGAN conducted investigations associated with economic development of new territories: the construction of the cascade of hydroelectric power stations on the Angara, the search for the raw-material and territorial resources for the industry and agriculture. Those efforts resulted in the generation of the geomorphological overview map for the European part of the USSR at a scale of 1:2 500 000 [35] and the map for the geomorphological areas of the USSR (completed before 1939 but never published).

During the 1930s, the institute had several integrated expeditions (in collaboration with the Council on the Study of Productive Forces (Russian acronym: SOPS) on Ural, the East-European Plain, North Caucasus and Transcaucasia, in the Komi Republic, Kirgizia and Western Siberia, along the future BAM route, in western Turkmenia, the Karakum Desert, in the Far East, on Lake Baikal, the Angara river, Kamchatka, and on Altai. One of the central missions at that period involved conducting new field expedition investigations, including in cooperation with the Botanical Institute and Soil Institute; teachers and university students were recruited.

After the transfer to Moscow, the institute initiated work on the multi-volume book series entitled "Geography of the USSR", the publication of which was declared as early as 1933 by the First Geographical Congress as the main mission of the country's geographers. This had two implications. First, the Department of Economic Geography headed by N.N. Baranskii was set up in the institute that was under the jurisdiction of the Department of Mathematical and Natural Sciences (Russian acronym: OMEN) of the Academy of Sciences of the USSR at that time. And, second, the problems of regional geography began to occupy a significant place in the institute's research efforts; in addition to geomorphology, significant success was also achieved in other geographical disciplines, especially in climatology and hydrology. In a number of republics, on the basis of permanent expeditions of SOPS with the participation of the institute's researchers, centers of regional research began to be set up. And more importantly, expeditions began to start not from Leningrad but from Moscow.

Using material of many years of expedition work, I. P. Gerasimov and K. K. Markov published the now classical monograph entitled "The Glacial Period on the Territory of the USSR" [36] in which they described for the first time the processes accompanying glaciation both in glacier areas and far beyond. The institute carried out field investigations in Siberia and in the Far East. Much attention was paid to the efforts in Middle Asia and Kazakhstan highlighted by the investigation into the desalinization of saline water, deep-water hollows, the formation of the Turan surface during the pluvial period, the origin and structure of the relief of sands, groundwater, the Uzboi channel, the Caspian Sea region and Khwarazm, the relief of sea shores and sea bottoms, and avalanches taluses in mountains.

The Great Patriotic War (1941–1945) introduced modifications into the institute's research and expedition efforts [37, 38]. The country was in need of the geographical support of the army and the home front, assessments of resources and explorations in areas of eventual evacuation of economic facilities and the population. During that period, special geographical maps, military-geographical descriptions and climatic and phenological reference information were prepared, and rear areas were surveyed in order to identify reserves for industrial and agricultural production. In Kazakhstan, investigations were made to identify reserves of agrarian lands, compile agroclimatic, geobotanical and water-management maps, siting of the evacuated enterprises in cities and settlements, and the prospects for a further development of transhumance livestock husbandry and irrigated agriculture. Subsequently, expedition work was extended to Kirgizia, Altai, Fergana, the Ural region, Siberia and the Far East.

The list of efforts made by the Institute of Geography during the Great Patriotic War [37] contains information material on the results of work done by researchers of the Alma-Ata and Moscow groups of the institute as well as of the special military-cartographic group set up at SOPS but located in the Institute of Geography at the basis of its special unit: work on mobilization of resources of rear areas to meet the needs of the defense, including expeditions for the study and mobilization of the land resources of Kazakhstan, on exploration of the possibilities for the production development of settlements in the eastern regions of the USSR, the Karaginskaya expedition (Mangyshlak Peninsula), the Talgarskaya expedition (under the guidance of G. A. Avsyuk), work on the restoration of the economy of the areas that had suffered from the war (Donets basin), military-geographical descriptions, the publication of handbooks for the Air Force of the Red Army, fronts and other countries, military-climatic descriptions, and the creation of special military-topographic maps and techniques for compiling them (under the guidance of K. K. Markov and I. P. Gerasimov).

The volume of expedition work done by the institute increased during two decades after the end of the Great Patriotic War (1945–1965). The national economy that was destroyed by the war, was in need of the scientific support, and Stalin's Plan for the Transformation of Nature and development of virgin lands required new assessments and additional field investigations.

