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BRANCHES OF THE ACADEMY OF SCIENCES OF THE USSR

By Dr. P. KOLESNIKOV

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IN the Soviet Union the Academy of Sciences has become the greatest scientific center of the country, embracing scores of institutes and hundreds of laboratories.

The time has long since passed when science and art were the domain only of the capital and of a few of the larger cities. To-day science is making swift progress and scientific personnel are quickly growing in the most distant national regions of the USSR.

The Academy of Sciences of the USSR comprises several republican branches and scientific bases. Article 48 of the Statutes of the Academy of Sciences reads:

Branches of the Academy of Sciences in the locality constitute incorporated research institutes, while the local bases of the Academy of Sciences represent complexes of research institutes, these branches and bases studying the natural wealth, the economy and the culture of the respective individual Republic, Territory and Region.

Branches and bases of the Academy of Sciences of the USSR are located all over the country—from the Kola Peninsula to the foothills of the Pamir Mountains. There are also the following major scientific centers—the Academy of Sciences of the Georgian SSR, those of the Ukrainian SSR and the Byelorussian SSR and the USSR Academy branches in the Azerbaijan and the Uzbek Republics.

Branches of the Academy of Sciences of the USSR are also established in Armenia, Kazakhstan, Tajikistan and in the Urals. Then there is the Kola Base in the Trans-Polar regions, and the Northern Base—in Archangel.

Each of these branches embraces a group of scientific institutes, laboratories, stations, preserves and other institutions engaging in research.

Altogether the Academy of Sciences has eight local branches and two bases, comprising 29 institutes and 105 laboratories, stations, observatories, botanical gardens and other scientific establishments.

About 3,000 scientific and scientific-technical workers are engaged in these branches and bases, including 15 academicians, 5 corresponding members of the academy, over 400 doctors and masters of science and 300 postgraduate students.

A numerable native personnel of scientific workers has been established in the national republics where academy branches are located. In the Armenian Branch, for instance, 93 per cent. of the scientific workers are Armenians by birth, 73 per cent. of the workers in the Georgian Branch are native Georgians, etc.

The volume of printed publications serves as an indication of the growth of academy branches and bases; publications exceeding 5,000 printer's signatures—such is the total volume of titles put out by the branches and bases in the past few years. In 1940 alone the Georgian Academy of Sciences prepared for press and published various scientific works totaling about 1,000 printer's signatures; in that same year the Azerbaijan Branch published 610 signatures, the Armenian Branch 530 signatures, etc.

Practically all the academy branches have their own printing facilities, allowing scientific works to be published not only in the corresponding national language but also in Russian. The Azerbaijan and Uzbek branches publish scientific and popular-scientific periodicals in the respective languages.

In recent years the scientific institutions of the academy branches and bases have accomplished a large program of work closely bound up with the national economy and the cultural progress of the national republics. In 1940 alone 168 various scientific works (on geology, metallurgy, chemistry, agriculture, etc.) were introduced into the national economy.

Various organizations and enterprises enjoy the systematic consultation of the Academy of Sciences branches.

In conformity with the tasks posited by the Soviet government—that of strengthening the raw material base of separate districts—the academy branches have widely developed the prospecting of minerals and the study of the geography of these districts.

On the basis of scientific explorations (Professor Chernov) the Northern Base of the Academy of Sciences established that salt deposits are located near Kotlas, in the north, and coal at the Cheshskaya Bay. The subsequent prospecting by geological parties fully confirmed this forecast and the North is now faced with the practical problems of working its own salt for the White Sea and Murmansk fisheries and of mining local coal for the swiftly developing industries of the Trans-Polar regions.

The discovery of niobium ore deposits, made by a group of prospectors, has brought up the question of establishing a Soviet niobium industry.

The discovery of selenium and other, richer compounds of rare earths on the Kola Peninsula has placed new tasks before the non-ferrous and rare metals industry of the USSR.

The Georgian Academy of Sciences is successfully employing new geophysical methods in prospecting the copper deposits in Svanetia.

The Armenian Branch of the USSR Academy of Sciences has furnished the first precise data concerning the local aluminium ores, constituting a local raw material base for the aluminium industry of Soviet Armenia.

The Tajik Branch has finished working up materials on the mineral resources of the Tajik SSR and has indicated the vast reserves of superior narzan mineral waters on the territory of this republic. Another important discovery made by the scientific workers of the Tajik Branch was that of the deposits of iron ores (magnetites and hematites) in Ramitsi District and the determination of the geological reserves in the explored part of these deposits.

