

Fathi Habashi



2015

My Trips in Russia

Volume derived from



Fathi Habashi

Department of Mining, Metallurgy, and Materials Engineering
Laval University, Quebec City, Canada

2015

The Book

The present volume is derived from *De Re Metallica. A Metallurgist on the Move*, which is a diary of the trips the author has undertaken during his professional career. He visited many industries, universities, research centres, and museums and participated in many conferences. The book therefore reflects the state of extractive metallurgy since he left his home country Egypt and went to study in Vienna. *De Re Metallica* is in seven volumes fully illustrated mainly by coloured photographs. It includes a short history of the place visited and its main sightseeing sites. Volume 1 Egypt, Volume 2 Canada, Volume 3 United States, Volume 4 Latin America, Volume 5 Asia [in two parts], Volume 6 Europe [in two parts], and Volume 7 Russia & other countries. Total number of pages was 5500.

Since these volumes could not be separated and therefore they will not be available to many readers, I decided to split the book into selected 29 small units, each representing one country or a group of countries closely related geographically. The present volume is one of these volumes.



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*To Nadia,
Hani, and Hatem
with love*

Other Books by the Author

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Technical

- F. Habashi, *Principles of Extractive Metallurgy*:
- Volume 1: General Principles (422 pages), 1969 (reprinted 1980) (out of print), Gordon & Breach Science Publishers.
 - Volume 2: Hydrometallurgy (468 pages), 1970 (reprinted 1980) (out of print), Gordon & Breach Science Publishers.
 - Volume 3: Pyrometallurgy (493 pages), 1986 (reprinted 1992) (out of print), Gordon & Breach Science Publishers.
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- F. Habashi, *Researches on Rare Earths. History and Technology*, 2008, 125 pages.
- F. Habashi, *Researches on Copper: History, Metallurgy*, 2009, 400 pages.
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- F. Habashi, *Pyrite. History, Chemistry, and Metallurgy*, 2012, 115 pages.
- F. Habashi, *Pressure Hydrometallurgy*, 2014, 242 pages.
- F. Habashi, *De Re Metallica. A Metallurgist on the Move*, 7 volumes, 2015, 5523 pages.

Historical

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- F. Habashi, D. Hendricker, C. Gignac, *Mining and Metallurgy on Postage Stamps*, 1999, 335 pages.
- F. Habashi, *Extractive Metallurgy Today. Progress and Problems*, 2000, 325 pages.
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- F. Habashi, *Ida Noddack (1896–1978). Personal Recollections on the Occasion of 80th Anniversary of the Discovery of Rhenium*, 2005, 164 pages.
- F. Habashi, *Readings in Historical Metallurgy*, Volume 1: Changing Technology in Extractive Metallurgy, 2006, 800 pages.
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Preface

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Since these volumes could not be separated and therefore they will not be available to many readers, I decided to split the book into selected 28 small units each representing one country or a group of countries closely related geographically as shown below.

1	Arab Countries	Jordan, Kuwait, Morocco, Syria, Tunis
2	Austria	
3	Australia & Southeast Asia	Australia, Cambodia, Indonesia, Malaysia, Philippines, Thailand, Vietnam
4	Balkans	Albania, Bosnia, Bulgaria, Croatia, Greece, Romania, Serbia, Slovenia
5	Baltic Countries	Latvia, Lithuania, Poland
6	Brazil	
7	Canada	
8	Caribbean	Cuba, Puerto Rico, Venezuela
9	Caucasus	Armenia, Azerbaijan, Georgia
10	Central Asia	Afghanistan, Kazakhstan, Mongolia, Uzbekistan
11	Central Europe	Czech Republic, Slovakia, Hungary, Switzerland
12	Chile and Argentina	
13	China	
14	Egypt	
15	England and France	
16	Germany	
17	Iberian Peninsula	
18	India	
19	Italy and Vatican	
20	Japan and Korea	
21	Low Countries	

22	Mexico	
23	Middle East	Iran, Turkey
24	Peru and Bolivia	
25	Russia	
26	Scandinavia	
27	South Africa	
28	USA	

I hope in this way the book will available to a large number of readers.

Fathi Habashi

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Chapter 1

USSR

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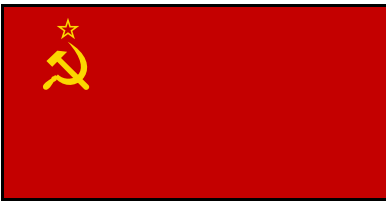


Figure 1.1: Flag of USSR.



Figure 1.2: Flag of Russia.

Names of cities changed during the Communist regime and were restored thereafter. They are mentioned here in their historical context.

Table 1.1: Summary of visits.

	Dates	Purpose	Hosts
1	July 28–August 10, 1957	World Festival of Youth in Moscow	World Federation of Democratic Youth
2	October–December, 1977	Leningrad Mining Institute	USSR Academy of Sciences, Leningrad
3	May 7–17, 1993	Saint Petersburg Mining Institute	Preparation for a joint conference
4	November 1–3, 1993	Saint Petersburg Mining Institute	Doctor of Science honoris causa
5	May 6–14, 1994	International Symposium on the Problems of Complex Ores Utilization	Saint Petersburg Mining Institute
6	May 5–12, 2001 May 12–18, 2011	GINSVETMET, Moscow Ural State University, Ekaterinburg	Andre Tarasov, Iosef Reznik Stanislav Naboychenko
7	August 31–September 8, 2003	IRGIREDMET, Irkutsk	Grigori I. Voiloshnikov
	September 8–14, 2003	Conference on Nonferrous Metals, Krasnoyarsk, Siberia	Gennady Pashkov, Russian Academy of Science, Siberian Branch
8	September 2004	Conference on Nonferrous Metals, Ulan-Ude	Gennady Pashkov, Russian Academy of Science, Siberian Branch

	Dates	Purpose	Hosts
9	October 6–16, 2004	Conference, “Scientific Heritage of V.N. Tatishchev”	Astrakhan State University
10	September 4–12, 2011	International Congress Non-ferrous Metals	Gennady Pashkov, Russian Academy of Science, Siberian Branch
	September 12–14, 2011	Norilsk	Nickel Plant

SUMMER 1957

While studying towards the doctorate at the Technische Hochschule in Vienna (now Technische Universität Wien), I learned about the World Festival of Youth and Students that would take place in Moscow in summer 1957. As a convinced socialist, I decided to participate. Travel agents in Vienna were organizing group trips to Moscow by train at a reasonable price that I could afford. This encouraged me to go to the Soviet Consulate and apply for a visa to Moscow on a piece of paper separate from my Egyptian passport because at that time my passport did not include the USSR among the countries to be visited. I obtained the visa to the Soviet Union (Figure 1.4), then bought a ticket with a travel bureau to join a group. We left by train to Prague, Warsaw, Brest, then arriving Moscow after two days. We stayed at Hotel Europa (Figures 1.5–1.9) — a small hotel near Bolshoi Theatre where I stayed with two friends from Vienna for two weeks.



Figure 1.5: Brochure of Hotel Europa in Moscow, 1957.



Figure 1.6: Hotel Europa in Moscow, 1957.

WORLD FESTIVAL OF YOUTH AND STUDENTS

The World Festival of Youth and Students is an international event, organized by the World Federation of Democratic Youth, a youth organization, jointly with the International Union of Students. The largest festival was the 6th, held in 1957 in Moscow. It was a time when Soviet Russia was opening its doors for the first time to the rest of the world. This festival also marked the international debut of the song “Moscow Nights,” which became the most widely recognized Russian song. During the Cold War, many festivals were held in capitals of Communist states because of the enormous expenditure and coordination required to support a youth festival. As a result, by the 1960s the festivals were accused of being a tool of Communist propaganda.

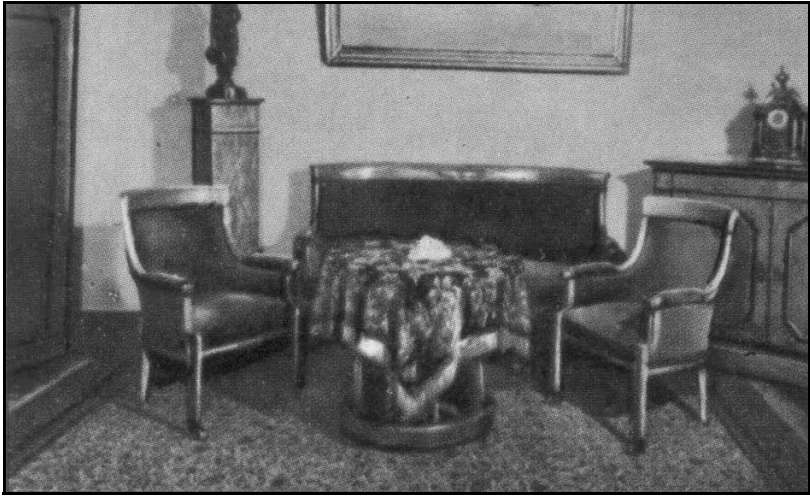


Figure 1.7: Hotel Europa in Moscow, 1957.



Figure 1.8: Hotel Europa in Moscow, 1957.



Figure 1.9: Hotel Europa in Moscow, 1957.

SOUVENIRS FROM THE FESTIVAL

The motto of the Moscow Festival was “За мир и дружбу” (Za Mir i Druzhu), i.e., For Peace and Friendship (Figure 1.10). Postcards, stamps, and pins were available in abundance (Figures 1.11–1.19).



Figure 1.10: Festival motto.



Figure 1.11: Postcard available during the festival.



Figure 1.12: Postcard available during the festival.



Figure 1.13: Postcard available during the festival.



Figure 1.14: Postcards available during the festival.



Figure 1.15: Postcards available during the festival.



Figure 1.16: Postcards available during the festival.



Figure 1.17: Postcards available during the festival.



Figure 1.18: Stamps issued during the festival.



Figure 1.19: Some of the pins available during the festival.

Table 1.2: History of the Festival

	Year	Host	Participants	Motto
1	1947	Prague, Czechoslovakia	17 000	Youth Unite, Forward for Lasting Peace!
2	1949	Budapest, Hungary	20 000	Youth Unite, Forward for Lasting Peace, Democracy, National Independence and a better future for the people
3	1951	East Berlin, German Democratic Republic	26 000	For Peace and Friendship — Against Nuclear Weapons
4	1953	Bucharest, Romania	30 000	No! Our generation will not serve death and destruction!
5	1955	Warsaw, Poland	30 000	For Peace and Friendship — Against the Aggressive Imperialist Pacts
6	1957	Moscow, Soviet Union	34 000	For Peace and Friendship
7	1959	Vienna, Austria	18 000	For Peace and Friendship and Peaceful Coexistence
8	1962	Helsinki, Finland	18 000	For Peace and Friendship
9	1968	Sofia, Bulgaria	20 000	For Solidarity, Peace and Friendship
10	1973	East Berlin, East Germany	25 600	For Anti-Imperialist Solidarity, Peace and Friendship
11	1978	Havana, Cuba	18 500	For Anti-Imperialist Solidarity, Peace and Friendship
12	1985	Moscow, Soviet Union	26 000	For Anti-Imperialist Solidarity, Peace and Friendship
13	1989	Pyongyang, North Korea	22 000	For Anti-Imperialist Solidarity, Peace and Friendship
14	1997	Havana, Cuba	12 325	For Anti-Imperialist Solidarity, Peace and Friendship
15	2001	Algiers, Algeria	6 500	Let's Globalize the Struggle For Peace, Solidarity, Development, Against Imperialism
16	2005	Caracas, Venezuela	17 000	For Peace and Solidarity, We Struggle Against Imperialism and War
17	2010	Tshwane, South Africa	15 000	Let's Defeat Imperialism, for a World of Peace, Solidarity and Social Transformation!

EVENTS

The crowds, the festivities, and the numerous museums, were very impressive. Some of the many events are shown below (Figures 1.20–1.25).



Figure 1.20: Some events during the festival.

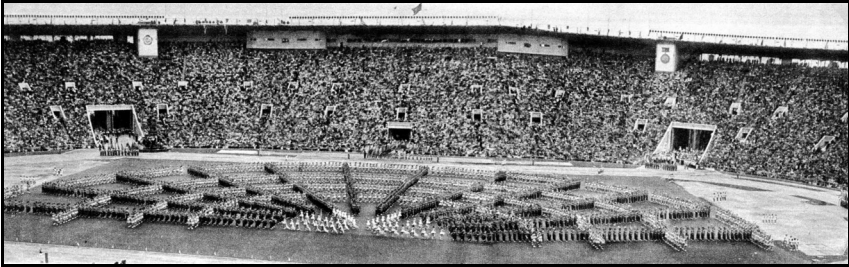


Figure 1.21: Some events during the festival.



Figure 1.22: Some events during the festival.



Figure 1.23: Some events during the festival.



Figure 1.24: Some events during the festival.



Figure 1.25: Some events during the festival.

Chapter 2

Moscow

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RED SQUARE

The square (Figure 2.1) was meant to serve as Moscow's main marketplace. It was also used for various public ceremonies and proclamations, and occasionally as the site of coronation for the Tsars.



Figure 2.1: Red Square.

ST. BASIL'S CATHEDRAL

St. Basil's Cathedral (Figure 2.2) was constructed by Ivan IV [The Terrible] (1530–1584) to commemorate the seizure of Kazan.

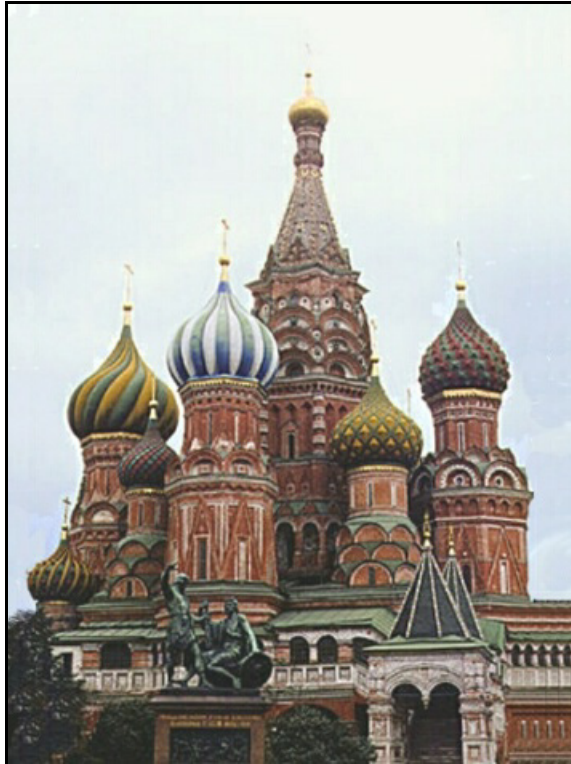


Figure 2.2: St. Basil's Cathedral.

YURI DOLGORUKIY

Yuri Dolgorukiy (1099–1157) (Figure 2.3), the Grand Prince of Kiev, was sent by his father to govern in his name the vast Rostov–Suzdal Province in the northeast of Kievan Rus'. In 1121, he quarrelled with the boyars of Rostov and moved the capital of his lands from that city to Suzdal. In 1147, he had a meeting with Sviatoslav Olgovich in a place called Moscow. In 1156, Yuri fortified Moscow with wooden walls and a moat. He is considered as the founder of Moscow although the settlement probably existed earlier.



Figure 2.3: Yuri Dolgorukiy (1099–1157), founder of Moscow.

MININ AND POZHARSKY

In 1601–1603, Russia suffered a famine and there was disorder. The Polish–Lithuanian Commonwealth profited from this chaos and occupied Moscow. Prince Dmitry Pozharsky and the Nizhny Novgorod merchant, Kuzma Minin gathered an army in 1612 and came from Nizhny Novgorod to expel the invaders. This era marks the beginning of the Romanov dynasty. A bronze statue in front of Saint Basil's Cathedral commemorates this event (Figure 2.4). Annually on November 4, Russia celebrates the anniversary of this event as a *Day of National Unity*.



Figure 2.4: Monument dedicated to Minin and Pozharsky, who expelled Polish–Lithuanian invaders.



Figure 2.5: Lenin–Stalin tomb, August 1957.

MAUSOLEUM

I had to stand in a long line to visit the Mausoleum in the Red Square to see Lenin and Stalin (Figures 2.5–2.8). Incidentally, Stalin was removed from the mausoleum few years after Nikita Khrushchev came to power in March 1957.



Figure 2.6: Guard of Honour.



Figure 2.7: Entrance to the tomb.



Figure 2.8: Lenin and Stalin in the mausoleum, 1957.

MUSEUM OF THE HISTORY OF THE REVOLUTION

The red building in the Red Square was constructed in 1883 on what was then the first Moscow University founded by Lomonosov in 1755. It was dedicated to the history of Russia then to the Revolution (Figure 2.9).

GUM

GUM — the Russian acronym of State Department Store during Soviet times — was built in 1890s. It was burned during the 1812 fire, rebuilt later, converted into offices during Stalin's time, then reopened as a store in 1953 (Figures 2.10–2.11).



Figure 2.9: Museum of the History of the Revolution.



Figure 2.10: Shopping centre GUM in the Red Square.



Figure 2.11: Inside GUM.

THE KREMLIN

The Kremlin (Figures 2.12–2.13) is a medieval fortress with palaces, armouries, and churches at the heart of Moscow, overlooking the Moscow River, Saint Basil's Cathedral and Red Square and the Alexander Garden. It includes four palaces, four cathedrals and the enclosing Kremlin Wall with Kremlin towers. The complex serves as the official residence of the President of the Russian Federation.

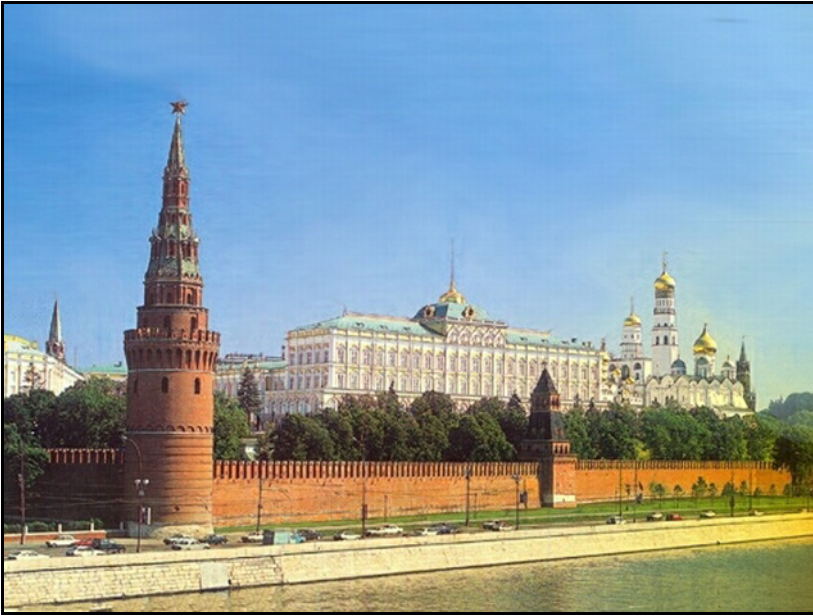


Figure 2.12: The Kremlin.



Figure 2.13: The Kremlin.

The Cannon

The 40-tonne cannon (Figure 2.14), built during the reign of Ivan the Terrible's son Fyodor in 1586, possesses a barrel in excess of five metres long and a calibre of 890 mm. The barrel and carriage are adorned with a

relief of a scene in which a Russian lion devastates a snake symbolizing Russia's enemies.



Figure 2.14: The 40-tonne cannon.

The Bell

The two-hundred-tonne bell (Figure 2.15), the largest in the world, was never rung. A smaller predecessor weighing 130 tonnes was built in the middle of the 17th century but was destroyed in the Moscow fire of 1701. Three decades later the Empress Anna ordered the fragments to be re-cast into a much larger bell, but the resultant wonder cracked in 1737 after having fallen into its casting pit. Another century passed before the bell was lifted and set in its present location. Beside the bell lies a small eleven-ton scrap that fell from the bell during its excavation.



Figure 2.15: The 200-tonne bell.

Cathedral of the Assumption

The Cathedral of the Assumption (Figure 2.16) is the oldest church in the Kremlin and the seat of the Russian Orthodox Church. Here Russian emperors were crowned, and before them tsars and Grand Dukes.



Figure 2.16: Cathedral of the Assumption.

Church of the Annunciation

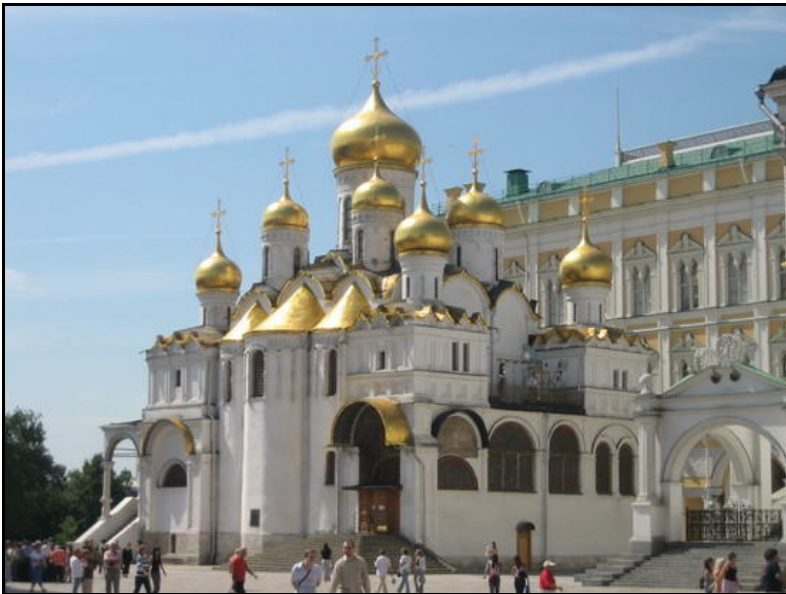


Figure 2.17: Church of the Annunciation.

Ivan the Great Bell tower

The gilt dome of the Ivan the Great Bell tower, 80 m high, constructed of white stone was completed in 1600, during the reign of Boris Godunov (Figures 2.18–2.19).

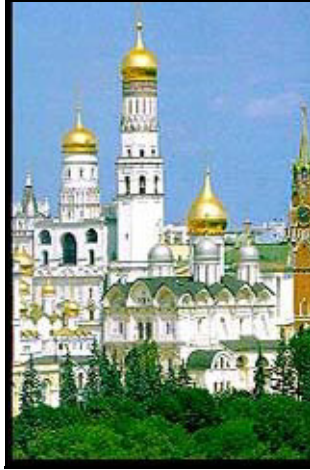


Figure 2.18: Ivan the Great Bell tower.

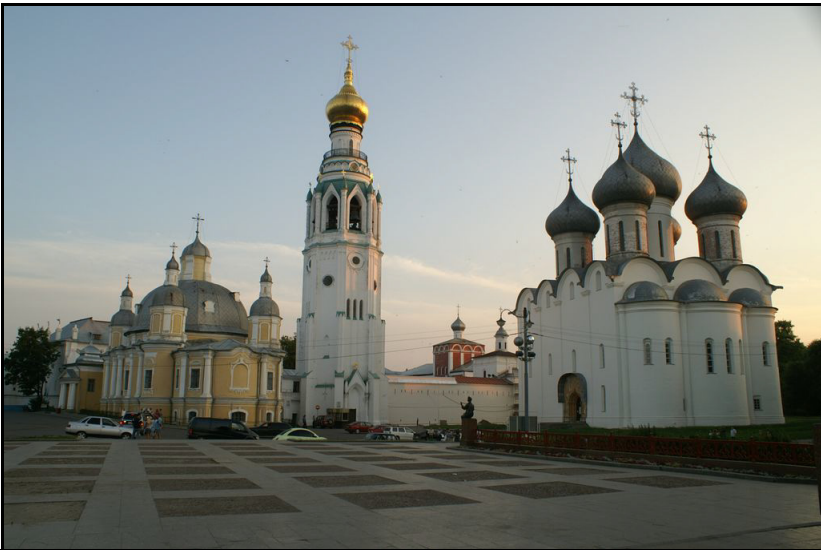


Figure 2.19: Ivan the Great Bell tower.

MOSCOW METRO

Opened in 1935 with one 11-km line and 13 stations. As of 2011, it has 185 stations and its route length is 305.7 km (Figure 2.20).



Figure 2.20: One of the stations of Moscow Metro.

LOMONOSOV UNIVERSITY

The University (Figure 2.21) was named after Mikhail Vasilevich Lomonosov (1711–1765), the famous Russian scientist, philosopher, and poet (Figure 2.22).

BOLSHOI THEATRE

The current building of the Bolshoi Theatre on Theatre Square was opened in 1824 (Figure 2.23). At that time, all Russian theatres were imperial property intended for opera and ballet.

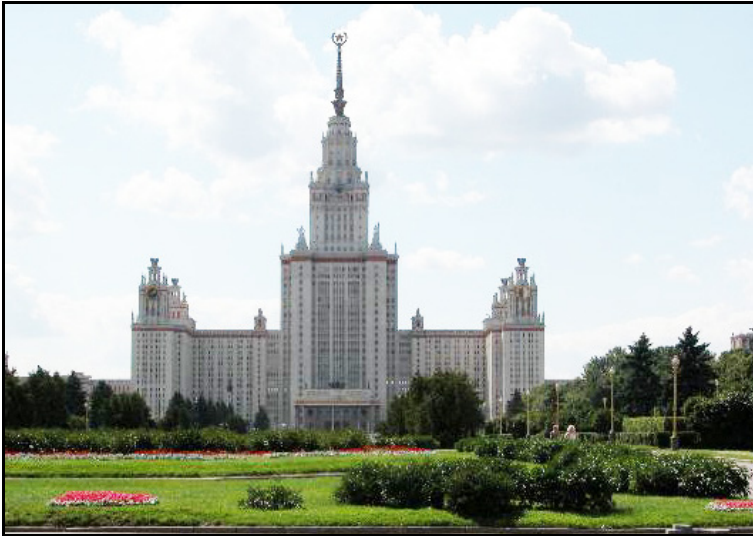


Figure 2.21: Lomonosov University.



Figure 2.22: Lomonosov statue in front of the University.



Figure 2.23: Bolshoi Theatre.

EXHIBITION PAVILION OF INDUSTRY AND AGRICULTURE



Figure 2.24: Entrance to the Exhibition Pavilion of Industry and Agriculture.



Figure 2.25: Moscow fountain.



Figure 2.26: A gilded statue in the fountain.

