

Scientist as Fiction Writer: Soviet Science-Fiction and Space Exploration
Tatiana Sokolova, Institute of Philosophy RAS, Higher School of Economics
Moscow

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Abstract

The success of the Soviet space programme (Satellite-1, the first man in space, and the first man in open space) are often considered to be the consequence of the arms race during the Cold War. This paper will aim to show that, at the ideological level, these successes were based on the synthesis of two seemingly contradictory philosophies: on the one hand, the philosophy of Russian Cosmism (especially in the version propounded by K. Tsiolkovsky), with the idea of man's responsibility before all rational beings in the universe; and, on the other, the Marxist thesis about the elimination the gap between manual and intellectual labour.

Such a synthesis was possible thanks to the general orientation of both Marxism and Cosmism to build a new society organized on scientific grounds. Such a society demanded a new type of man, who did not only have advanced technical skills and scientific knowledge, but also had particular moral qualities, such as strong faith in humanity, readiness for self-sacrifice, and the courage to explore outer space. These qualities, as well as highly sophisticated (yet nonetheless fantastical) technologies, were brought together in the science-fiction literature written by Russian scientists (including K. Tsiolkovsky, A. Beliaev, I. Efremov and many others), who in such works did not confine themselves to the simple popularization of the hard sciences.

Inspired by Tsiolkovsky's ideas, Soviet engineers and scientists (F. Zander, Y. Kondratyuk, S. Korolev and others) opened the new era of USSR's space exploration. Thus, the paper will examine the interaction between philosophical ideas and technical achievements based on an analysis of Soviet science fiction literature from 1920s to 1957 (the year of the launch of Satellite-1), as well as of its critics from the scientific community.

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Introduction

The main idea of this paper bases on the following premises:

- **Fiction before reality.** Literature (fiction) can and often do lead the role in the process of reality rearrangement. Due to the dreams, ideas and plans proposed by great writers, not only artists, but also scientists discover the sources for technical resolutions and accelerate the progress of scientific thought.
- **People resources.** Technical innovations don't create themselves. To develop the progress in sciences a society need a very special kind of people, inspired to follow the path of new ideas and to search the truth.

Some researchers point out that from historical point of view:

- K. Tsiolkovsky's ideas on space flights (and even on air flights) were dreams and not plans because of serious mistakes in calculations.
- S. Korolev was capable to build R7 Rocket and Satellite 1 only because he got German drawings of V-1 and V-2 (A4).

Conclusion: Soviet engineers had no real scientific base for space exploration, but military needs after WWII made USSR's government stimulate the rocket construction. The side product of this completely military race was Soviet space program.

We suppose that it is not the only one possible explanation for USSR successes in space. Through the Soviet sci-fi literature we can see the development of ideas and tools, which became real in 1960s.

Why to Space?

The first half of XX century was not a plausible period for Russian science: 1905 Revolution, WWI, civil war, intervention and WWII.

Nevertheless from the very beginning of XX century and during all the political catastrophes the idea of space exploration always survives in fiction and in science. Why?

We suppose, that space exploration as a Great project could give:

- a new picture of the future;
- a new scientific (i.e., solid) way to make this picture come true.



Figure 1: Cosmic Voyage

Soviet Theoretical Achievements

- 1903 “The Exploration of the World's Space with Reactive Instruments” by K. Tsiolkovsky
- 1907 “The Universe in Essays and Pictures” by K. Tsiolkovsky
“Red Star” by A. Bogdanov (a mission to Mars);
- 1908 “Jet-propelled Instrument as the Tool of Flight in Vacuum and in the Atmosphere” by K. Tsiolkovsky (published in 1910);
F. Tsander's paper on the technical details of the interplanetary travel
- 1912 “By the Rocket into the World's Space” by V. Ryumin
- 1914 Sci-Fi novel "Islands of Epher Ocean" by B. Krasnogosky and D. Svyatsky (an expedition to Venus)
- 1915 “Interplanetary Travel” by Yakov Perelman (based on K. Tsiolkovsky 's ideas)
- 1916 Prof Zhukovsky gives a positive review of N. Tikhomirov's solid-propelled rocket proposals
- 1917 Y. Kondratyuk's (Aleksandr Shargey) first work on spaceflight;
N. Kibalchich's proposal of a rocket-propelled flying vehicle discovered in the archive
- 1918 “Beyond Earth” by K. Tsiolkovsky published in “*Priroda i Lyudi*” journal
N. Tikhomirov proposes to organize a laboratory for the development of powder rockets;
- 1919 “To those who will read to build” by Y. Kondratyuk (published in 1964).

