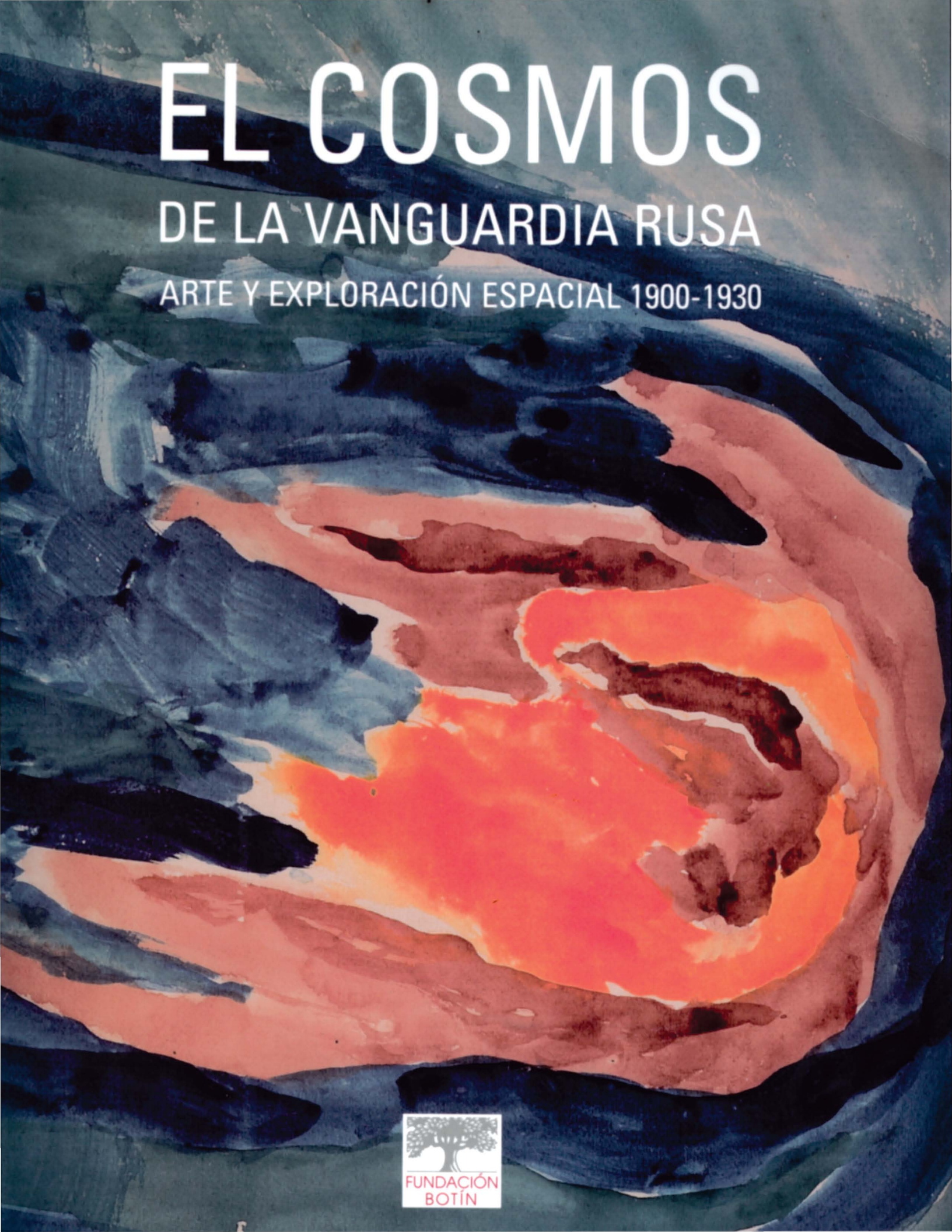
EL COSMOS
DE LA VANGUARDIA RUSA
ARTE Y EXPLORACIÓN ESPACIAL 1900-1930



FUNDACIÓN BOTÍN

THE ROAD TO SPACE

Mike Gruntman

Space flight requires powerful rockets. The Ancient Greeks observed the principle of rocket propulsion more than two thousand years ago and one thousand years later the first primitive rockets appeared in China. Subsequently, many other nations repeated the discovery, including Russia, whose love affair with rocketry goes back to the reign of Peter the Great: as early as 1690 skyrockets were used to entertain an uncertain public at a Moscow celebration, sometimes injuring unfortunate bystanders.