EPILOGUE

Beside sightseeing and visiting museums, visiting Moscow University, using the underground Metro, and attending some Festival activities, the rich experience gained convinced me that the Soviet Union was a closed society that did not allow its citizens the freedom that we enjoy in our country. Certain phrases are repeated by different young people as if they were a recitation to be told in conversations. Needless to say the monotonous discourse by our Intourist guides praising the Communist System let one immediately felt that he was in a police state. It was also obvious that technology was less advanced as compared to Vienna (Figure 2.27).



Figure 2.27: All shops used this manual calculator known as abacus in 1957.

Nothing was as beautiful as in Vienna; the people were very anxious to talk to foreigners, a sign that they were not well informed about the outside world. Very few could communicate in English, German, or French. Gradually, my thoughts started to change. I sensed that there was something wrong with the Soviet System.

Chapter 3

Leningrad 1977

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ALEXANDER NEVSKY

The lands along the Neva River had a mixed population of Slavs, Finns and other ethnic groups. In the ninth century this area was part of Novgorod which was an important centre of trade and craftsmanship. Novgorod merchants traded with Western and Northern Europe and later with the towns of the Hanseatic League. All that trade went through the Neva River. In 1240, when most of Southern and Central Russia was fighting the Mongol invasion, a Swedish force landed at the banks of the Neva River. Prince Alexander from Novgorod (Figure 3.1) successfully fought the battle of Neva and expelled the Swedes. Prince Alexander was given the name Alexander Nevsky and was declared a Saint of the Russian Orthodox Church.

When in the 16th century Novgorod was subdued by Moscow, the lands along the Neva River became part of Muscovite Russia. However, at the beginning of the 17th century unrest started in Russia, after the last tsar of the Rurik dynasty, Feodor Ivanovich (the son of Ivan the Terrible), had died leaving no heirs to the throne. The Swedes occupied a significant portion of North-Western Russia and effectively cut off Russia from the Baltic trade. Peter the Great (1672–1725) (Figure 3.2) was keen on regaining access to the Baltic Sea and establishing strong ties with the West. He started the Northern War with Sweden (1700–1721) and in 1703 gained control over the Neva River and founded Saint Petersburg.



Figure 3.1: Alexander Nevsky (1221–1263).



Figure 3.2: Peter the Great (1672–1725).

Leningrad on the Baltic Sea is a beautiful city, founded on a number of islands connected together by a large number of magnificent bridges. It has a large number of palaces, art museums, theatres, cathedrals. In 1914, the

German name of the city was changed to the Russian Petrograd when Russia was in war with Germany. After the death of Vladimir Lenin (1870–1924) in 1924, the city was renamed Leningrad in his honour. After the collapse of the Soviet Union in 1991, the name of the city was back to Saint Petersburg.

The most tragic period in the history of this city was during World War II when the Soviet Union was attacked by the German army. Leningrad was besieged for about 900 days, from September 8, 1941 till January 27, 1944. Food and fuel supplies were limited, public transportation has stopped, there was no heating, and almost no electricity. At least 640 thousand people had died during the siege from the cold and starvation. In the Piskaryovskoye Memorial Cemetery, almost 500 thousand people are buried.



Figure 3.3: Russian translation of F. Habashi, *Principles of Extractive Metallurgy*.

EXCHANGE PROGRAM CANADA–USSR

My second visit to the Soviet Union took place in 1977. I was then professor at Laval University in Canada and applied to participate in the Exchange Program Canada–USSR during my sabbatical leave. My demand was easily accepted because my two volumes *Principles of Extractive Metal-*

lurgy were translated in 1975 by Russian colleagues at the Mining Institute in Leningrad and the Academy of Sciences in Moscow (Figure 3.3). I was corresponding with Professor Ivan N. Maslenitsky (1900–1972) (Figure 3.4) who had visited the US Bureau of Mines in the 1920s and used to write in good English. Unfortunately, I never met him because he died few years before my visit in 1977. I met his brother who was also a hydrometallurgist at the Mineral Beneficiation Institute in Leningrad known by the acronym “Mekhanobr,” which was next door to the Mining Institute. The Mining Institute was my chief host.



Figure 3.4: Professor Ivan N. Maslenitsky (1900–1972).

Originally, the trip was planned to start in the first half of September, but due to delays from the side of the Academy of Sciences of USSR, the visa was obtained only in October 11, 1977. The visit was also planned for three months but was shortened to five weeks. Further, the visa issued in Ottawa was for two weeks only and was limited to Leningrad and Moscow. In Leningrad, I expressed dissatisfaction at the Academy of Sciences that it was not worth the expenses to come from Canada to spend only two weeks and that I left Canada with the understanding that I would spend three months. I finally succeeded in having my visa extended for another four weeks and obtained a visa for Alma Ata and Tashkent. The addition of Tashkent became necessary when I mentioned that I was going to India for a conference after leaving Alma Ata. Tashkent is the only exit from the Central Asia republics of the USSR and is near to the Almalik Copper Smelter which I hoped to visit.

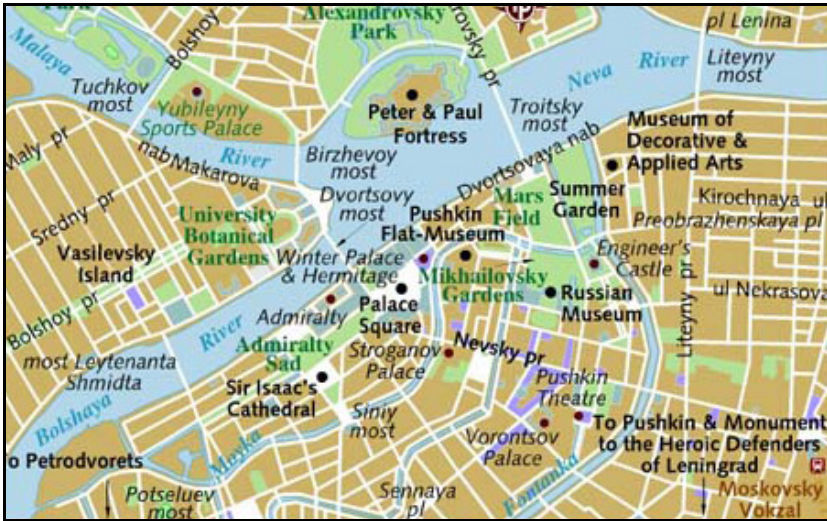


Figure 3.5: Map of Leningrad.



Figure 3.6: Hotel Leningrad.

HOTEL LENINGRAD

I stayed in Hotel Leningrad (Figures 3.6–3.8) and was able to use the Metro to go to Gostiny Dvor shopping centre. The hotel is located near Alexander Nevsky Monastery cemetery where great Russians are buried. Beriozka were shops in hotels that sell only in dollars. The name comes from the Birch tree that is found in abundance in Russia.



Figure 3.7: Hotel Leningrad displaying the symbol of Leningrad.



Figure 3.8: Leningrad underground Metro showing Gostiny Dvor Station.

GOSTINY DVOR

Гостиный двор (Gostiny dvor) is a Russian term for an indoor market built during the reign of Catherine the Great. It is translated from Russian as Guest Court.



Figure 3.9: Gostiny Dvor.



Figure 3.10: View of Nevsky Prospekt.

NEVSKY PROSPEKT

Nevsky Avenue (Figure 3.10) is the main street in Leningrad. Planned by Peter the Great as beginning of the road to Novgorod and Moscow. The chief sights include the Stroganov Palace, the Kazan Cathedral, the Art Nouveau *Bookhouse* (Dom Knigi), Elisseeff Emporium, half a dozen 18th-century churches, a monument to Catherine the Great, an enormous 18th-

century shopping mall, a mid-19th-century department store, the Russian National Library, and the Anichkov Bridge with its horse statues.



Figure 3.11: Anikhov Bridge named after the engineer who designed it.



Figure 3.12: Egyptian Bridge.



Figure 3.13: Sphinx on the Neva River.



Figure 3.14: Winged sphinx.



Figure 3.15: Academy of Fine Arts.

THE STROGANOVS

The Stroganovs were the richest family in Russia and were related to the Empress Elizabeth I by marriage. In 1752 baron Sergey Stroganov commissioned Rasterelli to build the palace (Figure 3.16).



Figure 3.16: Stroganov Palace.

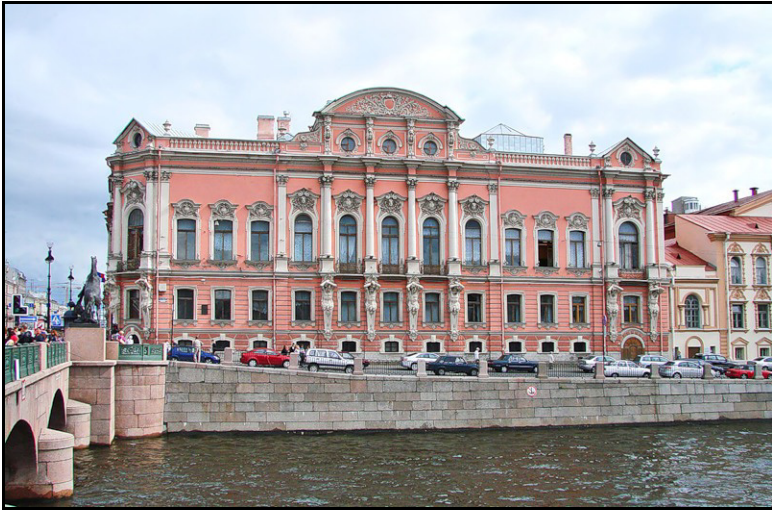


Figure 3.17: Other palace.



Figure 3.18: Literatura Doma.



Figure 3.19: General view.

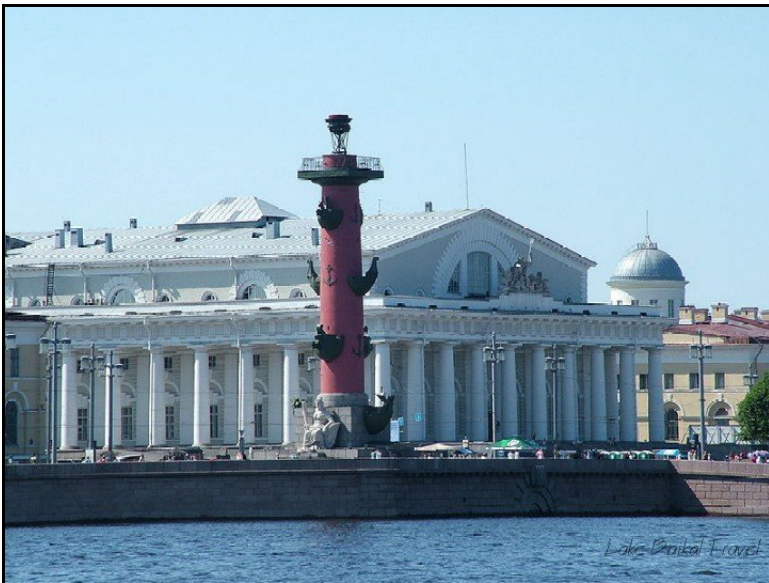


Figure 3.20: Lighthouse.

AURORA

The crew of Aurora joined the Bolsheviks, who were preparing for a Communist revolution. On 25 October 1917, they refused to carry out an order to put to sea. At 9:45 pm on that date, a blank shot from her signalled

the start of the assault on the Winter Palace. It is now kept as a museum (Figure 3.21).

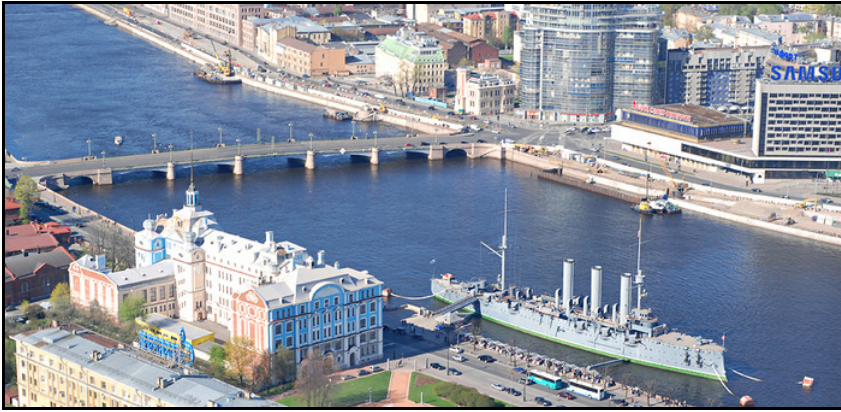


Figure 3.21: Aurora Museum.



Figure 3.22: Senate and Synode.

SENATE AND SYNODE

The Most Holy Synod (established in 1721) was the supreme organ of government of the Orthodox Church in Russia. It was presided over by a lay procurator, representing the Emperor, and consisted of the three metropolitans of Moscow, Saint Petersburg and Kiev, the archbishop of Georgia, and a number of bishops sitting in rotation.

The Senate and Synode is located on the Square of Decemberists (Figures 3.22–3.24). The two wings of the building are connected with the triumphal arch, symbolizing the unity of the spiritual and temporal power. The Senate originally established during the reform of Peter I, consisted of members nominated by the Emperor. It was the high court of justice and had supreme jurisdiction in all disputes arising out of the administration of the Empire.

THE PETER AND PAUL FORTRESS

The fortress (Figure 3.25) was the first building in Saint Petersburg and served as a high security political jail. Among the first inmates was Peter's own rebellious son Alexei. Later, the list of famous residents included Dostoyevsky, Gorky, Trotsky, and Lenin's older brother, Alexander. In the middle of the fortress stands Peter and Paul Cathedral, the burial place of all the Russian Emperors and Empresses from Peter the Great to Alexander III (Figure 3.26). The earlier tsars are buried in the Kremlin in Moscow. Other buildings in the fortress include the City History Museum and the Mint, one of only two places in Russia where coins and medals are minted.



Figure 3.23: Peter the Great facing the Senate and Synode building.



Figure 3.24: Ilya Beloglazov, Nadia Habashi, and guide Mira Abramovna in front of Senate & Synode. Photo by Fathi Habashi, 1993.



Figure 3.25: Peter and Paul Fortress.



Figure 3.26: Tombs of Russian Tsars in Peter and Paul Cathedral in the Fortress.

RUSSIAN ADMIRALTY



Figure 3.27: Russian Admiralty Building in Saint Petersburg.

SAINT ISAAC CATHEDRAL

In 1818 the construction of St. Isaac's Cathedral began during the reign of Alexander I and was completed 40 years later (Figure 3.28). The church is richly decorated and of particular interest are the columns made of malachite and azurite (Figure 3.29).



Figure 3.28: Saint Isaac Cathedral.

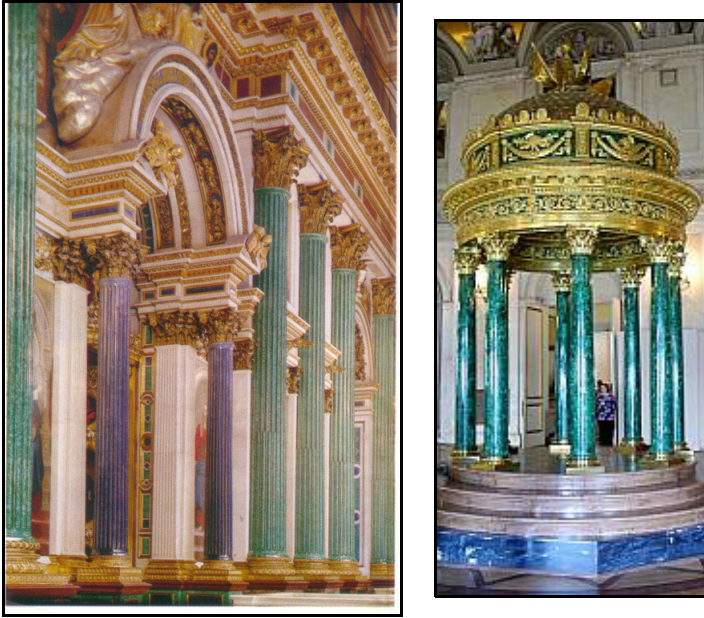


Figure 3.29: Columns made of malachite and azurite in Saint Isaac's Cathedral.

KAZAN CATHEDRAL

The Cathedral of Our Lady of Kazan (Figure 3.30) was built in the period 1801–1811 on orders of Emperor Pavel I (1754–1801). It was modelled after St. Peter's Basilica in the Vatican although the Russian Orthodox Church strongly disapproved of the plans to create a replica of the Catholic basilica in Russia's capital.

After the War of 1812, the church became a monument to the Russian victory over Napoleon. Field marshal Mikhail Kutuzov (1745–1813), who won the most important campaign of 1812, is buried inside the church. His statue stands in front of the cathedral (Figure 3.31). Prince Michael Andreas Barclay de Tolly (1761–1818) was a Russian Field Marshal and Minister of War during Napoleon's invasion in 1812. His statue also stands on front of Kazan Cathedral (Figure 3.32). During the Soviet period the Cathedral was transformed into Museum of the History of Religion and Atheism.



Figure 3.30: Kazan Cathedral.



Figure 3.31: Statue of Mikhail Kutuzov standing in front of Kazan Cathedral.

WINTER PALACE / HERMITAGE

State Hermitage is a museum of art and culture one of the largest and oldest museums of the world. It was founded in 1764 by Catherine the Great. The collections occupy a large complex of six buildings along Palace Embankment, including the Winter Palace, a former residence of Russian

emperors (Figures 3.33–3.40). Apart from them, the Menshikov Palace, Museum of Porcelain, Storage Facility at Staraya Derevnya and the eastern wing of the General Staff Building are also part of the museum.



Figure 3.32: Statue of Barclay de Tolly standing in front of Kazan Cathedral.



Figure 3.33: Winter Palace view from the river.



Figure 3.34: Winter Palace view from the Palace Square.



Figure 3.35: A staircase in the palace.



Figure 3.36: Art work made of malachite.



Figure 3.37: Art work made of azurite.



Figure 3.38: Palace Square facing the Hermitage.



Figure 3.39: Nadia in Palace Square in 1993 [Photo by Fathi Habashi].

CHURCH OF THE SAVIOUR ON SPILLED BLOOD

This Church was built by Alexander III (1845–1894) on the site where his father Tsar Alexander II (1818–1881) (Figure 3.41) was assassinated and was dedicated in his memory (Figure 3.43). Alexander II came to the throne in 1855 when his country had been exhausted and humiliated by the Crimean War (1853–1856). He emancipated the serfs, planned to exploit the natural resources and many other reforms.



Figure 3.40: The Gate in Palace Square.



Figure 3.41: Tsar Alexander II (1818–1881).



Figure 3.42: Neva River.

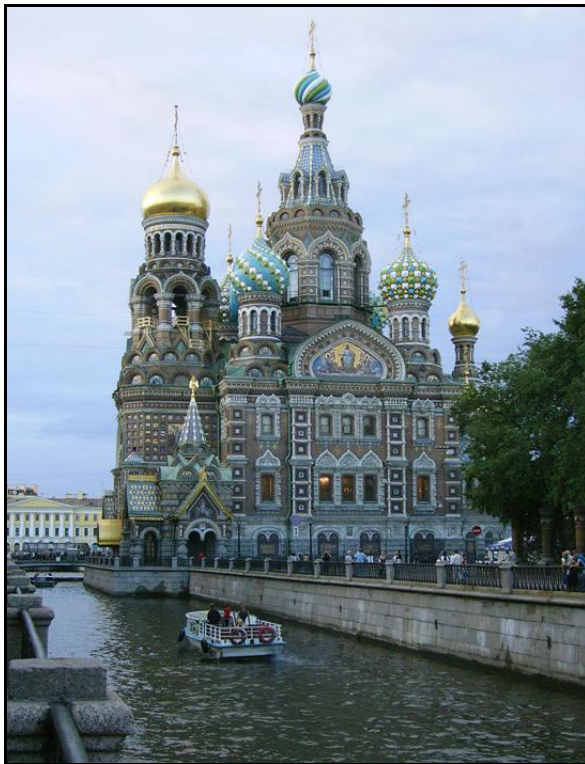


Figure 3.43: Church of Our Saviour.

SMOLNY INSTITUTE

Smolny (Figure 3.44) was Russia's first educational establishment for women and continued to function until the 1917 revolution when it became Lenin's headquarters before the government was moved to the Moscow Kremlin. After 1991, the Smolny was used as the seat of the city mayor (governor after 1996). The name Smolny derives from the location, in the early days of St. Petersburg the place at the edge of the city where pitch (смола in Russian) was processed for use in shipbuilding.



Figure 3.44: Smolny Institute.

SMOLNY MONASTERY AND CATHEDRAL

The convent was built to house Elizabeth (1709–1762) (Figure 3.45), daughter of Peter the Great from his first marriage with Catherine I, after she was disallowed succession to the throne and she opted to become a nun. When however her predecessor, the infant Ivan VI (1740–1764) was imprisoned with his German parents in 1741, she then decided against entering monastic life and accepted the Russian throne. Work on the convent continued with her patronage. Incidentally, Ivan VI was murdered in prison during the reign of Catherine II [the Great] when he tried to escape.

Under the reign of Elizabeth, the Russian court was one of the most splendid in all Europe. She encouraged Mikhail Lomonosov to establish the University of Moscow and founded the Academy of Arts in Saint Petersburg. She also spent exorbitant sums of money on the construction of the palaces in Peterhof, Tsarskoye Selo, Winter Palace, and Smolny Cathedral (Figures 3.46–3.47). She remains one of the most popular Russian monarchs. Contrary to her predecessors she appointed Russians and not for-

eigners to the highest positions in the country. Elizabeth's nephew Peter III did not rule for long. Shortly after assuming power he was overthrown by his wife, a German princess, who soon became Catherine the Great.



Figure 3.45: Elizabeth (1709–1762).



Figure 3.46: Smolny monastery and cathedral.

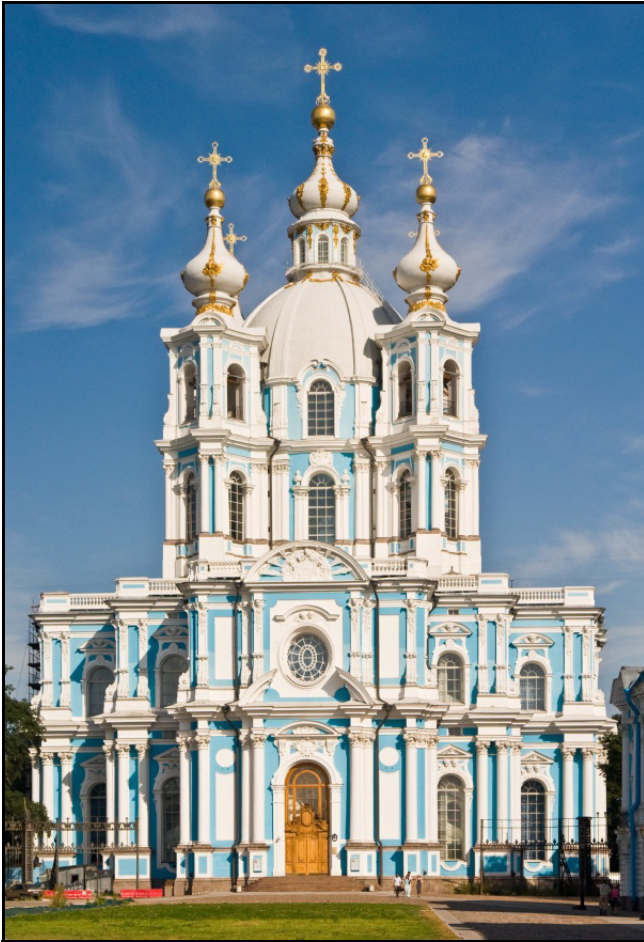


Figure 3.47: Smolny Cathedral.

KIROV THEATRE

Kirov Theatre was named after Sergey Kirov, prominent early Bolshevik leader who became head of the Communist Party in Leningrad. In 1934, he was shot and killed at his offices. Blame for his assassination has been directly attributed to Stalin but any evidence for this claim remains elusive. Kirov's death served as a pretext for Stalin's escalation of repression against dissident elements of the Party, culminating in the Great Purge of the late 1930s. Originally the theatre was named Mariinsky Theatre after Empress Marina Alexandrovna, wife of Tsar Alexander II (Figure 3.48).



Figure 3.48: Mariinsky Theatre.



Figure 3.49: Catherine the Great monument.

STATE RUSSIAN MUSEUM

The State Russian Museum was opened in 1895 by a decree of Tsar Alexander III, and as such was the first state-owned museum of art in Russia (Figure 3.50).



Figure 3.50: State Russian Museum.

RUSSIAN ACADEMY OF SCIENCES

The Academy (Figure 3.51) was founded in Saint Petersburg in 1724 by Peter the Great, inspired and advised by the German mathematician Gottfried Wilhelm Leibniz. Among the foreign scholars invited to work at the academy were the mathematicians Leonhard Euler, Daniel Bernoulli, and botanist Johann Georg Gmelin. Some members of the Academy were assigned to explore the remote areas of Russia, for example Vitus Bering explored Kamchatka in 1733–1743, and Peter Simon Pallas explored Siberia.



Figure 3.51: Kunstkamera.

The branch of Academy in Leningrad is housed in the original palace founded more than 250 years ago which contains among other things, statues of some of the famous scientists like Pavlov and Mendeleev, and an important wall mural made of mosaic designed and built by Lomonosov. I visited the library which is claimed to be one of the most important specialized libraries in Leningrad. It is situated in a building constructed in 1940's but looks completely neglected, old-fashioned architecture, and very dis-tressing from the inside. There are few reading rooms which are over-crowded with researchers and nobody is permitted to the stack rooms.

RASTRELLI

The name Francesco Bartolomeo Rastrelli (1700–1771) is mentioned often in Leningrad. He was an Italian architect from Florence, naturalized Russian, designed major works, including the Winter Palace, Strogonov Palace, and Smolny Convent in Saint Petersburg, and the Catherine Palace in Tsarskoye Selo.

Chapter 4

Leningrad Mining Institute

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The Saint Petersburg Mining Institute was founded in 1773 (Figure 4.1) by the Empress Catherine the Great (1729–1796) (Figure 4.2). It was the first institution of higher technical learning in Russia and for a century it remained the only higher educational institution of mining and metallurgy in Russia. It is still operating in the same original luxurious building on the Neva River (Figures 4.3–4.7). New buildings were added to cope with the diversification of the Institute and the increased number of students.

