

RUSSIAN INNOVATIONS

Overview Starting from their earliest history, the Russians have always struggled to bring their agricultural and backward country to the level of their industrialized neighbors. It was during Peter the Great's modernization period that Russia began to see new, positive developments in technology, and natural and social science studies. The development of the railroads gave Russia the impetus to expand its influence in the Far East, and at the same time economic expansion brought economic recovery. To compete with this new world, the pace of new scientific discoveries and inventions was accelerated, and eventually the space program followed during the Soviet Union.

ANCIENT PERIOD

Stone Age: Stone age people used tools made from flint, and these stone tools were then used to prepare wood and bone to create other tools, such as knives made of stone and some bone tools, such as sewing tools and bone arrow points.

In addition, these people developed new technologies to make different types and sizes of stone tools, such as the spears and arrows they used to hunt.

In the late Paleolithic period people began to process bone and horn more extensively. Therefore, this period is also called the Bone Age. Among the artifacts found in this period are daggers, spears, harpoons and awls.

Mesolithic: The new life style of this period required new technologies and new inventions that would make hunting easier. The most significant of them was the invention of the bow which allowed them to hunt wild animals and birds more efficiently. There also developed new techniques to work stone; and they used stone axes to shape wood. During this period, they also built small rafts and boats to use the rivers and lakes to move to their new habitats.

Neolithic (to 3,000 BCE). During the Neolithic Age (the last period of the Paleolithic Age) tribes began to unite, forming the basis for the creation of ethnic groups. This period is characterized by the emergence of grinding and drilling tools made from stone. They attached handles to axes, made clay pottery, knitted nets to catch fish, and built boats. Another important invention was the wheel. It was used for both the potter's wheel, as well as creating a revolution in transportation.

Bronze Age (to 1,000 BCE). The beginning of the Bronze Age goes back to 3000 BCE. During this period there were tribes in the North Caucasus, Central Asia, the Urals and Siberia living near copper and tin deposits who began to use metals for their tools. In addition to farming and cattle breeding, the development of metal working further increased the demand for male labor, consequently increasing the roles and status of men in society to the extent that the matriarchal family was transformed into a patriarchal one.

Iron Age (to 500 CE). The development and spread in the 1st millennium BCE of the technology and techniques for iron-making was a cause for the evolution of class societies from the slaveholding societies. Stone and bronze implements were replaced by iron due to its lower cost relative to bronze, and the greater availability of iron ore. The development of iron tools had a profound impact on almost all aspects of society, including trade, crafts and agriculture.

POST CLASSICAL PERIOD

GOVERNMENT:

Establishment of the First State - Kievan Rus': The first East Slavic state, Kievan Rus, emerged along the Dnieper River valley, where it controlled the trade route between Scandinavia and the Byzantine Empire. The rise of Kiev occurred as the Varangians increased their use of the Dnieper. Kiev gained importance around 900, when it functioned as a Khazar administrative and commercial outpost for the local Slavs. The Kievan state lasted from the late 9th century to the early 13th century. Its territory in the 12th century stretched from the Baltic Sea in the north to the Black Sea in the south, and from the Carpathians in the west to the Urals in the east.

ECONOMY:

Trade-from Varangians to the Greek: For the Early Russians and the Varangians, trade was an important source of revenue. The rivers flowing from the north to the south, from the Baltic to the Black Sea were the main routes to conduct trade with the Near East, the Byzantines and the Middle East.

RELIGION:

Conversion to Christianity - Unification of Slavic Tribes: During the rule of Vladimir I (the Great) the official Christianization of the pagan East Slavs took place in 988. Christianity (Eastern Orthodoxy) came to Kiev from the Byzantine Empire, with which they had close commercial ties. Vladimir I completed unification of all eastern Slavs in his state, and secured its borders against foreign invasions.