The early 19th century witnessed a major step towards perfecting the rocket. A British inventor, William Congreve, turned ineffective and erratic missiles into a modern weapon system with standardized and interchangeable components (fig. 56). In fact, these early British war rockets, known as the Congreves, burned Copenhagen in 1807, while the army of the Duke of Wellington tried out the new weapon in the Peninsula campaign against the French. British rocketeers also distinguished themselves in the Battle of the Nations at Leipzig in 1813 and later at Waterloo. Brought across the Atlantic Ocean, the Congreves then bombarded Fort McHenry near Baltimore in the United States of America later that same year. Francis Scott Keys immortalized the deadly missiles in the American National Anthem with his famous line "... And the rockets' red glare..."

War rocketry proliferated very rapidly throughout the world, reaching North and South America and Asia, and many European countries – particularly Austria, France, and Russia – established their own large-scale manufactories of war rockets. The Russian army, for example, employed the weapon in numerous engagements, especially against the Ottoman Empire. In 1834 the Russians even built a super-secret iron-clad submarine with a crew of ten men which fired rockets from a submerged position (fig. 58). By the mid-19th century, with the Empire expanding into Central Asia, Russia waged war against the Kokand Khanate. War rockets offered advantages of mobility in

rugged terrain with poor roads. In 1853, for example, a unit of Russian rocketeers marched through a desolate and nondescript place called Tyuratam on the shores of the River Syr Darya (in what is today's Kazakhstan): they advanced towards the Kokand fortress of Ak-Mechet', firing scores of rockets over the next couple of months. A century later, much bigger and incomparably more sophisticated rockets were roaring over Tyuratam – which become known to the world as the Baikonur Cosmodrome whence the first artificial satellite sputnik and the first cosmonaut, Yurii Gagarin, entered orbit.

By the end of the 19th century rocketry had lost much of its practical importance. Rapid technological progress resulted in a new kind of artillery vastly superior to military rockets. At this time men of plume stepped in to replace the men of sword as the bearers of the banner of spaceflight, a shift which resulted, for example, in a plethora of Russian translations of European literature, including Nicolas Camille Flammarion's *La pluralité des mondes habités: étude où l'on expose les conditions d'habitabilité des terres* célestes (1874). But nobody captured the public imagination with space fantasy more readily than the French writer Jules Verne. His novels fired and motivated many of the young people who decades later would transform the dream of spaceflight into a reality (fig. 59). But the late 19th century also brought the awareness that, until the rocket was perfected, there would be no trips through outer space, no landing on the Moon, and no visits to other planets. Complex practical work was needed in order to develop the science and engineering of powerful rockets and sophisticated spacecraft.

There followed a long period when isolated visionaries and thinkers, including amateurs (in the original meaning of that word), drafted the basic principles of spaceflight. But the various technical details were rarely credible and many elitist intellectuals and assorted "competent authorities" dismissed the idea of space travel as being ridiculous. Even so, a number of outstanding individuals did lay the foundations of practical rocketry and spaceflight. Four visionaries in four countries working under very different conditions became the great pioneers of the space age: the Russian Konstantin Tsiolkovsky, the French Robert Esnault-Pelterie; the American Robert H. Goddard; and the German Hermann Oberth.

Konstantin Tsiolkovsky worked as a school mathematics teacher in the provincial town of Kaluga, about 140 km south of Moscow (figs. 60, 61). In the inventor's own words, his "aspiration towards space travel was seeded by the celebrated French dreamer J. Verne." Tsiolkovsky concluded that the rocket was the only means

of propelling vehicles into and in space. His writings combined the development of scientific and technological ideas with an ambitious vision of space applications. In 1911, he proclaimed: "Mankind will not remain on the earth forever, but in pursuit of light and space will — at first timidly — penetrate beyond the limits of the atmosphere, and then conquer all the space around the sun." Physical circumstances often play decisive roles in the lives of individuals and ideas. Such is the case with Tsiolkovsky for his vision might have remained in obscurity had it not been for the efforts of a prolific and popular science writer named Yakov Perelman, who, in the 1910s published several pioneering treatises on interplanetary travel (figs. 20, 23). His widely acclaimed book *Tsiolkovsky. Zhizn i tekhnicheskie idei* [Tsiolkovsky. His Life and Technological Ideas], which saw ten editions in twenty years, introduced Tsiolkovsky's vision of space exploration to the broader Russian public.

