HUMANITIES INSTITUTE

RUSSIAN SCIENCE

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Overview After the conversion to Christianity in the 10th century Byzantine culture became the most important source of inspiration and influence for early Kiev. However, Byzantium's cultural influence was limited almost entirely to the sphere of religion for two main reasons. First, establishing a firm foundation for the new faith and encouraging its spread was the most important goal for the early churchmen. Second, the centuries of Mongol domination that continued to the 15th century effectively cut Russia off from nearly all outside influence. As a result, Byzantium's legacy of Ancient Greek and Hellenistic science and philosophy was never transmitted to Russia, and Russian interest in science did not develop until the 18th century. Science, scientific studies, and developing a scientific outlook were all elements of Peter the Great's program of Westernization.

POSTCLASSICAL PERIOD

Despite the fact that during the same period of Kievan Rus' florescence some of the greatest Islamic thinkers and scientists lived in Bukhara, the likelihood that Kiev would be exposed to Arabic science from that quarter was extremely low. There was contact between the Rus and the Muslim Volga Bulgars who had commercial links with the Arabs, the Volga Bulgars had no interest in Arabic science. There was, however, one exception, medicine, where some knowledge from the Islamic world did reach Kiev.

None of the major Ancient Greek or Hellenistic scientific works were translated in Russia during the medieval era. The translation of Byzantine works introduced some technical scientific terms into Russian, as well as words like 'planet', and translations of the names of signs of the zodiac, but overall Greek science was little influence on the culture of Kievan Rus.

In addition to these factors, the strong resistance to secular learning in Kievan Rus also played a role in keeping Greek scientific works from being translated. This attitude stemmed from the fact that Christianity was a foreign religion that had only recently been adopted from Byzantium, and the art of writing that came with it was equally new. The rulers supported Christianity for both pious and political reasons, and book learning was regarded as merely another method to bolster support for the new faith.

Finally, in the approximately two and a half centuries that Western Europe transitioned from the middle ages to the Renaissance and the early modern period, growing culturally and politically, the Russian principalities were under Mongol rule. Kiev's links with the West and Byzantium were cut, and this, combined with the decline of the Byzantine Empire and the expansion of Ottoman power in the Balkans, left Russia isolated ideologically and culturally.

EARLY MODERN PERIOD

Although Old Russian culture before the reign of Peter the Great had produced brilliant works of art, music and architecture, until the early 18th century science in the form it had developed in Western Europe was virtually unknown in Russia. Both the Renaissance of the 15th-16th centuries and the Scientific Revolution of the 17th century bypassed Russia, and it was only during the reign of Alexei Mikhailovich in the latter half of the 17th century that a party of Westernizers close to the monarch were able to introduce some Western customs via Poland and the Ukraine, but nothing even close to an introduction of Western science. It was not until the 18th century that Copernicus' astronomical discoveries and Arabic numerals made their way to Russia. It was Peter I who, in the first half of the 18th century, opened the door to Western science and technology and established the first Russian institutions for independent scientific research.

Peter I was inspired to establish such institutions after travelling abroad and meeting the leading scientists of the time, among them Sir Isaac Newton. In Prussia, France and England Peter I visited academies of science, and upon his return to Russia established the Academy of Science in Russia. This academy

sponsored the translation of scientific works from Europe, provided technical advice to the government, and promoted education in the sciences. Despite the work of the Academy of Science, even after 1755 Moscow University still offered little instruction in science and the vast majority of Russia's population remained illiterate.

The first major branches of Russian science that emerged in the 18th century were mathematics and the study of natural resources. The latter field was inspired by field expeditions such as the first and second expeditions to Kamchatka.

In addition, foreign academicians were brought to St. Petersburg, particularly those who specialized in mathematics and the physical sciences. Among these early scientists were the mathematicians Daniel and Nicolaus Bemouilli, and Leonhard Euler.

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

The 19th century witnessed the blossoming of Russian science and the emergence of a number Russian scientists in a variety of fields who would become known around the world. Most, like Lomonosov, were from families of modest means living in distant quarters of the empire. Despite the greater educational opportunities available in the major cities, children from the privileged upper classes made almost no contribution to the development of Russian science. Although scientists benefitted from educational reforms implemented by the tsarist regime and were able to establish a firm base for the advancement of Russian science, at the end of the 19th century Russia still lagged far behind its western European neighbors politically and economically.

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.

TWENTIETH CENTURY

Although Russian science before 1917 was still not at the level of science in the major Western countries, its development had been impressive, and at the start of the 20th century Russian scientists in a number of fields – physiology, mathematics, astronomy, soil science, and some branches of biology, physics and chemistry – had gained international prominence.

Nonetheless, a number of factors hampered the development of Russian technology and science in the era before the Russian Revolution. For example, industrial research remained extremely weak since both the techniques and the capital for Russian industry generally came from outside of Russian. Even strong domestic industries such as the machine and chemical industries frequently utilized foreign sources to conduct their research and development. Compared to industrial research, research conducted at Russian universities was more developed, but still relatively new.

