Germ Content. In the absence of any satisfactory chemical method for estimating germ, estimates have been made based on the microscopic appearance of the flours when compared with standard preparations. The final column in Table 2 shows the results obtained with the six flours: a thorough examination was also made of twenty other flours of varying fibre content and taken at random. The same general result was obtained, the range of germ content being 1–2 per cent, with an average of 1·5 per cent. It should, however, be remembered that it is not the quantity but the quality of the germ that matters, and recent work has indicated that the dry milling of National flour will tend to retain the scutellum or vitamin B_1-rich fraction of the germ[3].

Granularity. There is no official specification for this aspect of National flour, but the Medical Research Council has advised (June 2, 1942) that all coarse bran (particles greater than 0·5 mm. cross-section) should be excluded, while the remaining particles should not have a cross-section greater than 0·2 mm. In practice this means that all the flour should at least go through a No. 5 silk. To some extent the ideal of a low fibre content and fine particle size run counter to one another, since in obtaining the maximum amount of endosperm (and least fibre) it is essential not to chop up the bran too finely. Progress, however, is being made, and the following gives a comparison of the average values obtained from the same hundred mills on samples (*A*) before, and samples (*B*) after March 23, 1942. In the case of samples (*B*) correction was made for the added G.R. flour, which was assumed to pass through a No. 10 silk.

	A	*B*
Over 32 g.g. (aperture 0·60 mm.)	3·5%	1·2%
Through 32 g.g. and over 5 silk	7·7%	6·4%
Total over 5 silk (aperture 0·27 mm.)	11·2%	7·6%

The improvement is also evident from the following figures, which show the average percentage fractions, for each successive 100 samples received, over No. 5 flour silk and No. 8 silk (aperture 0·19 mm.) respectively:

Sample No.	% over 5 silk	% over 8 silk
1–100	11·9	15·0
101–200	10·5	14·9
201–300	9·3	14·2
301–400	8·4	13·0
401–500	5·5	9·9

Comparison with Quality of Samples before March 23, 1942. There are indications that the National average fibre figure is decreasing and that the range of variation is becoming narrower. In order to attempt a comparison those mills which sent in samples before (*A*) and after (*B*) March 23 have been included in a table in which each mill has been weighted on its milling capacity (sacks of flour per hour). In all, 149 mills have been included, and the following figures have been calculated for fibre:

Limit of fibre	*A* %	*B* %
≤ 0·50	10·8	26·3
0·60	30·2	46·7
0·70	56·3	75·5
0·80	79·7	86·5
0·90	92·6	90·5
1·00	96·0	99·3

A number of millers, realizing that commercial bran as such contains a considerable amount of attached endosperm, have adjusted their milling methods so as to scrape off this endosperm without chopping up the bran in the process. In this way they have been able, after prolonged experiment, to produce an 85 per cent meal with a fibre of 0·35–0·40 per cent. This technique is being followed in other mills but a limit will be set by the need for extra machinery. The following are typical samples:

	Sample 1 %	Sample 2 %
Over 5 silk	0·0	0·4
Over 8 silk	1·5	2·2
Over 10 silk	9·3	5·8
Fibre %	0·4	0·35
B_1 I.U./gm.	1·00	1·15

Quality of Bread

Four hundred and fifty-nine samples of bread have been examined. In every case a sample of the wheatmeal used was available in order to make any necessary check. The loaves were judged for quality by Dr. P. Halton and Mr. W. E. Spencer, and the following points taken into consideration: (1) general outside appearance; (2) volume; (3) crumb quality; (4) colour. Particular stress was laid on crumb quality, the standard being that of a first-quality commercial loaf. Four classes of quality were recognized—good, fair–good, fair and poor—and the following figures obtained:

Good	= 278 loaves	= 60·6%
Fair–good	= 102 ,,	= 22·2%
Fair	= 58 ,,	= 12·6%
Poor	= 21 ,,	= 4·6%

The chief defect was lack of proper fermentation and/or insufficient baking, giving a weak crumb.

The experimental work in this survey was carried out in the Laboratories of the Research Association of British Flour-Millers, St. Albans.

