Symposium on Minerals of Russia

Green Center, Petroleum Hall, Colorado School of Mines,
924 16th St., Golden, Colorado,

September 10, 2011

Sponsored by
Friends of Mineralogy, Colorado Chapter
Denver Gem and Mineral Show
Colorado School of Mines Geology Museum

Eudialyte with lamprophyllite, Khibiny massif, Kola Peninsula, Russia

Friends of Mineralogy, Colorado Chapter
P.O. Box 5276, Golden CO 80401
http://friendsofmineralogycolorado.org/

Symposium on Minerals of Russia

Green Center, Petroleum Hall, Colorado School of Mines, 924 16th St.,
Golden, Colorado, September 10, 2011

9:00 Opening Remarks, Bruce Geller, Director, Colorado School of Mines Geology Museum

9:15 Igor V. Pekov* and Anna G. Turchkova: **Classic Russian Mineral Localities: An Overview** (* speaker)

10:00 coffee break

10:30 Jolyon Ralph: **Mineral Museums of Moscow**

11:15 Anna G. Turchkova* and Igor V. Pekov: **Outstanding Minerals and Mineral Localities of the Kola Peninsula** (* speaker)

12:00 lunch, and, CSM Geology Museum open for tours

2:00 Peter J. Modreski: **A Comparison of Kola Peninsula Mineral Localities to those of North America**

2:30 Igor V. Pekov: **Unique Iodide Mineralization at the Rubtsovskoe Deposit (NW Altai, Russia) and its Genesis**

3:00 John Watson: **Na Pamir! A Tribute to Anatoly Mikhailovich Skrigitil (1941-1999); the Rangkul Pegmatites, Eastern Pamirs, Tajikistan**

3:30 William Shelton: **Compiling an Index of Mineral Localities for the Former Soviet Union**

3:45 Jolyon Ralph: **Mineral Museums of Moscow** (continued) and **Russian Mineral Classification Systems**

4:30 General discussion and closing

4:45 Discussion continues at the Golden City Brewery, 920½ 12th St., Golden

~6:30 Dinner together for all attendees who wish to join for it, location TBA

Sponsored by the Friends of Mineralogy, Colorado Chapter; Denver Gem and Mineral Show; and Colorado School of Mines Geology Museum

Published by Friends of Mineralogy, Colorado Chapter, P.O. Box 5276, Golden CO 80401
http://friendsofmineralogycolorado.org/
program and cover photo by P. Modreski

Classic Russian Mineral Localities: An Overview

Igor V. Pekov and Anna G. Turchkova, Moscow, Russia*

*speaker

About thirty mineral localities of Russia can be considered as the classics: they have been known for more than half a century as source of numerous high-quality mineral specimens well-represented in famous long-lived museum collections. There are objects of Urals, South Siberia, and Kola Peninsula. Serious mineral collecting at Russian localities was started in the 18th century in South Siberia (Adun-Cholon pegmatites; Sherlovaya Gora greisen deposit; Western Altai and Nerchinsk District polymetallic deposits; Slyudyanka and Akhtaragda skarns) and Central Urals (Berezovskoye gold deposit, Gumeshevskoye copper deposit, Murzinka and Sarapulka pegmatites). It was closely connected with rapid development of the mining industry and gem trade. Famous Russian minerals of this period include beryl-aquamarine, red tourmaline, malachite, crocoite, and quartz-amethyst. The 19th century, especially its second half, became the "golden age" of Russian minerals in museums all over the world. Most Russian mineral localities yielding world-best specimens were discovered at this time: in the Central Urals (Nizhniy Tagil copper and platinum deposits; emerald mines; Shaitanka and Adui pegmatites; Saranovskoye chromite deposit; Tur'inskiye copper mines; Nev'yansk gold-platinum placers), South Urals (Ilmeny Mountains pegmatites; Akhmatovskaya Pit and neighboring, related skarn deposits; placers of the Miass and Sanarka rivers) and Siberia (Borshchovochnyi Kryazh pegmatites; Lena river gold placers). Classic Russian minerals of the 19th century included: native metals (gold, platinum, osmium, and iridosmine nuggets, copper dendrites), chrysoberyl-alexandrite, blue and purple topaz, beryl (heliodor, aquamarine, emerald), colored tourmaline, perovskite, uvarovite, malachite, crocoite, phenakite, grossular, vesuvianite, zircon, ilmenite, aeschynite, and samarskite. The Khibiny and Lovozero alkaline complexes (eudialyte, astrophyllite, lamprophyllite, loparite and a great number of rare minerals) in Kola, the Dalnegorsk boron-polymetallic deposits (ilvaite, datolite, danburite, pyrrhotite, galena, sphalerite, fluorite, calcite, etc.) in the Far East, Vishnevye Gory (zircon, pyrochlore, ilmenite, rare minerals) and Lipovka (elbaite) in the Urals can be considered as Russian classics of the 20th century. More than half of above-mentioned localities remain important sources of good specimens today. Russian localities found in the last fifty years and now actively producing