CULTURE:

Introduction of the alphabet: Writing was not known to the Pagan Rus,' and only came to Rus' in the wake of Vladimir I's Christianization process that began in 988. It was the two Slavic-speaking Byzantine brothers and missionaries, Saints Konstantinos (Cyril) and Methodios, in the late 9th century who devised the first alphabet, *Glagolitic*, for the Slavs. When Cyril and Methodios died, Methodios' successors were forced by the Catholic clergy to move to the south of Bulgaria, and Clement of Ochrid and Konstantine of Preslav continued to work on an alphabet, called *Cyrillic*, that was closely based on the Greek alphabet.

Icon Painting: Although Byzantine religious icons were brought to Russia after Vladimir I's conversion to Christianity, Russian artists did not slavishly follow Byzantine styles of icon painting. Instead, Russian icon painters began to create their own original style by modifying Byzantine models and to form distinctive schools of icon painting.

EARLY MODERN PERIOD

GOVERNMENT:

Table of Ranks: In 1722 Peter cancelled the old precedence that had been determined by birth, and introduced a new order of precedence known as the *Table of Ranks* in which rank was determined by merit and service to the ruler; it remained in use until the Bolshevik Revolution of 1917.

Nakaz: Catherine II (the Great) was a patron of the arts, corresponding with leading thinkers of Europe's Enlightenment such as the French philosophers Montesquieu, Voltaire and Diderot. She issued her *Nakaz (Instruction)*, a statement of legal principles, in the hope that it would be a major Enlightenment achievement. Catherine firmly believed that Russia required autocratic rule, and left serfdom, an institution condemned by the Enlightenment, untouched. This new legal code was compiled in 1767.

MILITARY:

First Navy: The foundation of Russian access to the western seas and the creation of the first the Russian Navy belong to the reformist Peter I (the Great). Peter I borrowed shipbuilding techniques from Holland to create the navy; and the first navy corps of marines was established on Nov. 27, 1705. The construction of

the navy made Russia a great naval power and a major actor in European and world affairs. The Naval Academy in St. Petersburg was opened in 1715.

ECONOMY:

Early Industrialization: During the reign of Peter the Great new industrial enterprises specializing in wood work, gunpowder, leather, glass, paper, porcelain and other areas were established. In addition, there were great successes in the mining industry. New factories were opened; one of them was a silver smelting factory. Ship building was also the most important achievement of Peter the Great's reform program in the early 18th century.

CULTURE:

Civil script (Grazhdanskiy shrift): During the modernization and secularization period, Peter the Great introduced the simplified *civil script (grazhdanskiy shrift)* in 1708; This modernized Cyrillic alphabet distanced writing from the Church which continued to use the ancient script. All textbooks and works on mathematics, geography, artillery, and military science were produced using this civil script, but the Russian Orthodox Church continued to use the Church-Slavonic alphabet. During Peter the Great's reign, translations from European languages into Russian increased the capacity of the printing industry and the number of secular literary publications. In addition, the literary language was freed from religious influence and opened up to western borrowings.

Three styles of writing: Various writers such as A. Kantemir, A. P. Sumarokov and V. Trediakovsky made serious attempts to modernize the Russian language. Nonetheless, it was M.V. Lomonosov's proposal of three styles of writing for Russian in his Russian grammar published in 1755 that contributed significantly to the development of the Russian language. According to this theory, in the high style, Old Church Slavonic should be used for the composition of epics, odes, and poems. The middle style should be used in dramatic works and literary prose; and the low style, the language of townfolk and peasants, should be used for comedy and personal correspondence.

New Calendar: Peter the Great revised the calendar, by ordering the New Year to be celebrated on January 1 based on the Julian calendar. Before that in Russia, the New Year was celebrated on September 1 after the adaption of Christian Era in 1700.

ARCHITECTURE:

Russian Wooden Structures: From the 17th to the 19th century Muscovite architecture liberated itself from the Byzantine style and modified it by using the traditional Russian style of architecture. Two of the finest examples of wooden structures are located at the Kizhi Pogost site on Kizhi Island which includes the 18th century Transfiguration Church with 22 domes and the Intercession Church with 9 domes.