At that period the Department of Geomorphology participated in comprehensive expeditions of SOPS for the study of future shelter-belts for agrarian lands, and the introduction of subtropical crops, including tea, in the northern areas. Studies were made of the contemporary tectonics of the USSR; on the new large reservoirs, on the Rybinsk and Tsimlyansk reservoirs in particular, the dynamics of banks and bottom was studied; in collaboration with the other departments of the institute, field work was carried out in areas of new economic development of the Yakut ASSR, Buryat-Mongol ASSR, in Kazakhstan and Western Siberia, republics of Middle Asia and in the Volga region.

The Department of Climatology was reorganized into the Department of Climatology and Hydrology. In the interests of agrarian development of the country's southern regions, their climate and water regime were investigated, and techniques were developed for studying the heat and water balance and dry wind (suhovei) and drought control. The department also participated in research efforts of the International Geophysical Year.

The Department of Physical Geography, in close cooperation with the Department of Climatology and Hydrology, studied at the permanent stations the erosion processes in the steppe and forest-steppe regions of the USSR and the influence of agro-technical measures on the flow and hydroclimatic regimes. Researchers of the department carried out investigations on the eastern slope of Northern Ural and in the adjacent part of the West-Sibrian Lowland in connection with the construction of the Ural-Pechora railroad. Results of field work in Buryatia, Tyva and in the Far East were used to develop proposals for the utilization and settlement of the areas subject to economic development. Investigations along similar lines were also conducted in areas of plain Altai, within the Syr-Darya and Amu-Darya river basins, along the Karakum canal and in the northern Caspian Sea region. Studies were continued into the contemporary glaciation on Tian Shan: the characteristic property of those investigations was that use was made of significant volume of photogrammetric survey which serves as the basis for determining the velocity of the ice.

In 1952 and 1954, the institute's researchers continued the study into the glaciation of Polar Ural. Similar efforts were made on the Arctic glaciers: on Novaya Zemlya, Franz-Josef Land and Polar Ural the institute did research within the framework of the International Geophysical Year as well as thermometric research on the glaciers of Tian Shan and Pamir.

Starting in 1955, the institute was very activity involved in the investigations of the Antarctic and coordinated the conduct of all glaciological investigations in the country within the framework of the International Geophysical Year.

In the 1970s, the institute continued the investigations in the Antarctic and on Spitsbergen; the permanent Middle-Asian, West-Siberian, Baikal and Caucasus expeditions were active, and investigations were made of the eventual implications of the river flow diversion. A special department for nature transformation was set up, which became the Department of Engineering Geography some time later (S. Yu. Geller, A. N. Kunin, S. L. Vendrov, and N. T. Kuznetsov) that had persisted in the institute until the start of perestroika when there were special research sectors engaged with problems related to the river flow diversion and the Aral Sea.

During the 1970s–1991s the institute continued expanding field investigations, and their focus was altered dramatically: more attention was paid to fundamental, rather than applied, problems. Large glaciological expeditions worked on Spitsbergen, Pamir and Tian Shan; soil scientists made investigations in the Arctic, Western Siberia and on the Caucasus; biogeographers (within the framework of the integrated expedition to the zapovedniks of the USSR during 1972–1974) made investigations in

15 State zapovedniks (Kandalakshskii, Laplandskii, Kavkazskii, Bashkirskii, and others; during several years a multidisciplinary team of geographers made Soviet-French expedition investigations under the Alps – Caucasus and Alps – Eastern Pyrenees – Crimea – West Caucasus projects as well as the Soviet-Bulgarian Caucasus – Stara Planina field project. The Department of Physical Geography conducted large-scale field work along a new direction: recreation geography. Those efforts encompassed Seliger, Moscow oblast and the Caucasus which enjoy popularity among tourists.

Most of the institute's staff members worked in the Russian-Mongolian expedition and participated in the creation of the National Atlas of the Mongolian People's Republic (1990). Concurrently, together with Vietnamese colleagues, the institute's researchers conducted field investigations in Vietnam and prepared for publication the national atlases of the country. In either case, they drew on experience of geographical research in Cuba and the publication of its national atlas for which the institute received a State Award in 1973.