museum-quality mineral specimens (Kovdor alkaline massif and the Keivy area in Kola; Subpolar Urals alpine-type quartz deposits; Norilsk CuNiPdPt-deposits, Murun, Inagli and Konder alkaline cpmplexes, Malkhan pegmatites, Mir and Udachnaya kimberlite pipes in Siberia, etc.) have a chance of becoming classics of the future.

Igor Viktorovich Pekov

Igor V. Pekov was born in 1967 in Moscow, Russia. From 1984–1989 he was a student of the Geological Faculty of Lomonosov Moscow State University, specializing in geochemistry, mineralogy and crystal chemistry. From 1989 to the present he works at the Department of Mineralogy in this University and now occupies the position of leading researcher. He has a PhD in mineralogy (1997), and a Doctor of Sciences in mineralogy and crystal chemistry (2005). Pekov is a specialist in general and genetic mineralogy, crystal chemistry and geochemistry of rare elements, mineralogy of alkaline rocks, granitic pegmatites and the oxidation zone of ore deposits, crystal chemistry and properties of zeolite-like compounds, and the history of mineralogy. He is an author or co-author of more than 500 scientific publications including 8 monographs and more than 250 articles in refereed journals. Pekov is a discoverer of 100 new minerals, as the senior author (60) or co-author. His main objects of studies, including field work, are the alkaline complexes of the Kola Peninsula, South Greenland, and Eifel, the granitic pegmatites of the Kola Peninsula and Urals, and the oxidized ore deposits of the Urals, Russian Altai and Greece. Pekov is also a mineral collector. His systematic collection includes more than 10,000 specimens representing 3,000 mineral species from worldwide localities but with the accentuation on former Soviet Union countries. The collection is actively used for mineralogical studies.

Mineral Museums of Moscow

Jolyon Ralph, Surrey, England, jolyon@mindat.org

Jolyon Ralph has visited Moscow three times in the previous three years, and during these trips has visited several museums with mineralogical collections, both small and large. His presentation describes public and private museums, explains key differences between western and Russian styles of operating museums, and explores some of the treasures of their collections.

Russian Mineral Classification Systems

Jolyon Ralph

Russian mineralogists seem to have no shortage of classification systems for dealing with the mineral world - although none are presented as an ideal system, each has its own merits and they are all almost unheard of outside of the Russian speaking world

Jolyon Ralph is an active mineral collector who developed and operates the non-profit website www.mindat.org, the largest mineralogy resource available on the internet. Jolynon studied geology at Imperial College, London. He has worked as a computer programmer, consultant, software publisher, computer forensics expert witness, computer journalist, and lecturer, and is currently the Managing Director of Mysterious Ways, Ltd., a website development and consultancy company. According to his home page on mindat.org, Jolyon has personally uploaded 2820 mineral photos, 52 locality photos, 1519 other photos, and published 98 articles on mindat.org. Jolyon was the 2011 recipient of the Mineralogical Society of America's Distinguished Public Service Award, presented to him in Tucson, AZ in February 2011, for his work in creating Mindat.