Tent-type (shatër): This style was developed to prevent snow from piling up on the roofs of wooden churches. This type of architecture resembles the Gothic architecture of Western Europe. The Church of St. John the Baptist in Kolomenskoye and St. Basil's Cathedral on Red Square are two prime examples of this type.

Kokoshniks: In Russian church architecture the tent-type structure was replaced with successive rows of curved corbel arches known as *kokoshniks*, a traditional Russian architectural feature. An outstanding example of this style is the Kazan Cathedral on Red Square.

Bochka roof: The *Bochka* roof is the type of roof in traditional Russian architecture that has a form of a half-cylinder with an elevated and sharpened upper part, resembling the sharpened *kokoshnik*. Typically made of wood, the *bochka* roof was extensively used both in church and civilian architecture in the 17th and 18th centuries. Later it was sometimes used in Russian Revival style buildings.

SCIENCE:

The Academy of Science: The Russian Academy of Sciences was founded by a decree of Peter the Great in 1724. The Academy mostly concentrated on the study of mathematics and natural sciences. The first geographical Atlas of Russia compiled by the Academy of Science was published in 1745; and included 19 maps of Russia's provinces and one general map.

The First Russian Scientist - Mikhail Lomonosov: Lomonosov's scientific interest was wide-ranging, including physics, metallurgy, mineralogy, chemistry, optics and mining, as well as history. His major contributions were in the field of mechanical philosophy, popular in the 17th-18th centuries and based on the previous research of Descartes, Gassendi and Boyle. Lomonosov applied this approach to a number of various phenomena, and came to be regarded as the first prominent Russian scientist.

NINETEENTH CENTURY

SOCIETY:

The abolition of serfdom: Serfdom was abolished in March 1861 by Alexander II, granting the serfs their freedom without payment. However, they were liberated without land, which was a major disappointment for the serfs since they had to pay landlords for the use of their land. The government provided loans for these payments, but the peasants were unable to keep up with their payments. As a result, they fell deep into debt.

TECHNOLOGY:

Establishment of railway and steamship lines: In 1815 Russia's first steamship was built. The first railroad connecting Petersburg to the suburbs opened in 1837, and the line connecting St. Petersburg and Moscow opened in 1851. Mileage doubled between 1895 and 1905 with the building of the Trans-Siberian Railroad reaching Siberia and the Far East.

Discovery of Oil: In 1870 oil was discovered in the Caucasus, and petroleum industry developed soon after. At the beginning of the 20th century, Russia became the world's second largest petroleum producer.

CULTURE:

Golden Era of Russian Literature: Traditionally the 19th century is regarded as the "Golden Era" of Russian literature. Poetic talent in particular flourished in the Romantic movement; some of the most prominent writers in this period were A. Zhukovsky, A. S. Pushkin, M. Y. Lermontov, I. A. Krylov. It was in this era the link between literature and national life was emphasized, and literary realism was advanced through the works of N.V. Gogol, I. A. Goncharov and A. N. Ostrovsky.

SCIENCE:

Nikolai Ivanovich Lobachevskii: Sometimes referred to as the "Copernicus of geometry", Lobachevskii became prominent for his work in mathematics and geometry. The non-Euclidian geometry he developed was named after him, Lobachevskian geometry, as was his important work on Dirichlet integrals which came to be known as the Lobachevskii integral formula.

Dmitrii Ivanovich Mendeleev: One of the most important figures in the history of chemistry, Mendeleev was the discoverer of the periodic law and the creator of the periodic table which enabled scientists to predict both new chemical elements and their properties. In 1869 Mendeleev wrote *Principles of Chemistry*, a textbook on inorganic chemistry and his name was given to the Russian Physical-Chemical Society that had just been established.

Periodic Table: The Periodic table that classifies chemical elements was created by the Russian chemist Dmitri Ivanovich Mendeleev.

Dimitri Iosifovich Ivanovsky - Germ Theory of Disease: In the 1800s Russian scientists supported a theory called the *Germ Theory of Disease* which advocated that infectious diseases were caused by microorganisms. Dimitri Iosifovich Ivanovsky worked on a disease affecting tobacco plants known as *wildfire*.