To receive the best scientific education possible, graduate students from Russia had no choice but to study abroad, frequently in Germany. However, because many of the most talented students became involved in political activities during their studies and became part of the political opposition in the turbulent last years of the Russian Empire, scientific professionalism was weakened as was official support for science. Lengthy strikes and demonstrations in the early 20th century effectively shut down Russian universities, and more than a hundred of Russia's most talented professors were removed from their positions by the minister of education in 1911. By this time the circumstances that the tsarist government found itself in made it unable to match the support other states were providing for advanced scientific education and research.

A number of educational reforms that would impact the future development of Soviet science were implemented during the brief period when democratic socialists and liberals held the reigns of power in 1917. Among these were professional societies free of state control, new forms of administering university faculties, the election by its members of the president of the Academy of Sciences, A. P. Karpinskii, a geologist.

After the Revolution, despite calls from the proletarian culture movement for the replacement of traditional science with a radically different form of science, Lenin remained skeptical, and, instead, believed that existing institutions of scientific and technical expertise should be maintained. During the years of the Cultural Revolution, 1928-1931, the Soviet scientific establishment underwent a period of extreme change, and many scientists involved in basic research feared that insistence on social relevance and strict ideology would have a negative impact on the field of theoretical science.

The Academy of Sciences survived the Cultural Revolution, but it had undergone a series of profound transformations. While most work in the natural sciences continued much as it had before, and some researchers were able to continue their work with little serious change, other scientists were less fortunate. Hundreds lost their jobs, and of these many were sent to prison. A system of censorship controls was imposed on Academy publications, and the Academy itself was no longer a politically neutral institution. The Academy of Sciences of the USSR that was formed in this way was the flagship of Soviet 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.

Lev Semenovich Vygotsky:

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 and 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 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.

Stalin Period:

During Stalin's rule dialectical materialism became a byword for the terrorizing of Soviet scientists. Defense of a scientific theory that had been labelled "bourgeois" or "idealistic" by one of Stalin's lackeys could lead

to charges of political disloyalty against the scientist involved. The consequences of suspected political loyalty ranged from dismissal to prison sentences, or even execution in some cases. In this form, dialectical materialism not only crushed the creative elements in Soviet Marxism, it also became a tool for some Marxist scientists and philosophers to advance their own careers by denouncing their colleagues to the authorities for expressing “anti-Marxist” opinions. Stalin’s purges had effectively broken most citizens’ will to resist, with the result that by the late 1930s-early 1940s Soviet intellectual life was almost completely dominated by Stalin’s system of controls.

Lysenkoism:

Lysenkoism was perhaps the quintessential example of ideological dogmatism and political oppression during the Stalinist era. Named after its main advocate, Trofim Lysenko, Lysenkoism rejected both Darwinian evolutionary theory and Mendelian genetics. Supporting the theory of acquired characteristics advocated by Lamarckism, Lysenko’s theory rejected natural selection, as argued by Darwin. In addition, Lysenkoism also advocated a technique called “vernalization” that was supposed to increase the chances of peasant farmers harvesting their traditional crops before the first frost. Although “vernalization” was a method that had been known to cultivators around the world for centuries, Lysenko’s frequent claims that he was working to transform socialist agriculture for the benefit of the Soviet state earned him Stalin’s support.

Natural Scientists:

In the years following Stalin’s death, scientists became the advocates of important social issues. They were able to take on this role due to their obvious importance to the Soviet government. In particular, nuclear physicists had earned great prestige by providing the Soviet government with nuclear weapons, and space scientists would be viewed in the same light when the Soviet Union became the first country to put an artificial satellite into orbit in 1957, and the first man in space in 1961.

International conferences became the venue for meetings between Western and Soviet scientists, where issues related to international peace and security could be discussed. At home, Soviet scientists carried out reforms of the Academy of Sciences, stressing greater emphasis on basic research; they established new research centers, among them the *Akademgorodok* in Novosibirsk; and sought ways to provide new opportunities for talented students of science to more rapidly expand their knowledge.

However, Soviet officials clamped down on intellectuals and their contacts with Western scientists after Khrushchev’s fall in 1964, and even more so following the 1968 incursion by Soviet troops into Czechoslovakia to suppress the “Prague Spring”. These changes can be illustrated by the career of Andrei Sakharov, who was highly regarded in the early Khrushchev years, and then came under increasing suspicion during the Brezhnev period. Sakharov was eventually denounced and exiled by the late seventies, but when Gorbachev came to power he was again in favor and even held an elected position.

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.

Discussion/Questions

1. Discuss the Soviet scientists, their effectiveness, research performance and social relations during Stalin’s period. Why was the creative spirit of scientists destroyed by Stalin? Why were scientists who engaged in research labeled "idealistic" or "bourgeois" and their research ideologically suspect?

2. If substantial numbers of Soviet scientists had been permitted to participate in international scientific networks on a regular basis after Stalin’s death, what potential difficulties could the Communist Party have faced as a result of this regular interaction with international scientists?

3. Why did Lysenkoism fail? How did the Soviet Union and its allies suffer under Lysenkoism?

Reading

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5- Pollock, Ethan, *Stalin and The Soviet Science Wars,* Princeton University Press, 2006.