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RUSSIAN LITERATURE IN THE FIELD OF ASTRONAUTICS - PART I. This issue, Part I, and the following issue, Part II, (January 1, 1960) will be devoted primarily to the review of Soviet Literature in the field of astronautics. Part I is intended as a review of current Soviet books in thf field of astronautics. Many of the books reviewed are English translations and are readily available while others are in Russian and are available only through foreign book dealers. Discussions are given of those available in English and title, author and the table of contents are given for those in the Russian language.

The release of information in the field of astronautics is carefully controlled in the Soviet Union. As a result the major portion of the technical information presented is data on American space vehicles. With very few exceptions the only material presented on Soviet spacecraft is taken from the Russian newspaper Pravda. The Soviets have thus provided themselves with a very effective method of controlling the release of technical information in the field of astronautics.

PATH TO THE COSMOS

Material from "Pravda" on three Soviet artificial earth satellites

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THE SECOND SOVIET ARTIFICIAL EARTH SATELLITE

Material previously published in "Pravda"

SOVIET BOOK LITERATURE. During the last few years a gradually increasing quantity of Soviet rocket and astronautical books have appeared in English-language translations. Some have been good, some fair, others poor, but all have offered pathetically few details on specific Soviet missiles and space vehicles.

Books appearing to date have been of three types (1) straight translations of complete Soviet works (e.g., Shternfeld's "Soviet Space Science"), (2) Soviet-edited compilations of articles (e.g., Kurnosova's "Artificial Earth Satellites"), and (3) surveys of Soviet developments based largely on translations from widely scattered sources put together by English-language authors (e.g. Krieger's "Behind the Sputniks"). Obviously missing from the permanent literature has been an analysis, by a Western author with an intimate knowledge of the Russian language, of Soviet missile and space flight developments and trends.

"Russia's Rockets and Missiles": The appearance, in mid-November 1960, of Dr. Albert Parry's book "Russia's Rockets and Missiles" helps to close to an extent a serious gap in our understanding of Soviet progress. Born in Russia, Parry came to the United States in the 1920's. During the Second World War he was associated with the Office of Strategic Services, following which he established Colgate University's Russian study program. Aside from his Colgate duties, he is a consultant and visiting lecturer at the Army War College.

"Russia's Rockets and Missiles", published by the Doubleday and Company, Garden City, New York (382 pages, $4.95), has a short introduction by Willy Ley in which a number of significant observations are made. Ley points out that Parry has based his book on first-hand sources rather than from translated communiques and "bits and pieces". While there are many books "written by Russians for Russians", he cautions that "what the Russians really want to know is not necessarily the same as what an American reader will wish to know." He goes on to say that "a Russian book has naturally been censored so that many things an American would be especially curious about will not even be in the original". Nevertheless, "the Russian works which Professor Parry read before he sat down to write this book have been censored too. But by reading many sources without an interpretor getting in the way and by possessing a general, suitable background, the handicap of the original censorship can be overcome to some extent. If you really master a language and its background, it is surprising how much can be read between the lines". Parenthetically, it is significant to note that the same general philosophy has been practiced by the Air Information Division of the Library of Congress for many years in making translations of key Soviet documents from widely scattered literary sources.

The Rocket Gap: Parry commences his book with a chapter asking the question "How Wide the Rocket Gap?" (the word rocket is used throughout to mean not only conventional military missiles but space carrier vehicles, artificial satellites, and spacecraft). He records that

while the U. S. has placed far more vehicles into satellite orbits or departure trajectories than the Russians, the total payload weight boosted into space by the Soviets exceeds the total payload weight of American vehicles. He underscores the fact that the Soviets have enjoyed greater international public acclaim for their technological firsts (e.g. first man-made object to hit the Moon, first animal in orbit, first photographs of lunar far side), while the U. S. has gained a more esoteric variety of prestige from its scientific firsts (e.g. the discovery of the Van Allen belts, the discovery that solar X-rays emanate from the Sun's corona, the discovery that the Earth is slightly pearshaped). One interesting sentence from the first chapter is quoted: "For a long time after the beginning of the rocket race the Soviets insisted that scientific advantages claimed by Americans were but a faint cry, smothered by the bark of Laika in Sputnik 2...."

Carrier Vehicle Thrust: The author estimates that Sputnik 3's carrier may have developed between 600,000 and 750,000 lb of thrust, while the Lunik 3 carrier's thrust is estimated at up to 800,000 lb. Although the announced weight of Sputnik 3 was 2,925½ lb, the total weight in orbit may have totaled 8,800 lb, according to Parry.