Igor Ivanovich Sikorsky: Igor Ivanovich Sikorsky designed helicopters, and built fixed-wing aircraft. During one of his flights, he was forced to crash-land. When he discovered that a mosquito in the gasoline could starve the engine of fuel, he built a multi-engine plane to stop this problem. One of them was known the S-6 plane which held three passengers. In 1913 he designed the world's first multi-engine fixed-wing aircraft, the four-engine S-21 *Russky Vityaz* (Russian Knight) and later the S-22 *Ilya Muromets*, the world's first airliner in 1913. During WWI, Sikorsky redesigned the S-22 *Ilya Muromets* as the world's first four-engine bomber.

TWENTIETH CENTURY

GOVERNMENT:

First Socialist State: After the collapse of the Russian Empire the world's first socialist state, the Union of Soviet Socialist Republics, based on Marxist ideology, was established in 1922.

ECONOMY:

War Communism: War Communism was an emergency measure designed to win the Russian civil war. It was the name given to the economic system that existed in Russia from 1918 to 1921 and introduced by Lenin to combat the economic problems brought on by the Civil War in Russia. These emergency measures were introduced to win the Civil War, but had a devastating effect on the national economy and the Russian people.

NEP: In order to remain in power and to recover economically from the damage caused by both the Civil War and WWI, the Bolsheviks had to abandon the old style War Communism. In its place Lenin introduced the New Economic Policy (NEP) in 1921. Food seizures from the peasantry were stopped, the farmer's tax was reduced and a fixed tax in money was introduced, and the peasants could sell their products in the open market.

Industrialization: According to Marxist theory a socialist society must be highly industrialized with a vast majority of workers. However, the Soviet Union during the New Economic Policy (NEP) was partly industrialized, and workers were a minority of the overall workforce. Stalin advocated rapid industrialization in order to make the Soviet Union a powerful participant in the international arena. Rapid industrialization increased the number of intellectuals, workers, and other professionals, and the Soviet Union became powerful enough to resist any external threat, but it failed to increase the standard of living of the people.

Introduction of Five-Year Plans: Stalin introduced a series of five-year plans in 1928. The Five-Year Plans specifically concentrated on heavy industries, new factories and technological advancement. New industrial cities were constructed; hydroelectric stations were built; a railroad line was built connecting Central Asia to the Trans-Siberian line. By the end of the 1930s about 80% of all industrial production came from new factories.

Collectivization: Stalin decided to transfer all peasant land into new agricultural units which all peasants had to join. The pooling of assets angered peasants and they began to show resistance to collectivization. However, heavily armed units of the secret police and the army were sent to crush resistance. Full-scale collectivization began in December 1929 and more than half of the peasants had been placed on collective farms by the 1930s. Collective farms lasted until the end of the Soviet Union.

CULTURE:

Painting: Kasimir Malevich (1878–1935), produced a modernist art of abstract collages and geometric shapes called CuboFuturism. Malevich was also responsible for the Suprematist movement, a mystical approach he defined as the supremacy of feeling over form in art. A talented young artist from Vitebsk, Marc Chagall (1887–1985), painted colorful and whimsical works inspired by the Jewish shtetl, or village, in which he was born. Vassily Kandinsky (1866– 1944), a Russian artist who became a major figure in the German Blue Rider school, is generally acknowledged as the founder of abstract painting. Several women were prominent members of the Russian modern art movement, although their contributions are often overlooked. One major figure was Natalia Goncharova (1881–1962), a talented member of the Primitivist movement who drew on icons and traditional Russian themes to produce a nativist art form. Vladimir Tatlin (1885–1953) and Aleksandr Rodchenko (1891–1956) were leading figures in the Constructivist school, which reflected their revolutionary dedication to building a new society. Tatlin is best known for designing a monument to commemorate the founding of the Third International Communist Movement (the Comintern) in 1919.