Outstanding Minerals and Mineral Localities of the Kola Peninsula

Anna G. Turchkova and Igor V. Pekov, Moscow, Russia*

* speaker

The Kola Peninsula is now one of the most important mining regions of Russia, with huge operating mines for apatite, iron, nickel, and rare metals. Geologically, it is the north-west part of the Baltic Shield mainly consisting of Pre-Cambrian metamorphic rocks, with many complexes of different igneous rocks, both Pre-Cambrian and Paleozoic. Kola is unique in its mineralogy. More than 1000 mineral species have been found in the area of less than 100,000 km^2: almost a quarter of the diversity of all the mineral kingdom. 250 minerals were first discovered at Kola. Khibiny is the world's largest alkaline complex that hosts the world-largest deposits of magmatic apatite. Khibiny produces superb, spectacular eudialyte, astrophyllite, natrolite, villiaumite, and loparite. Lovozero is another famous Kola alkaline complex, a source of remarkable specimens of lorenzenite, zircon, manganoneptunite, catapleiite, elpidite, etc. Kovdor is the most famous carbonatite-containing alkaline-ultrabasic complex at Kola, from which outstanding specimens of kovdorskite, bobierrite, baddeleyite and magnetite have originated. All three of these alkaline complexes are also well-known due to their great diversity of rare mineral species. Granitic pegmatites are also widespead at Kola. They also contain many rare minerals, including fine amazonite crystals and the world's-best plumbomicrolite and holtite. High-alumina metamorphic yield superb staurolite twins and outstanding almandine and kyanite. Also noteworthy is glendonite, a pseudomorph of calcite after ikaite, formed recently in sand-clay sea-coast deposits.

Anna Georgievna Turchkova

Anna G. Turchkova was born in 1963 in Saratovskaya Oblast, Russia. From 1980–1985 she was a student of the Geological Faculty of Lomonosov Moscow State University, specializing in mineralogy and crystallography. From 1985 to 1996 she was a science researcher in the Institute of Lithosphere of the Russian Academy of Sciences (Moscow). From 1996 to present she has worked at the Department of Mineralogy in the University as a science researcher. She has a PhD in mineralogy (1998). Turchkova is a specialist in experimental mineralogy, in mineralogy and properties of zeolites, and in the history of mineralogy. She is an author or co-author of more

than 60 scientific publications including one monograph. Her main objects of studies, including field work, are the alkaline complexes of the Kola Peninsula and Eifel. She carries out experimental work with zeolites and related minerals on their transformations under hydrothermal conditions.

A Comparison of Kola Peninsula Mineral Localities to those of North America

Peter J. Modreski, Wheat Ridge, CO; pmodreski@usgs.gov

The alkaline, silica-undersaturated igneous complexes of the Kola Peninsula, Russia, are among the world's most prolific localities for rare and unusual minerals. The Khibiny massif, the world's largest such complex, is composed of concentric intrusions of a variety of syenites and related rocks, including "khibinite", a coarse-grained, eudialyte-bearing nepheline syenite. East of it is the somewhat smaller Lovozero complex, containing nepheline-, sodalite-, nosean-, and analcime-bearing syenites. The Kovdor complex, in the western Kola Peninsula, mined for magnetite, apatite, and phlogopite mica, includes carbonatite as well alkaline and ultramafic rocks such as nepheline syenite, ijolite, and pyroxenite.