At the very beginning of perestroika the institute organized during three years (1989–1991) the Soviet-Chinese expedition to Tibet to make investigations of modern glaciation. During the 1990s, the Aral expedition was active under the guidance of N. F. Glazovskii, and the Aral Scientific Research Coordination Center (headed by V.M. Kotlyakov) was set up. The Kursk permanent station was used as the basis for establishing the Laboratory of Experimental Methods of Investigation which took active part in the "Kurex-85", "Kurex-88", Geoex-86" and other field experiments.

NEW PERMANENT STATIONS OPERATED BY THE INSTITUTE OF GEOGRAPHY

The Institute of Geography of the Academy of Sciences of the USSR pioneered stationary geographical research in the USSR and in Russia. One of the first to introduce the idea of setting up permanent stations for conducting field investigations was professor L. L. Rossolimo who organized the first stationary investigations of lakes: initially, in the village of Kosino near Moscow (from 1923 to 1941), and then also on Lake Valdaiskoe in Novgorod oblast (the 1960s–1970s), where he applied his own balance principle of studying water bodies and set up the national limnological school.

In the 1930s, at the initiative of M. I. L'vovich, the Valdai water-balance permanent station was set up (later renamed the All-Union Service of Hydrological Forecasts and the Valdai Branch of the Hydrological Institute).

In 1937, with the purpose of developing further the ideas of A. A. Grigoryev and G. D. Rikhter, the institute set up the first scientific geographical station, i.e. the Podmoskovnaya Physical-Geographical Station in the village of Zelenaya Sloboda on the bank of the Pakhra river. Its mission was to study the moisture and heat balance in nature.

The Tian Shan physical-geographical station operated by the Institute of Geography (it was transferred to the Academy of Sciences of the Kirgiz SSR) was established at the initiative of A. A. Grigoryev at Lake Issyk-Kul in 1948.

Very early in the 1950s, an integrated research station was set up in the village of Gorlovka near Moscow. And as early as 1957, at the initiative of B. L. Dzerzievskii, the scientific base was established at Zagorsk (currently the city of Sergiev-Posad) with the mission of studying the forest heat balance, and it became the pivotal point for investigations in the field of geophysics of natural landscapes.

In 1961, the Kursk field experimental base (in 1984, it was renamed Kursk Biosphere Station IG RAS) was established at the initiative of D. L. Armand in the Central Black Earth Zapovednik. Its operation provides vivid examples of development of the national hydrology, climatology, geophysics and landscape geochemistry, soil geography, remote sensing methods of studying the Earth and biogeography. More than 700 scientists from 15 countries were carrying investigations over the course of half a century. To date the permanent station hosts conferences of young scientists every year, and serves as a basis for doing research into the dynamics of steppe landscapes.

During the 1960s–1970s the Department of Glaciology made stationary investigations of the glaciers of the Mount Elbrus massif with winter stays. V. M. Kotlyakov participated as the research leader. In those years, continuing observations within the International Polar Year and the International Geophysical Year, the department organized the Polar-Ural station, and in 1978 for stationary investigations on the Elbrus glaciers A. B. Bazhov established the North-Caucasus scientific station operated by the institute.

In 1973, M. V. Glazov and A. A. Tishkov, staff members of the institute's Laboratory of Biogeography organized at the initiative of its Head Yu. A. Isakov the Valdai Forest permanent Station where, in collaboration with scientist of the Soil Biology and Geography Faculties of Moscow State University, comprehensive research was done into the structure, functioning and dynamics of forests and bogs of the Valdai watershed divide.

Without exception, all the permanent stations operated by the institute provided long-term series of

data and brought the research status to the international level: the objects for study at Kursk, on the Caucasus and on Valdai became a standard, were included in many international geographical and ecological programs and served as the basis for monitoring the state of zonal landscapes.

CONCLUSIONS

The analysis of the vectors of the main expedition activities for 100 years of existence of Institute of Geography RAS (*see table*) suggested the following conclusions.