The Institute changed its name as follows:

- 1804: Military School of Mines
- 1833: Institute of the Corps of Mining Engineers
- 1866: Mining Institute

Metallurgy was first taught within a chemistry course. In 1804, metallurgy came to be regarded as an independent discipline. During the period 1773 to 1893, the Institute graduated 3 000 mining engineers. The Mineralogical Society was founded there in 1817 and one of the oldest scientific technical journals in Russia, Горный Журнал (*Mining Journal*), began publication in 1825. The title of the journal, however, did not reflect exactly its contents since it included many articles on steel and steelmaking. The Institute was active in translating into Russian important foreign books on mining. During the mandate of Soimonov, 75 books were translated. In 1973, the former Soviet Union celebrated 200 years of foundation of the Institute by issuing a commemorative stamp (Figure 4.8).

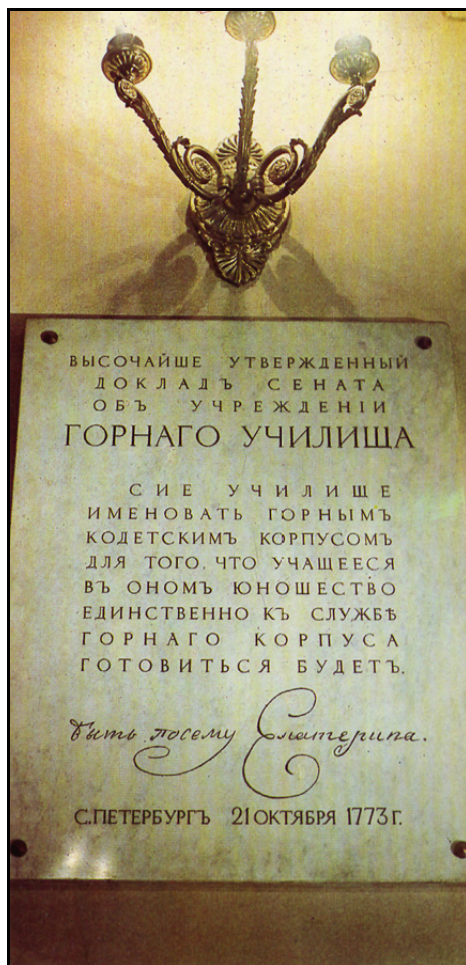


Figure 4.1: Memorial plaque giving the date of founding the Saint Petersburg Mining Institute.



Figure 4.2: Empress Catherine the Great, founder of the Saint Petersburg Mining Institute.

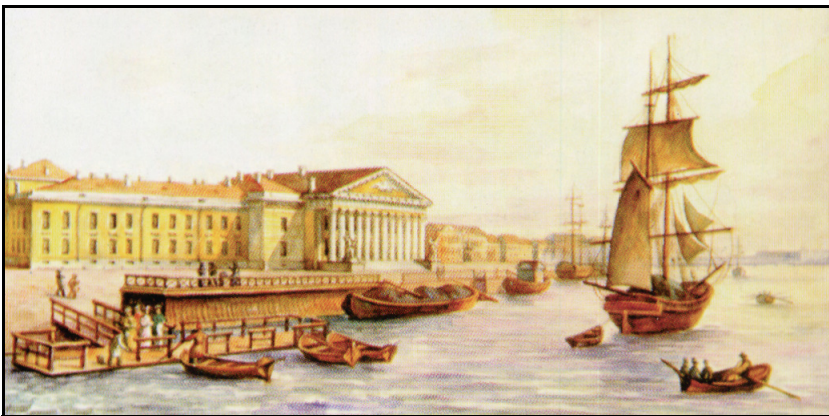


Figure 4.3: A photolithograph in 1860 showing the Saint Petersburg Mining Institute and the Neva River.



Figure 4.4: Saint Petersburg Mining Institute main entrance.

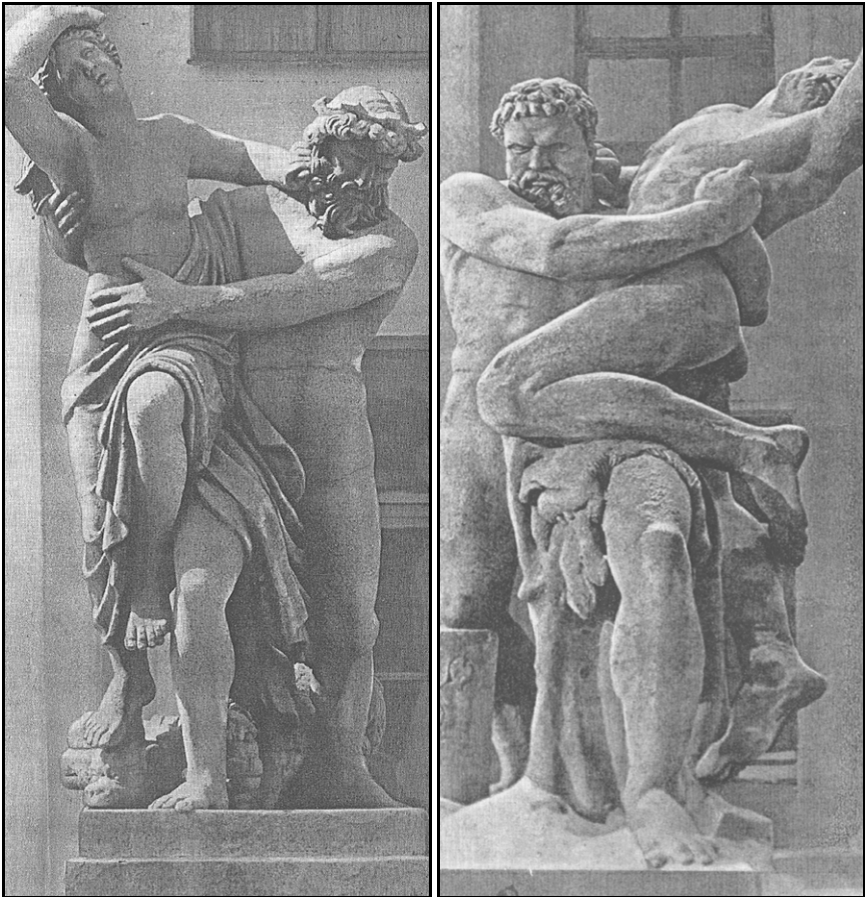


Figure 4.5: Statues at the main entrance of the Saint Petersburg Mining Institute symbolizing mastering of natural resources by man.

Minerals Museum

This is one of the oldest in Russia, was founded at the same time as the Mining Institute and served as an aid in students training. It has more than 200 000 exhibits including more than 2 200 varieties of minerals, 350 meteorites, a great number of rock and ore samples, fossils, as well as models of mining and metallurgical machinery (Figures 4.9–4.11).



Figure 4.6: Main staircase to the Main Assembly Hall.

History of the Institute Museum

The Museum relates the story of the Institute since its foundation. It has also old paintings of Saint Petersburg.

Professors Gallery

The Institute also honours its professors and rectors by displaying their portraits in the main corridor (Figure 4.12).



Figure 4.7: Inner yard of the Institute.



Figure 4.8: In 1973, the former Soviet Union celebrated 200 years of foundation of its School of Mines.



Figure 4.9: Entrance of the Minerals Museum.



Figure 4.10: Models of mining and metallurgical equipment in the Minerals Museum.



Figure 4.11: One of the halls in the Minerals Museum.

Library

Its library contains an excellent collection of old books. For example it contains the original editions of Agricola, Biringuccio, Boerhaave, Basil Valentine, Robert Boyle, Barba, Bergman, Humboldt, Mendeleev, Gmelin, Gellert, Rittinger, and many others. Recent additions to the library are almost exclusively Russian books. Professors and students cannot enter the stack rooms, and further the books cannot be checked out (except Lenin Works). There is only one small reading room, always overcrowded. Reference books are in locked glass cupboards along the walls. The most amazing thing is that books are arranged not according to subject matter but according to their sizes. This is claimed to make full use of the space. Thus, Group A are books 10 cm high, Group B are 12 cm high, Group C are 14 cm high, etc.



Figure 4.12: Rectors gallery.

At the time of visiting [1977], there were 7 000 students and eight faculties:

Mining Engineering	Mineral economy
Mine Construction	Geological Prospection
Underground Geodesy	Geophysics
Mine Equipment	Metallurgy of Nonferrous Metals and Mineral Processing

Some famous chemists and metallurgists were teaching there. For example, the Swiss chemist Germain Hess (1802–1850), whose law of thermochemistry formulated in 1840, is well known. He also authored a textbook for chemistry for students which was the first Russian chemistry book. Among its famous metallurgists was N. S. Kurnakov (1860–1941) whom the Academy honoured by naming the Institute of Inorganic Chemistry in Moscow after him.



Figure 4.13: Visiting the laboratories of the Metallurgy Department at the Mining Institute in Leningrad in 1977. I am on the left, next is the interpreter, then Prof. L. M. Shaligin, and Dean Galnbek. Taken from one of the publications of the Institute.

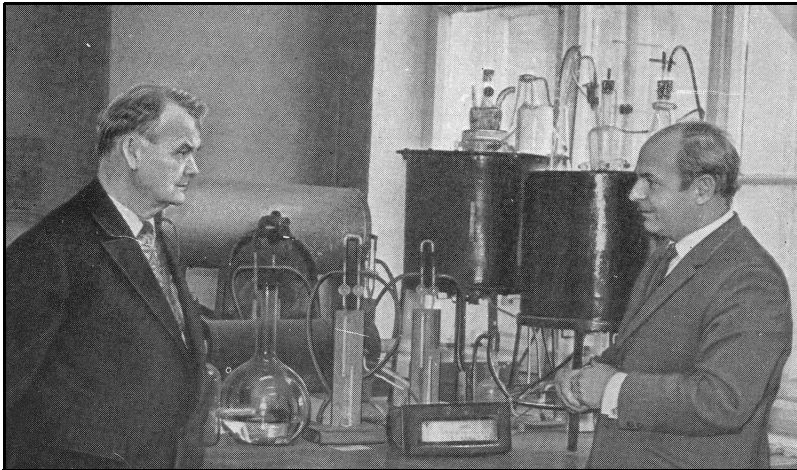


Figure 4.14: Professor Piskonov, Chairman of Metallurgy Department, and his assistant Feodor Boumazhnov, 1977.



Figure 4.15: With Professor L. M. Shaligin [left] and Sergei Russokhia [right].

State Institute for Nickel Research

State Institute for Nickel Research is known by the Russian acronym GIPRO-NICKEL, Director: Usakov, belongs to the Ministry of Nonferrous Metals. Staff about 1 200. The Pressure Hydrometallurgy Department was headed by Yakob M. Shneerson.

The Great October Revolution

My stay in Leningrad coincided with the celebrations for the 60th anniversary of the “Great October Revolution” which takes place on November 7. For this occasion, all offices were closed from 4 to 8 November inclusive; November 5 and 6 being a week-end. It is one of the most important festivals in the Soviet Union and is equivalent to Christmas in Western countries because people exchange greetings cards. The Academy invited me to watch the military parade.

Mendeleev Museum

Dmitrii Ivanovich Mendeleev (1834–1907), the most famous Russian chemist, who is also well known all over the world as the founder of the

Periodic System of the chemical elements, was teaching at the University of Saint Petersburg from 1857 to 1890 (Figure 4.16). He also studied there at the Pedagogical Institute from 1850 to 1855. During the years 1866–1890, Mendeleev lived in a three-room apartment in the University building adjoining the chemical laboratory as did all the professors of the chemistry at that time. This same apartment has been preserved as the Mendeleev Museum (Figure 4.17). The Director of the Museum is also Head of the Inorganic Chemistry Department, the same Chair that was occupied by Mendeleev. Of special interest is the photo stuck on his desk taken in 1900 in Berlin on the occasion of the 200th Anniversary of the Prussian Academy of Sciences (Figure 4.18).



Figure 4.16: Saint Petersburg University.

Lomonosov Museum

This museum is a part of the Institute of History of Science and Technology of the Academy of Sciences and houses the archives of Mikhail Vasilovich Lomonosov (1711–1765), the Famous Russian scientist, philosopher, and poet. After the foundation of the Academy of Sciences in 1724, *Kunstkamera* became one of its key parts, and has played an important role in the formation of Russian science. The *Kunstkamera* was the place where the first Academy members worked including Lomonosov (Figure 4.19).



Figure 4.17: Mendeleev's desk at his office in Saint Petersburg University.

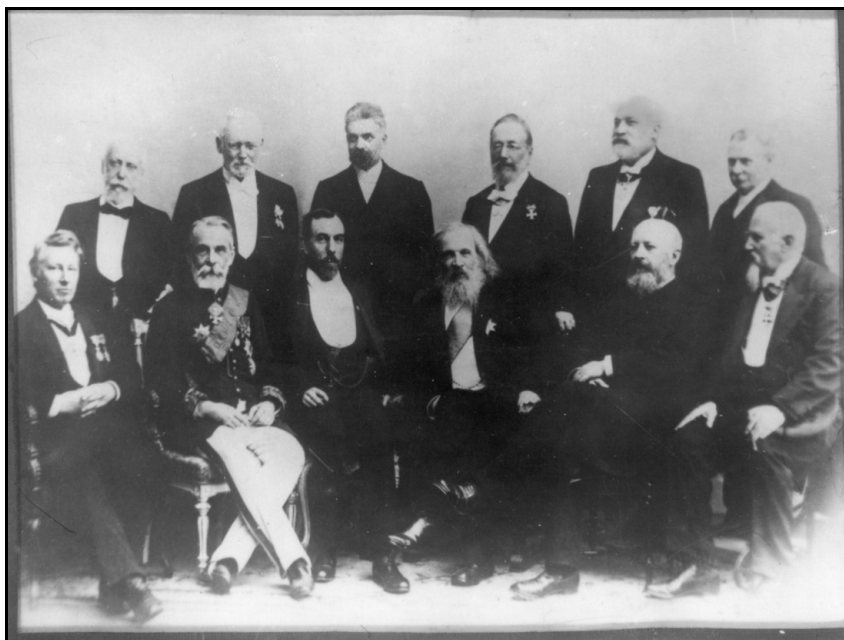


Figure 4.18: Photograph taken in 1900 in Berlin on the occasion of the 200th anniversary of the Prussian Academy of Sciences.



Figure 4.19: The room where the Academicians met at the Kunstkamera.

The Museum was founded in 1947 as a unit of the Institute of Ethnography. In 1953 it was transferred from this institute to the newly-created Institute for the History of Natural Science and Engineering. In 1993 it was returned to Peter the Great Museum of Anthropology and Ethnography (Kunstkamera). The Museum was opened in 1949, in the upper part of the tower of the Kunstkamera, where Lomonosov had worked in 1741–1765.

Chapter 5

Appendix

Principles of Extractive Metallurgy, volume 1	82	Principles of Extractive Metallurgy, volume 2	84
Introduction to the Russian edition	83	Introduction to the Russian edition	84

PRINCIPLES OF EXTRACTIVE METALLURGY, VOLUME 1

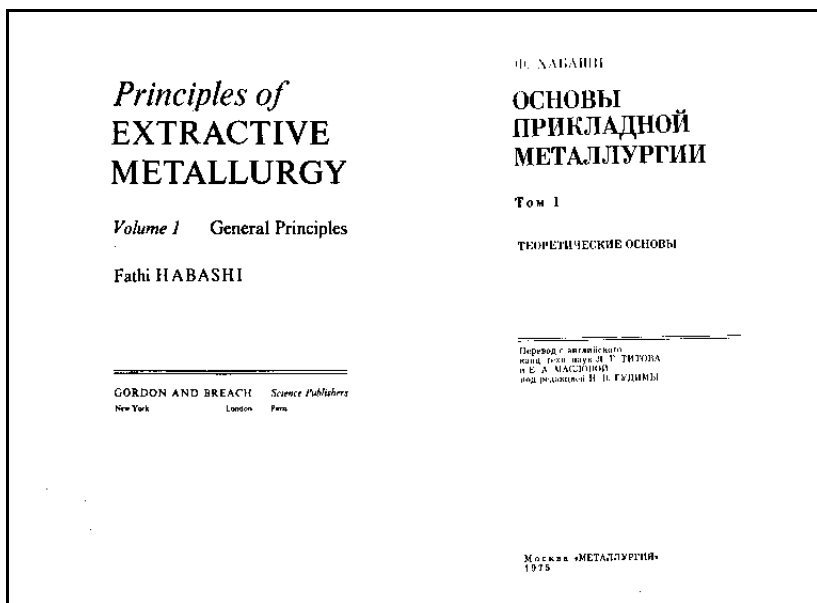


Figure 5.1: Fathi Habashi, *Основы Прикладной Металлургии (Principles of Applied Metallurgy)*, Volume 1, Theoretical Principles, 232 pages, 122 illustr., 30 tables, and 782 references. Translated from English by candidates of technical sciences L. G. Titov and E. A. Maslova, under the direction of N. V. Gudima, Moscow: Metallurgia, 1975.

Principles of chemical thermodynamics and kinetics, characteristic of metallurgical processes, are explained. Kinetics of heterogeneous reactions: solid–gas, solid–liquid, solid–solid, liquid–gas, liquid–liquid, and of electrode processes are discussed. Theoretical explanations are accompanied by

numerous practical examples which were taken from original sources. The book is of interest to students of metallurgy during later years of study, for production engineers, and for research workers.

Introduction to the Russian edition

In 1969, the publication of the four-volume book *Principles of Extractive Metallurgy* was started in USA. Volume I: *Theoretical Principles*, volume II: *Hydrometallurgy*, volume III: *Pyrometallurgy*, and Volume IV: *Electrometallurgy*. The publishing house "Metallurgiya" prepared for publication the first two volumes of this series.

The first volume is only partially translated. In the Russian edition, the chapters concerning the history of metallurgy, mineralogy and chapters about mineral deposits and ore enrichment were omitted; these chapters are usually not included in our course of metallurgy. Also, the very detailed bibliography concerning general problems and special metals, in which the author included many bibliographic references and having only historical value is omitted. The very extensive special bibliography concerning each chapter was almost completely translated because it is of considerable interest for specialists.

A short chapter on thermodynamics and several chapters on chemical kinetics typical for metallurgical processes were included. The author's style is a utilitarian approach to theoretical problems. He collected many practical problems, which can be found in practice and included many figures which permit to find relations between variables. This book can be used as handbook for a large number of technical people and for university students in later years of their study.

During translation, errors of the American edition were corrected. Also units were changed in figures and some other changes were made. In some cases important notes made by the editor were included.

Physico-chemical principles of hydrometallurgy are explained. All types of extraction of metals from ores are discussed and the wider use of hydrometallurgical rather than pyrometallurgical processes is demonstrated. The leading role of the most progressive methods such as autoclave hydrometallurgy, ion exchange, and solvent extraction is underlined. In all chapters an extensive bibliography of Soviet and other research workers is given. This book is suitable for scientific and technical workers of the metallurgical industry. It can also be useful for students of metallurgical institutes.

PRINCIPLES OF EXTRACTIVE METALLURGY, VOLUME 2

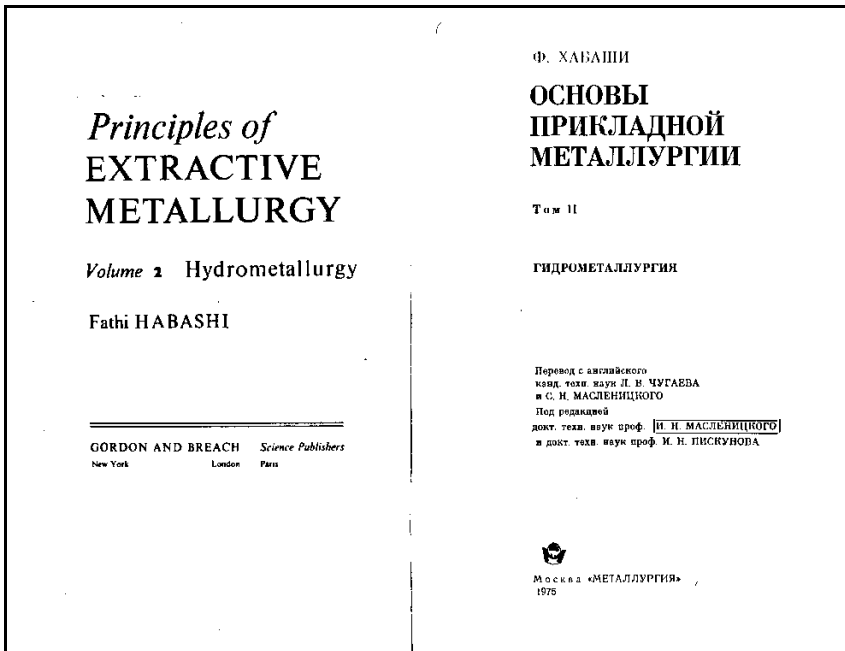


Figure 5.2: Fathi Habashi, *Основы Прикладной Металлургии*, (*Principles of Applied Metallurgy*), Volume II, Hydrometallurgy, 392 pages, 144 illustrations, 45 Tables and 2018 references. Translated from English by candidates of technical sciences L.V. Chugaev and S.N. Maslenitski, under the direction of doctor of technical sciences Prof. I. N. Maslenitski and doctor of technical sciences Prof. I.N. Piskunov, Moscow: Metallurgyia, 1975.

Introduction to the Russian edition

Rapid development of the non-ferrous metal production needs an improvement of methods for extraction of metals from ores. The most important place among methods which can improve productivity belongs to hydrometallurgical methods; these methods permit not only the extraction of rare metals from ores which are difficult to treat by mechanical ore enrichment but also limit the pollution of the environment. In 1969, the publication of *Principles of Extractive Metallurgy* was started in USA. Volume I entitled: *Theoretical Principles*, volume II: *Hydrometallurgy*, volume III: *Pyrometallurgy*, and volume IV: *Electrometallurgy*. The publishing house Metallurgyia prepared translation of the first two volumes of this series. In the second volume of this series the theory and practice of leaching, crystallization, adsorption, and precipitation of metals from their solutions using

different precipitating agents are presented; also ion exchange and solvent extraction is treated from the theoretical and practical point of view.

During translation, some parts of the text were shortened, errors were corrected and units in Figures were changed.

This translation was made by Karel Hajmrl, Department Mining and Metallurgy, Laval University, Quebec.

Chapter 1

A Scholar from Leningrad

Within the Exchange Program Canada–USSR, Professor Ilya N. Beloglazov (Figure 1.1) from Leningrad Mining Institute came in January 1989 to Laval University to spend two months at the Department of Mining and Metallurgy. During his stay the idea of organizing a joint conference between the Mining Institute and Laval University to be held in Leningrad [Saint Petersburg] in 1994 was discussed. In May 1993 I visited the Mining Institute to prepare for the conference. The conference finally took place May 1994.



Figure 1.1: Professor Ilya N. Beloglazov from Saint Petersburg Mining Institute, 1993.

Chapter 1

Saint Petersburg 1993

Piskaryovskoye cemetery	87	State Institute of Applied	
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USSR changed to Russian Federation in 1993. Since the first visit in 1957, numerous changes took place beside abandoning the name Leningrad. The US dollar became equivalent to 1 000 rubles instead of the former exchange rate of one to one. Names of buildings were changed back to those during the Tsar's time. For example, Kirov Theatre is back to Mariinsky Theatre. Most Lenin monuments were removed. Lenin Museum was replaced by an art gallery. Churches are open, books about the Tsar family are available. City maps also became available and Marxism-Leninism literature disappeared from hotels. The city is slowly becoming to look like any other European city. However, buildings and roads badly need repair and tap water is no longer drinkable.

Since the landmarks of the city were already explored in 1977, the 1993 visit was devoted to the palaces in the suburbs: Peterhof, Pavlovsk, and Pushkin (Figure 1.1–1.2). The first was changed in 1944 to Petrodvorets, i.e., Peter's Palace as a result of wartime anti-German sentiment but the original name was restored in 1997 by the post-Soviet government. The second was built by Pavel I [Catherine the Great's son] and was named after him [Pavel in Russian is Paul]. The third was known as Tsarskoye Selo, i.e., the Tsar's Village and was renamed Pushkin in 1937 by the Communist. Peterhof and Pushkin were captured by German troops in 1941 during the siege of Leningrad and were held until 1944. The occupying forces largely destroyed the palaces and the fountains. Restoration work began almost immediately after the end of the war and continues to this day.

PISKARYOVSKOYE CEMETERY

On May 9 every year, the Russians remember those who died during the Nazi Siege of Leningrad. People go to Piskaryovskoye cemetery to lay flowers at the memorial (Figure 1.3).



Figure 1.1: Location map of Saint Petersburg, Pushkin below, and Peterhof to the left [known as Petrodverts]. Pavlovsk is close to Pushkin [Tsarskoe Selo].



Figure 1.2: Map of Saint Petersburg.

PETERHOF

Peterhof is a German name for Peter's Court, known in Russian as Pavlovsk — the summer residence of Peter the Great (Figure 1.4–1.9). It is a huge palace with garden, fountains, and gilded statues.



Figure 1.3: Piskaryovskoye cemetery.



Figure 1.4: Peterhof Palace.

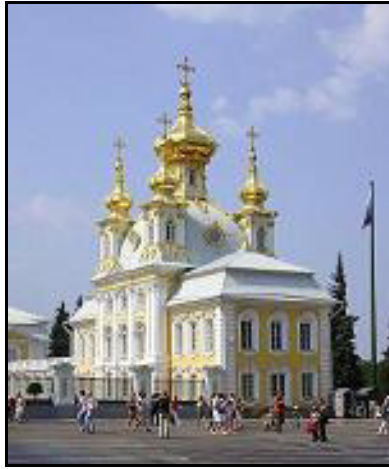


Figure 1.5: Peterhof Chapel.



Figure 1.6: Peterhof Palace.



Figure 1.7: Peterhof Palace.



Figure 1.8: Peterhof cascade.



Figure 1.9: Peterhof.

The Amber room that was presented to Peter the Great by Friedrich the Great of Prussia (Figure 1.10). Another collection of palaces is at Pushkin, for example, Tsarskoye Selo, i.e., Tsar's village where Nicholas II, the last tsar, was arrested and deported to Ekaterinburg. The golden onion-shaped churches are remarkable. During the time of tsars, the domes were gilded by the hot amalgamation process which was highly polluting due to the formation of mercury vapours in the work place. It is said that thousands of workers lost their lives because of that.

PAVLOVSK

Pavlovsk is located 30 km south of Saint Petersburg (Figures 1.11–1.15) was the summer residence of Tsar Pavel I (1754–1801) son of Catherine the Great. He reigned from 1796 till his assassination. During the first year of his reign, Pavel reversed many of the policies of his mother. He opposed to the many expansionary wars that Catherine fought and instead preferred to pursue a more peaceful, diplomatic path. He was succeeded by his son Alexander I (1777–1825) who was 24.



Figure 1.10: The Amber Room in Peter's Hof.



Figure 1.11: Pavel I and his family.



Figure 1.12: Pavlovsk palace with the statue of Pavel I.



Figure 1.13: Pavlovsk garden.