- 1920 “Riches of the Universe” by K. Tsiolkovsky published.
Aelita by A. Tolstoy (civilization on Mars) and Yakov Protozanov’s film;
The Society for Studies of the Interplanetary Travel, OIMS, is founded in
1923- Moscow; Tsiolkovsky’s work “Rocket into cosmic space” describes multi-stage
1924 rockets;
Tsander publishes “Flight to Other Planets”.
Tsiolkovsky, Tsander and Kondratyuk propose the use of the atmosphere as a
breaking medium for the spaceships returning to Earth.
- 1928 N. Rynin starts a nine-volume encyclopedia “Interplanetary
Communications”(fiction literature on space, technology and astronomical
topics)
- 1929 “The Conquest of the World’s Space” by Y. Kondratyuk;
“Space Rocket Trains” by K. Tsiolkovsky
- 1935- “Rocket Flight in Stratosphere” by S. Korolev;
1936 “Rockets, Their Design and Application” by Langemak and Glushko of RNII;
“Cosmic Voyage” sci-fi film (K. Tsiolkovsky – an official consultant)
- 1937 “Introduction to Cosmonautics” by Ari Shternfeld is published in the USSR

Soviet Practical Achievements

- 1921 A.F. Andreev requests a patent for a portable personal flight vehicle propelled by
a liquid engine burning oxygen and methane;
Tikhomirov’s rocket development lab in Moscow.
- 1927 The world’s first exhibition of technology for interplanetary travel opens in
Moscow;
Engineers at Tikhomirov’s laboratory propose to use solid-propellant motors to
assist in the aircraft takeoff.
- 1928 Tikhomirov’s lab conducts test launches of rockets, burning smokeless powder,
reaching range of 1,300 - 1,500 meters.
- 1930 The first test of a liquid-fueled engine developed by F. Tsander.
V. Glushko develops the first Soviet liquid-fuel engine, ORM-1.
- 1931 Group for Study of Rocket Propulsion, GIRD, is formed in Leningrad. Mos-
GIRD led by F. Tsander is established in Moscow.
- Tsander starts testing the 50–kilogram OR-2 engine burning benzene and liquid
oxygen.
- 1933 A rocket with a hybrid engine GIRD-09, designed under leadership of M.
Tikhonravov is launched.
- Moscow-based Scientific Research Institute for Jet Propulsion (RNII) by the
order of the Revolutionary Council, Revvoensovet.

- GIRD-X rocket with a liquid-propellant engine is launched near the town of Nakhabino reaching 70-80 meters.
- RNII initiates development of the ORM-65 engine with the thrust of 175 kilograms.
- 1936 Official test firing of the ORM-65 engine for the RP-318 rocket glider and the 212 cruise missile at RNII.
RNII conducts a test launch of an 217/p anti-aircraft winged missile with a solid-propellant engine.
- 1939 An experimental cruise missile 212 powered by the ORM-65 No. 2 engine is tested in flight.
- 1940 The RP-318-1 rocket-powered glider, originally designed by Korolev, is tested in flight and reaches a speed of 200 km per hour.
Tikhonravov presents a report "Means of reaching long range of firing with missiles."
- 1948 The R-1 (the Soviet copy of German A-4) is launched for the first time.
S. Korolev discusses a possibility of launching dogs on ballistic missiles with the expert in aviation medicine V.I. Yazdovsky.
- 1949 The first R-2 ballistic missile is launched.
S. Korolev officially becomes a chief designer of OKB-1, the developer of the Soviet long-range ballistic missiles. Within R-3 ballistic missile program, Korolev team studies a multistage version of a rocket capable of launching a satellite.
- 1950
- 1RB rocket with dogs Mishka and Chizhik to the altitude of 88.7 km is launched whose cabin then parachutes safely back to Earth after experiencing an acceleration of 5.5 g during the ascent.
- 1951 The launch of the "geophysical" rocket in the USSR carrying live animals onboard.
- 1952 The final test flights of the R-2 ballistic missile.
- 1955 The NII-4 research institute issued a preliminary report No. 571 on the Subject No. 72, entitled "The research on the issue of creation of artificial Earth satellite" commissioned by Korolev.
- 1957 R-7 completes the first successful test flight.
World's first artificial satellite is launched.