[1] Research Association of British Flour-Millers, NATURE, **149**, 460 (1942).
[2] E. C. Barton-Wright, NATURE, **149**, 696 (1942).
[3] J. J. C. Hinton, *J. Soc. Chem. Ind.*, **61**, 143 (1942).

MINERAL RESOURCES OF THE U.S.S.R.*

By DR. DAVID WILLIAMS

SINCE the inception of the first Five-Year Plan in 1927 the U.S.S.R. has made great strides towards the goal of domestic self-sufficiency in mineral supplies. Under the ægis of central authorities such as the Institute of Geology and Prospecting and the Academy of Science, thousands of geologists have been engaged in the search for new resources, playing an essential part in the industrial revolution which has swept through the Soviet Union. Although vast areas still remain to be explored, probably no country is more nearly self-supporting, and certainly none has brighter prospects of industrial and agricultural expansion in times of world peace. To some extent this favourable position is due to methods of national economy, whereby commercial considerations are subjugated to national expediency.

* Paper read on July 25 at the Conference on Mineral Resources and the Atlantic Charter, arranged by the Division for the Social and International Relations of Science of the British Association.

The most important deposits of metallic minerals lie within the ancient and deeply eroded mountain chain which extends along the Urals and then swings eastwards through Kazakhstan into Central Asia, and to a lesser extent among the younger and more rugged mountains of the Caucasus and Eastern Siberia. In the gently undulating country of the Russian platform, to the west of the Urals, enormous deposits of potassium salts and phosphate rock ensure the Union a foremost rank in the production of mineral fertilizers.

Russia's immense reserves of coal, iron and petroleum afford a sure basis for industrial progress, and in each of these three most important commodities she is capable of long maintaining a surplus output.

Iron and Ferro-Alloys

Even omitting the astronomical tonnages of comparatively low-grade quartzitic iron ores of the Kursk district, the Soviet reserves of iron ore have recently been estimated at more than 10,000 million tons, surpassing those of the United States. In 1940 Russia produced 28 million tons of ore, about two thirds of which was raised from the Ukraine deposits of Krivoy Rog and the remainder largely from Magnitogorsk and elsewhere in the Urals. Among other extensive deposits are the oolitic, brown iron ores of the Kerch Peninsula in the Crimea, the magnetites of the Kuznetsk region, and the hæmatites of Far Eastern Siberia. With such huge resources of iron ore it is clear that the Soviet Union has the opportunity not only of fulfilling her own internal demands, but also of contributing a generous export supply.

Among the ferro-alloys Russia has been, within recent years, the world's largest producer of manganese and chromite, supplying respectively about a half and a quarter of the total world output. In 1936 manganese resources were computed at more than 700 million tons, sufficient for more than 200 years output at recent levels, the chief ore bodies being the two famous deposits of Nikopol in the Ukraine, and Chiaturi in the Caucasus. Although the output of chromite has increased during the past decade, it has latterly been used almost wholly for domestic requirements of ferrochromium and chromium chemicals. The principal mines lie near Sverdlovsk in the Central Urals. Unless fresh discoveries are made, Russia may feel compelled to retain her entire production of chromite for home consumption.

Russian supplies of nickel have so far proved to be inadequate, but by exploiting several extensive low-grade nickel silicate deposits in the Urals and nickel sulphide bodies in the Kola Peninsula and in Northern Siberia, she may well become independent of imports in times of peace. According to present information, however, it is unlikely that the U.S.S.R. will ever raise a surplus supply of nickel.

For tungsten and molybdenum the Union relies very largely upon imports. Both metals occur in widely separated localities throughout European and Asiatic Russia, many promising discoveries having been reported. Workable deposits of tungsten ore (wolfram) have been located in the Transbaikal area, but no great reserves are claimed. Much is expected from the new tungsten-molybdenum concentrator at Tyrny-Aus in the heart of the Caucasus, and from other mills erected for the recovery of molybdenum in Kazakhstan and Eastern Siberia. It seems reasonable to infer that the U.S.S.R. will eventually become self-sufficient in molybdenum, though the outlook for tungsten appears to be less promising.