In October, 1917, the Communist Revolution shattered the hieratic and patriarchal society of the Russian Empire. The new Socialist order opened up numerous opportunities, charging popular enthusiasm for things impossible. To many young men and women, filled with hope for the future, the ultimate frontier of spaceflight seemed suddenly to be in reach. But at the same time the Marxist experiment had exterminated large segments of the educated classes, so important for the implementation of spaceflight. Exalted social engineers murdered thousands of scientists, educators, administrators, engineers, writers, and civil servants on the road to the Socialist paradise.

The young republic was embracing new revolutionary ideas, but it was also establishing the omnipotent and stifling control of free thought. Marxism emphasized the transformation of society on the basis of a scientific understanding of the world. Consequently, the Soviet government elevated support for science and technology – but a totalitarian state will not tolerate independent thought or activities. Hence, the Soviet Union channeled the burgeoning enthusiasm for rocketry and spaceflight into a monolithic, governmental enterprise, the Red Army initiating rocket research as early as 1921 when Nikolai Tikhomirov convoked a team of specialists to develop solid-propellant missiles.

At the same time a number of young enthusiasts came together in Moscow and Leningrad (St. Petersburg), including the young space pioneer Fridrikh Tsander whom, incidentally, Lenin himself had noticed at a meeting of inventors in 1921 (fig. 62). The Soviet government also recognized the importance of Tsiolkovsky and his researches, so that thenceforth his official status enhanced his reputation — making it difficult today to separate his true accomplishment from propagandistic embellishment. In the Soviet Union, Tsiolkovsky was often called the "Father of Cosmonautics" and while he never built rockets, his writings inspired generations of Soviet space enthusiasts.

In the early 1920s, the Soviet populace was reading space adventures with unbridled enthusiasm. Novels such as Aleksandr Bogdanov's *Krasnaia zvezda* [Red Star] and Aleksei Tolstoi's *Aelita* carried particular resonance and Yakov Protazanov's movie, *Aelita* (based on the novel and released in 1924), enjoyed immediate success. Also in 1924 space enthusiasts established the Section of Interplanetary Flight at the Air Force Engineering Academy named after Nikolai Zhukovsky, involving both Tsiolkovsky and Tsander in their investigations. A public lecture by Mikhail Lapirov-Skoblo at Moscow's Polytechnic Museum on May 30, 1924, led to the establishment of the Society for the Study of Interplanetary Travel, 104 men and 17 women subscribing to the new society (90 of whom were under 30).

Similar spaceflight and rocket societies followed in other countries: in Austria (in 1926), Germany (1927), USA (1931), and Great Britain (1933). In April-June, 1927, an association of inventors organized a very unusual event in downtown Moscow — the "First Universal Exhibition of Models of Interplanetary Apparatuses, Mechanisms, Devices and Historical Materials" presented a vast collection of model rockets and spaceships and all kinds of materials on astronomy, the solar system, and spaceflight. Thousands of people visited this first space exhibition, which received an enthusiastic press (figs. 1-3, 7).

Modern rockets belong to a category of inherently complex and advanced technologies wherein an isolated creative and gifted inventor cannot succeed. Only the concerted effort of numerous well-organized professional scientists and engineers supported by significant resources can lead to practical and practicable systems. For better or for worse, the powerful state of the Soviet Union provided the revolutionary enthusiasts with both ideological guidance and material resources.

It is misleading to assume that National-Socialist Germany was the first to initiate a large-scale rocket effort in the early 1930s. Certainly, Germany did develop a technological marvel — the ballistic missile A-4 (better known as the V-2), during World War II. However, it was the Communist Soviet Union which, by the late 1920s, had established the first large rocket development program: in 1929 the Revolutionary Military Council of the USSR reorganized the activities of Tikhomirov's group to form the Gas Dynamical Laboratory (GDL) in Leningrad. By 1932, the Laboratory boasted two hundred employees engaged in professional rocket research. At the same time another organization controlled by the military — the *Osoaviakhim* or Society for Assistance to Aviation and the Chemical Industry — also brought together like-minded space and rocket enthusiasts. These groups, known as GIRD or Groups for the Study of Jet Propulsion, built models, arranged exhibitions, and, in general, did much to popularize rocketry. Tsander headed the most advanced GIRD (fig. 63).