Professor Abramovich, of the Azerbaijan Branch, has collected material substantiating the assumption of distribution of petroleum in strata, the direction of flow of oil to the well and the approximate determination of the change in the properties of petroleum when worked.

Expeditions of the Azerbaijan Branch have amassed considerable material on the geology, tectonics, petrography and mineralogy of the barite deposits in the Chavdar and other areas of the basin of the River Ter-ter. In 1940, on the basis of these data furnished by the expeditions, the Azerbaijan Geological Board conducted wide-scale and detailed prospecting of barites.

Gabrielyan, a scientific collaborator of the Uzbek Branch, has evolved a method for combating sand jamming during the exploitation of oil wells.

Another equally important work—that of Krylov, also collaborating in the Uzbek Branch—gives new

foundations proving the presence of fresh water in the Golodny desert steppes, occurring at great depths in the crushed rocks and relating to the ancient beds of the Cherchik and Angren rivers. These conclusions are of major practical purport in projecting meliorative measures. The engineering-and-geological characteristics of the area of the stretch of the Northern Ferghana Canal—worked out by Krylov—and his estimations of the ground of different sections of this area which are destined to serve as the construction site for hydro-engineering structures, have been handed over for utilization to the corresponding People's Commissariat.

The scientific workers of the Armenian Branch have made a geological study of the Akverian marble deposits which are to-day being extensively quarried to supply material for the construction of the Palace of Soviets, the Moscow Metro Railway, etc. Several new marble deposits have been located, and the Armenian Marble Trust has been entrusted with making a detailed prospecting survey of them.

An expedition equipped by the Kazakh Branch of the USSR Academy of Sciences has discovered considerable quantities of tin at the Pavdin deposits, which had been hitherto known only for their deposits of copper. This expedition likewise established the presence of bismuth in the polymetallic ores of the Akchibal deposits, in Central Kazakhstan. This substantially extends the area of occurrence of tin in the Kizyl-Este ore deposits.

The Urals Branch has brought its study of the suitability of Ural dunites to serve as fireclays to the stage of commercial utility in industry. This branch has also worked out methods for obtaining naturally alloyed metals by means of usual blast furnace smelting of the ore and has proved the possibility of obtaining niobium pig-iron by blast furnace process. This academy branch has likewise established the agglomerative properties of loparite concentrates, thus making it feasible to widely utilize the niobium ores for the production of special steels.

The possibilities of utilizing the waste products after concentration of the Kusin titano-magnetites have likewise been proved feasible. This will reduce the cost of agglomerates produced by the plant.

The Urals Branch has also designed and constructed several types of precision instruments of much importance for industry. These appliances include a transportable kiloamper meter for a comparatively rough gauging of the strength of current, which is necessary in regulating electrolytic baths, a kilowatt-hour meter in which the electric current coil is replaced by a metal strip; besides this, improvements have been introduced in the magnet-wire of transformers. A rational system as well as methods and the requisite appliances have been designed for the factory control of the magnetic properties of transformer steels and the application of these devices in one of the Urals works resulted in a marked improvement in the quality of these steels. Finally, an improved method of magnetic defectoscopy has been worked out for testing track rails and parts of powerful, high-speed machines.

These undertakings allow the positing and solution of problems which could not have been solved before, when technology, chemistry and geology stood separated from each other. And it is this joint work of different specialists which forms one of the salient features of the local undertakings of the academy branches.

In this respect mention should be made of the work done in relation to petroleum. Oil, which abounds in the Apsheron Peninsula, particularly attracts the attention of geologists, physicists and chemists. Workers of the physics department of the Azerbaijan Academy have made an electric model of an oil stratus. By means of data characterizing the hydraulic permeability of the layer in separate points, this model makes it possible to judge of the distribution of oil throughout the whole stratum. This in turn enables the oil workers to sink the well in the most efficient manner, ensuring the maximum yield of petroleum. This method of electric modelling of oil strata—which has passed laboratory tests—is to be employed in the Azerbaijan oil fields.

Another interesting method worked out by the collaborators of the Azerbaijan Branch allows the hydraulic permeability of porous rocks drawn out of the well hole to be quickly measured—in ten minutes. This method will be of great utility not only in geology but also in hydro-engineering, metallurgy, soil study, chemistry, etc.