One can compare these complexes to those found across the Atlantic. The Ilimaussaq complex of southwest Greenland, composed of a variety of syenites and syenite pegmatites, is famous for its tugtupite, sodalite, and other minerals. In Canada, Mont St-Hilaire is one of the alkaline syenite localities best known to mineral collectors, with its pegmatites and miarolitic cavities in sodalite-nepheline syenite. Oka, Quebec and Magnet Cove, Arkansas are two carbonatite complexes, concentric intrusions composed of a variety of rock types. Oka is particularly rich in niobium and was mined for that metal, present in pyrochlore, latrappite, and the silicate, niocalite. Magnet Cove is famous for its magnetite, rutile, anatase, the Zr-bearing garnet species kimzeyite, and many more minerals. Point of Rocks Mesa, in Colfax County, northeastern New Mexico, is a sill of phonolite (the volcanic or subvolcanic equivalent of nepheline syenite) containing small miarolitic cavities hosting many of the same minerals found in the larger, deeper igneous complexes; it is notable for its presence of villiaumite, eudialyte, lorenzenite, neptunite, and manganoneptunite.

A comparison of statistics on these several complexes follows; data on number of mineral species are from mindat.org. Khibiny clearly holds the title for the most known mineral species from a locality, outstripping the 354 valid species from the Franklin, New Jersey district.

igneous complex	*area, km²*	*no. of species*	*type species*
Khibiny massif, Russia	1327	482	109
Lovozero massif, Russia	650	400	100
Kovdor complex, Russia	40	165	20
Ilimaussaq, Greenland	135	195	34
Mont St-Hilaire, Quebec	9	387	59
Oka, Quebec	10	56	2
Magnet Cove, Arkansas	5 1/2	141	5
Point of Rocks, New Mexico	8	52	0

Peter J. Modreski is a geochemist with the U.S. Geological Survey, and is part of the USGS Office of Communications and Publishing. He has a B.A. in Chemistry from Rutgers University, and an M.S. and Ph.D. in Geochemistry from Penn State. He is an Executive Editor of Rocks & Minerals magazine, a Research Associate at the Denver Museum of Nature and Science, and is the current president of the Colorado Chapter, Friends of Mineralogy.

Unique Iodide Mineralization at the Rubtsovskoe Deposit (NW Altai, Russia) and Its Genesis

Igor V. Pekov, igorpekov@mail.ru

Unusual, extremely rich iodide mineralization was found in 2009 in the oxidation zone of the Rubtsovskoe volcanic-hosted massive sulfide deposit (NW Altai, Russia) that is in operation by underground mining for copper, lead and zinc. Primary ores contain >50%, typically 80-90%, sulfides. The stratiform orebody is surrounded by a wide aureole of argillized rocks and covered by sedimentary clays 80-100 m thick. The oxidation zone, formed in Miocene time, occurs at the top of the orebody. Its upper part is a typical iron cap while the lower part contains very rich secondary ores with native copper, cuprite, chalcocite, cerussite, *etc*. Iodide mineralization shows clear zoning. Iodargyrite is distributed in the iron cap while Cu-rich iodides of the marshite-miersite series occur lower, in rich secondary copper ores. Iodargyrite and Ag-poor marshite are "antagonistic" while miersite is assosiated with marshite or iodargyrite in different areas. The concentration of iodides in some areas is up to 5% (!) of the rock; 1% is their typical content.

Iodargyrite is pure AgI. Isostructural cubic marshite, CuI, and miersite, (Ag,Cu)I, form an isomorphous series. Well-shaped crystals of marshite are up to 3 cm, iodargyrite – up to 1 cm.

Iodides are some of the latest minerals at Rubtsovskoe. Iodargyrite only occurs in cracks or cavities, marshite crystallizes in clay pockets, fills cavities, or replaces azurite, cuprite, native copper, malachite and osarizawaite. Marshite was formed under reducing conditions and does not occur in parageneses with oxygen-bearing copper minerals, unlike the Ag-rich iodides. Iodargyrite was formed later than miersite that shows increase of the I:Ag ratio. In the assumed genetic model, exhalations of ore-forming "seafloor fumaroles" are the most probable source of iodine. Further, it was captured by clays of the argillized aureole near ore and mainly concentrated in them in absorbed forms and as I^0 and I^- in pore solutions. A very important factor for iodine concentration at Rubtsovskoe is a high content of sulfides in primary ores. During the first stages of oxidation, such ores produced much sulfuric acid that altered illite of argillized rocks to kaolinite, dickite and alunite. It also oxidized I^0 and I^- to $(I^{5+}O_3)^-$. Sulfate solutions containing much Cu^{2+} (and very mobile iodate ions) infiltrated down and formed, as a result of reactions with sulfides, extremely rich ores with native copper and cuprite. In this process, I^{5+} was reduced to I^0 and further to I^- that was fixed in hardly soluble iodides of Ag and Cu^+.