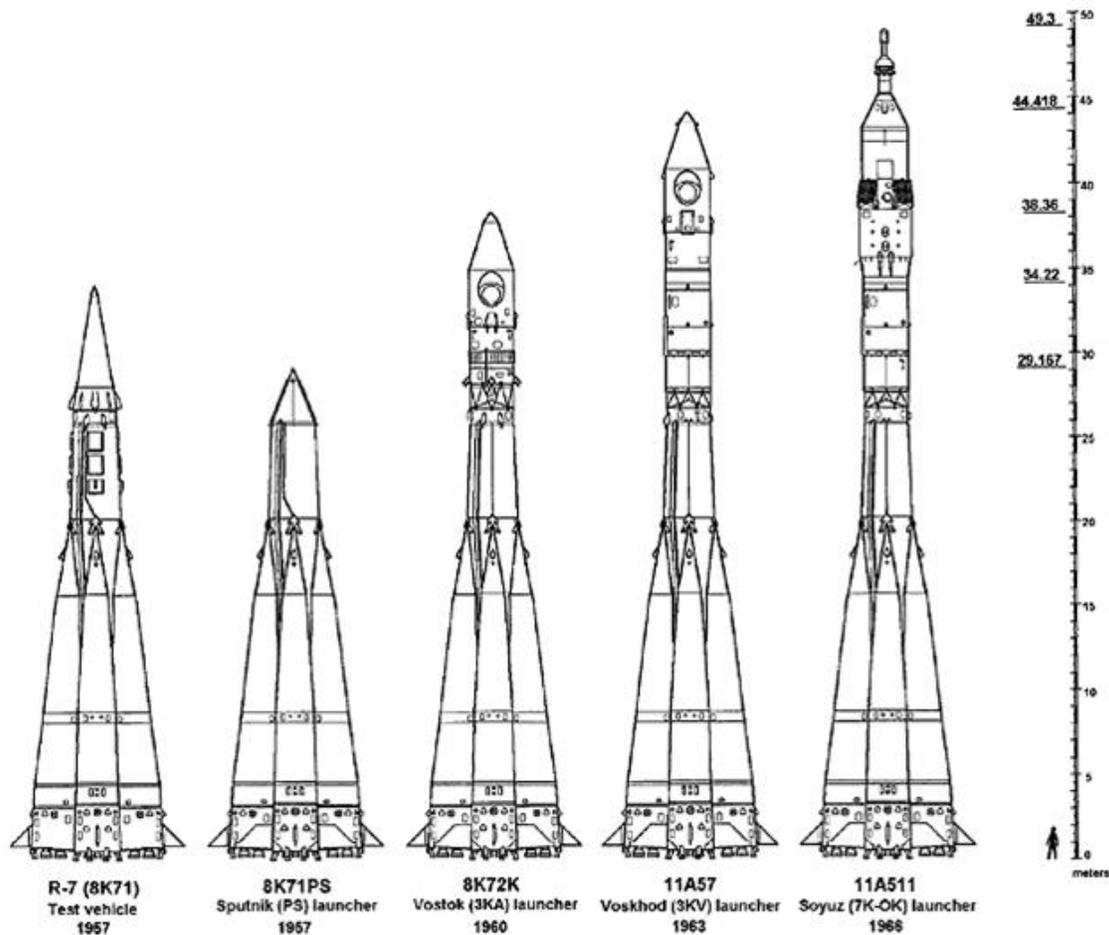


Figure 2: [Evolution of Soviet Space Launch Vehicles](#)

Soviet Sci-Fi: Authors

The most important authors for Soviet science fiction before 1957 are:

Konstanin Tsiolkovsky – occasional sci-fi author, but mainly scientist and philosopher. His ideas of space explorations and proposals of rockets and spacecrafts was the main source of inspiration for almost all the sci-fi writers of this period.

Alexander Belyaev – inspired by Tsiolkovsky’s ideas, he writes sci-fi novels on space exploration and aircraft construction, trying to describe the life on a space ship or a space station. Most of his novels contain a philosophical debates on technical development.

Ivan Efremov – one of the most famous Russian sci-fi writers. His book “Andromeda” is now considered as a boundary mark for Soviet sci-fi literature.



Figure 3: Cosmic Journey 2

Critics: Near and Distant Target Debate

In early sci-fi literature in USSR critics distinguished two ways of writing:

Near target sci-fi – oriented to present achievements of science. (e.g. “Airship” by A. Belyaev).

Distant target sci-fi – describes far future and the new world, which is totally different from the present situation (“Andromeda” by I. Efremov)

After 1957 when “Andromeda” was published, the debates on near and distant target science fiction were stopped. The winner for a long time was distant target science fiction.