Ballets Russes: Despite its name, Sergei Diaghilev's Ballets Russes (1911-1929), never performed in Russia, instead it used Russian artists to bring its vision of traditional Russian dance merged with new choreography, modern design, contemporary music, and folk art. Two of its dancers, Vaslav Nijinsky and Anna Pavlova, would become household names. Just before the outbreak of World War I, Diaghilev began to collaborate with artists such as Braque, Cocteau, Matisse, Derain, Satie, and Picasso, as well as with Russian modernists such as Goncharova, Naum Gabo, and Larinov to stage avant-garde works.

Calendar Change: In 1918, Lenin issued a decree to switch to the Gregorian calendar to be in harmony with all the civilized countries in the world. However, due to differences between the Julian and Gregorian calendars over the calculation of leap years a total of 13 days had to be "cancelled".

SCIENCE:

Dialectical Materialist Scientists: A strong evolutionary viewpoint is a distinguishing characteristic of dialectical materialist scientists. However, for these scientists, evolution was not limited to Darwinian biological evolution, but extended to nonliving matter both prior to and after the emergence of life.

Vygotsky, a famous Soviet psychologist, argued that both Marxist theories and societal influences were major factors in his theory of psychology. He established cultural-historical psychology, a theory of bio-social and human cultural development that remained unfinished at the time of his death, and was a well-known supporter of the "psychology of the superman", a novel theory of consciousness. In addition, he was the head of an intellectual group known as the Vygotsky Circle.

Other important scientists of the 20th century who helped to revive interest in the question of life's origins were the biochemist Aleksandr Ivanovich Oparin, and the physicist V. A. Fock. Before this, Oparin and Vygotsky had both shared an interest in the relationship between science and Marxism.

Fock, on the other hand, made advances in the fields of quantum mechanics and relativity physics, unusual at a time when the majority of Marxist thinkers had reservations about the theory of relativity. However, Fock's materialistic understanding of relativity was philosophically compatible with Marxist theory.

Space Program: The Soviets were willing to make massive expenditures to advance the space program. Korolev was the founder of the Soviet Space Program. In October 1957 the Soviet Union launched the first manmade satellite, Sputnik 1, invented by Sergei Pavlovich Korolev. In April 1961 the first flight of a human to space was launched by cosmonaut Yuri Gagarin, and, in 1966 the spacecraft Luna 9 landed on the moon.

Andrei Sakharov: A nuclear physicist who worked on the development of the Soviet hydrogen bomb while working at the Lebedev Institute, Sakharov eventually became an opponent of the Soviet regime. His calls

for civil reforms and civil liberties resulted in both official persecution and the awarding of the Nobel Peace Prize in 1975.

MILITARY:

Nuclear Weapons: In the five years following the defeat of Nazi Germany, relations between the Western powers and the Soviet Union deteriorated. Fearing that the United States might use its nuclear capability to pressure the Soviet Union, Stalin ordered the development of a Soviet atomic bomb. The first Soviet atomic test, code-named *First Lightning*, took place on August 29, 1949.

Armaments: Named after their original designer, Mikhail Kalashnikov and officially designated in Russian as "Avtomat Kalashnikova" (AK), Kalashnikov is the name given to a series of assault rifles that were initially designed in 1947 (hence the designation AK-47) and entered service with the Red Army in 1948.

Discussion/Questions

1. Why was the Trans-Siberian Railroad important for Russia?
2. Why did the Soviet Union arm themselves during the Cold War? What were the considerations of the Soviet leadership and their perceptions of American actions and policies?
3. Why did the War Communism and the New Economic Program introduced by Lenin fail?
- 4- Why was the institution of serfdom preserved till the late 19th century in Russia?
- 5- How did the introduction of the alphabet and the spirit of literacy effect the development of Russian culture?

Reading

- 1- Stearns, P., *The Industrial Revolution in World History, 4th Edition*, Westview Press, 2013, pp. 89-93, 121-139.
- 2- *The Cambridge Companion to Modern Russian Culture*, edited by Nicholas Rzhevsky, Cambridge University Press, 1998.