Na Pamir!

A Tribute to Anatoly Mikhailovich Skrigitil (1941-1999)

John Watson, Fallbrook, CA, geospace321@yahoo.com

In Soviet times the central Asian nations were all incorporated into the USSR and this included the Tajikiskaya SSR. The Soviet government was always interested in exploitation of the resources of central Asia and conducted geological survey and prospecting in all of them. Some deposits became essential to the industrial and defense efforts of the USSR. This need resulted in survey activity that was staffed by large numbers of Russians posted to sites remote from Russian cities. Among these sites was Dushanbe, the capitol of Tajikistan. Anatoly was posted to Dushanbe, Tajikistan, its capitol, in 1971 and served as a geologist in Tajikistan for the following 21 years, 18 of them in the Pamirs. He became an expert on the geology and mineral deposits of one of the most remote regions in the world – the easternmost fringes of the Pamir ranges. And this includes the **Rangkul gem pegmatites**.

This paper will show the location of the pegmatites, geologic setting, and examples of minerals from the prospects. Included will be a 12 minute video on two separate expeditions, imagery taken by Skrigitil using his own videocam.

John Watson

Watson knew Anatoly Skrigitil on his many trips to Moscow on a space program in the years 1933-2004. He bought a number of specimens from his collection and these samples will be shown in the main Denver show. He knows the family and had family dinners in the Skrigitil apartment on many occasions. He and Watson rendezvoused in Washington DC in 1995 when he accompanied a Duma member, Valentin Tsoi, who was trying to stimulate Russian-American commerce. Watson made requests for photos and maps and field notebooks and Skrigitil was able to generate a video from his large collection of slides and videos for Watson. He also provided a number of stills of the area. The status of his professional notes and files is unknown.

Watson was trained as a geologist and has Masters' degrees from the University of Oklahoma and Caltech. He has collected fossils and minerals for over 60 years. He is retired after 40 years in the aerospace and defense industries as a scientist/engineer/technologist. His last project, which brought him to Moscow, was collaboration in unmanned military space. He served in the US Navy as a pilot.

Compiling an Index of Mineral Localities for the Former Soviet Union

William Shelton, laeliason@msn.com

William Shelton holds a M. A. in oceanography from West Connecticut University (Danbury, CT). His lifelong interest and passion regarding minerals, particularly from the former Soviet Union, is well-known. Bill plans to donate the best of his collection to the A. E. Seaman Museum at Michigan Tech. Bill has written numerous articles which have appeared in Mineral News. His *Mineral index with localities for the former Soviet Union, based on World of Stones,* compiled for the 30th Rochester Mineralogical Symposium, 2003, was well-received by serious collectors who appreciate Russian pieces

Minerals of Russia: Selected Bibliography

Anastasenko, Galina F., and Michael B. Leybov, 2008, Diamonds of Russia. *Rocks & Minerals* vol. 83, no. 6, p. 508-517.

Evseev, A.A., 1994, Siberia and Far East: a brief mineralogical guide. *World of Stones*, No. 4, p. 42-54.

Ivanyuk, G. Yu., V.N. Yakovenchuk, and Ya.A. Pakhomovsky, 2002, *Kovdor.* Laplandia Minerals, Apatity, Russia, 326 pages (English/Russian).