The vast construction now proceeding throughout the Soviet Union requires a tremendous volume of building materials. Some of the academy branch institutes, in particular the Chemical Institute of the Uzbek Branch, have placed before themselves the task of cement production out of locally available raw material. This undertaking is finding successful solution in Central Asia, Professor Kancepolsky being in charge of this work here.

The investigations of the Chemical Institute of the Uzbek Branch have shown that the loess of the Khimkov deposits, containing 35 per cent. calcium carbonate, after processing, possesses particularly high binding properties and stability, exceeding that of the standard grades and requiring less fuel in manufacture.

Considerable works have been accomplished by the academy branches in the domain of biological sciences

—geobotanical studies of individual territories (the Kazakh Branch and the Kola Base), extending the pasture acreage and raising its productivity, measures aimed against salinification of the soil, work on increasing fodder resources, etc.

A number of botanical gardens, the high-mountain soil-and-botanical station on the Pamir Mountains and the Polar botanical gardens in Kirov study the local flora, raise various species of decorative plants and have introduced the cultivation of several wild-growing plants.

(To be Concluded)

IMAGINARY SUBMARINE CANYONS[1]

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THE VEATCH-SMITH SUBMARINE CONTOURS

FOR some years the discovery of the great submarine canyons along the oceanic slopes off the east coast filled many of the outstanding geological theorists with misgivings. They were less disturbed by the deeply submerged canyons with the characteristics of river valleys off California, since this coast was well known to be unstable, but river canyons off the supposedly stable east coast were unthinkable; and to make matters worse, charts were showing that submarine canyons were practically universal. Assuredly the continents of the world could not all have been moving up and down many thousands of feet during the late part of geological time. Into the breech at the critical moment stepped a series of maps of outstanding workmanship which appear to have taken at least the eastern part of the country by storm. These maps were the result of painstaking contouring by A. C. Veatch and by his collaborator, Paul Smith.[2] The contours, as both Veatch and Smith have frankly admitted, are based on the hypothesis that the submarine slopes have a stream-cut type of topography. Accordingly, the contours show a great mass of gullies and valleys even out at the greatest depths where there are few soundings. These small valleys shown on the maps have been seized on eagerly without any apparent attempt to determine their basis and are now established as the pièce de resistance of three new hypotheses advocating submarine origin of the canyons. Two of these have appeared in books[3] and a third as a short article.[4] The maps have also been reproduced in many textbooks and have been the source from which a model reposing in the American Museum of Natural History was drawn. Even *Life* magazine recently reproduced a picture of this model with mention in garbled form of one of the new hypotheses.

Since the tendency of late has been to regard these gullies as the typical submarine valleys and accordingly to disregard the great rock-walled canyons which have been revealed by years of scientific exploration of the sea floor, it might be well to give the scientific public some insight on the basis of these supposed gullies and their relation to the problem of the history of the ocean floors. Regarding these contours one must admit in all fairness that they represent long painstaking effort. Certainly it would have been difficult to fit stream-dissected slope topography more perfectly into the soundings than has been done. On the other hand, the contouring could have been executed with the same care in attempting to show what actually existed out on these submarine slopes off the east coast. That this was not done is indicated by the fact that the same soundings were contoured by a series of six topographers and geologists of the U. S. Geological Survey and by the present writer and his co-worker, K. O. Emery, and in no case did these closely spaced small valleys appear in the contoured maps which resulted. Instead of these myriads of gullies a series of relatively large canyons (shown also by Veatch and Smith) are revealed on the slopes. The canyons are of the type which recent theories have so meticulously avoided. In a forthcoming paper, Emery and the writer will present in some detail the abundant evidence which is thought to reject the gully hypothesis of contour interpretation of these soundings off the east coast. It may be sufficient to state here that any one who has a conviction of the existence of these gullies need only return to the original data and attempt to contour some portion of the deep outer slopes bearing in mind that unavoidable errors of observation increase with depth.

A SUBMARINE ORIGIN OF THE CANYONS

The recent hypotheses which attempt to explain submarine canyons as formed without emergence include

[1] Contributions from the Scripps Institution of Oceanography, New Series, No. 214.

[2] Special Paper 7, Geological Society of America, 1939.

[3] D. W. Johnson, "The Origin of Submarine Canyons," Columbia University Press, 1939; R. A. Daly, "The Floor of the Ocean," Univ. of North Carolina Press, 1942.

[4] W. H. Bucher, *Bull. Geol. Soc. Amer.*, Vol. 51, pp. 489–512.