Figure 1.14: Pavlovsk palace.



Figure 1.15: Pavlovsk palace.



Figure 1.16: Tsarskoye Selo Palace.

TSARSKOYE SELO/PUSHKIN

Tsarskoye Selo (Figure 1.16–1.20) belonged to Peter the Great's first wife Catherine I (1684–1727) and was renovated by her daughter Elizabeth I. It was there that Nicholas II was born and also it was there that he and his family were arrested by the Bolsheviks in 1917.



Figure 1.17: Tsarskoye Selo gate.



Figure 1.18: Tsarskoye Selo entrance.



Figure 1.19: One of the many golden onion-shaped domes of the Russian churches.



Figure 1.20: Nadia Habashi, Ilya Beloglazov, and guide Mira Abramovna. Photo by Fathi Habashi, 1993.

The village was named Pushkin in 1937 after the most popular Russian poet Alexander Pushkin (1799–1837) (Figures 1.21–1.22). Pushkin was portrayed by Bolsheviks as an opponent to bourgeois literature and culture. When Alexander I (1777–1825) suddenly died in December 1825, a group of liberal young army officers, later called the Decembrists, started a revolt hoping that Nicholas I, Alexander’s younger brother, would agree to sign a Constitution for the country. The uprising was cruelly crushed, the five organizers were executed and the rest exiled to Siberia. Pushkin was also under surveillance of the Imperial secret police because he was accused of

taking part in the uprising. Due to the uprising, the new Emperor adopted the most conservative policies.



Figure 1.21: Russian poet Alexander Pushkin (1799–1837).

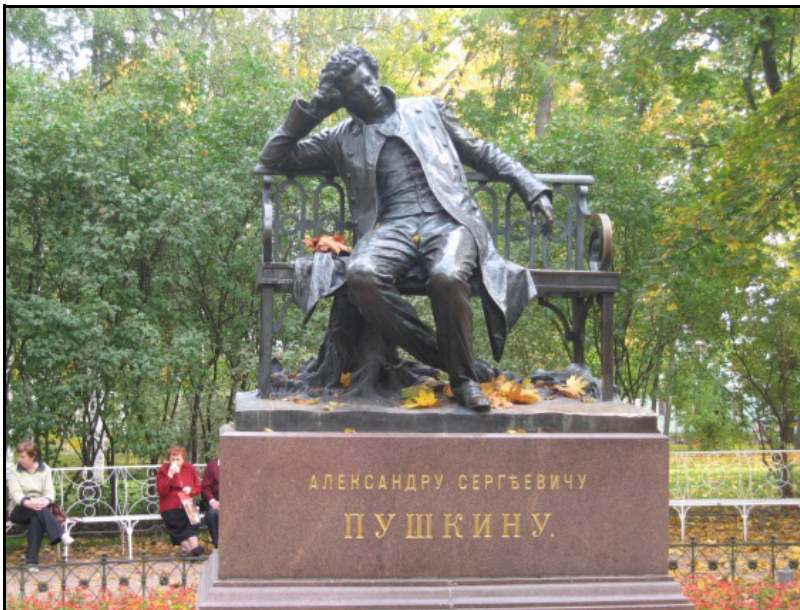


Figure 1.22: Monument of Alexander Pushkin in Pushkin.

Pushkin was born in a noble family in Moscow; his great-grandfather, was Abram Petrovich Gannibal (1696–1781), an African page raised by Peter the Great. After finishing his school he moved to Saint Petersburg where he graduated from the Imperial Lyceum in Tsarskoe Selo. The Lyceum was moved to Saint Petersburg in 1844 and what remains in Pushkin today is a Museum (Figures 1.23–1.24).



Figure 1.23: Visiting the Imperial Lyceum in Tsarskoe Selo, 1993.



Figure 1.24: Visiting the Imperial Lyceum in Tsarskoye Selo. Photo by Fathi Habashi, 1993.

Pushkin wrote *Boris Godunov*, *Eugene Onegin*, and *Ruslan and Lyudmila*. The first was the basis of an opera by Mussorgsky, second another opera by Tchaikovsky, and the third by Glinka. This is not to mention ballets and cantatas, as well as innumerable songs set to Pushkin's verse. Suppé, Leon-

cavallo and Malipiero, among non-Russian composers, have based operas on his works. Alexander Pushkin became an inseparable part of the literary world of the Russian people at a time when Russian language was considered unfit for the aristocracy who preferred to use German or French words in their conversation.

Pushkin fought many duels. At the age of thirty-seven, however, he was fatally wounded in such an encounter with a French officer who allegedly had been attempting to seduce his wife, Natalya Pushkina. Today, duels may be considered bizarre, but in most Western nobilities of the 18th and 19th centuries it was an accepted manner to resolve disputes. A duel would be ended as soon as one man was wounded, even if the wound was minor; the victor was regarded as a hero. It was only at the outbreak of World War I that duelling became illegal.

SAINT PETERSBURG INSTITUTE OF TECHNOLOGY

Founded in 1828 by Nicholas I to meet the requirement of the growing Russian chemical industry (Figure 1.25). The Saint Petersburg Institute of Technology was one of the first such institutes in the world. Now it has 5 000 students, 2 000 researchers, 500 doctors degree candidates and 700 professors organized in five faculties:

- Inorganic Chemical Technology
- Organic Technology and Biotechnology
- Cybernetics
- Explosives
- Uranium, Rare Earths, and Nuclear Materials.

It should be noted that refrigeration, textiles, wood technology pulp and paper, and photographic technology are taught elsewhere. A meeting was held with the Rector: Anatolii Sergeevich Dudaren (member of the American Institute of Chemists). A visit was made to the Faculty of Uranium, Rare Earths and Nuclear Materials. A meeting was held with Prof. V.F. Frolov, chairman of Department of Processes & Equipment of Chemical Technology. This is the department where unit operations are taught. Note, however, that Chemical Engineering is taught at the Polytechnic Institute in Saint Petersburg. A visit was made to the laboratories (unit operations). A meeting was held with Prof. A. Loskutov who described his work on the preparation of platinum deposited on steel to act as catalyst for automobile exhaust.



Figure 1.25: Saint Petersburg Institute of Technology.

The institute's Museum is well kept. Mendeleev taught there from 1863 to 1873 before moving to the University. Germain Hess was Vice Rector. Beilstein was also teaching there. Tchaikovsky's father was Rector. The Institute closed during World War I to function as a hospital. There are three other institutes in Russia similar to this one. They are in Moscow, Ekaterinburg, and Tomsk.

STATE INSTITUTE OF APPLIED CHEMISTRY

This Institute, until very recently, was completely out of reach of visitors. It was there that all fuels for space technology were developed and produced. Due to the absence of the Institute's director, a meeting was held with his deputy. A visit was made to calorimetry and gas chromatography laboratories. Huge multistory building with long dark depressing corridors.

ALL UNION ALUMINUM AND MAGNESIUM INSTITUTE

Better known by its acronym VAMI. A meeting was held with the director: Dr. N. Kaluzhsky, Deputy Director Dr. Nikolay N. Tikhonov and an interpreter. The Institute was founded in 1931 as the leading research and design institute for the Russian light metal industry. Russia has the only plants in the world that produce aluminum from non-bauxite sources:

- Nepheline 4–4.5 t when mixed with limestone and heated yields 1 t Al_2O_3 , 0.6–0.8 t Na_2CO_3 , 0.2–0.3 t potash, and 9–10 t cement.

-
- Alunite 3.3 t when mixed with 2.1 t nepheline and limestone and heated, yields 1 t Al_2O_3 , 1.1 t K_2SO_4 , 5–6 t cement, and 1.5–2 t porous quartz granules.
 - High-silica bauxite are treated by Bayer Process, but the red mud generated is then sintered with limestone to recover the remaining alumina.

Chapter 1

Honorary Doctorate

**Text of speech of thanks
accepting the honorary degree** 108

In September 1993, it was a great surprise when a Fax was received from Nikolay M. Proskuryakov, Rector of the Saint Petersburg Mining Institute, informing me that the Academic Senate has approved my nomination to the honorary doctorate on the occasion of 220th Anniversary of the Institute. Plans were therefore made to attend the ceremony.



Figure 1.1: With Rector Nikolay Maximovitch Proskuryakov [right] and Vice Rector Vladimir S. Litvinenko [left]. Photo by Nadia Habashi, 1993.



Figure 1.2: Rector Nikolay Maximovitch Proskuryakov congratulating. Photo by Nadia Habashi, 1993.



Figure 1.3: Honorary Doctorate (Russian).



Figure 1.4: Honorary Doctorate (English).



Figure 1.5: Dean Arnold Galnbek standing offering sandwiches. Photo by Fathi Habashi, 1993.



Figure 1.6: Faculty members. Photo by Fathi Habashi, 1993.

Meetings were held with: Rector Nikolai Proskuriakov, Vice-Rector: Vladimir Litvienenko, Dean of Metallurgy: Arnold Galenbek, Prof. Ilya N. Beloglazov and others. A visit was made to the Mineral Collection Museum, Director: Vladimir D. Kolomensky. Special show piece: a 5.56-kg platinum nugget from Ural.

TEXT OF SPEECH OF THANKS ACCEPTING THE HONORARY DEGREE

Doctor of Science

Consecutive translation in Russian

Saint Petersburg, November 3, 1993

Rector Proskuryakov:
Honourable guests:

I am delighted and greatly honoured to be with you here today celebrating the 220th Anniversary of your renowned institution. I am sorry I cannot express this in Russian. It is hard to believe that you still occupy these buildings for over two hundred years. I sincerely wish that this magnificent building be kept as a museum and you get a new working space. We are very happy that the Cold War has ended and the coming of Perestroika and Glasnost. It is time to turn swords into ploughshares, and defence spending into creation of nondestructive purposes. It is also time to get rid of some of the old bureaucratic system and adopt new working methods. Each time I come to your country I get upset by the provocative procedures of the Consular system — to the point that I sometimes say “I will never go again to this country.” But I came and I hope that next time I come to Russia, there will be no more visas like in other European countries.

I sincerely wish you success in your struggle for democracy. I have been in contact with your Institute for about thirty years now. I have been impressed with its glorious history and distinguished professors many of those I knew have passed away. I am sure that the new generation will continue with this tradition. I have also always been impressed with Russian culture, your beautiful city, and your wonderful hospitality. I will try to create programs to bring young Canadians here to study Russian and work in your industry. We also look forward for Russian metallurgists to come and visit us. The cost of sending one thousand students abroad for one year is less than the cost of one military aeroplane. I thank you for the honorary degree you bestowed on me and for you hospitality. Thank you.

Fathi Habashi

Chapter 1

Saint Petersburg 1994

Internal Symposium 111

The International Symposium on Complex Ores Utilization took place on May 10–14, 1994 at the Saint Petersburg Mining Institute (Figures 1.1–1.2).



Figure 1.1: International Symposium on Complex Ores Utilization, Saint Petersburg, 1994.



Figure 1.2: Some of the Western delegates. From left: Engin Osberk [Canada], Fathi Habashi, ?, Lauri Hollapa [Finland], ?, H. Eric [South Africa].

INTERNAL SYMPOSIUM

Introduction by Fathi Habashi

Mineral Processing and Extractive Metallurgy Review 15 (1–4), 1–2 (1996).

The International Symposium “Problems of Complex Ores Utilization” was held in Saint Petersburg Mining Institute in Saint Petersburg, Russia on May 10 to 14, 1994. It was organized jointly by the Saint Petersburg Mining Institute and Laval University in Quebec City, Canada. It is believed that this is the first joint venture between a Russian educational institution and a Canadian university devoted to extractive metallurgy. Relations between these two institutions go back to 1970 when Russian professors of metallurgy at the Saint Petersburg Mining Institute translated the writer’s two volumes “Principles of Extractive Metallurgy.” This was followed by reciprocal visits of professors.

The idea of holding the Symposium in Saint Petersburg is aimed at strengthening relations between metallurgists of the former Soviet Union and their Western colleagues. It is well known that the republics of the former Soviet Union have severe economic problems. As a result scientists from these countries cannot travel to North America to attend conferences because of

the high costs and the high registration fees for these conferences. It seems therefore logic to hold conferences in Russia with extensive Western participation. In this way not only we can meet our Russian colleagues but also, to a modest extent, contribute to improving the local economy. The Saint Petersburg Mining Institute has its own guest house, tour guides with buses, and its own restaurant.

The Symposium attracted 16 Western delegates (seven of them were accompanied by their wives), thus a total of 23. They came from Canada, Austria, Finland, China, South Africa, USA, and France. From Russia and the Commonwealth of Independent States there were 70 participants. Large delegates came from remote areas such as Norilsk, Khazakstan, and Georgia. However, many Russian delegates paid their registration fees but did not show up at the conference because they were unable to attend due to a sudden recent rise in transportation cost in Russia. This shows the extreme economic problems facing Russia today.

The number of abstracts submitted in English were 40 of which 15 were submitted as complete manuscripts. On the other hand, abstracts submitted in Russian were 400 of which only 308 were accepted: some of the Russian papers were in form of posters. There was excellent simultaneous translation during all the sessions.

Russian papers presented at the Symposium will be published in the Russian Journal of Nonferrous Metallurgy. English papers will be translated in Russian and published also in the same journal. They are published here together with those Russian abstracts that were available in English at the Symposium as a special issue of Mineral Processing and Extractive Metallurgical Review.

At the closing ceremony, all delegates expressed the desire to hold a second symposium in two years time. The Organizing Committee responded by agreeing and announced that the Second International Symposium on the Problems of Complex Ores Utilization will be held again in Saint Petersburg at the Mining Institute with the collaboration of Laval University on May 19 to 24, 1996. Western Participants were all fetched from the airport or the railway station and stayed in the Mining Institute Hotel at Morskaya Naberezhnaya 15 (near Hotel Pribaltiiskaya) which looks on the Gulf of Finland. Each delegate was also returned to the airport or railway station at the end of his or her stay. Included also in the registration fees which was US \$200 and US\$90 for accompanying person was a city tour by bus, a night tour in boat on the Neva River, and a get-together reception.

Farewell dinner with an excellent one hour folk dancing was extra at US\$30. The cost of the hotel was US\$95 single and US\$136 double, three meals included. Transportation to and from the Mining Institute was provided with shuttle buses. Cultural tours to museums were extra but at a reasonable price.

Getting a visa to Russia is still complicated. One must receive a letter of invitation from the Mining Institute to forward to the Russian Consulate. The Consulate requires three recent passport photographs, a certified cheque with the consular fees, and four weeks time to work out the visa which one gets on a separate sheet of paper.

Saint Petersburg is one of the most beautiful cities in the world. It is full of monumental architecture, palaces, parks, bridges, and museums. Summer palaces in the neighbourhood make excellent excursions. Metallurgical research centres in the city are now open to visitors. For example the Nickel Research Laboratories (Gipronickel) and the Light Metals Research Laboratories (Vami) are only a few to mention.

There were no parallel sessions; as a result the discussions were kept to a minimum to accommodate the large number of papers. This was one of the errors of the Organizing Committee and it is hoped to correct it in the future.

Although the conference in general can be considered as a success it was still heterogeneous—the Russians were in a separate hotel, city tours were separate, and meals were taken separately. Russian participants did not bring their spouses at the farewell dinner, as the custom in Western conferences; hopefully this will change in future meetings. Russian abstracts were not translated in English. Russian names on the badges were written in Cyrillic only. It is believed that these can be corrected in the next meeting.

The Russian hosts were exceedingly hospitable and friendly and although communication was in some cases difficult, language barrier cannot be an obstacle for mutual understanding.

There are many people who did the hard work of preparation and execution of the program. I would mention only a few: Ilya N. Beloglazov, Vladimir S. Litvinenko, Arnold Galnbek, the interpreters, the secretaries, the tour guides, those at the registration desk, and many others.

Opening speech by Fathi Habashi

Mineral Processing and Extractive Metallurgy Review 15 (1–4), 2–4 (1996).

On behalf of my colleagues in the Organizing Committee and personally I welcome you warmly to the International Symposium on Complex Ores Utilization and to Saint Petersburg — one of the most beautiful cities in the world and at the same time the most heroic. I am sorry that I cannot say these few words in Russian, but I think that with the four languages I already know, you will excuse me.

This Symposium is a joint activity between the Mining Institute in Saint Petersburg and Laval University in Quebec City, Canada with the support of the Russian organizations Gipsonickel, Vami, and the Russian Academy of Science. To my knowledge this is the first joint venture between a Russian and a Canadian educational institutions in the area of extractive metallurgy.

Relations between Laval and the Saint Petersburg Mining Institute go back to the 1960s when Professor Ivan Nicolai Maslenitsky (1900–1972) chairman of the Metallurgy Department of the Leningrad Mining Institute wrote to me requesting certain publications. Few months later, we exchanged books authored. Prof. Maslenitsky then with a group of professors and researchers at his institute undertook translating the first two volumes of my book “Principles of Extractive Metallurgy,” and published them in 1973 and 1975. In 1972, he responded positively to an invitation to write an article on his researches in the newly-founded “Progress in Extractive Metallurgy” to which the present writer acted as Editor¹. The paper was of great interest because it traced the historical background of separating nickel from copper as practiced now in Russia and by INCO Metals in Sudbury showing that the idea was conceived simultaneously in Canada and USSR. The whole volume of Progress in Extractive Metallurgy was reviewed favourably in 1975 in the Russian Bulletin of Nonferrous Metals².

In summer 1972 I received a telegram from Prof. Piskunov informing me of the death of Prof. Maslenitsky. I regretted that greatly and sent him my condolence.

In 1977, I participated in the Bilateral Exchange Program between the Canadian National Research Council and the Acad-

¹ I. N. Maslenitsky, E. I. Maslenitskaya and L. V. Chugaev, “Separation of Nickel and Copper from Matte by Flotation and Hydrometallurgical Treatment,” pp. 103–126 in vol. 1, *Progress in Extractive Metallurgy*, editor F. Habashi, Gordon & Breach, New York 1973.

² G. N. Dobrokhotov, “Progress in Extractive Metallurgy, editor F. Habashi, Volume 1, Gordon & Breach 1973,” *Izvest. Vischidr. Ucheb. Zavedenii, Tsvet n Metal.* (1) 151–152 (1975).

emy of Sciences of USSR. The program included visits to Leningrad, Moscow, Alma Ata, and Tashkent. In Leningrad, I met Prof. Piskunov and Prof. Dobrokhotov, both are no longer with us. A Trip Report summarizing the activities of this visit was published in 1978. This was followed in 1982 by a paper entitled "Chemistry and Metallurgy in Imperial Russia," which summarized visits made to the Lomonosov Museum and Mendeleev Museum, both in Leningrad¹. The paper was presented at the meeting of the History of Chemistry Division of the American Chemical Society in Washington, D.C. A Feature Article published by the present writer in *Chemical and Engineering News* in February 1982 was translated by workers in the Leningrad Mining Institute and published in *Russian Bulletin of Nonferrous Metals* in 1983².

My first visit to the Soviet Union was to Moscow in August 1957 when I was a graduate student at the Technische Hochschule in Vienna, Austria. I was at that time 29 years old and was eager to visit your country because I was a convinced socialist. The International Youth Festival with motto "Za mir i druzhbu" (За мир и дружбу — For Peace and Friendship) was the most suitable occasion for me to come and see how the socialist system works. I came and felt immediately that there was something wrong.

Relations with the Mining Institute were strengthened when in 1989 Dr. Ilya Nikitich Beloglazov spent six weeks with the writer at Laval University on an exchange program between Canada and USSR. During one of the numerous discussions we had, I proposed to hold a joint conference in Leningrad between the Canadian Institute of Mining, Metallurgy, and Petroleum and the equivalent organization in Russia. The idea was immediately killed at the Canadian Institute on the grounds that it was very difficult to do anything with the Russians. Beloglazov, however, pursued the idea further and on his return wrote a couple of letters on this matter. I did not take the matter seriously because his correspondence was always by sea mail and of course this is not the way to organize conferences. I changed my mind, however, when in 1992 I received a fax from the Mining Institute. I realized then that the time is opportune to work together. This conviction was strengthened when to my great pleasure and surprise, I met Rektor Nikolai Maximovitch Pereskuryakov at a

¹ F. Habashi, "Chemistry and Metallurgy in Imperial Russia (1713–1917)," *Bull. Can. Inst. Min. & Met.* 75 (861), 79–85 (1984)..

² F. Habashi "Hydrometallurgy," *Izvest. Vischich Uchelb., Tsvet.Metal* (3), 25–33 (1983).

conference in Calgary, Canada dealing with the environmental problems in the mineral industry.

In May 1993, I went to Saint Petersburg on the invitation of the Institute to discuss preparation for the Symposium. In November the same year, I celebrated with you the 220th Anniversary of the founding of your renowned institute and was greatly touched by the honorary doctorate you bestowed on me.

We were very happy in the West to hear about "Perestroika," "Glasnost," and the end of the "Cold War." Russia for me is not Stalin, Beria, and KGB but Mendeleev, Tchaikovsky, and Rimsky-Korsakov. I admire Russian culture and civilization and I sincerely hope that you will recover soon from the economical problems facing you today. I also hope that your consular system will be reformed soon because we have great hardship dealing with it when we want to come and visit you. We faced many problems during the organization of this Symposium. But these can be easily avoided when preparations are properly coordinated. Language cannot be a barrier. I thank my Russian colleagues for the excellent work they have done and I thank you for your attention.

Closing remarks by Fathi Habashi

Mineral Processing and Extractive Metallurgy Review **15** (1-4), 4 (1996).

Let me first correct what my colleague Viktor Mikailovich Sizyakov has said regarding the organization of this conference. My contribution has been indeed very little and he has exaggerated my effort. The hard work was really done by those sitting next to me at this platform: Dean Galnbek, Vice Rector Beloglazov, Professor Shaligin, Professor Sizyakov, Professor Greyer, Professor Tikhonov, and many others.

This is the first time for me to attend a Russian conference and it is indeed quite different from the conferences we have in North America. It is very useful to hold this last session to discuss the positive and negative points of the conference and to find ways to improve future conferences. I have attended many Russian banquets and I would also note that they are different from our banquets as I mentioned at the dinner last night. That is why probably I do not know what to say or to do under such circumstances.

I am very pleased to hear that many delegates were, satisfied with this conference and request holding similar meetings in the future. I am happy to inform you that the Organizing Committee has agreed to hold our next meeting on May 19 to 24,

1996. So I look forward to meet you again in two years and I promise you that we will have a better meeting than this one.

I will do my best that our Russian colleagues will be staying with us in the same hotel and that we have our meals and excursions together. With better coordination the number of Western delegates will increase to at least four times the number of present participants. I look forward that Russian abstracts will be available in English so that we can follow up closely with your work and the name badges will also be printed in Latin and Cyrillic.

As a final comment I noted that many papers and much of the discussion in many sessions were dealing with sulfur dioxide emission and its problems. I hope that in our next meeting we will be reporting on improving this situation. Goodbye and thank you.



Figure 1.3: Part of a brochure of St. Petersburg Mining University with translation added.

Chapter 1

Moscow 1977

Baikov Research Institute of Metallurgy 118

BAIKOV RESEARCH INSTITUTE OF METALLURGY

In 1977, I spent a few days in Moscow as guest of the Russian Academy of Sciences in connection with the Exchange Program Canada–USSR. The Academy in Leningrad planned a meeting for me with Prof. N. V. Gudima, Head of the Institute of Nonferrous Metallurgy of the Academy of Sciences in Moscow who edited the translation of my book. Prof. Gudima had just retired at the age of 82 and the visit did not materialize. Instead a visit to the Baikov Research Institute of Metallurgy was organized. A short meeting was held with the Director E. M. Savitsky. A small group headed by G. N. Zviadadze, a Georgian, was devoted to extractive metallurgy. This group was founded by D. M. Zhizhikov who passed away in 1976 at a very old age. L. Pliginskaya, Z. Gyljanitskaya, and E. Subbotica worked on the anodic dissolution of sulfides.

The Institute was named after Alexandr Alexandrovich Baikov (1870–1947) (Figure 1.1) a graduate from Saint Petersburg University. In 1899 he was sent to study at the laboratory of Henri Le Chatelier (1850–1936) at the School of Mines in Paris. On his return he was appointed professor at the Saint Petersburg Polytechnic Institute where he established the first metallographic laboratory in Russia. In 1927 he was appointed director at the Metallurgical Institute. In 1930, the Institute was separated from the Leningrad Polytechnic Institute. In 1932 he was elected member of the Academy of Sciences of the USSR. During World War II he was Chairman of General Metallurgy at the Moscow Institute of Steel.



Figure 1.1: Alexandr Alexandrovich Baikov.

Chapter 1

Moscow 2001

Moscow.....	120	State Research Institute of	
The Orthodox Church	122	Nonferrous Metals	135
Cathedral of Christ the Sav-		Iosef Davydovich Reznik (1916–	
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Park of former Soviet leaders .	131	Pushkin Café.....	138
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Obviously Moscow in 2001 is completely different from Moscow I saw in 1957 or in 1977. The Red Square became full with people selling all sorts of things, GUM has been completely transformed into a Western style shopping centre and a Food Court, and Stalin is no longer in the Mausoleum.

MOSCOVY

Moscow was founded in 1147 by the Kiev Prince Yuri Dolgorukiy, and before that time Russia was called Rus and the first Rus State was Kiev Rus. In old times, the Romans called these people Ruthenians. The Principality of Muscovy was able in 1480 under Ivan III (1440–1505) (Figure 1.1) to overthrow the over 200 years of Mongol domination. His successor Ivan IV (1530–1584) (Figure 1.2), also known as Ivan the Terrible [he married seven times and was responsible for killing his son], was able to conquer and absorb the Khanates of Kazan, Astrakhan, and Siberia, and surrounding principalities.

In the early 17th century, a new Romanov Dynasty continued this policy of expansion across Siberia to the Pacific. Peter I (1672–1725) who ruled from 1682–1725 and died at the young age of 53, extended his rule to the Baltic Sea and the country was renamed the Russian Empire. During the 19th century, more territorial acquisitions were made in Europe and Asia. Peter the Great moved the capital from Moscow to the newly built Saint Petersburg in 1710.



Figure 1.1: Ivan III (1440–1505).



Figure 1.2: Ivan IV, the Terrible (1530–1584).



Figure 1.3: Vladimir Lenin (1870–1924).



Figure 1.4: Josef Stalin (1878–1953).

Autocracy, corruption, palace plots and assassinations, wide spread poverty, devastating defeats of the Russian army in World War I led to widespread rioting in the major cities of the Empire and to the overthrow in 1917 of the imperial regime. The Communists under Vladimir Lenin (1870–1924) (Figure 1.3) seized power and formed the USSR. In 1918 the Russian capital was moved from Petrograd [Saint Petersburg] to Moscow. The brutal rule of Josef Stalin (1878–1953) (Figure 1.4), who ruled from 1924 until his death, strengthened Russian dominance of the Soviet Union.