Ivanyuk, G.Yu., and Yakovenchuk, V.N, 1997, Minerals of the Kovdor massif. Kovdor-Apatity: Kovdorsky Mining and Dressing Plant Co. and Russian Academy of Sciences Kola Science Center.

Kantor, Boris Z., 2001, Mineral collecting in Russia. Rocks & Minerals, vol. 76, no. 1, p. 10-16.

Klopotov, K.I., 2006, Slyudyanka: a brief mineralogical guide. Mineralogical Almanac, vol. 10, p. 6-30.

Moroshkin, V.V., and N.I. Frishman, 2001, Dalnegorsk: notes on mineralogy. *Mineralogical Almanac* vol.4, 128 p.

Pakhomovsky, Yakov, V. Yakovenchuk, and G. Ivanyuk, 2001, Recent findings of unique mineralogical specimens on the Kola Peninsula. *Rocks & Minerals*, vol. 76, no. 1, p. 24-37.

Pavlishin, V.I., and S.A. Dovgyi, 2007, Volodarsk-Volynski; Mineralogy of the Volynian chamber pegmatites, Ukraine. *Mineralogical Almanac*, vol. 12, 125 p.

Pekov, Igor V., 1998, *Minerals First Discovered on the Territory of the Former Soviet Union.* Moscow, Ocean Pictures, Ltd., 370 p.

Pekov, Igor V., 2000, *Lovozero massif; history, pegmatites, minerals*. Moscow, Ocean Pictures Ltd., 480 p.

Pekov, Igor V., and A.S. Podlesnyi, 2004, Kukisvumchorr deposit: Mineralogy of alkaline pegmatites and hydrothermalites. *Mineralogical Almanac*, vol. 7, 140 p.

Popov, V.A., and V.I. Popova, 2006, Ilmeny Mountains: mineralogy of pegmatites. *Mineralogical Almanac*, vol. 9, 151 p.

Popov, V.A., V.I. Popova, and A.A. Kanonerov, 2002, Murzinka: Alabashka Pegmatite Field. Moscow, Ocean Pictures, Ltd., 127 p.

Ralph, Jolyon, 2011, Mineral Museums of Moscow. *Rocks & Minerals*, vol. 86, no.5.