In the process of analyzing the institute's expedition efforts, a "spatial conjuncture" and relevance of geographical research is clearly seen in different years of development of this country: during the 1920s–1930s – Siberia, the Far East and Northwestern regions, in the 1940s (including the period of the Great Patriotic War) – the European part of Russia, Ural, Donbass, the south of Siberia and Mongolia, during the 1950s–1960s – Siberia, the republics of Middle Asia and Baltic republics, Arctic, Caucasus, Polar Ural and China, the 1970s–1980s – the European part of Russia, the mountains of Middle Asia, Caucasus, Western Siberia, Vietnam, Cuba and Mongolia, and during the 1990s–2000s – the European part of Russia, Arctic, Caucasus, the south of Siberia, Aral and China. Nowadays, almost every year the institute's staff members work in seasonal expeditions in the Antarctic and on Spitsbergen and under international projects in the Andes, Alps and Himalayas.

As early as the 1980s, the periods when the expeditions lasted for several months and even years (such as the winter stays of our glaciologists on the islands of the Arctic Ocean, in the Antarctic and on Mount Elbrus during the 1950s–1960s) were replaced by short-lasting travels and, in the last decade, even by travels to the field arranged as business trips without typical expedition gear. The expedition transport has also changed: there are no longer means of transportation which were used in field work by the institute's staff as early as the 1960s. While at earlier dates our researchers had sleddogs, horses, camels and domestic reindeer (animal-drawn transport), rafts, motor and rowing boats, various types of automobiles (largely produced by the Gorky automobile factory (GAZ-69, GAZ-51, and GAZ-66), helicopters and small aircraft, today's investigations most often use personal or rental cars and the operation of the institute's only expedition minibus is scheduled for the year ahead.

The past 100 years also saw a drastic change in the pattern of expedition work of our geographers. At earlier dates, a long-lasting expedition was preceded by a long preparatory period necessarily involving selection of available cartographic material; after that, expedition members had to use several months to reach the destination place and start work; upon completion of expedition work, actually one year (or sometimes more) was devoted to processing of observations at office and compiling maps. At present, however, on receiving a short-term grant and funds for field investigations, the geographer "stocks up" on fresh satellite images for the study area, quickly reaches the center of civilization nearest to the point of investigation and put his trust in the luck only. Furthermore, the modern scientist has everything always right at hand: a computer with maps, satellite images and software programs for data preprocessing, the GPS/GLONASS navigator, unmanned flying vehicles, the geolocator, the field meteostation, etc. There is always a possibility of receiving in the online mode fresh satellite information on the study area, and communicating via mobile and satellite communication tools with colleagues and family members. Of course, the conditions of expedition investigations have become different but their essence changed little. This is very good for geography studying the changing world as well as for geographers who manage to do more for a unit of time by availing themselves of the possibilities provided. The most important specific feature of the geographical expeditions of the 21st century is the fact that they are aimed largely at verification of remote sensing data or at re-inventory and revision of previous data obtained with primitive tools.

Centennial experience of the institute's expedition work showed yet another peculiarity, namely work at scientific permanent stations in no way became a substitute for "geographical field work" proper. Whenever a particular permanent station was established, it was experiencing maturing, blossoming and decay. And there were no exceptions. But the geographical permanent stations were distinguished by the fact that they served as "pivotal points" of sorts for studying surrounding territories. The fate of the main permanent station operated by Institute of Geography RAS, the Kursk Biosphere Station, has been identical, but it is beginning to revive, largely thanks to young scientific staff members.

In 2016 and 2017, the Scientific Council of the institute held special annual sessions of brief reports on expedition work. It turned out that every year the institute's staff members participate in 45–50 expedition trips (long-lasting expeditions and work of field groups). The geography of the expeditions remains exceptionally varied and includes 8–10 countries and 20–30 federal subjects of Russia. Zapovedniks and national parks were very lucky with their traditionally available infrastructure for doing research. For geographers there also remains

the "attractiveness" of places for integrated studies of archaeological monuments, such as in Novgorod, Vladimir, Kulikovo Field, and others. For each of the subdivisions there are model regions, points and sites for which long-term observation series are marshaled on the basis of expedition investigations. It is because of some of them that it becomes possible to make new geographical discoveries, such as the discoveries of disappeared glaciers of Polar Ural and lost fragments of the hydrological network of steppe regions and new places of mass nesting of birds, work on restoration of steppe vegetation of Black Earths in Kalmykia, and to compile the "chronicles" of climatic events reconstructed by different methods and for different sites in different regions of Russia. This is a further demonstration of continuity of the institute's expedition work, a continuous thread of today's geographical work without which there is no "geographical fact" and, hence, no subject for study.

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