By the late 1920s the future leaders of the Soviet ballistic missile program, Valentin Glushko and Sergei Korolev, had joined GDL and GIRD, respectively. Jules Verne's novels had inspired both young men: later on Glushko would become the leading developer of the high-thrust liquid-propellant engines which brought about the real breakthrough into the cosmos; Korolev would lead rocket and satellite development, making the first intercontinental ballistic missile – the R-7 — in 1957 and placing the first artificial satellite (also in 1957) and the first man into orbit (1961)

Like their counterparts in National-Socialist Germany, Soviet military leaders were quick to recognize the promise of rocketry. The Red Army moved to concentrate rocket research and development in one major center: so, in 1933, Deputy People's Commissar for the Army and Navy, Marshal Mikhail Tukhachevsky, ratified the Jet Propulsion Scientific Research Institute (RNII) in Moscow, merging the Leningrad GDL with the Moscow GIRD. Under the omnipotent aegis of Tukhachevsky the RNII embarked on large-scale research and development programs in solid- and liquid- propellant rockets: by 1934 the sprawling complex was employing 400 scientists and engineers in addition to numerous technicians and administrators. At that moment the Soviet missile program dwarfed the German effort.

In the early 1930s the Jewish-Polish scientist, Ary Sternfeld (Ari Shternfeld), living in France, introduced the word "cosmonautics" as he strove to promote Tsiolkovsky's ideas (fig. 67-76). An earnest believer in Communism, Shternfeld immigrated to the Soviet Union in 1935. where he joined the RNII and published his award-winning treatise *Vvedenie v kosmonavtiku* [Introduction to Cosmonautics] in 1937 (figs. 64, 35). But only one year later Shternfeld had lost his job, even if, miraculously, he did survive the purges and the anti-Semitic campaigns which followed. Thereafter, he earned his living by writing popular books on spaceflight which were then translated into many languages, bringing international acclaim – so that Shternfeld became one of the very few Soviet space pioneers known outside the Soviet Union. Ironically, the Soviet state never allowed him to work in the top-secret ballistic missile and space programs.

All this is to say that Soviet rocketeers shared the common fate of their fellow countrymen as the Communist Party conducted the Great Terror in the mid- and late 1930s. Many scientists and engineers

were loyal to the Soviet state, enthusiastic about the Socialist paradise which they were building and devout members of the Communist Party. Just prior to this, in the 1920s and early 1930s, they had approved of, or at least accepted, the extermination of thousands of

"enemies of the people", but now they were themselves being arrested, tortured, banished or executed after token trials.

Tukhachevsky, patron saint and protector of Soviet rocketry, was among the most trusted, if brutal of Soviet military leaders. Allegedly, he pioneered the use of poison gases for killing peasant rebels during an anti-Soviet insurrection in 1921. But even such zeal did not save Tukhachevsky from liquidation in 1937.

The Soviet Secret Police arrested many leading rocketeers. RNII director Ivan Kleimenov and his deputy Georgii Langemak, for example, were shot in January, 1938; Glushko and Korolev were arrested in 1938 and sentenced to eight and ten years of hard labor, respectively. If they were lucky, convicted scientists and engineers ended up in special prisons — the so called *sharashka* (a combined prison, research and design facility). Thousands of imprisoned specialists worked in these *sharashki,* which at least granted some hope of survival. A very different fate awaited the many sent to concentration labor camps, where malnutrition, hard labor and abuse took their toll. Korolev ended up in a *sharashka* headed by a fellow prisoner and former colleague — Glushko. They were both released in 1944.

As World War II drew to a close, the Soviet Union revitalized its rocket program. The German successes in designing and mass-producing the first modern ballistic missile V-2 had demonstrated the extraordinary potential of the new technology. Emerging atomic weapons made long-range missiles especially important for future warfare, even if guidance accuracy was still limited, The Soviet Union now began a massive campaign to develop ballistic missiles, an endeavor which, eventually, would lead to the launching of the first sputnik and first cosmonaut into space.