Non-Ferrous Metals

Russia has for long held either first or second place among the world's platinum producers, and although full statistics have not been available lately, it is obvious that she will continue to be a foremost exporter of the metal. Until a few years ago, mercury was mined only at Nikitovka in the Donetz basin, but quicksilver deposits have now been opened up in the Kirghiz, and apparently the Union's mercury supplies and demands are roughly balanced.

Aluminium was first produced by the Soviets on an industrial scale in 1932, and although production failed to reach the projected output the amount of metal won from bauxite had risen to 55,000 tons in 1940. The hope that a total production of 200,000 tons of aluminium would be attained in 1942 cannot materialize, for some of the chief hydro-electric plants (Dnieper, Volkhov near Leningrad, Kandalaksha in Karelia) are now in, or close to, enemy hands. In favourable circumstances, there are good prospects of achieving and even exceeding this figure, though the discernible output for some considerable time to come will be required for domestic use. Bauxite reserves, sufficient for several decades, are estimated at 45 million tons, the largest and richest deposits lying in the Urals to the north of Sverdlovsk. Immense quantities of nepheline and alunite are also available for the production of alumina and aluminium, and already plants have been erected for treating nepheline tailings from the apatite works at Kirovsk in the Kola Peninsula. The potential supply of nepheline, which contains about 33 per cent of alumina, must exceed 100 million tons.

Although Russia produced more than 100,000 tons of copper in 1938, she also had to import approximately two thirds as much. Most of the copper smelted hitherto has been won from Uralian deposits (notably Degtiarsk, near Sverdlovsk) but the greatest ore reserves are in Central Asia, at Kounrad and Djhezkazgan near Lake Balkhash, and at Almalyk in the Tashkent area. The estimated resources of copper (metal) have been placed at 16 million tons, and although this may be an optimistic figure, it is clear that when the mines and smelters are working to full capacity there will be no need for the Union to import any copper from abroad.

Production of lead and zinc has been steadily increasing during the past twenty years. Although the position with regard to lead is not yet satisfactory, the zinc output is probably ample for domestic needs. During the three years preceding the outbreak of war the imports of lead and zinc averaged approximately 30 and 2 per cent respectively of the country's total requirements of those metals. Russian reserves of lead and zinc have been calculated at 11 per cent and 19 per cent respectively of the world totals, the chief deposits and refineries being in the Caucasus (Sadon) and in the Altai Mountains of Kazakhstan (Ridder, Chimkent, Sokolny, and Belousovsk). In view of the likely future demands, there appears to be small likelihood of the Union producing a surplus of these two base metals.

Up to 1937, Russia was almost wholly dependent upon imports for both tin and antimony, receiving annually about 12,500 tons of the former and more than 2,000 tons of the latter. Apparently the most promising of the tin-bearing areas so far prospected lies in Eastern Transbaikal, but the recorded tonnages of proved ore are not large. Reports suggest that tin smelters may soon be operating in Yakutia and Tetiukhe, in Eastern Siberia. Unless tin substitutes are developed, however, it is inferred that the U.S.S.R. must continue to rely partly on imports of the metal. Valuable deposits of antimony ore have been discovered at Kadam Djai in the Kirghiz and in Central Siberia, and it seems justifiable to expect that Russia will be able to meet her own moderate peace-time needs of antimony.

Statistics for gold production are a State secret, but it is certain that the Union has adequate resources of this precious and enigmatic metal.

Non-Metallic Minerals

Russia's position with regard to many non-metallic minerals is stronger than that of any other country.

In recent years the U.S.S.R. has been the world's largest producer of crude magnesite. The Satka deposit, near Cheliabinsk in the Central Urals, alone yielded more than 800,000 tons of the mineral in 1937; including nearby deposits, the reserves are reputed to be about 250 million tons. Hitherto most of the output has been utilized for refractory purposes, but some magnesium metal is also manufactured from Satka ore. Although the production of metallic magnesium was less than 4 per cent of the world total in 1940, the potential output is enormous, for there are extensive supplies of raw materials from which the metal can be extracted, notably the rich carnallite ($KMgCl_3.6H_2O$) deposits of Solikamsk in the Western Urals, brine from various salt lakes, and the Satka magnesites.

