GENERAL SCIENCE

Soviet War Science

Russian scientists mobilize. New methods produce vital supplies far to north and east of battle area. Exploration develops resources. Ask information exchange.

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➤ THE HEROIC achievements of the whole Soviet people in stemming the Nazi tide have been enormously aided by the part played by science in the U. S. S. R. At the outbreak of war, Soviet scientists were mobilized, ready to use against the attacker every technical and theoretical weapon at their command.

This total mobilization of science has made possible the incredibly swift and complete preparations for carrying on vital war industries behind the Ural mountains. Whole industries have been moved east, new centers built, new sources of raw materials opened, existing possibilities expanded in the shortest possible time. Even before the war, new industrial centers were planned to provide maximum safety from attack, in East and West Siberia, on the steppes of Kazakhstan, among the Altai mountains and in the semi-tropical regions of vast Asia.

Three principles have guided the planning of Soviet industrial centers. First, to place them close to the sources of raw materials; second, to place them far away from possible Nazi attack, thus also insuring the desirable opening up of "backward" regions; and third, to use all possible technological and scientific knowledge, so that industrial problems would be closely integrated with those of agriculture.

A special committee of scientists, headed by academician Komarov, has been working on the numerous problems connected with the rapid increase of steel production in the Urals and the necessity of supplying this rapidly growing industry with a continuous flow of adequate raw materials.

New iron deposits have been discovered and local coal mines have been opened up, mostly of the open-cut type, providing greater supplies of coal and iron near at hand and relieving the railroads, which formerly had to haul coal to the blast furnaces of the Urals from the Kuznetsk and Karaganda mines, a distance of over 2,000 miles.

Another problem solved by the scientists for the Urals steel industry was the development of improved methods, making possible the employment of low-grade Siberian manganese ores for the production of ferro-manganese.

A group of scientists of the staff of the Urals branch of the Academy of Sciences of the U. S. S. R., in collaboration with the management and workers of a local plant, have perfected a new method for the production of ferrochrome in large quantities. A new method has been developed for extracting manganese from formerly useless slag piles. The Komarov committee also perfected methods for the direct smelting of nickel-alloyed iron from ore containing both iron and nickel, and for extracting and combining manganese and iron ores. The committee also helped solve the problem of producing armor plate with existing equipment.

Scientific work should also be given some credit for the high production records recently achieved by the Sverdlovsk blast furnaces and steel mills, where the output has reached nearly double the rate of production at the outbreak of the war.

Scientific exploration has been a boon to the Soviet navy. Before the war, almost all the navy's fuel oil was refined in a single city. At present, the People's Commissariat of Oil Industry is able to draw for its oil upon several refining centers, depending upon the location of the ultimate consumer. The number of plants refining various special lubricants has been doubled during the war. The Soviet aircraft, the Soviet tank and the Soviet warships, which have made such a wonderful showing in the present war of machines, have all had the benefit of the creative ingenuity of Soviet scientists.

The greatest development of all has been in the new Volga valley oil fields. As a worker put it, "in 1939 we got oil here by the spoonful, in 1940 by the pail, and now we get it by the tank car." These Volga Valley Oil Works have become known as the "second Baku," and their potential output is scheduled to equal that of the rich oil fields of the

STEEL is being poured at the Stalin Metallurgical Combinate in Kuznetsk. Many such vital war industries have been moved behind the Ural mountains.

***EXPERIMENTAL FIELD** of the biological station shown in the picture is in Eastern Pamir at an altitude of two miles.*

Urals, and the Emba on the Caspian Coast. In this same region rich new gas and oil deposits have recently been discovered.

A famous American economist, Brooks Emeny, once remarked that of the twenty-two strategic raw materials essential for successful war in case of blockade, the Soviet Union lacked only four: tungsten, tin, antimony and nickel. But that was in 1938. Intensive exploration has since discovered numerous deposits of these valuable minerals and metals in the Urals, Siberia, Northern Kazakhstan, Kuznetsk, Alatau.

Valuable non-metallic minerals were discovered by assiduous prospecting in various regions; mica along the Biryusa River, in the Sayan range, in the Baikal area, and on the Aldau plateau; graphite in the Tunguska Basin—large enough to supply the world for a long time; asbestos; feldspar; magnesite; barium; fluorspar; gypsum; cement materials; quartzites; various clays; marble; jade; roofing slates; sands for the glass industry; phosphorites and new deposits of salt have been discovered in various regions of Siberia.

In no field of endeavor has the contribution of Soviet science been so great, not to say spectacular, as in the field of agriculture. Despite wartime handicaps and temporary loss of large districts to the German invaders, this year's crops covered a greater area than ever before. This was due largely to extensive felling of forests and employing of virgin soil. The acreage of Central Asia under cereals, cotton, and especially sugar beets, has been increased to compensate for loss of sugar beet regions around Kursk. Larger areas were planted to wheat on the steppes of North Caucasus. The Volga region, the Urals, Kazakhstan, Central Asia, Siberia and even the extreme northern regions of the U. S. S. R. are supplying an ever greater part of the food and agricultural raw materials of the country.

The development of agriculture in the northern regions of the U. S. S. R. is generally known as the crowning achievement of Soviet agricultural scientists. In places where even reindeer used to be unable to find sustenance, today's crops are being raised. In some places, agriculture has spread to the very shores of the Arctic Ocean, beyond the 70th parallel. The most northerly farm in the world is in the northern region of U. S. S. R., 200 miles within the Arctic Circle. The Arctic Experimental Station at Naryan Mar succeeded in developing a potato that will not freeze at temperatures below 32 degrees Fahrenheit, and which gives good yields under the severe northern conditions. The same Experimental Station, grown now to an important scientific institution, has developed a variety of wheat adapted to the northern climate. Wheat, barley, oats, rye, flax, hemp, beets, turnips, sugar beets and garden crops—such as carrots, radishes, onions, lettuce and many others—are now growing over hundreds of thousands of acres in the far north.