The Soviet economy and society stagnated in the following decades until General Secretary Mikhail Gorbachev who ruled from 1985 to 1991 introduced glasnost (openness) and perestroika (restructuring) in an attempt to modernize Communism, but his initiatives released the oppressed forces that by December 1991 the USSR splintered into 15 independent republics. Since then, Russia has struggled in its efforts to build a democratic political system and market economy to replace the strict control of the Communist period.

THE ORTHODOX CHURCH

Christianity was introduced by Prince Askold (c. 860), and Kiev Rus adopted Greek Orthodoxy from the Byzantines under the reign of Vladimir the Great (reigned 980–1015). During the reign of Boris Godunov (c. 1551–1605) (Figure 1.5), the Russian Orthodox Church received its patriarchate, freeing it from the influence of the Patriarch of Constantinople. After the fall of Constantinople to the Ottoman Turks in 1453 the centre of Orthodoxy was shifted to Moscow.



Figure 1.5: Boris Godunov.



Figure 1.6: Photo by Nadia Habashi, 1993.

CATHEDRAL OF CHRIST THE SAVIOUR

When Napoleon Bonaparte retreated from Moscow, Emperor Alexander I signed a manifest on 25 December 1812, declaring his intention to build a Cathedral in honour of Christ the Saviour “to signify Our gratitude to Divine Providence for saving Russia from the doom that overshadowed Her” and as a memorial to the sacrifices of the Russian people (Figure 1.7). In the meantime Alexander I was succeeded by his brother Nicholas I who favoured a model of Hagia Sophia in Constantinople. The cornerstone was laid in 1839 and the cathedral was finished in 1860.

After the death of Lenin, the prominent site of the cathedral was chosen by the Soviets as the site for a monument to socialism known as the Palace of the Soviets with a gigantic statue of Lenin. On 5 December 1931, by order of Stalin’s minister Kaganovich, the Cathedral of Christ the Saviour was dynamited (Figure 1.8).

Before demolition, some of the marble from the cathedral were used in Moscow Metro stations. The construction of the Palace of Soviets was interrupted owing to a lack of funds, problems with flooding from the nearby Moskva River, and the outbreak of war. Under Nikita Khrushchev, the site was transformed into the world’s largest open air swimming pool. In February 1990, the Russian Orthodox Church received permission from the Soviet Government to rebuild the Cathedral. It was completed in 2000

(Figure 1.9).



Figure 1.7: A historic painting showing the Cathedral before demolition.

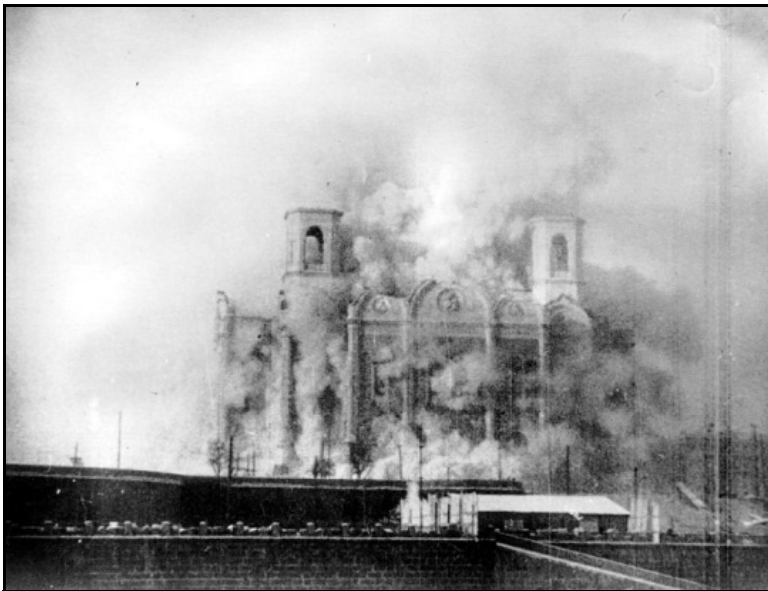


Figure 1.8: A photo showing the church being dynamited by the Soviets.

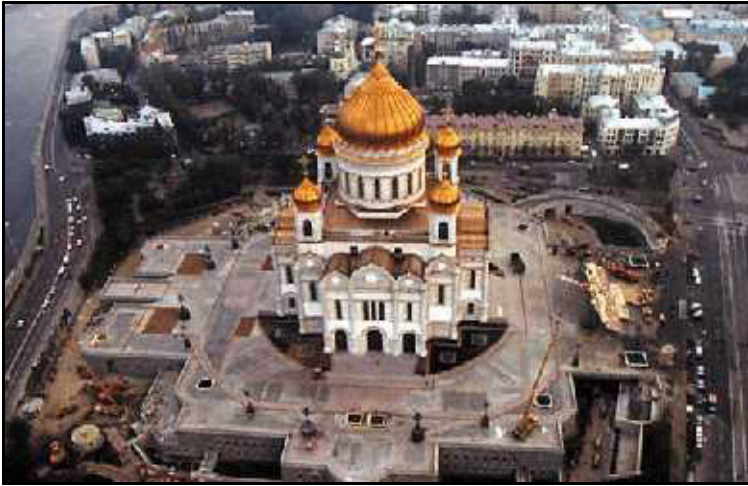


Figure 1.9: The restored church.

CATHEDRAL OF OUR LADY OF KAZAN

This is another church that was demolished by the Communist Party in 1936 and rebuilt after the collapse of the USSR in 1990–1993 (Figure 1.10).

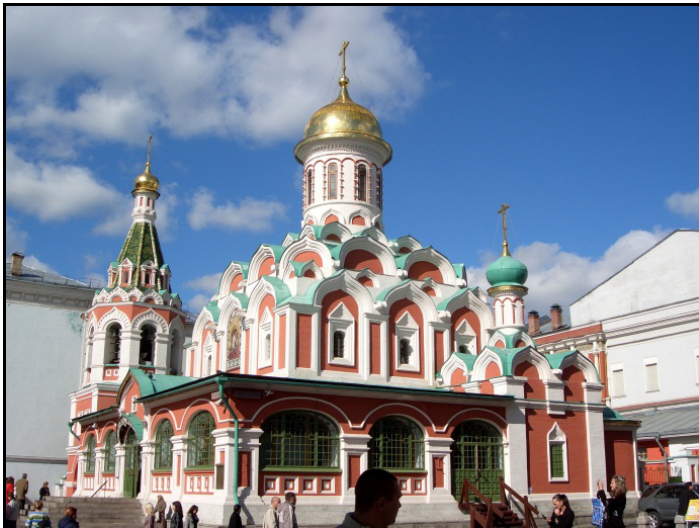


Figure 1.10: Cathedral of Our Lady of Kazan, 2001.

GUM

The department store GUM [page 23] was completely transformed.



Figure 1.11: GUM 2001.



Figure 1.12: GUM 2001.



Figure 1.13: GUM 2001.



Figure 1.14: GUM 2001.

PETER THE GREAT MONUMENT



Figure 1.15: Peter the Great monument in Moscow.



Figure 1.16: Peter the Great monument in Moscow.



Figure 1.17: Moscow River with Professor Vladimir and Maria Vigdergauz. Photo by Fathi Habashi, 2001.

PARK OF FORMER SOVIET LEADERS



Figure 1.18: Former Soviet Leaders' Park.



Figure 1.19: Former Soviet Leaders' Park with Professor Vladimir and Maria Vigdergauz. Photo by Fathi Habashi, 2001.

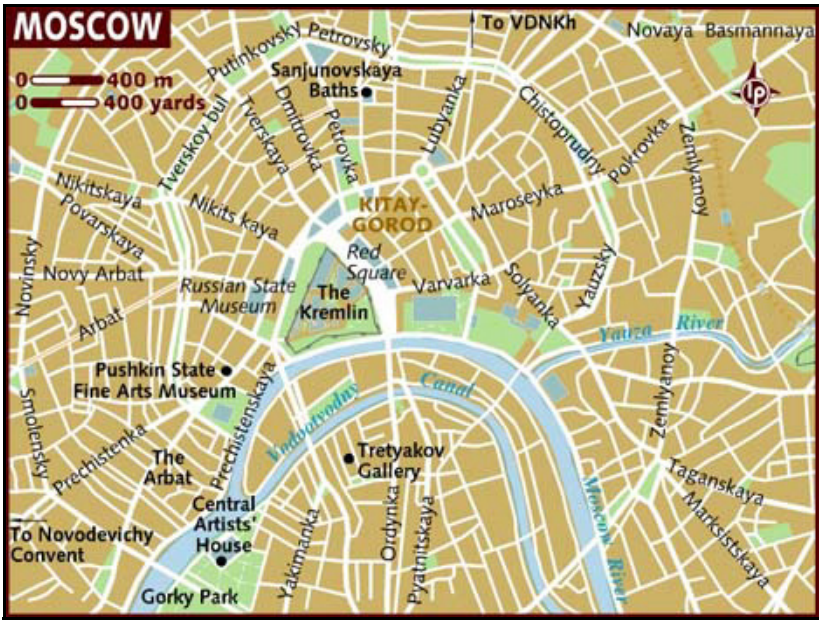


Figure 1.20: Map of Moscow.



Figure 1.21: Metro station Tretyakovskaya.

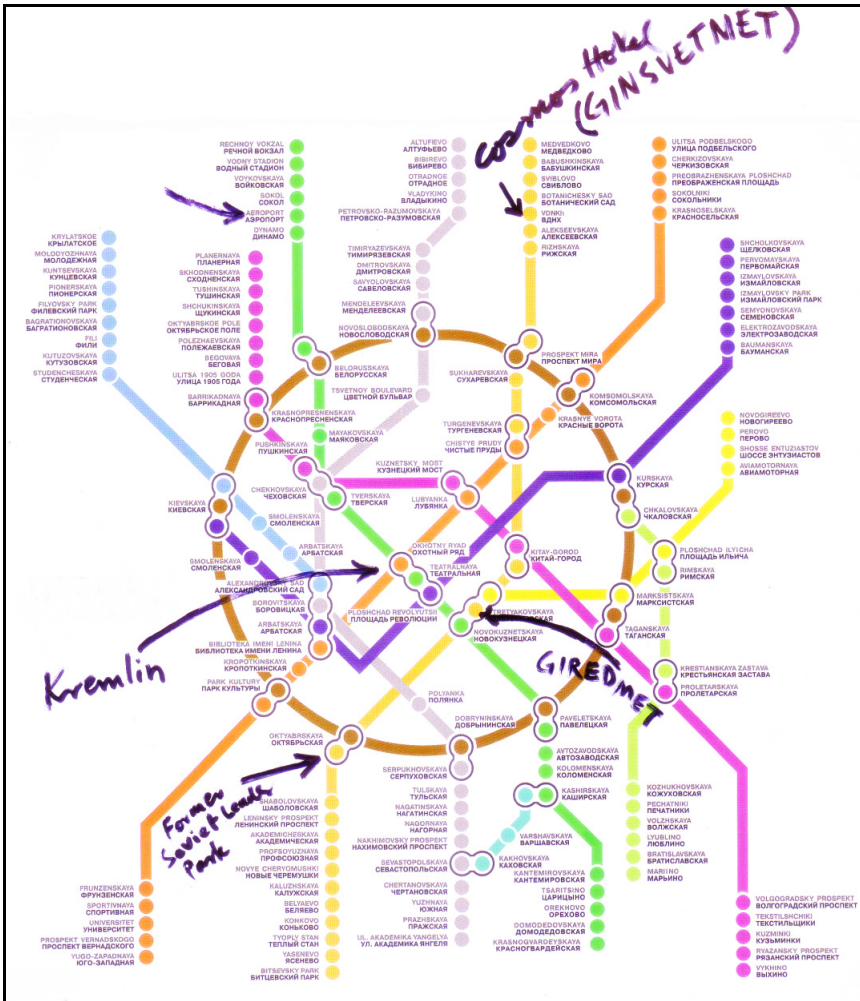


Figure 1.22: Metro map of Moscow.



Figure 1.23: Tretyakov Art Gallery.

PUSHKIN STATE MUSEUM OF FINE ARTS

The Museum has the most representative collection in Russia of foreign art dated from ancient times to modern days (Figure 1.24).



Figure 1.24: Pushkin State Museum of Fine Arts.

STATE RESEARCH INSTITUTE OF NONFERROUS METALS

The Institute is known by its Russian acronym GINSVET-MET (Figures 1.25–1.26).



Figure 1.25: GINSVET-MET in Moscow.

Iosef Davydovich Reznik (1916–2002)

Reznik was born in Ukraine. In 1940 he graduated from the metallurgical faculty of Moscow Institute of Non-Ferrous Metals. During 1940–1945 he worked at Ural Nickel Combine becoming chief of the Research Division. Starting from 1946 until his death he was a researcher at GINTSVET-MET. He was author or co-author of the following monographs:

- *Improvement in the Treatment of Oxidized Nickel ores*, 1949
- *Raw Materials Preparation for Metallurgical Treatment*
- *Oxygen Application in Non-Ferrous Metallurgy*, 1973
- *Improvement of Shaft Smelting of Oxidized Nickel Ores*, 1983
- *Cobalt*, 2 volumes, 1995
- *Nickel. Science & Technology*, 3 volumes, 2000–2002



Figure 1.26: Meeting at Ginsvetmet. Dr. Iosef D. Reznik (sitting), Dr. Andrey Vladimirovich Tarasov, Director (standing with the book in hand), Dr. Sergei Klushin, Interpreter (to the left). Photo by Nadia Habashi.

STATE RESEARCH & DESIGN INSTITUTE OF RARE METALS INDUSTRY

The Institute is known by the Russian acronym GIREDMET is located at Metro station Tretyakovskaya near Trityakov Art Gallery (Figure 1.27). It is remarkable that in Russia the term “Rare Metals” is commonly used for titles of research institutes involved in studying metals such as zirconium, niobium, tungsten, etc. These metals are of course not rare — they are more abundant than gold and silver, but the terminology cannot be changed.



Figure 1.27: GIREDMET.

INSTITUTE OF CHEMICAL TECHNOLOGY OF LOMONOSOV UNIVERSITY



Figure 1.28: Meeting with Prof. Alexander Chekmarev and co-workers.
Photo by Nadia Habashi, 2001.



Figure 1.29: Academician Dr. Alexander Elutin, Director (far left), Dr. Yuri Karpov, Corresponding Member of the Academy, and Miss Vassilissa Baranaevskaya, Interpreter. Photo by Nadia Habashi.

PUSHKIN CAFÉ

My hosts Vladimir and Maria Vigdergauz took us for dinner at Pushkin Café (Figures 1.30–1.31), an elegant but very expensive restaurant. It is clear that there are many very rich people in the former USSR because the restaurant was full of guests.



Figure 1.30: Pushkin Café.



Figure 1.31: Pushkin Café.

MONUMENT TO THE CONQUERORS OF SPACE

The Monument (Figure 1.32) was erected in 1964 to celebrate achievements in space exploration. The monument is 110 m tall and is made of titanium. The monument is located outside the main entry to today's All-Russia Exhibition Centre near Cosmos Hotel (Figures 1.33–1.34), where my wife and I were staying.

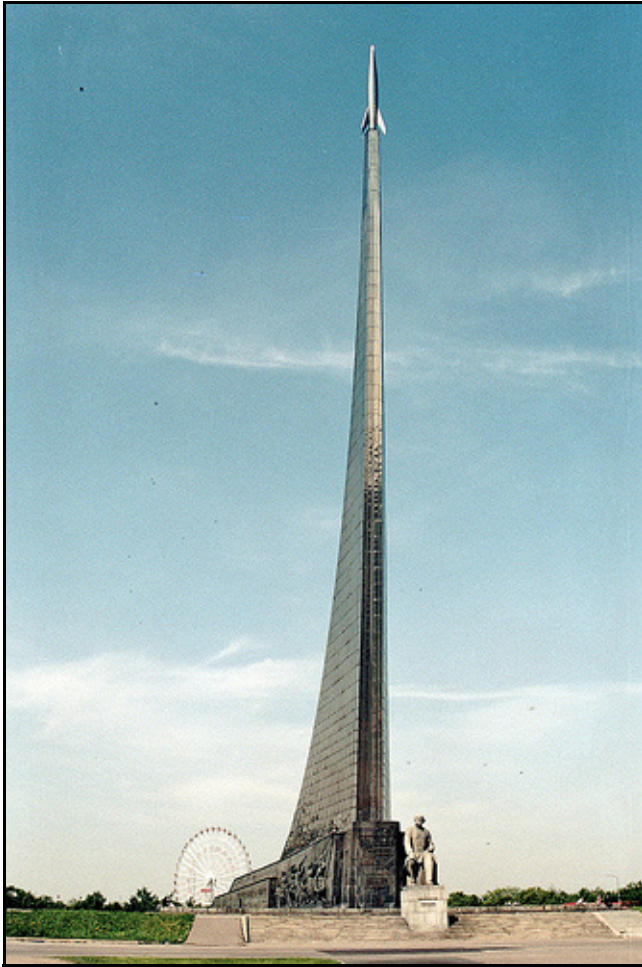


Figure 1.32: Conquering of Space monument.



Figure 1.33: Hotel Cosmos, Moscow 2001.



Figure 1.34: Hotel Cosmos Caucasian Restaurant, Moscow 2001.

Chapter 1

Ural

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The Ural Mountains separate Asia from Europe (Figure 1.1). The Ural Monument is a short drive from Ekaterinburg, it marks the dividing line between Asia and Europe. It was constructed in 1853 by an exploring expedition (Figure 1.2).



Figure 1.1: The Ural Mountains separates Asia from Europe.

EKATERINBURG

Ekaterinburg (Figures 1.3–1.4) was founded on orders of Peter the Great by Willim Ivanovich Gennin (1676–1750) and Vasily Tatishchev (1686–1750) in 1722 as a fortress in the eastern foothills of the central Urals (Figure 1.5). Gennin was a Dutch military officer and engineer in the service of Peter the Great. He specialized in mining and metallurgy. Tatishchev was a prominent statesman, and ethnographer. The fortress was named after the emperor’s second wife Catherine I (1684–1727) (Figure 1.6), the former Latvian peasant Marta Elena Skavronska, who succeeded her husband and reigned as Empress of Russia from 1725 until her death at the young age of 43.



Figure 1.2: Monument marking the dividing line between Asia and Europe near Ekaterinburg.



Figure 1.3: Location map of Ekaterinburg. It was named Sverdlovsk during the Soviet Regime.



Figure 1.4: General view of Ekaterinburg.



Figure 1.5: Vice Rector Sergei Shanchurov at the monument of Gennin and Tatischev, the founders of Ekaterinburg, erected for the 275th anniversary of the city. Photo by Nadia Habashi. [For Tatischev, see also page 253.]



Figure 1.6: Tsarina Catherine I, second wife of Peter the Great, died at the young age of 43.

Ekaterinburg became a major machine manufacturing city at the western terminus of the Trans Siberian Railroad. It was named Sverdlovsk in 1924 till the fall of the communist regime in 1990. Here, in 1918, the last Russian Tsar Nicholas II and his family (Figure 1.7) were executed on orders from the Communist Party leader of the Ural region, Yakov M. Sverdlov (1885–1919), whose name was given later to the town Sverdlovsk. His statue is standing in the centre of the town (Figure 1.8). He was also honoured on a number of stamps (Figure 1.9). A chapel has been erected on the spot where the Tsar and his family were executed (Figure 1.10). Today, Ekaterinburg is the 3rd largest city in Russia [population about 1.3 million in 2001]. It was near there that the American U2 spy plane was hit by a missile launched from the local military base on May 1, 1960.



Figure 1.7: Russian tsar Nicholas II and his family executed in Ekaterinburg.



Figure 1.8: Yakov M. Sverdlov monument in Ekaterinburg.



Figure 1.9: Soviet stamps honouring Yakov Sverdlov.



Figure 1.10: Memorial for the Tsar family. Photo by Nadia Habashi.

Ekaterinburg has an Opera House (Figure 1.11) and an Administrative building (Figure 1.12) as well as many wooden houses with interesting decorations (Figures 1.13–1.14).



Figure 1.11: Opera House.



Figure 1.12: Ekaterinburg administrative building.



Figure 1.13: Wooden houses.

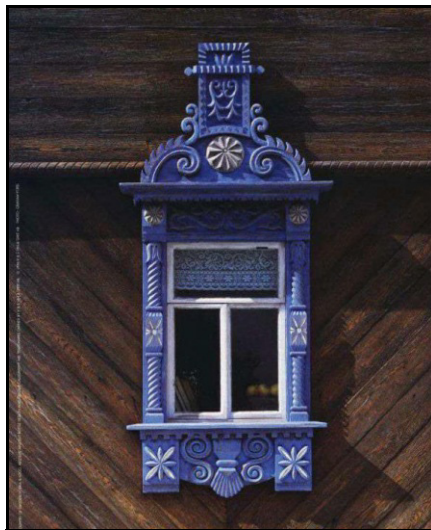


Figure 1.14: Wooden house decorations.

STATE UNIVERSITY OF TECHNOLOGY

In Ekaterinburg, the former Ural Polytechnic Institute now State University of Technology (Figure 1.15).



Figure 1.15: Ural State Technical University in Ekaterinburg, 2001.



Figure 1.16: Ural State University of Technology, Ekaterinburg: Prof. Stanislav Naboychenko, Rector (Pointing with the finger), Sergei Shanchurov, Vice Rector for International Affairs.



Figure 1.17: Farewell at Ural State University of Technology, Rector Stanislav Naboychenko, Sergei Shanchurov, Vice Rector for International Affairs. Olga Gorieva (graduate student), guide at extreme left.

Sulfuric Acid Plant, and Triple Superphosphate. Guide: Evgenie Toropov. Lunch at Plant Restaurant, Staff meeting, Seminar. Visit to Jewellery Plant.



Figure 1.18: Lunch with Technical Director: Dr. Konstantin Plekhanov [with beard] and Stanislav Kerolov at Peshma Electrolytic Copper Refinery, 2001.



Figure 1.19: Sredneuralsky Copper Smelter at Rivda uses Vanyakov furnace, 2001.

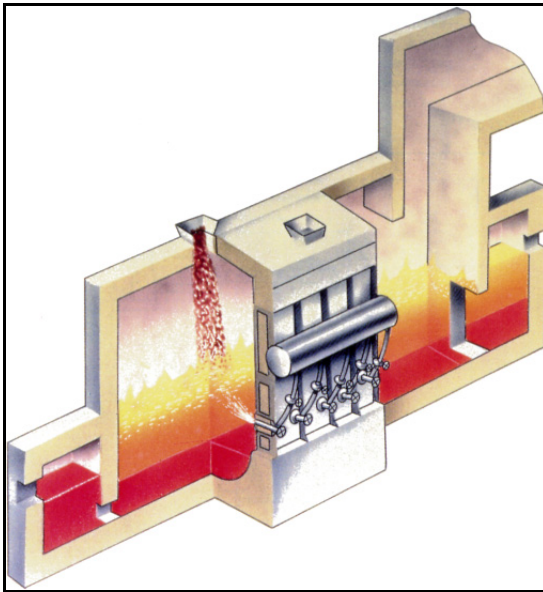


Figure 1.20: Vanyakov furnace.

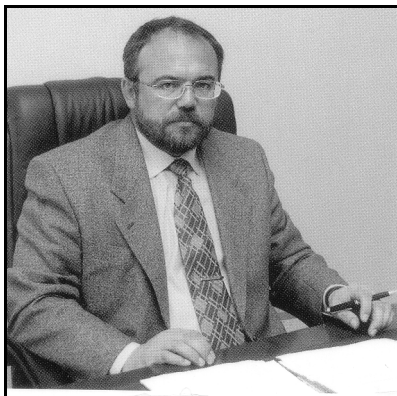


Figure 1.21: Alexander Kozitsyn, General Director.



Figure 1.22: Valeri Kolmachichin, Plant Manager.

NONFERROUS METALS PROCESSING PLANT

Starting from the 1940s and up to the present, the Plant is rated as a Russian leading manufacturer of precious metals. For refinery of iridium, platinum and its alloys electron-beam melting is used.

- Wires of over 200 metals and alloys based on gold, silver, platinum, palladium, iridium, rhodium
- Woven and knitted gauzes made of precious metals and their alloys



Figure 1.23: Dr. Nikolai Timofeev, Director General.



Figure 1.24: Viktor Dimitriev, Iridium products, guide.

THE DEMIDOV FAMILY

The Demidov family was a dynasty of Russian industrialists and land-owners who, in the 18th and 19th centuries developed the Ural region, setting up iron foundries and arms factories and building whole cities around their ventures. The founder of the dynasty, Nikita Demidov (1656–1725) (Figure 1.25), was born into a peasant family in the town of Tula. His father was a blacksmith. To avoid being recruited into the army, Nikita had to flee his hometown and make a living as a blacksmith. Peter the Great was impressed with the superb quality of the pistols made by Demidov. They were as if they had been imported from abroad but their cost of production was much cheaper.

Nikita Demidov and his eldest son, Akinfy Demidov (1678–1745) (Figure 1.26), were among the few Russians in those days to have studied science in the West. By the mid-18th century the country produced as much pig iron as the rest of continental Europe combined. For several years Nikita Demidov worked in Tula.



Figure 1.25: Nikita Demidov (1656–1725).



Figure 1.26: Akinfy Demidov (1678–1745).

Nikita built one of Russia's first metallurgical factories in Tula, producing the first Russian iron to rival English and Swedish iron in quality. He became the first ironmaster to use waterpower and, after buying up several other small foundries, he began to produce muskets cheaper than those imported. With the beginning of the Great Northern War (1700–1721) between Russia and Sweden, Demidov factories became the main supplier of cannons, pistols, swords and other munitions to the Russian army.

The Nevyansk factory north of Yekaterinburg founded by Peter I in 1701 to process iron was turned over to Demidov who used the Chusovaya River to transport cast iron, copper and weapons by barges into the heart of European Russia. Between 1716 and 1725 Nikita built four new metallurgical works in the Urals. By the end of the 18th century the Demidov industrial empire included 55 plants and factories producing 40% of the total amount of iron manufactured in Russia. In 1720, Peter the Great granted Nikita Demidov the title of prince as a reward for his services.