Example 1:

“In front of our science fiction, as well as to the entire literature, the main goal for all its genres is overriding objective: to shape the outlook and aesthetic taste of the reader. Poorly written novel or story is harmful, even

if it is read with interest the lowly reader. It spoils the taste. And this is a very big sin to our culture, to our people". (Bibl. 5)

Example 2:

"We care about the future of tomorrow's man armed with science and technology. Even today science has become ruler of the doom of our generation! Even today, it largely determines the criterion of thought and dream about the future! And tomorrow? Is it possible to oppose the social theme of research and tear a human being of his creation a "superpowerful machines" (Bibl. 7)

"But we follow not only today's practical reasons. We also have scientific aims, which eventually will serve to practice". (Bibl. 2)

Philosophy: Cosmism

The main idea of Russian Cosmism, proposed by K. Tsiolkovsky was the Mission of Reason, which means that:

Reason is the leading a basic feature of a human nature;
There could be another rational beings in the Universe;

Ergo: as a rational being humans should explore the space to find out about another rational forms of life to make a contact with them.

But this scientific aim is also a moral aim, because (as Tsiolkovsky supposed) the true scientific mind is also a moral mind. That's why the science of space exploration is also an ethic of space exploration.

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Philosophy: Marxism

Marx's main idea about elimination of the distinction between hand and intellectual labour was the basic idea for many sci-fi writers.

Intellectual labour requires knowledge, which was almost inaccessible for those, who worked with their hands. "Old type scientists"

1. Avoided hand labour;
2. Didn't considered workers as rational beings, who should have an equal access to sciences, because it could be a threat to the social order:

"machines produce workers, workers carry the revolution, and the revolution will destroy us all" (Bibl.3)

Elimination of this distinction in all the spheres of work could also eliminate "routine work," because till this moment all types of work will require intellectual abilities.

Example 3:

"Sixty million tons of steel - it is at the same time, an unprecedented development of the energy sector of the country, hundreds of new power plants, and hence the mighty sweep of fuel production - primarily coal and oil. Hence, new discoveries, unprecedented scope of invention and rationalization, new hundreds of thousands of engineers and technicians, and most importantly, a steady and rapid rise and technical and cultural level of the people. In other words, the actual implementation of one of the basic conditions of a communist society - the total elimination of the boundaries between physical and mental labor. On the other hand, a huge increase in metal production and enormous development of the energy sector related to the unprecedented growth in the world of agriculture. Sixty million tons of steel - which means billions more tons of grain, new tons of oil, meat and sugar. These prospects for agriculture, in turn, are organically linked with the introduction of all branches of agriculture power. In the near future, our farmers will be required to possess not only agronomic knowledge, but also knowledge of mechanics. Near future collective farmer will change its appearance in relation to the collective farmer today's moment. This is a very cultured man in the same time agronomist and techniques. Hence, the actual implementation of the second basic condition of a communist society - the total elimination of the distinction between town and country". (Bibl. 6)

Engineer's Culture

As the opposite to the old type of scientists, both ideas of Cosmism and Marxism creates a new type, which was incarnated in engineers.

As a scientists engineer has rich scientific background, but he is also a worker, capable to realize his own theoretical projects.

“They were friendly, but as she said, I was only a “cabinet scientist” with limited interests, hesitating mind and old man’s habits like sitting all day in my lab” (Bibl. 4, P. 162).

One the one hand, an engineer has education, cultural needs and can share scientific and cultural values. On the other hand, he does not try to escape physical labour and understands it’s importance.

Conclusions: Great Projects

1. Science-Fiction literature on space exploration in USSR formed a very special “engineer culture” inspired by Great projects;
2. Within this culture practical and technological tasks were considered as parts of much more global aims such as:
 - Mission of reason;
 - Symbiosis of hand and intellectual labour;
3. Scientists, inspired by these ideas (and not pragmatic or commercial interests) were capable to create USSR’s space technologies, which are still considered as important achievements in the history of science.

The philosophy of both Soviet science fiction and space exploration was developed in the frame of Soviet Marxism.

But even when Marx’s philosophy in former USSR was abandoned, the Great projects in science based on the Cosmism and Marxism remain relevant to the present scientific needs. On a par with commercial needs they create human resources to develop scientific projects.

For this reason we can say that in the case of scientific exploration (and especially space exploration in USSR) political ideology and political aims during Cold War was not the main source for Soviet space exploration.

Example 4:

“In the past years it was often said that “space must be pragmatic“. But it seems that in the headlong pursuit of this pragmatism, today we have

come close to the point where we vitally need just the opposite. To be more precise, we need a clear-cut state support program of “non-pragmatic” space. Especially since there are a lot of people willing to work on such projects, even without super-salary, but for the opportunity to express themselves in a truly interesting case, to realize the Dream, write articles, dissertations, and finally - to declare their names”. (Bibl.)

Contact details: sokolovatd@gmail.com

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