Since the outbreak of the war the scientists connected with the botanical gardens and laboratories of Moscow have devoted themselves to an increasing degree to the war effort. They are engaged primarily in an effort to discover new vegetable sources of vitamins for the Red Army and the civilian population, on the premise that wild plants often prove richer in vitamins than cultivated plants. They are also working toward a more effective and wider utilization of wild plants for medicinal purposes, and toward the utilization of vegetable growths as raw materials for essential industries.

Before leaving this subject, I would like to call attention to the appeal to his American colleagues of the botanist and academician Boris A. Keller. He requests that American scientists in those fields exchange information with him and his colleagues. Academician Keller is especially interested in any recent research on the active principle of the cola nut and its effective substitutes. Academician Keller informs us that the Moscow Botanical Gardens hopes to devote considerable space to American flora, with the cooperation of American botanists after the war.

In other fields of science, the most outstanding recent contributions may be summarized briefly. They are the development of new methods for (1) production of phosphorus; (2) production of optical glass for special purposes; (3) application of oil of balsam bandages, a method now widely used in Red Army field hospitals; (4) selection and cultivation of new varieties of wheat and barley; (5) valuable studies in radio technique, metallurgy, geochemistry, and mathematics, including new computation tables to be of benefit to the Red Army.

The Soviet Seismologic Institute, which has proceeded with its normal scientific work of recording earthquakes

occurring in all parts of the world, has undertaken special research in air-raid defense methods. The work of this scientific organization, which before the war was directed toward insuring stability of buildings in earthquake zones, has now been applied to the construction of bomb shelters and other essential buildings in the war zones.

The same institute, together with the Academy of Sciences and other research organizations, has undertaken extensive prospecting for strategic war materials and has taken up for solution problems of military engineering, primarily in the field of aviation.

Two chemical institutes devoted to colloid-electrochemistry and physical chemistry, which had to be moved from Moscow deep into the rear, are now working on subjects closely related to war industries.

One of the most striking war inventions is that of the military engineer Kostikov, awarded the title of Hero of the Soviet Union. The Soviet press said that his innovation had already been successfully tested in battle and had won high praise.

The Soviet Academy of Sciences, which has always expressed warmest admiration for American and British scientists, recently elected as honorary members Dr. Gilbert N. Lewis, professor of chemisty at the University of California; Dr. Walter B. Cannon, professor of physiology at Harvard University; and Dr. Ernest O. Lawrence, professor of physics at the University of California.

To the scientists of America, the Soviet Academy makes this appeal: ". . . We call on you American scientists, our dear comrades, to . . . unite all the efforts of your people in the struggle against Hitlerism, to mobilize all your science and technique for the victory of democracy over Hitlerite barbarism. The united technical thought of freedom-loving countries, together with the military valor of our peoples, will assure the defeat of fascism in 1942."

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MEDICINE

Eye Injuries Frequent

Reduction of accidents has not kept pace with development of new treatments. Great strides have been made in preventing blindness.

➤ REDUCTION of blinding eye injuries has not kept pace with the progress in the past 20 years in reducing blindness from disease, Lewis H. Carris, director emeritus of the National Society for the Prevention of Blindness, charged at a meeting of the St. Louis Society for the Blind.

The Leslie Dana Gold Medal for outstanding accomplishments in the movement for protecting eyesight was presented to Mr. Carris at the meeting.

"Industry as a whole has been slow to realize that investment in eye protection pays dividends both in eyes saved and in lowered cost of production," Mr. Carris declared.

As a happy exception and an example of what can be accomplished, he cited the record of the Pullman Company where in 10 years not one worker of the 25,000 employed has lost an eye.

Greatest progress in saving eyesight, apparently, has been made through laws requiring the use of a prophylactic in the eyes of all newborn babies to prevent ophthalmia neonatorum. In 1906-07, Mr. Carris reported, over one-fourth (28.2%) of new pupils enrolled in schools for the blind were blind because of this disease. By 1941-42 the number had dropped to about 7%.

Mr. Carris paid tribute to Dr. Gerhard Domagk, discoverer of the first of the sulfa drugs which are now saving eyesight threatened both by gonorrhea and by trachoma.

Orthoptic training for development of binocular vision and depth perception, so important in these days of aerial warfare, dates back a century or more but has been enormously improved and refined in the last two decades during which other notable achievements in eyesight saving have been made.

The average person identifies orthoptic training with the correction of crossed eyes. It has lately helped some of the young men originally rejected for service in the air forces to meet the visual requirements of this branch of the Service, Mr. Carris stated.

Great strides in preventing blindness due to detached retina were noted. Mr. Carris quoted one authority as saying that improvements in operating technique during the past few years have resulted in one-half the cases being reported cured, though once this condition was practically hopeless.

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PHYSIOLOGY

New Lens Simplifies Examination of the Eyes

➤ A LENS which changes its focus in the same way that the human eye does, namely, by changing the curvature of its surfaces, has been patented by Robert Graham of Ohio State University. The oculist in testing the eyes, instead of trying one lens after another, may put this single lens before the eye. Turning a little knob changes the focus, and a needle on a dial indicates the power. Two crossed cylindrical lenses of very thin glass (0.0028 inch) with liquid between them are used. Squeezing these together along the edges changes the curvature.

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