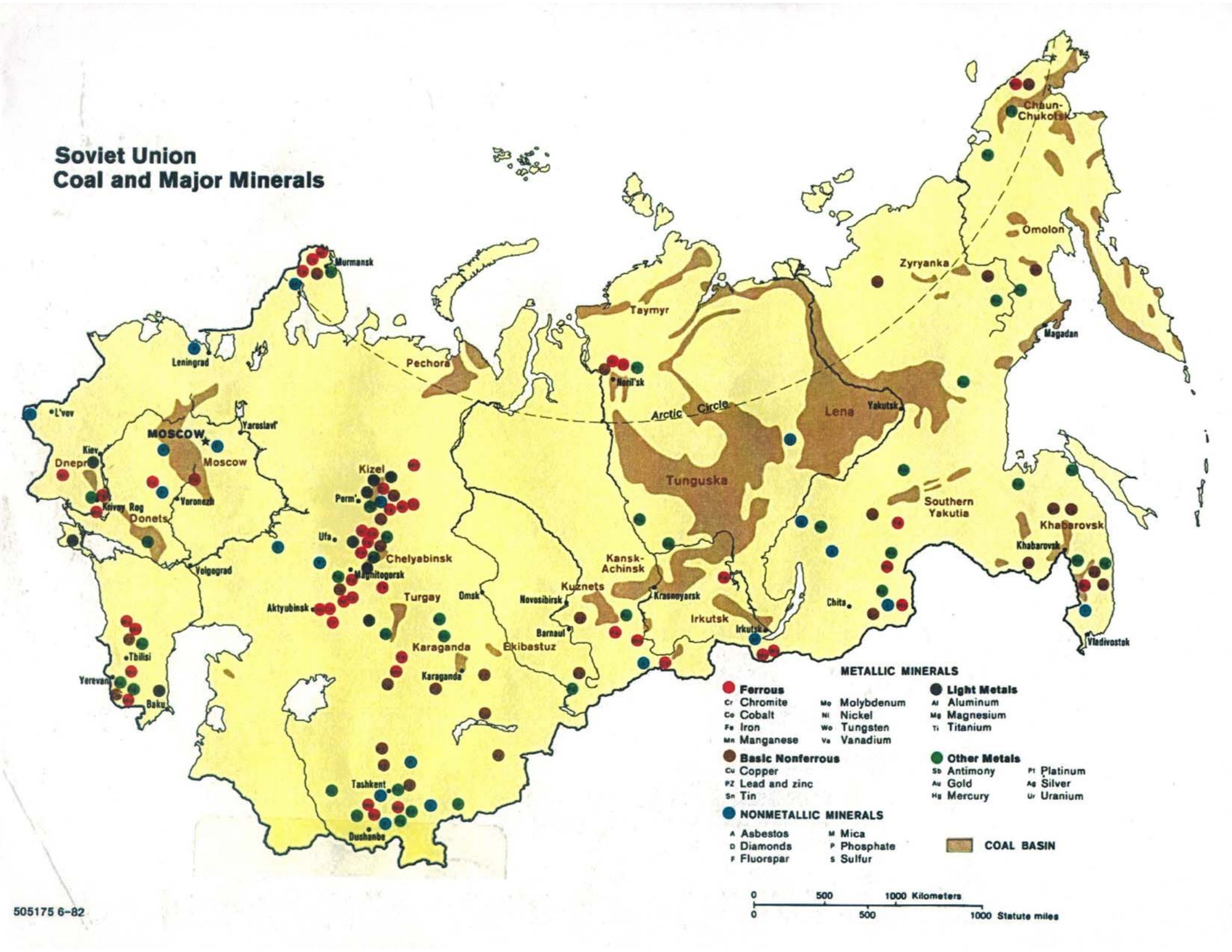
Shelton, William, 2003, *Mineral index with localities for the former Soviet Union, based on World of Stones*. Compiled for the 30th Rochester Mineralogical Symposium, 174 p.

Spetsius, Z.V., and Taylor, L.A., 2008, *Diamonds of Siberia: photographic evidence for their origin.* Tranquility Base Press, Lenoir City, Tennessee, 278 p.

Zhernakov,Vladimir I., 2009, Ural emerald mines (Izumrudnye Kopi): Notes on mineralogy. *Mineralogical Almanac*, vol. 14, no. 2, 125 p.


North Sea
NORWAY
SWEDEN
ARCTIC
OCEAN
Chukchi Sea
Bering Sea
East Siberian Sea
Elbe
GERMANY
Gulf of Bothnia
Kovdor
Murmansk
FINLAND
Khibiny massif
Lovozero massif
Keivy
Baltic Sea
Barents Sea
White Sea
POLAND
St. Petersburg
Minsk
BELARUS
Dniepr
Volga
Moscow
Puiva
URALS
Ob
Yenisey
Indigirka R.
Kiev
Kama
Saha kimberlitic region
Lena R.
Magadan
Don
Volga
Dnieper
Saranovskii mine
UKRAINE
Murzinka
Irtysh
RUSSIA
Sea of Okhotsk
Volga
Don
Sverdlovsk
Ekaterinburg
Ob
Lena R.
Volgograd
Murun massif
Ural
Yenisey
Caspian Sea
Amur
Amur
Irtysh
Lena R.
Rubtsovskoe mine
Irkutsk
L. Baykal
KAZAKHSTAN
Yenisey
Ulan Ude
Slyudyanka
Sikhote-Alin
CHINA
TURKMENISTAN
UZBEKISTAN
JAPAN
IRAN
Tashkent
Bishkek
Alma Ata
CHINA
MONGOLIA
Vladivostok
Dalnegorsk
Sea of Japan
500 miles
500 kilometers

Soviet Union
Coal and Major Minerals



505175 6-82