Peter the Great (1672–1725) paid special attention to the mining and metallurgical industry. He hired a large number of foreign specialists to help him develop these areas. Among those were Benedikt Franz Johann Hermann (1755–1815), hired in 1781 from Styria in the Austrian Empire, to build a steel plant in Ekaterinburg. In the 17th century a few blast furnaces

were operated in the Eastern part of Russia that met the needs of domestic industry for ferrous metals. Iron of higher grades, however, had to be imported from Sweden. When the war with Sweden started in 1700, all imports ceased. The exigencies of the war made industrial development an urgent matter. Peter the Great built iron foundries in the Urals where the Tagil and Neiva Rivers flow, and where iron ores are found to make cannons, grenades, and all kinds of arms. The vast forests, the deep rivers along which logs could be floated made the mid-Urals particularly suitable for the development of the industry.

Demidov's son Akinfy Nikitich Demidov increased his inherited wealth by establishing gold, silver, and copper mines. He built iron and copper foundries in the Ural Mountains, Altay Mountains, and in central Russia. The development of the metallurgical industry soon had its effect on Russia: the army and the navy were supplied with their material needs. At the town of Poltava in the spring of 1709 Russians won the crucial battle against the Swedes with weapons made at the Ural foundries.

In 1720 Peter the Great sent a group of specialists from the Bergkolle-gium and Saxons specialists to Urals to explore for ore deposits. It was headed by the Russian artillery captain Vasily Nikitich Tatishchev (1686–1750). Tatishchev became under Peter the Great and later Tsars one of the most important statesmen of Russia. In 1712 he was sent to Berlin, Silesia, and Saxony to study engineering, artillery, and mathematics. He guided the mining industry of Urals and Siberia, founded towns and fortresses at southeastern borders of Russia, developed foreign trade, headed the mint, and took care of finances and monetary policy of the country.

The Swedish government after signing the Treaty of Alliance in 1724 did not prevent her specialists from working in Russian industry and would allow scholars from Russia to be trained at Swedish enterprises. In 1724 Tatishchev was sent to Sweden to hire specialists in mining. He saw that the Russian industry was behind the Swedish. He noted that one water-driven machine worked instead of a hundred people. By the end of the first quarter of the 18th century Russia equipped its mining and metallurgy with advanced Swedish technologies. Tatishchev knew that coke was used as an alternative fuel in England.

GENNIN

Willim Ivanovich Gennin (1676–1750) (Figure 1.27) — a Dutch engineer was hired from Holland to direct the industry in the region of Olonetski and later in the Urals. He introduced major improvements in the production of cast iron and cannons. In 1716 he was sent abroad to hire skilled masters to work in Russia. With their help he established new workshops and reconstructed old ineffective blast furnaces of Olonez plant. In 1719 Gennin made another trip abroad to gain new industrial experience.

On his return he drew a plan of re-equipping Olonez plant with new foreign machines. He launched steel making, tin making, tinsplating and other factories at Ekaterinburg plants. He introduced metal-cutting machines and flattening mills borrowed from Saxony. In 1751 there were 14 water wheels at Barnaulsky plant. They served eight pairs of blast bellows, two hammers, two flour mills arrangements for grain milling, i.e. about 20 machines. In the middle of the 1730s, new machinery was installed at Ekaterinburg plant.

SOBOLEVSKY

Peter Gregorevich Sobolevsky (1782–1841) (Figures 1.28–1.29) was born in St. Petersburg, graduated from a cadet military school in 1798 and was a commissioned officer. After six years, he resigned and became a civil servant. In 1815, he went to the Urals for work at the Pojevsky Works, where the largest blast furnaces of the time were operated. He was entrusted with the technical leadership of this enterprise. He developed new designs of machines and perfected methods of chemical control of production. He introduced in Russia the puddling process instead of the bloomery process for pig iron conversion.



Figure 1.27: Willim Ivanovich Gennin (1676–1750).

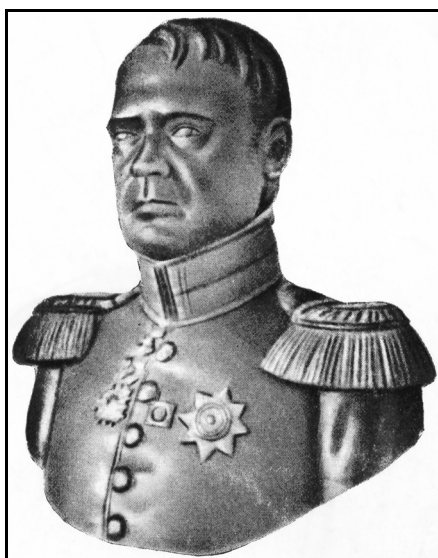


Figure 1.28: Peter Gregorevich Sobolevsky (1782–1841), Russia's first metallurgist.



Figure 1.29: Sobolevsky stamp.

In 1817, Sobolevsky became chief engineer of the State Ramsky-Votkin Works. These works produced rolled iron, steel and boiler iron, anchors for ships, and many other products. There he organized a chemical laboratory, created a library and other research facilities, and was nominated manager at the end of 1819. In 1824, he returned to St. Petersburg. There, he organized a “United Chemical and Metallurgical Research Laboratory” at the Mining Cadets Corps (now Leningrad Mining Institute). Among many problems solved by this laboratory was the development of a method for refining platinum as well as new method for obtaining compact malleable products from powdered platinum.

Chapter 1

Irkutsk

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Institute 166

Lake Baikal 170

Irkutsk was founded in 1652 when Ivan Pokhabov and his men built a winter quarters for gold trading (Figure 1.1). Epiphany Cathedral (Figure 1.2) was built in 1718–1746. The first road connection between Moscow and Irkutsk, the Siberian Road, was built in 1760 from which the town benefited economically. Many products were imported from China for the first time.



Figure 1.1: Yenisei River basin and the location of Norilsk in the north, Krasnoyarsk and Irkutsk in the south.



Figure 1.2: Epiphany Cathedral.



Figure 1.3: Wooden church.

In 1821, Irkutsk became the seat of the Governor-General of East Siberia. In the early 19th century, many Russian artists, officers, and nobles were

sent into exile in Siberia for their part in the Decemberist revolt against Tsar Nicholas I. Irkutsk became a centre of intellectual and social life for these exiles. Many of their wooden houses survive today (Figures 1.3–1.4). By the end of the 19th century, Bolshevik exiles were also sent to Irkutsk. In 1879, a fire destroyed the town, however, Irkutsk quickly recovered. The Trans Siberian Railways was built from 1891 to 1916. In 1898 it reached Irkutsk and a major train station opened (Figures 1.5–1.6). The large Irkutsk Reservoir was built on the Angara River between 1950 and 1959 to facilitate industrial development.

During the Russian Civil War that broke out after the Bolshevik Revolution, Irkutsk became the site of many bloody clashes between the Whites and the Reds. In 1920, Admiral Alexandr Kolchak (1874–1920) (Figure 1.7), the commander of the anti-Bolshevik forces, was executed in Irkutsk. During the Communist years, the industrialization of Irkutsk was encouraged. The City Administrative building is shown in Figure 1.8 and the theatre in Figure 1.9.



Figure 1.4: Decembrists' Museum.



Figure 1.5: Trans Siberian Railroad.

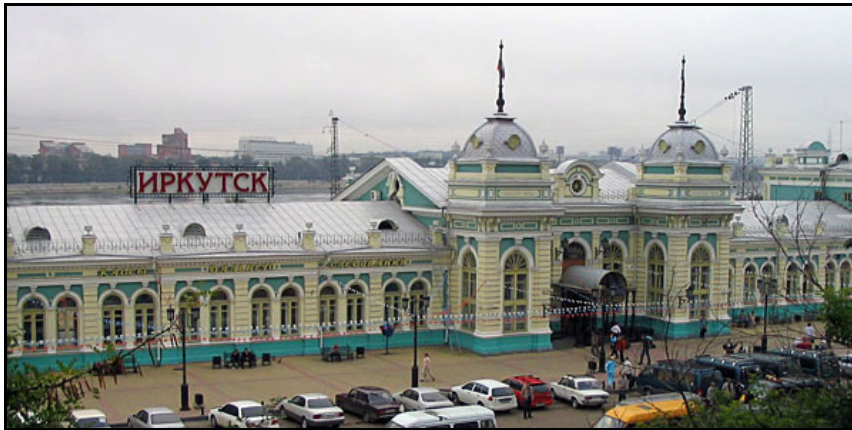


Figure 1.6: Irkutsk Train Station.

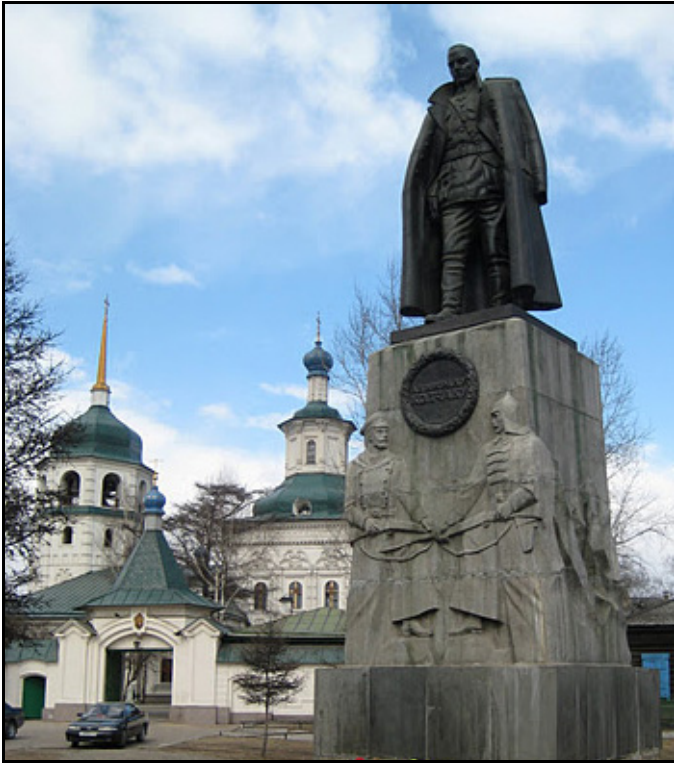


Figure 1.7: Admiral Alexandr Kolchak monument unveiled in 2004.



Figure 1.8: Administrative building.



Figure 1.9: Theatre.

IRKUTSK SCIENTIFIC RESEARCH INSTITUTE

Irkutsk Scientific Institute of Precious and Raw Metals and Diamonds (Figures 1.13–1.15), known by its Russian acronym IRGIREDMET, was founded in 1871 as a laboratory for smelting of the alluvial gold mined from the gold field of Eastern Siberia. In its first year 19.2 tonnes of high grade gold concentrate were melted. In 1883 the laboratory began research to adopt the cyanidation process on a commercial scale. In 1932 the laboratory was named All-Union State Scientific Research Institute of Gold and Its Associates and its Russian acronym was GINZOLOTO.

During World War II, the Institute was transformed into a military factory for the manufacture of munitions as well as research on the beneficiation of tungsten and molybdenum ores. Following the discovery of diamonds in Yakutsk the Institute undertook in 1955 the responsibility of developing the technology for diamond recovery. After the collapse of the Soviet Union the Institute was reorganized as a joint-stock company. In 2001 the total staff was 250.



Figure 1.10: With Guide Lucia.



Figure 1.11: Irkutsk Museum.



Figure 1.12: Irkutsk wooden houses on the way to Lake Baikal.



Figure 1.13: Irkutsk Scientific Research Institute of Precious and Rare Metals and Diamonds [IRGIREDMET].



Figure 1.14: Staff of IRGIREDMET. From left: Oleg V. Zamyatin [Deputy Director], F. Habashi, Grigori I. Voiloshnikov.



Figure 1.15: IRGIREDMET Director Vladimir E. Dementiev was on a business trip.

LAKE BAIKAL

The city lies on the Angara River, a tributary of the Yenisei, 72 kilometres below its outflow from Lake Baikal (Figure 1.16). The river, 580 metres wide, is crossed by the Irkutsk Hydroelectric Dam (Figure 1.17) and three other bridges downstream. Temperatures in Irkutsk are not as extreme as elsewhere in Siberia because of Lake Baikal.

Lake Baikal is the world's deepest lake with an average depth of 744 m. In some places it is nearly 1 620 m deep. It is about 636 km long and 80 km wide. There are 30 rocky islands on the lake. Of the many rivers flowing into Baikal, only the Angara flows out. It is the most voluminous freshwater lake in the world. It is home to more than 1 700 species of plants and animals, two thirds of which can be found nowhere else in the world and was declared a UNESCO World Heritage Site in 1996.

The lake is about 455 m above sea level. The name of the lake seems to come from Chinese "Bei-Khai", i.e., Northern Sea or from "Baigal" meaning sea or ocean in Yakut. The water is transparent to a depth of about 40 m. Thermal springs coming up from the bottom have been recently discovered. The average temperature of the water is +4 °C. Baikal freezes gradually and after the first few months of winter, the entire surface of the lake freezes. Lake Baikal is home to the world's only fresh water seal. It is home of the golomyanka, one of only a few viviparous fish in the world. The small, transparent golomyanka and its cousin, the gobi, live in the lake's cold temperate zone. Since more than half of the golomyanka consists of fat, the fish easily drifts through the icy water.

There is an enormous number of small crayfish at Lake Baikal. These tiny crayfish, the Baikal epishura, devour the tiny water weeds and bacteria that cloud the water. The crayfish is only one and one-half millimetres long. Over the span of a year, this crayfish is capable of sweeping clean the top 50 metres of the water three times. Another type of crayfish, the gammarid shrimp (macrohctopus) destroys practically everything that threatens to pollute the water including dead fish, drowned insects and animals.

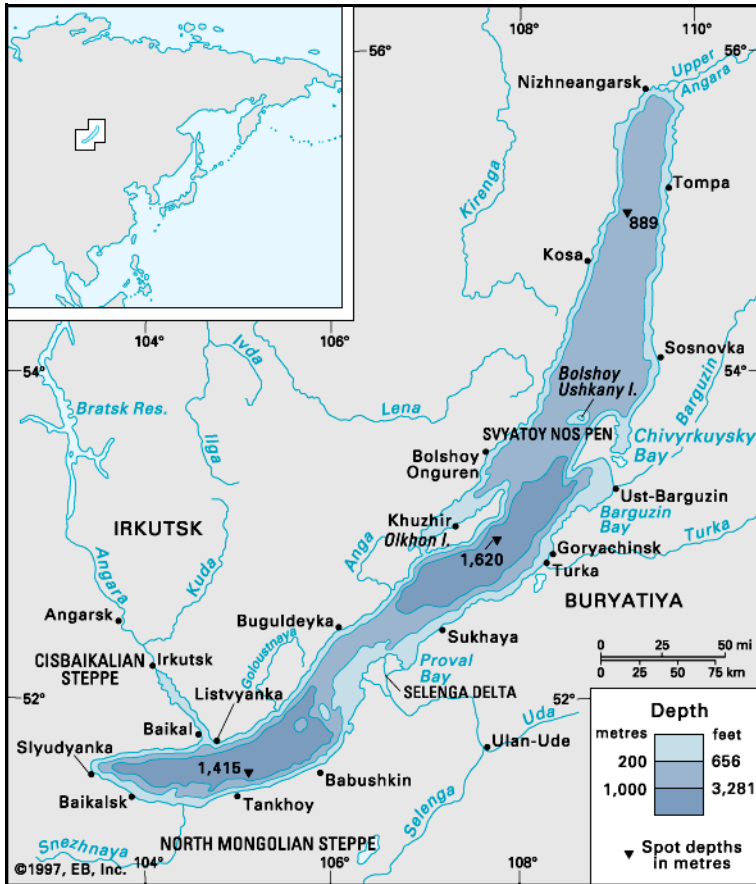


Figure 1.16: Lake Baikal.



Figure 1.17: Irkutsk Hydroelectric Dam.

Chapter 1

Siberia

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Siberia (Figure 1.1) is an extensive region constituting almost all of North Asia. The region has been dominated by the Russians since its conquest in the 16th and 17th centuries. Siberia makes up about three quarters of Russia’s territory but is home to only about one fourth of Russia’s population.

The growing power of Russia in the West began to undermine the Siberian Khanate in the 16th century. Groups of traders and Cossacks began to enter the area, and then the Russian army began to set up forts further and further East. The indigenous people offered fierce resistance to Russian expansion beyond the Urals.

SIBERIA AND THE EXILE SYSTEM

The book entitled *Siberia and the Exile System* by the American engineer George Kennan (1845–1924) (Figure 1.2) was published in 1891 and strangely enough was reprinted in 1970. This work represents a heroic action of a person who risked his life and persecution by the tsar’s secret police. He exposed himself to all sorts of inconveniences: cold weather, miserable travelling conditions, poor lodging, etc., just to visit the penal quarters and document the status of those exiled in Siberia mainly for political reasons. He was accompanied by an artist who drew for him pictures of the most cruel conditions those in exile had to work in the gold mines that belonged to the tsar and his family or the nobility (Figure 1.3).

Kennan was employed in 1864 by the Russian American Telegraph Company to survey a route for a proposed overland telegraph line through Siberia and across the Bering Strait. In May 1885, Kennan began another voyage in Russia, across Siberia from Europe.



Figure 1.1: Map showing the Ural Mountains to the left separating European Russia from Asia and the Yenisei River dividing Russia into eastern and western regions. Krasnoyarsk on the banks of the Yenisei is the geographical centre of Russia.



Figure 1.2: The American journalist George Kennan (1845–1924).

GOLD IN SIBERIA

Russia was one of the major gold producers in the 19th and 20th centuries. Many Russian counts and tsars sent expeditions to prospect for gold, silver, and base metals in Siberia but the lack of experience led the early attempts to failure. In 1737 gold was discovered on the northern coast of the White Sea, in 1733–1735 and in the Altay Mountains.



Figure 1.3: Political exiles derived by police to work in the gold mines in Siberia belonging to the tsar.

In 1745 a peasant found gold on the eastern slope of the Ural Mountains. It took two years to verify his find and in 1748 the first Russian gold mine was set up. This however did not start a gold rush because the vast majority of the Russian population were serfs and political prisoners attached to numerous noble landlords or few industrialists. This was well documented by George F. Kennan.

Exploration in Siberia started in 1826 when the Crown granted the first permissions to search for gold to several entrepreneurs and in early 1830s a wave of gold rush inundated Southern Siberia. Hundreds of alluvial deposits were found in the mountains of Altay, Sayan, Eniseysky Kriazh. The gold output in the south of Western and Central Siberia grew up to 17.4 tonnes

in 1855 and then began to decline in 1913. Gold was mainly mined by hand, put through Chilean mills, and then amalgamated.

In the early 19th century, Irkutsk was flourishing as trading and administrative centre on the Angara river, and hence the ancient river route leading from the Arctic and the Yenisei river, via the Angara to Lake Baikal, a trading route. It had further benefitted by the opening up of the Siberian Trakt, a direct road from Moscow, rough though it was, it meant there was provision for means of transport and somewhere to stay the nights on the way. Irkutsk was established as a trading post on major trade routes and frontier town — being near the frontier with China. It was now filling with exiles and traders, industrialists, and travellers, and was established as the capital city and centre of government for Eastern Siberia.

After the abolition of serfdom in 1861 and rapid industrial development, gold mining became more and more advanced and mechanized but horsepower remained the main earth-moving force till the end of the 19th century when dredging was introduced with assistance of the Western professionals. The presence of gold in the basin of the Amur River was first discovered in 1850. In the winter 1857–1858 an expedition found gold in the basin of the Maya river. The next several years of extensive search brought numerous discoveries. The major gold district of the Amur region — the Zeyski — yielded 66.8 tonnes of gold from 1876 to 1900. The first dredger was introduced in the Amur in 1894. The dredge was built in Holland. The operation proved to be successful and in a year another dredge was ordered. In 1902–1915, about 96 tonnes of gold were produced in the province.

Exploitation of gold deposits in the Urals was responsible for the creation of Ekaterinburg and later when Siberian gold became important the Trans Siberian Railroad was inaugurated in 1901. Before World War I Russia remained one of the major gold producers. Its annual output was about 64 tonnes.

THE RUSSIAN REVOLUTION

During the Revolution of 1917 and the Civil War that followed, gold mining was interrupted. When the Soviets took over the Government the philosophy at that time, as formulated by Karl Marx (1818–1883) was that gold will eventually lose its value when Communism prevails and that is why there was no interest to explore for gold and all effort was to be directed to iron and steel.

When Joseph Stalin came to power in 1922, he was much impressed by the California Gold Rush after reading a number of books on this subject. Fearing Japanese imperialism to occupy the sparsely populated eastern provinces he thought that the best way to populate these regions and to stand against such threat was to explore for gold and open the region for

miners like what happened in California. In 1927, he sent Alexander Pavlovitch Serebrovsky (1884–1938), Director of Azerbaijan Central Oil Administration and Professor at the Moscow School of Mines, to study gold mining in the United States.

Serebrovsky hired John D. Littlepage (1894–?), an American mining engineer working in the gold mines in Alaska, to develop the gold industry in Russia. A Gold Trust was being established for this purpose, many miners from Germany and other countries were hired, and mining equipment was purchased. Prospectors and miners were encouraged to search for gold and so the Russian Gold Rush started with several hundred thousands of men and women working under the control of the Gold Trust. It was during this period that cyanidation process was introduced. It is remarkable that the Gold Rush in Russia was well organized and the miners were on their best behaviour. However, due to the liquidation policy of the kulaks and the use of forced labour, the industry got a set back and there was much sabotage that resulted in the purges of 1933. Russia's main mines are located near a city named Bodaybo in central Siberia, at Magadan on Siberia's east coast, and on the Chukotskiy Peninsula on the Bering Strait. After World War II the USSR became the second gold producer in the world.

Alexander Serebrovsky, a native of Ufa, member of the Communist Party of the Soviet Union, studied at St. Petersburg Institute of Technology, graduated from the Higher Technical School in Brussels, was Deputy of People's Commissar of Heavy Industry of the USSR, was arrested on 23 September 1937. The Military Collegium of the USSR Supreme Court convicted him on February 8, 1938 of "counter revolutionary activities." He was shot in Moscow on February 10, 1938. Many heads of the industry of the USSR have been subjected to repression in 1937–1938. All of them have been rehabilitated in 1960s.

KRASNOYARSK

Krasnoyarsk (Figure 1.4) was founded in 1628 during the reign of Tsar Mikhael Romanov as a military fort to defend the Russian settlement from the Kirgiz people. The fortress was named *красный* (*krasny*), which means "red" in Russian. It lies on the banks of Yenisei River and connected by three bridges. Gold discovery and the arrival of the Trans-Siberian Railroad accelerated Krasnoyarsk growth. Krasnoyarsk is the capital of Western Siberia. It was there that Lenin was exiled for a short time.

While the Ural Mountains divide Russia into the European and the Asian Territories the Yenisei River divides the country into Eastern and Western Russia. Krasnoyarsk on the banks of Yenisei is the geographical centre of Russia.

During the Russian Empire, Krasnoyarsk was one of the places to which political exiles were banished. During the epoch of Stalin, Krasnoyarsk was a major centre of the Gulag system. During World War II, dozens of factories were evacuated from Ukraine and Western Russia to Krasnoyarsk and nearby towns, stimulating the industrial growth of the city. After the war additional large plants were constructed: the aluminum plant, the metallurgic plant, the plant of base metals and many others. Krasnoyarsk is a modern and prosperous city of one million people (Figure 1.6). There are still some primitive wooden houses built by the pioneers who first settled the region.

Krasnoyarsk is the capital of Krasnoyarsk Region, which extends from Norilsk in the north to Sayan Mountains in the south. It is one of the richest regions of Russia where the nickel deposits of Norilsk are located as well as coal, gold, and other metals.

Lenin Museum

The Soviet Government built a large Lenin Museum in Krasnoyarsk. Today, it became cultural museum.



Figure 1.4: A view of Yenisei River and Krasnoyarsk, the capital of Krasnoyarsk Region.



Figure 1.5: One of the three bridges across the Yenisei River.



Figure 1.6: Hotel Krasnoyarsk.

Ethnographic Museum

The Ethnographic Museum well documents the history and life in Siberia, its explorations, and its peoples. It is one of the biggest and oldest muse-

ums in Siberia and Far East. It occupies a house that was once owned by a rich merchant built in an ancient Egyptian style (Figures 1.7–1.10).



Figure 1.7: Photo showing one of the 3 bridges on the Yenisei River at Krasnoyarsk and the Ethnographic Museum on the left hand side.



Figure 1.8: Krasnoyarsk Regional Museum of Local Lore.



Figure 1.9: The Director of the Museum explaining.



Figure 1.10: The Director of the Museum explaining.

Krasnoyarsk heraldic lion

In 2005, a 16 metres tall pillar with a bronze statue of the Krasnoyarsk heraldic lion upon its top was erected at the Krasnoyarsk Railway Station square (Figures 1.11–1.13).

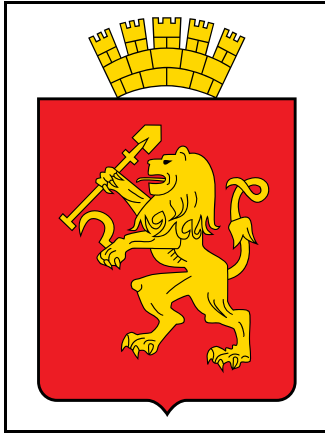


Figure 1.11: Heraldic lion of Krasnoyarsk. **Figure 1.12:** The bronze statue of the heraldic lion on the top of the column.



Figure 1.13: Krasnoyarsk Railway Station with the heraldic lion column in front.

Yenisei River fountain

The fountain (Figures 1.14–1.16) is located in front of Krasnoyarsk Hotel.



Figure 1.14: Yenisei River fountain.



Figure 1.15: Yenisei River fountain.



Figure 1.16: Yenisei River fountain.

Krasnoyarsk Power Station

Krasnoyarsk has the largest power station in Russia. The Dam is a 124-metre high concrete gravity dam located on the Yenisei River about 30 km upstream from Krasnoyarsk (Figure 1.17). It was constructed from 1956 to 1972 and supplies 6 000 MW of power, mostly used to supply the aluminum plant Rusal. As a result of the damming, a reservoir was created, now known as Krasnoyarsk Sea. It has an average depth of 36.6 m, and a depth of 105 m near the dam.

Russian Academy of Sciences

Of the important research institutes on metallurgy in Siberia are:

- Chemistry and Chemical Technology Institute of the Siberian Branch of the Russian Academy of Sciences in Krasnoyarsk
- Irkutsk Scientific Research Institute of Precious and Rare Metals and Diamonds in Irkutsk, known as IRGIREDMET

In addition, there is the Polytechnical University which is the successor of Irkutsk School of Mines founded in the 1920s. The city lies on the Trans Siberian Railways.



Figure 1.17: Krasnoyarsk hydro-electric power station at Krasnoyarsk; the largest in Russia.