Russian geologists claim that the prospected phosphate rock deposits of the U.S.S.R. now exceed 60 per cent of the world's resources. Near Kirovsk, in the Kola Peninsula, remarkable bodies of apatite, discovered in 1926, have recently been yielding more than 2 million tons of ore annually, with reserves for another millennium. The principal phosphorite deposits occur in European Russia, in the regions of Kirov (Phosphoritnaya) and Moscow (Egorjevsk), but an extensive and favourably situated field near Aktiubinsk in North-west Kazakhstan is being developed to supply agricultural fertilizers for western Soviet Asia.

No details of mica production have been issued since 1935, when the Union held second place in world rank. The muscovite pegmatites of the Mama-Vitim area in Eastern Siberia and the Chupa Fjord district of Karelia, and the phlogopite veins of Slyudyanka at the western end of Lake Baikal, are doubtless capable of providing adequate supplies for domestic consumption. For many years the Russian output and export of asbestos has only been exceeded by that of Canada. The yearly production of chrysotile asbestos from the well-known Bazhenov field, near Sverdlovsk, is roughly 100,000 tons, the total reserves amounting to more than 30 million tons. It is unquestionably one of the largest and most productive asbestos fields in the world.

The region of Solikamsk, on the western slopes of the Urals, has long been known for its brines and salt works, but it was only after deep boring commenced in 1925 that the remarkable deposits of potassium and magnesium salts (sylvinite and carnallite) and the enormous masses of rock salt were thoroughly investigated over an area of some 700 square miles. Production started in 1932 and within five years the annual output had risen to more than two million tons of crude salts, and large quantities were being exported. Solikamsk reserves are claimed to represent about 80 per cent of the world's resources, consisting of 15,000 million tons of potash salts, 18,000 million tons of magnesium salts, and scores of thousands of millions of tons of rock salt. Even the famous Stassfurt deposits of Germany are dwarfed.

In 1938 Russia was among the leading producers of pyrite, with a tonnage approaching one million, derived chiefly from the Uralian cupriferous bodies (especially Degtiarsk) and from various coal mines. Expeditions to the Kara Kum Desert and the Gourdak Range in Turkmen territory, east of the Caspian Sea, have discovered huge supplies of native sulphur, quite comparable with the great Sicilian deposits. These Turkmen occurrences are likely to be the main future supply of sulphur, except in areas where it is being recovered during the treatment of sulphide ores.

Adequate resources of other minerals, such as graphite, fluorite and gypsum, are known to exist within the Union.

The development of mineral resources in the U.S.S.R. during the past fifteen years has far surpassed anything formerly achieved in a like period of the world's history. Sceptics may doubt the validity of some of the Russian estimates of ore reserves, but it should be recalled that vast territories still await detailed investigation and that the actual resources might well prove to exceed those now claimed. Despite the present marked deficiency in a few metals, notably tin and tungsten, it is reasonable to suppose that the U.S.S.R. will eventually become almost entirely self-supporting and may be able to export large quantities of coal, iron, petroleum, manganese, platinum, magnesite, phosphates, asbestos, potash and sulphur. The U.S.S.R., with her immense natural resources and man-power, has much to offer in the cause of world progress and welfare, and not least a share in her abundant mineral wealth.

OBITUARIES

Prof. A. Ukhtomsky

THOSE physiologists from Great Britain who had the good fortune to attend the International Congress of Physiology at Leningrad and Moscow in 1935 will remember the picturesque figure of Prof. Ukhtomsky and his novel and philosophic approach to the problems of nervous physiology. As successor to Wedensky, he had done much to develop the ideas of his brilliant teacher. It is with great regret that we now learn of his recent death in a message from Prof. K. Kekcheev addressed to the Physiological Society, on which the following notes are based.

Alexey Ukhtomsky was born in 1875 and for twenty years held the chair of physiology in the University of Leningrad, to which he was appointed on the death of his teacher, the well-known Russian physiologist Wedensky.

Ukhtomsky is known for his numerous researches into the excitation inhibition of the central nervous system. In 1911 he established the principle of the 'dominant', according to which, given the presence of any excited point in the brain, other auxiliary excitations do not call forth the usual reflexes but serve to enhance the excitation of the given point.