International Conference “Metallurgy of Nonferrous and Rare Metals”

The Conference (Figures 1.18–1.19) was organized by the Russian Academy of Sciences; Government of Krasnoyarsk Region; Ministry of Industry, Science, and Technology of the Russian Federation; Institute of Chemistry & Chemical Technology of the Siberian Branch of the Russian Academy of Sciences; Norilsk Nickel, and Krasnoyarsk Nonferrous Metals Plant. It took place at the House of Sciences & Technique in Krasnoyarsk, September 9–12, 2003.

The opening ceremony of the Conference included a short music concert; welcoming speeches by the governor of Krasnoyarsk Region; academician N. P. Lyakishev, Chairman of the Organizing Committee; Prof. Gennady L. Pashkov, Director of the Institute of Chemistry & Chemical Technology of the Siberian Branch of the Russian Academy of Sciences, as well as other officials. This was followed by the plenary lectures. A very enjoyable dancing banquet was held in the evening. Next days were devoted to scientific sessions, an excursion to Stolby in Sayan Mountains — a scenic drive in the Siberian forest, and a guided tour to the Historical Museum.

The term “rare metals” is not appropriate because titanium, niobium, zirconium, vanadium, chromium, and strontium are not at all rare — they

are as abundant as copper, lead, and zinc. The proper terminology is “less common metals” as used in the German literature [Sondermetalle].



Figure 1.18: Opening ceremony, 2003.



Figure 1.19: Opening ceremony, 2003.



Figure 1.20: With Professor Gennady Pashkov.



Figure 1.21: With Professor Micklen and his students, 2003.



Figure 1.22: With a participant from Macedonia, 2003.



Figure 1.23: Excursion in the mountains, 2003.



Figure 1.24: Dancing in the banquet, 2003.



Figure 1.25: Prof. Pashkov and Elena Voskresenskaya, 2003.

Metallurgy Conference took place September 7–9, 2011. The International Congress of Nonferrous Metals is now the most important Metallurgical Conference in Russia. It unites:

- The International Conference of all Siberia
- Conference of Metallurgy of Nonferrous and Rare Metals
- Symposium of Gold of Siberia



Figure 1.26: In front of Hotel Siberia. From left to right: Prof. Gennady L. Pashkov, Director Institute of Chemistry and Chemical Technology, Russian Academy of Sciences — Siberian Branch, Dr. Elena N. Voskresenskaya, Technical Secretary of the Institute, both are active members of the Organizing Committee, and the writer, 2011.

It is an annual event that started in 2009. Before that date each conference was held separately. Thanks to the effort of Professor Gennady L. Pashkov of the Siberian Branch of the Russian Academy of Science and his co-workers who were able to bring together around 600 specialists at every conference to discuss and review the problems of metallurgy. The Congress was supported by the Government of the Krasnoyarsk Region as well as by Russian Foundation of Fundamental Research.

The conference banquet started at the River Port (Figures 1.28–1.29) to take luxury ship named after the Russian hero Valeri Chkalov for an evening cruise on Yenisei River where dinner was served (Figure 1.31). The sessions took place at Hotel Siberia (Figure 1.33). There was a sight seeing tour

of the city, a visit to nearby Rusal Aluminum Smelter, and a closing ceremony with dancing groups. Everything was very well organized.



Figure 1.27: Dinner in an Armenian restaurant, 2011.



Figure 1.28: Yenisei River Port.



Figure 1.29: Meeting at Yenisei River Port, 2011.



Figure 1.30: Valeri Chkalov cruise ship on Yanisi River.



Figure 1.31: Dinner on board of the Chkalov.



Figure 1.32: With the precious metals Gold and Silver at the conference, 2011.



Figure 1.33: Sessions at the conference.



Figure 1.34: With Professor Nina Nemchinova from Irkutsk State Technical University, 2011.

Siberian Engineering Technologies

Institute Sibtsvetmetniiproekt was organized in 1949 to develop technologies for the extraction and processing of non-ferrous metals, as well as the design of mining enterprises. For over 60 years, the Institute executed projects for tungsten–molybdenum, lead, zinc production, pelletization of iron ore, recycle of platinum catalyst, enrichment of fluorite, copper–nickel, manganese and other ores, etc. After the collapse of the Soviet System, the Institute was transformed in 1994 into a Joint Stock Company. General Manager: Sergei Ivanov (Figure 1.35).



Figure 1.35: Sergei Ivanov.



Figure 1.36: Visiting Siberian Engineering Technologies. From left: Peter Polyakov [Russia], Harald A. Øye [Norway], Jomar Thonstad [Norway], René von Kaenel [Switzerland], Fathi Habashi [Canada], and ?.

Rusal Aluminum Smelter

RUSAL, the acronym for Russian Aluminum, is the world's largest aluminum company, with headquarters in Moscow, accounts for 11% of the world's primary aluminum output. The United Company was formed by the merger of RUSAL, SUAL, and the alumina assets of Glencore in 2007. It includes 16 aluminum smelters, 12 alumina refineries, 8 bauxite mines, 3 powder metallurgy plants, 3 silicon smelters, 3 secondary aluminum plants, 3 aluminum foil mills, 2 cryolite plants.

The company has more than 75 000 employees. At the plant in Krasnoyarsk there are 24 pot rooms, 2 230 cells. Twenty one rooms use Søderberg anodes and 3 using pre-baked anodes. The Søderberg anodes use a new pot feeding system. As a result the plant is relatively clean and not much pollution. Production is about one million tonnes. Slabs produced are $60 \times 133 \times 1\,130$ cm (Figure 1.38). The plant has also the only aluminum refining cells in Russia producing 99.999% pure aluminum.



Figure 1.37: With René von Kaenel from Switzerland, 2011.



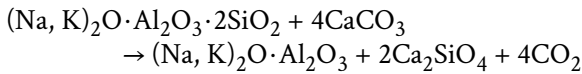
Figure 1.38: Aluminum ingots $60 \times 133 \times 1130$ cm shown on the back-ground, 2011.

The smelter gets its alumina from nepheline deposits, $(\text{Na}, \text{K})\text{AlSiO}_4$, located about 40 km from the city by a unique process (Table 1.1).

Table 1.1: Typical analysis of nepheline.

	%
Al_2O_3	23–28
SiO_2	45.60
Fe_2O_3	1–3
TiO_2	0.2
CaO	1–3
MgO	0.1
$\text{Na}_2\text{O} + \text{K}_2\text{O}$	4–6
H_2O	trace

The feed material is mixed with limestone and calcined at $1\,250\text{--}1\,300\text{ }^\circ\text{C}$ in a rotary kiln:



The sintered product is then crushed, ground, then leached with recycle NaOH solution. The filtrate is processed by CO₂ to precipitate Al(OH)₃ while the residue is used to make cement. Some sodium carbonate and potassium carbonate are also recovered by crystallization from the leach solution after precipitating Al(OH)₃.

Closing ceremony At the closing ceremony awards were given to distinguished authors and others who contributed to the success of the conference. Drinks and food were in abundance. Many troops entertained the participants that made a memorable event (Figure 1.39–1.45).



Figure 1.39: Closing ceremony cake.



Figure 1.40: Singing at the closing ceremony.



Figure 1.41: One of the many dancing groups at the closing ceremony.



Figure 1.42: Receiving an award from the Conference Chairman, 2011.



Figure 1.43: The award cover and first page inside.

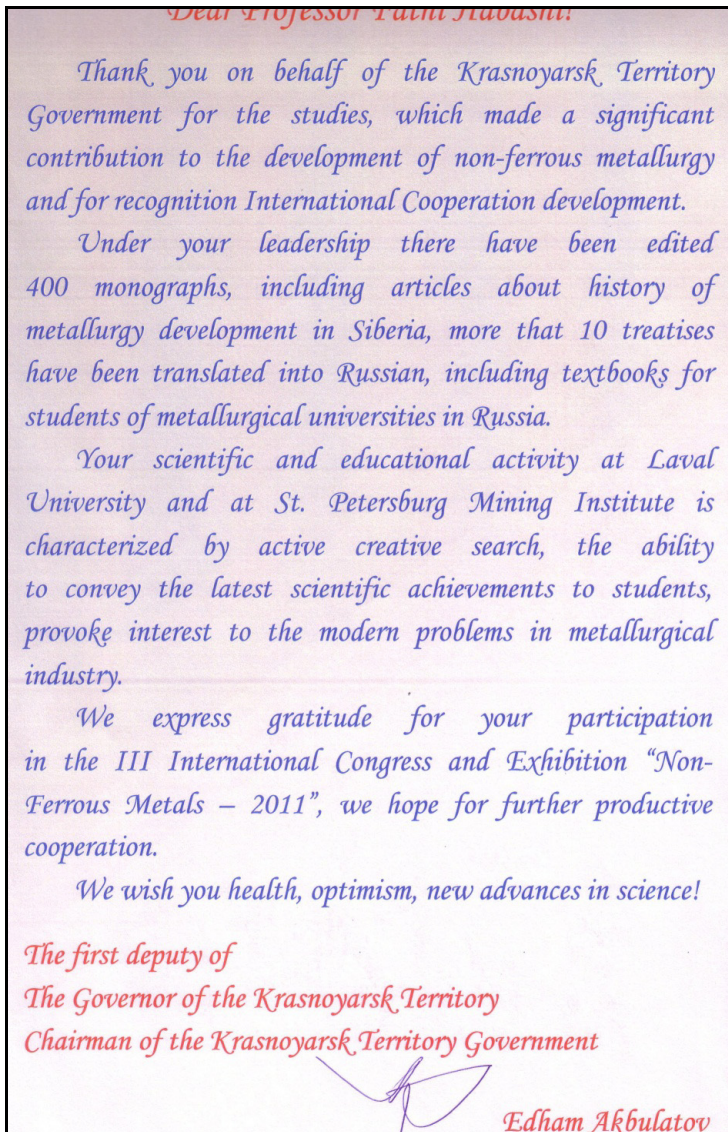


Figure 1.44: The award text.



Figure 1.45: Honorary diploma.

Excursions with friends

Making an excursion with the yacht with the Siberian friends (Figures 1.46–1.56).



Figure 1.46: Monument of fish.



Figure 1.47: In front of large fish monument. From left: Sergei Ivanov, Peter Polyakov, Fathi Habashi, Tavifa Pashkov, Elena Voskresenskaya, Gennady Pashkov, standing behind is Alexander Yuzhannikov. Photo taken by Gennady Voskresensk.



Figure 1.48: Gennady Voskresensk.



Figure 1.49: Scene on the river during the yacht trip.



Figure 1.50: At Krasnoyarsk Power Station.



Figure 1.51: Caviar, cognac, and vodka.



Figure 1.52: Captain of the yacht Sergei Ivanov.



Figure 1.53: During the yacht trip.



Figure 1.54: During the yacht trip.



Figure 1.55: During the yacht trip.



Figure 1.56: Academician Peter Polyakov jumps in the cold water of Yenisei.

Dacha

Going to the dacha with the Siberian friends (Figures 1.57–1.58).



Figure 1.57: Shopping before going to the dacha.



Figure 1.58: At the Dacha, 2011.

NORILSK

During Stalin's time rich nickel deposits were discovered in Norilsk (Figure 1.59) in the north of Siberia and the region was developed mainly by forced labour (Figure 1.60). Norilsk is a city of two hundred thousand residents located in Northern Siberia in the Arctic Circle, 1 550 km away from Krasnoyarsk. Norilsk's mineral products can be shipped by the Northern Sea route. The Norilsk region contains more than a third of the world's nickel reserves, and 40% of the world's reserves of platinum as well as significant amounts of cobalt and copper. It produces 40% of the world's palladium. Between 1935 and 1953, Norilsk housed one-third of a million prisoners of the Soviet Gulag, who constructed its facilities and then mined and processed its minerals. Norilsk was just one of the many Soviet labour camps.



Figure 1.59: Location of Norilsk.



Figure 1.60: Map showing Soviet labour camps.

The Gulag was the government agency that administered the main Soviet forced labour camp systems. It is the acronym for *Chief Administration of Corrective Labour Camps and Colonies* of the NKVD, which in turn is the Russian acronym for the *People's Commissariat for Internal Affairs* — the public and secret police organization of the Soviet Union. It was officially created on April 25, 1930 and dissolved on January 13, 1960. Aleksandr Solzhenitsyn, winner of the 1970 Nobel Prize in Literature, introduced the term to the Western world with the 1973 publication of his *The Gulag Archipelago*. The book likened the scattered camps to “a chain of islands” and described the Gulag as a system where people were worked to death.

Exploiting the mineral wealth

Copper deposits were already known to exist as early as the 1660s by the early explorers. The geological study of the Norilsk area began in earnest in the early 1920s, but the first large expedition, consisting of 250 experts, was dispatched to Norilsk only in 1930. This expedition was under the auspices of the Main Administration for Nonferrous Metal and Gold of the Supreme Council of the National Economy, which took on the responsibility for developing Norilsk's reserves. The expedition concluded that the Norilsk deposits were rich enough to warrant the start-up of development. In 1933 about 500 workers, employees, engineers, and technicians were already working on this task at Norilsk, but their number was too small for significant progress.

The exploration and development of Norilsk remained largely under the heavy industry ministry until 1935, when it was transferred to the NKVD and its Gulag administration.

Natural conditions were favourable for the mining and processing of Norilsk ores because large deposits of rich coal were located in the region. The first group of prisoners arrived in Norilsk in 1935. The camp was named “Norilsk Correctional Labour Camp” and was generally referred to as “Norillag.”

Norilsk had long winters, violent snowstorms, and was remote from all means of transport. In winter the temperature drops to minus 45 °C, and Norilsk is without sun for months at a time. Construction was carried out under conditions of permafrost. As geologists found unusually rich lodes with high nickel contents, the decision was made in 1939 to expand the Norilsk plant from an experimental plant to an industrial complex.

The town was founded in the 1930s. The present airport is 50 km far from the town. Hotel Nordstar (Figure 1.61) is a modern comfortable hotel located in the city centre next to Lenin’s statue. There are many nice and colourful buildings reminiscent of Saint Petersburg. There is a mosque (Figure 1.62) belonging to the local Tatar community, a church (Figure 1.63), an Ethnographic Museum (Figure 1.64), a Theatre, and a Polytechnic Institute where most of the managers studied.



Figure 1.61: Hotel Nordstar located in the city centre next to Lenin’s statue shown at the extreme left.

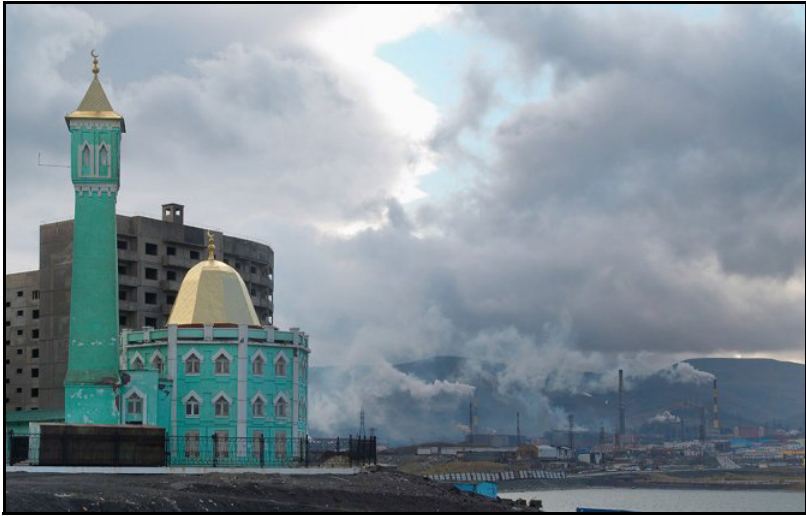


Figure 1.62: Mosque.

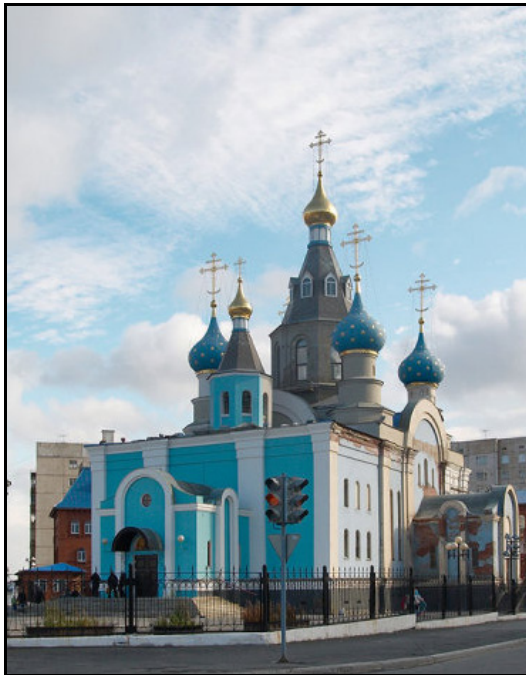


Figure 1.63: Church.



Figure 1.64: Norilsk Museum.

Metallurgical plant

Norilsk metallurgical operations are quite varied, complicated, and highly polluting. The plant is composed of at least 3 major sections:

- Hydrometallurgical operations at Nadezhda
- Nickel smelter
- Copper smelter

Beneficiation plants are located at Talnakh 25 km north of Norilsk and the mines are nearby. Conventional flash smelting and electrorefining of nickel are used. Cobalt is recovered from the electrolyte. Vanyukov furnace, Peirce–Smith converters, and electrorefining are used for copper. Anodic slimes from both plants and the platinum metals fraction are sent for processing in Krasnoyarsk at the Nonferrous Metals plant.



Figure 1.65: View of smelters in Norilsk.



Figure 1.66: Norilsk plant. Left: Maxim Igorevich Ryabushkin, Chief Engineer of Norilsk Smelter. Centre Dr. Elena Voskresenskaya of the Russian Academy of Sciences, Siberian Branch in Krasnoyarsk, 2011.



Figure 1.67: The main entrance to Nadezhda Plant, 2011.



Figure 1.68: Poster showing the new metallurgical plant Nadezhda Russian for "Hope," 2011.



Figure 1.69: Model of Nadezhda plant, 2011.



Figure 1.70: Nadezhda plant Director Anton Eduardovich Krievs, 2011.

Aqueous oxidation of pyrrhotite

The most unique operation in Norilsk is that at Nadezhda, which started in 1978 and is treating one million tonnes of pyrrhotite–pentlandite flotation concentrate per year. The concentrate analyses 1.1–1.7% Ni, 0.05–0.08% Co, 0.25–0.45% Cu, and 18.5–26.5% S. The process is meant to be a chemical beneficiation process to prepare concentrates for nickel and copper smelters and to remove as much as possible of sulfur from the concentrate in the elemental form. The product from this plant is proceed to matte that is refined to the binary sulfides Cu_2S – Ni_3S_2 , which are then separated by slow cooling, crushing, grinding, and selective flotation. The copper fraction goes to the copper smelter and the nickel fraction to the nickel smelter.

In this plant, there are 4 lines of autoclaves each containing 4 horizontal-type autoclaves 125 m^3 capacity each. They are 3.4 m diameter and 15 m long, lined with acid resisting bricks and divided into 4 compartments. The pyrrhotite–water slurry is fed to the autoclaves to which 80% oxygen enriched air is used to oxidize the charge at $120\text{ }^\circ\text{C}$. Reaction is exothermic and the temperature is controlled by cooling coils. Slurry leaves the autoclave at $80\text{ }^\circ\text{C}$. Contrary to theory, no acid is introduced into the autoclaves and still elemental sulfur is formed in large amounts. However, large amounts of ferrous sulfate and acid are also formed.



Figure 1.71: Piping to horizontal autoclaves.

Slurry leaving the autoclaves is introduced into tanks where iron pellets produced by reduction of iron oxide and transported from the metallurgical

plant in Murmansk are added to precipitate nonferrous metals by cementation. Any hydrogen generated by this reaction reacts with sulfur to form H_2S which in turn precipitates any nonferrous ions as sulfides. Slurry leaving the precipitation tanks is introduced into indoor thickeners and the thickened slurry is subjected to flotation to collect elemental sulfur, metals, metal oxides, and metal sulfides as a thick foam. The down-flow is treated with lime and nepheline to precipitate iron hydroxide for discharge at pH 8 in the tailings pond.



Figure 1.72: Visiting Norilsk.

The complex elemental sulfur mixture containing metals, oxides, and sulfides is now introduced in large vertical autoclaves heated at $120\text{ }^{\circ}\text{C}$ to disengage elemental sulfur from the mixture. Molten sulfur is then drained and solidified in form of small blocks for storage while the nonferrous sulfide mixture is sent to the smelter for producing matte which is then purified then cooled, crushed, ground and floated to separate $\text{Cu}_2\text{S}-\text{Ni}_3\text{S}_2$.

Treatment of flotation concentrate

The complex elemental sulfur mixture containing metals, oxides, and sulfides is now introduced in large vertical autoclaves heated at $120\text{ }^{\circ}\text{C}$ to disengage elemental sulfur from the mixture. Molten sulfur is then drained and solidified in form of small blocks for storage while the nonferrous sulfide mixture is sent to the smelter for producing matte which is then purified then cooled, crushed, ground and floated to separate $\text{Cu}_2\text{S}-\text{Ni}_3\text{S}_2$. Figure 1.74 shows a simplified flowsheet of the operation.



Figure 1.73: Vertical autoclaves in the background for separating elemental sulfur from sulfides. Left: Evgeny Kudrin, Chief of the Elemental Sulfur Department, 2011.

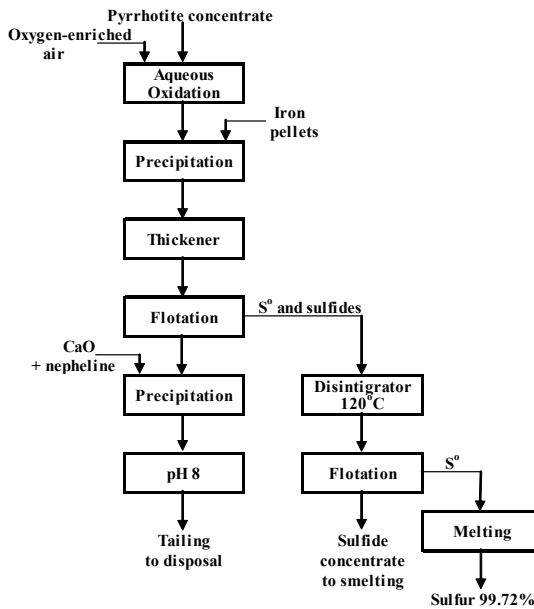


Figure 1.74: Simplified flowsheet of the chemical beneficiation process at Nadezhda plant in Norlisk, Russia.

Observations and remarks

- (1) It seems that acid was not added in the autoclaves so that the product of this operation will contain enough sulfides to permit producing a matte by smelting. If acid were added then the process could have been greatly simplified to be similar to Voisey Bay operations (Figure 1.75).
- (2) Sulfur dioxide emissions are abundant causing extensive pollution and corrosion of equipment. The tallest chimney is 250 m high [the chimney in Sudbury is 381 m]. The present task of Norilsk engineers today is to collect SO_2 produced in the smelters and reduce it by natural gas to elemental sulfur. Plans are underway to start this project.

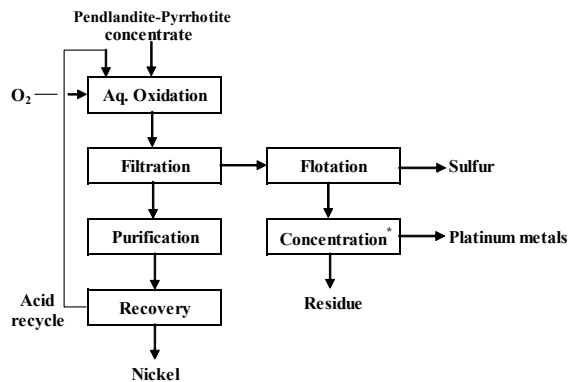


Figure 1.75: Voisey Bay flowsheet.

To my knowledge, there has been no full description of Norilsk operations published in English. Due to language barrier, it was sometime not possible to get exact information.

Monuments to political prisoners

After the Perestroika it was possible to consult some of the secret archives and the Gulag system became officially known. Many communities erected monuments in memory of those who lost their lives building the city and the industry (Figures 1.76–1.84).



Figure 1.76: Entrance to Norilsk monuments hill, 2011.



Figure 1.77: General view of some of the monuments on the hill [Photo by F. Habashi].



Figure 1.78: A chapel erected by the citizens of Norilsk in honour for all who lost their lives building the city, 2011.



Figure 1.79: View on top of the hill, 2011.



Figure 1.80: Monument to the Polish political prisoners who built the railroad [Photo by F. Habashi].



Figure 1.81: Monument to the Polish political prisoners who built the railroad [Photo by F. Habashi, 2011].



Figure 1.82: Monument to the Latvian political prisoners [Photo by F. Habashi, 2011].



Figure 1.83: Monument to the Estonian political prisoners [Photo by F. Habashi].

Acknowledgement

Norilsk is not open to foreigners and as a result I am most grateful to Academician Gennady Pashkov and his technical secretary Dr. Elena Voskresenskaya for securing a special permission to my visit which I had to show at the airport. I thank the management of Norilsk Metallurgical plants for organizing the transportation, interpreter, and guide to the plant and to the Museum. At the plant, I received a warm welcome and full explanations from:


- Maxim Igorevich Ryabushkin, Chief Engineer of Norilsk Smelter
- Anton Eduardovich Krievs, Director of Nadezhda plant
- Evgeny Kudrin, Chief of the Elemental Sulfur Department at Nadezhda plant
- Yuri Vasilishin, Interpreter

Contrary to Russian tradition, photography was allowed at Nadezhda plant. Thanks to Dr. Elena Voskresenskaya, who took the photos inside the plant.



Figure 1.84: Monument to perished Estonians [Photo by F. Habashi, 2011].

Appendix



НОРИЛЬСКИЙ НИКЕЛЬ
 ГОРНО-МЕТАЛЛУРГИЧЕСКАЯ КОМПАНИЯ
 ОТКРЫТОЕ АКЦИОНЕРНОЕ ОБЩЕСТВО
ЗАПОЛЯРНЫЙ ФИЛИАЛ
АДМИНИСТРАТИВНОЕ УПРАВЛЕНИЕ

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31.08.2011 № 3Ф-33/1316

Начальнику Таймырского ЛОВД
 УТ МВД РФ по СФО
 капитану милиции
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О приезде иностранного гражданина

12 сентября 2011 г. по официальному приглашению ЗФ ОАО «ГМК «Норильский никель» в Норильск прибывает профессор, автор фундаментальных работ по металлургии Хабаши Фати:

№	Фамилия, имя	Паспорт	Согласование ФСБ	Рейс №
1.	Хабаши Фати	№ ВА390548	№ 28/22-4889/1 от 09.08.2011	ТЫ 9777

Оригинал документа, подтверждающего, что пребывание вышеуказанного иностранного гражданина в Норильске согласовано с компетентными органами в соответствии с Законом РФ № 115-ФЗ от 25.07.2002 г. «О правовом положении иностранных граждан в Российской Федерации», находится в Административном управлении ЗФ ОАО «ГМК «Норильский никель».

Начальник  Е.Е. Балышева

Литвичук
22-74-35

Figure 1.85: Permission to visit Norilsk.

ПРИГЛАШЕНИЕ № 2D7020357
на въезд в Российскую Федерацию

Категория и вид визы: обыкновенная Од Кратность визы: однократная

Гражданство: КАНАДА

Государство проживания: КАНАДА

Въезд с 03.09.11 Пребывание по 16.09.11 На срок (дней) 014

Фамилия: ХАБАШИ / HAVASHI

Имя, отчество (имена): ФАТИ / FATIИ

Пол: муж

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Номер и дата выдачи документа, удостоверяющего личность: ВА 390548 12.05.2008

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г. Красноярск, Красноярский Рабочий пр., 160-19-16

Маршрут (пункты посещения): Красноярск-Москва-Норильск

Следует с детьми (до 16 лет)

Дополнительные сведения

Приглашение действительно до: 17.09.2011

Орган, оформивший приглашение:
ФМС 136

Подпись должностного лица




Figure 1.86: Permission to get visa.

Chapter 1

Buryatia

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THE BURYATS

The Buryats or Buriyads, numbering approximately 436 000, are the largest ethnic minority group in Siberia. They are the major northernmost subgroup of the Mongols. They live in and around Ulan-Ude (pronounced Ulan Oudeh), and speak a dialect of Mongol language. They inhabit the eastern side of Lake Baikal (Figures 1.1–1.2). The Mongolian Consulate in Ulan-Ude occupies an impressive building (Figure 1.3). Ulan-Ude is connected by railways to Ulaan Baatar, the capital of Mongolia, and it lies on the Trans-Siberian Railways.



Figure 1.1: Buryatia.



Figure 1.2: Railway connection Ulan-Ude–Ulaanbaatar.



Figure 1.3: Mongolian Consulate in Ulan-Ude.



Figure 1.4: Mother of Buryatia.



Figure 1.5: Mother of Buryatia.

Buryatia is the home of the Evenks, who are supposed to be the original inhabitants of Siberia (Figures 1.6–1.12).



Figure 1.6: Buryat women.



Figure 1.7: Buryat singers.

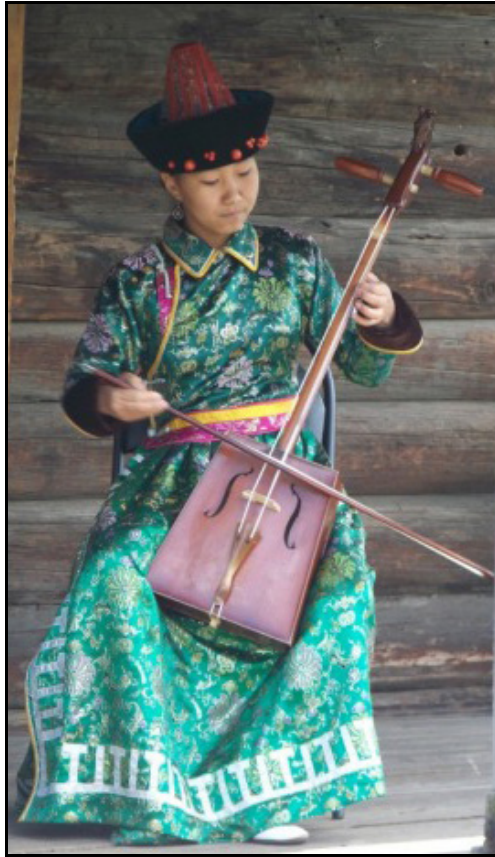


Figure 1.8: Buryat musician.



Figure 1.9: Buryat musician.



Figure 1.10: Buryat beauty.



Figure 1.11: The Evenks in Siberia.



Figure 1.12: Buryat decoration, with Professor Rodimir Ilić from Montenegro.

BUDDHISM IN BURYATIA

Ulan-Ude is the centre of Buddhism in Russia (Figures 1.13–1.15).



Figure 1.13: Buddhist temple.



Figure 1.14: Ulan-Ude is the centre of Buddhism in Russia, with Prof. Borbat and Dr. Elena Voskresenskaya.



Figure 1.15: A Buddhist statue.

RUSSIANS IN BURYATIA

Ulan-Ude was founded in 1666 by the Kazaks who served the Russian tsar as border guards. It was first called Udinskoye for its location on the Uda River. From around 1735, the settlement was called Udinsk. The current name was given to the city in 1934 and means Red Uda or Red Gate. Buryatia became the home of the Old Believers — one of the many persecuted Christian sects that did not accept the religious reforms of Peter the Great (Figure 1.16). Many of them came to Manitoba in Canada and are known as Dukhobors. Until 1991 Ulan-Ude was closed to foreigners.

There are old merchants' mansions richly decorated with wood and stone carving in the historical centre of Ulan-Ude, along the river banks. The city has a large ethnographic museum. There is also a large and highly unusual statue of the head of Lenin in the central square, the largest in the world (Figures 1.18–1.19). Built in 1970 for the centennial of Lenin's birth, it is 7.7 metres high and weighs 42 tons.



Figure 1.16: Old Believers.



Figure 1.17: Hotel Buryatia.



Figure 1.18: Main Square.



Figure 1.19: A huge bronze head of Lenin in the main square of Ulan-Ude.



Figure 1.20: Opera House.



Figure 1.21: Theatre.



Figure 1.22: Lenin Street.

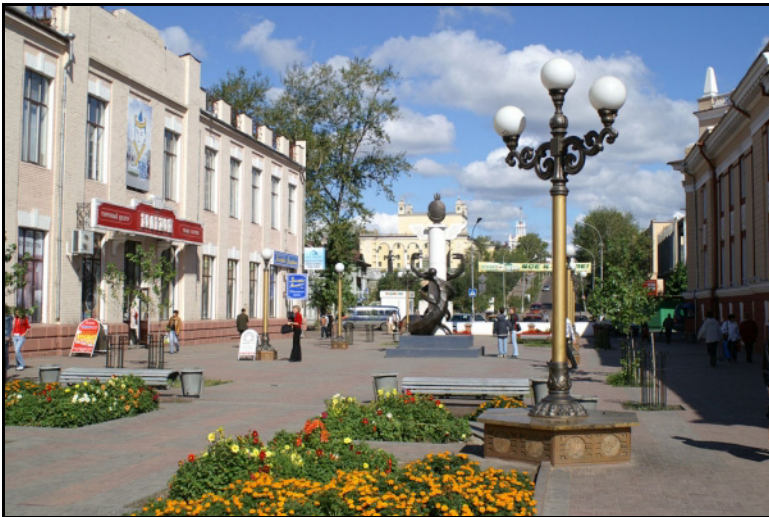


Figure 1.23: Lenin Street.



Figure 1.24: Russian architecture.



Figure 1.25: Ethnographic Museum.

SYMPOSIUM

The Third International Symposium Gold of Siberia and Far East was organized by the Siberian Branch of the Russian Academy of Sciences (Figure 1.26).



Figure 1.26: Participants in the conference.

Chapter 1

Astrakhan

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Astrakhan is a major port on the Caspian Sea on the Volga delta famous for its fishing and caviar industry (Figures 1.1–1.2). It lies 28 m below sea level. It was the capital of the Tatar Khanate known as Khazaria and Golden Horde and was burnt by Tamerlane in 1395. In 1557, it was captured by Ivan IV, who founded the Kremlin as a fortress (Figures 1.3–1.4). Still many Tatars are living there; they are Mongols who adopted Islam. In the 17th century, the city was developed as a Russian gate to the Orient (Figure 1.5). The city became the commercial centre of the Volga basin and many merchants from Armenia, Persia, India and Khiva settled there.



Figure 1.1: Location map of Astrakhan.



Figure 1.2: General view of Astrakhan.

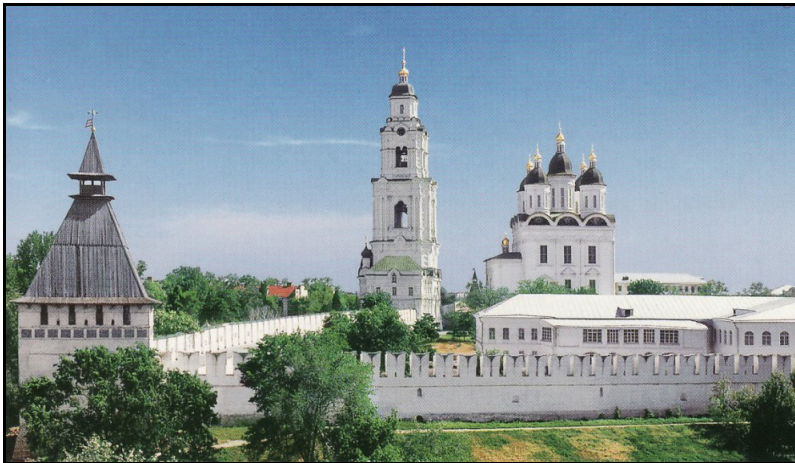


Figure 1.3: The Astrakhan Kremlin.



Figure 1.4: With Marina 1 and Marina 2 at Astrakhan Kremlin, Photo by Nadia Habashi, 2004.

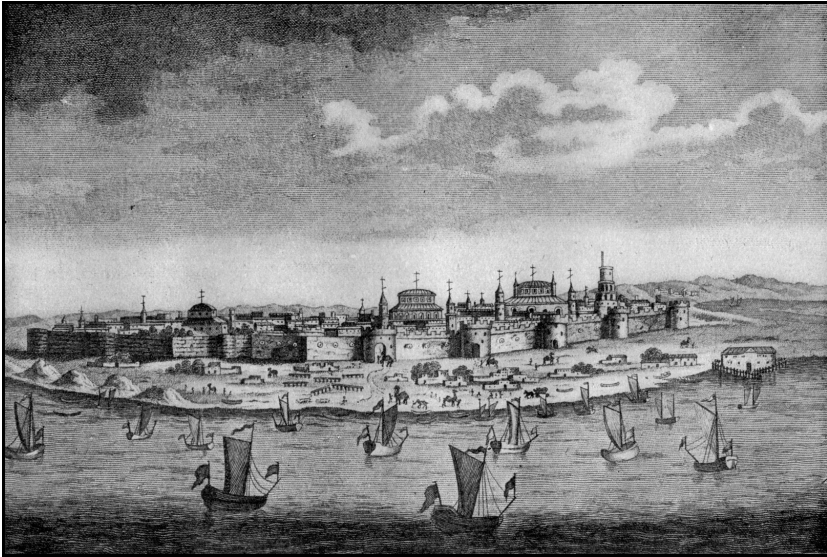


Figure 1.5: A 17th-century picture of the fortified city.



Figure 1.6: Monument for Peter the Great constructed in 2007.

Peter the Great (Figure 1.6) constructed a shipyard there and made Astrakhan the base for his hostilities against Persia, and later in the same

century Catherine II accorded the city important industrial privileges. Today the city looks neglected because it suffered from a number of executions after the Russian Revolution. The merchants in the city were against the Bolsheviks. Present population is about half a million.



Figure 1.7: Astrakhan theatre.



Figure 1.8: Astrakhan mosque.



Figure 1.9: Lenin monument, Astrakhan 2004.

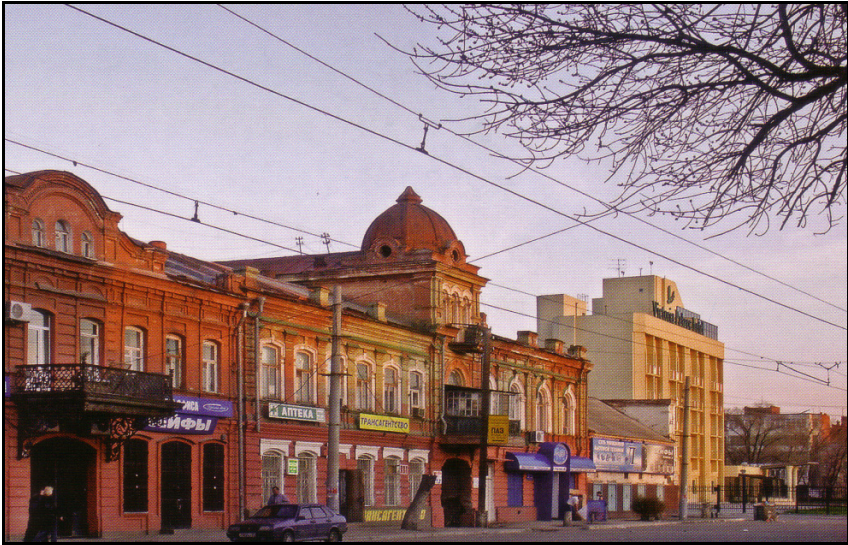


Figure 1.10: Merchants' House — a landmark of the city.



Figure 1.11: An old building now housing Coffee Shop Sharlau, a place frequented by university students.



Figure 1.12: Another old building.



Figure 1.13: Victoria Palace Hotel recently constructed and where we stayed, 2004.

TATISHCHEV

Vasily Nikitich Tatishchev (1686 –1750) (Figure 1.14) wrote *Russian History Dating Back to the Most Ancient Times* published in 5 volumes after his death and compiled the first *Dictionary of the Russian language*. He took part in the 1700–1721 Great Northern War with Sweden, was in command of Siberian operations during the Bashkir War of 1735–1740, and was Governor of Astrakhan from 1741 to 1744.

Having graduated from the Engineering school in Moscow, he was entrusted by Empress Anna with the management of Ural factories. At that post he founded the cities of Perm and Yekaterinburg on orders from Peter the Great. A conference in his honour was organized by Professor Vyacheslav V. Ishin and held at Astrakhan State University in October 2004 (Figures 1.15–1.16).



Figure 1.14: Vasily Nikitich Tatishchev (1686–1750), Governor of Astrakhan from 1741 to 1744 [see also page 145].



Figure 1.15: Rector Alexander Lunyov at the opening ceremony of the First International Conference “Historical Fates of Russia in Scientific Heritage of Vasily N. Tatishchev.”

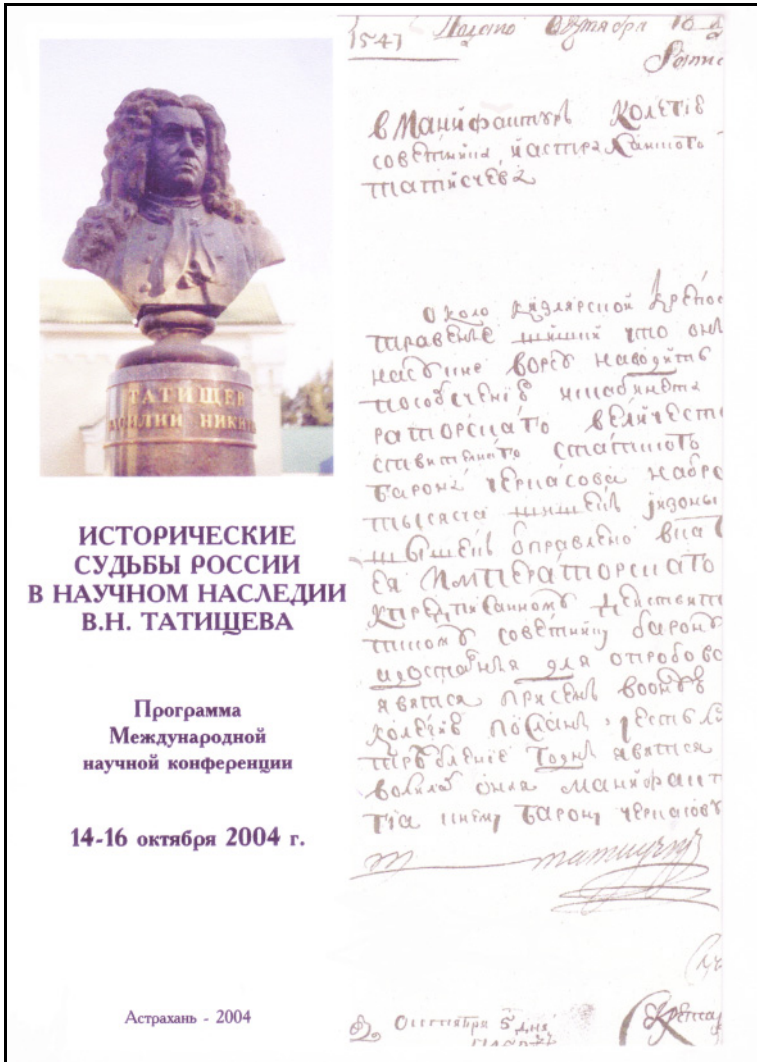


Figure 1.16: Cover of the Book of Abstracts of the First International Conference Dedicated to Vasily Nikitish Tatitshchev.

BOAT TRIP ON THE VOLGA

The conference terminated by a magnificent boat cruise on the Volga.



Figure 1.17: Volga basin [Volgograd is the former Stalingrad].

ASTRAKHAN STATE UNIVERSITY



Figure 1.18: Main building of Astrakhan State University.



Figure 1.19: Entrance to the University with Vice Rector Vyacheslav V. Ishin and guide Marina.



Figure 1.20: Astrakhan State University: Rector Alexander Lunyov and his Vice Rectors. Photo by Nadia Habashi, 2004.



Figure 1.21: At the University with professors and vice rectors.



Figure 1.22: Seminar to university students. Extreme right sitting is Vice Rector Marat Bulakov.

RUSSIAN CAVIAR

Black caviar is the roe [eggs] of sturgeon [large fish] living in Caspian Sea while red caviar is the eggs of salmon (Figure 1.23). Sturgeon may be 2 to 3 metres long (Figure 1.24).



Figure 1.23: Russian caviar.



Figure 1.24: Sturgeon.

Chapter 1

Culture

Russian folk dances are varied and magnificent (Figures 1.1–1.4).



Figure 1.1: Russian folk dances.



Figure 1.2: Russian folk dances.



Figure 1.3: Russian folk dances.



Figure 1.4: Russian folk dances.



Figure 1.5: Russian art.



Figure 1.6: Russian art.



Figure 1.7: Russian art.



Figure 1.8: Russian art.



Figure 1.9: Russian art.



Figure 1.10: Russian art.



Figure 1.11: Russian art.



Figure 1.12: Russian art.



Figure 1.13: Russian art.



Figure 1.14: Russian art.

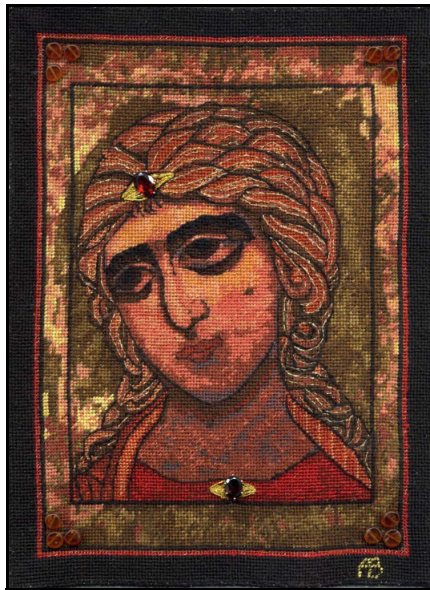


Figure 1.15: Russian art.



Figure 1.16: Russian art.



Figure 1.17: Russian art.

Chapter 1

Epilogue

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EXCHANGE PROGRAM CANADA–USSR

In 1977 I spent two weeks in Leningrad, a week in Moscow, and two weeks between Alma Ata and Tashkent. I was always accompanied by a guide who spoke good English. The lack of communication with Russian academics was remarkable. Nobody spoke any foreign language. I recall that during my stay the ruble was 1.10 US dollars. The control system in the hotels was very upsetting. Each floor in the hotel had a supervisor for 24 hours to whom I had to handle the room key each time I leave the room, and ask for it each time I want to go in. I had to show my identification card each time. Hotels in Siberia are still keeping the system of intimidating the guests.

The negligence in maintenance of the water closets, the lack of food in restaurants and hotels, the disintegration of the buildings was something unexpected to see in the country supposedly leading the world towards social justice. The miserable quality of services in universities was very remarkable. The political literature in a variety of languages available free everywhere in hotels is quite striking. The pictures and statues of Lenin every where, was just absurd. The buildings recently constructed were terribly primitive, inefficient and outmoded. I was really shocked. I returned home a convinced anti-socialist.

For no reason during my visit in 1977, the Academy refused my visit to the Ural Polytechnic Institute in Sverdlovsk [Yekaterinburg] although the visit was proposed in my original program. I was supposed to meet there Prof. I. A. Kakovskii, who is doing work in heterogeneous kinetics and extractive metallurgy of interest to me, and with whom I was in correspondence for many years. I learned later that Sverdlovsk was closed to visitors.

Further, it was clear that the Academy has nothing more to show me since all other visits which were not mentioned in my preliminary program were refused with the excuse that 3 to 4 weeks were needed to get permis-

sion. Thus, I was refused visits to the All Union Institute for Aluminum and Magnesium Research known as VAMI (the acronym of the Russian name), which is located in Leningrad, and is famous for developing the process for recovering aluminum oxide from nepheline-syenite as a substitute to bauxite. Also, I was refused a visit to the State Institute of Nonferrous Metals Research known as GINSVET-MET, which is located in Moscow and is mainly concerned with the extractive metallurgy of copper. All these I visited later after the Perestroika.

I recall in 1993, for example, that the US dollar jumped to 1 000 rubles after it was one to one in 1957. Original names of cities and places were restored. Most monuments of Lenin were removed. Churches were opened, books about the tsars and their families were available in bookstores and street vendors. Marxist-Leninist literature disappeared, city maps became available — something that was terribly missing in my first two visits, Lenin Museum was replaced by an art gallery but tap water is, unfortunately, no longer drinkable.

In Moscow, most monuments of the Communist leaders were collected together and placed in a park in central Moscow. The different nationalities in the former USSR has always been and still is a hot problem. I met a member of a Russian family from the diamond-rich Yakutsk Republic whose family had to migrate to Russia recently because of the friction existing there with the Russians. I was invited to visit any research centre I wanted.

VISA PROBLEM

Getting a visa to the Soviet Union was an acceptable routine. A letter from the host institution must be submitted to the Soviet Consulate together with the normal application form, the photograph, and the fees. After the collapse of the Soviet Regime, strangely enough the procedure became more complicated. The host institution must first get permission from the Ministry of Foreign Affairs in Moscow to authorize issuing a visa. Without this official document which takes usually 2–3 weeks, no visa can be issued.

A remarkable incident took place for me during one of my trips. After going through all these steps and getting the visa on my passport, I discovered that there is not enough empty pages left in my passport and I had to get a new passport. In the Moscow airport, the Pass Control officer refused to accept my visa on my old passport. He accused me to trying to enter Russia illegally with an invalid passport, although I have another valid one. The Canadian authorities invalidated the passport but not the Russian visa. I had to go to the Consulate in the airport and pay a penalty and apply for another visa at a high cost. I had to sign two documents, spend about three hours until the matter was settled. I was even threatened to be put back on the next airplane and be denied entry to Russia.

A month later, I was on a trip to Vietnam. At Hanoi Airport I showed the Pass Control officer my two passports: one expired with a valid visa, and the other a valid passport but without a visa. The officer informed me that I have to ask for transferring the visa from the old passport to the new one and pay a modest fee of \$5. This took few minutes to process. Naturally, this was an intelligent and a logical solution.

SIBERIA

If going to Moscow is difficult, then going to Siberia is much more difficult. One must change from the international to the domestic airport and this takes time. If the flight schedule is inconvenient then one must spend a night at the Moscow airport hotel “Novotel,” which is quite expensive.

MOSCOW AIRPORTS

- Sheremetyevo International: 28 km northwest of Moscow, 11 km from Moscow Ring, terribly out of date. It has two terminals:
 - Sheremetyevo-1: Main directions: Saint Petersburg, Minsk.
 - Sheremetyevo-2: Main directions: International flights.
- Vnukovo: The biggest airport, 28 km from Moscow centre. Main directions: Crimea, Caucasus, and the Baltic Republics.
- Domodedovo: 45 km from Moscow. It is the second big airport, new and modern. Main directions: Central Asia, Siberia, Far East, and chartered flights.
- Bykovo: The oldest Moscow airport, situated in 35 km from Moscow. Main directions: Central Russia, Ukraine, Belorussia, Eastern republics.

The problem is to know which airlines use which airport and there are numerous Russian airlines beside Aeroflot. It can be so that one departs for a domestic flight from Sheremetyevo 1 and returns to Domodedovo, and to catch the international flight one has to go to Sheremetyevo 2. There is no shuttle bus between these airports and a taxi costs \$60 US and takes one and half hour. International flights to Russia and domestic flights in Russia are surprisingly full. One must make early reservation.

RUSSIAN WAY (Figure 1.1)

Going to Russia is still very tiresome and one must be terribly patient, accepts occasional intimidation by the system and must forgive a lot of foolishness. Rules are not obeyed: people smoke when no-smoking signs are. My neighbour on a 5-hour local flight went at least twice to the toilets to smoke.



Figure 1.1: Moscow airports.

- The Russians have, no doubt, a sense for conservation of their heritage. Every educational or research institution has a space devoted to the history of this organization and its major achievements. Such museums contain pictures of the directors and researchers, plans of the buildings and their expansion with time, pictures of students or faculty members who lost their lives defending their country, and many others souvenirs.
- Russian churches are masterpieces of architecture, Russian music is magnificent, and Russian performing arts are world famous.
- Although many things have changed to the good in Russia after the fall of the Soviet Regime, the consular system seems to have become more centralized and bureaucratic. Some of the procedures may discourage many visitors who travel to Russia on their own.
- Most hotels in Russia are still operating in the old Soviet way: one must hand his room key to the lady on his floor when leaving and then show his identity card to her again when he wants to get back — a super way of controlling the guests.
- Russian metallurgists are erroneously using the term “Rare Metals” extensively. Institutes belonging to the Academy of Sciences are so named, conferences under this title are held, and books dealing with metals such as niobium, tantalum, titanium, zirconium, etc., are written under the title Rare Metals. Such metals are naturally not rare — they are as abundant as

copper and zinc. There is no way that this misleading terminology will ever change in Russia. In German literature, the term “Sondermetalle”, i.e., “Special Metals,” is not very precise. It supposedly corresponds in English to the term “Less Common Metals,” which is certainly best.

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