IRBMs and ICBMs: It is estimated that the Soviets had 35 operational ICBMs as of June 1960; by June 1961 it is speculated that they will possess up to 200 ICBMs (compared with U.S.'s 50 or so). By 1963 the Soviets may have between 500 and 2,000 operationally ready missiles. As for IRBMs, it is felt that by mid 1958 the Soviets had made more than 1,000 test flights in the 500 to 1,400 mile range. Parry writes that certain American experts hold that the Russians have operational stockpiles of several hundreds of IRBMs in the 800 to 1,800-mile bracket. By the end of 1963 up to 2,000 IRBMs may be available to the Soviets.

Russian Technology: Several chapters in the book are devoted to the myths and facts of Russian technology. The author says "their success in recent times may be summarized by one long-range development and one short-term phenomena. The traditional factor is their long-standing emphasis on the physical sciences in their schools. This dates back to the Tsarist times, but it was not as general then as it is now. We have been aware of the same emphasis in the schools of Germany and a few other Western countries, but rather ignorant of the Russian replica of it. And their short-term reason for the triumph was...Khrushchev's relaxation of many of Stalin's terroristic fetters formerly handicapping Russian science and technology."

History of Rocketry: Parry introduces a chapter entitled "To the Stars: the Early Record" with the questions: "In their spotty ledger of achievements and lags, what is it that has made the Russians reach into outer space so successful? What makes them skilled astronauts when they produce such ill-functioning railroads, inadequate automobiles, and until their very recent jet airliners fair but not brilliant planes?" One way of answering these questions is to probe into the historical development of Russian astronautical thinking, particularly that associated with Tsiolkovsky.

Tsiolkovsky's Writings: Russia's conventional early flight achievements are shown to be rather undistinguished and, "in Soviet times, surely overclaimed". Interesting historical information from the 1700's is supplied, carrying through to Tsiolkovsky's epoch which ended a few years before World War II. In order to appreciate the extent of his pioneering activities, a partial list of published titles is given from the 1954 Soviet Academy of Sciences' Collected Works of Tsiolkovsky:

"Free Space"	1883
"Investigating Space with Reaction Devices	1903 and 1911 (revised in 1914 & 1926)
"The Space Ship"	1924
"The Space-Rocket, An Essay"	1927
"The New Airplane"	1927
"Cosmic Step-Rockets"	1929
"The Jet Airplane"	1930
"To Astronauts"	1930
"Ascending Acceleration of the Rocket Plane"	1930
"The Semi-Jet Stratoplane"	1932
"Reaching the Stratosphere, Rocket Fuel"	1934
"The Maximum Speed of a Rocket"	1935

As early as 1911 the Russian pioneer wrote: "Only a searching mind and science could show the way (from rocket propulsion) into something vast, almost beyond the range of our preception." He wrote far more daringly than America's rocket pioneer, Robert H. Goddard, saying that the development of rocketry would permit man "to step on the soil of asteroids; to pick up a stone from the Moon with his own hand; to organize interplanetary platforms; to form rings--with life on them--around the Earth, the Moon, and the Sun; to observe Mars itself".

Following the first Soviet experimental rocket flight in 1933 near a Moscow airport, Tsiolkovsky is supposed to have said (in response to the remark that the rocket had only climbed to an insignificant height): "Remember the first flight in an airplane! Not many understood then that a new era was dawning. The same is true of this first rocket-launching. It opens a new page in man's conquest of endless expanses--with the aid of rockets. The hour is not far off when Soviet rocket ships will rush off into great airless expanses. And this will happen in our twentieth century!"

Early Rocket "Hardware": Tsiolkovski was not a "hardware" engineer in any sense of the word, and is not known to have ever built or fired a rocket (although he did offer suggestions and advice). This task was left to Friedrich Tsander who, between 1928 and 1930, developed first an OR-1 (Opytnyi Reaktivnyi, or Experimental Jet) rocket engine, powered by benzine and gaseous oxygen, and later an OR-2 which used liquid oxygen. Mos-GIRD (a group to study rocket propulsion in Moscow) experimenters began to test this engine in March 1933, using it to power the ORM-50 in two flights on 17 August and 25 November 1933.

Military Rocket Program Begins in 1934: A year later, Parry records that a major military rocket research program was founded near Moscow which led to a 19 May 1939 firing of a two-stage test model designed by J. A. Merkulov. During World War II Soviets gained fame from their airplane-launched air-to-surface rockets and from surface-to-surface rockets fired from Katysha launchers.

Role of Germans in Soviet Union: Before moving on to modern Soviet missile and spacecraft developments, Parry pauses to discuss the role of German Scientists and engineers in Russian rocketry. Much of the information is based on the observations made by Helmut Groettrup, who headed "2,000 captured or enticed German rocket and missile specialists" into the Soviet Union after the war. Parry writes that only a few Soviet rocket research teams were composed solely of Germans; however, there was one that worked on an IRBM up until 1950 to 1952. "The Russians then froze the delivered design, removed the Germans from the job, and went on with the work of building and testing the IRBM for the next five years."

Relations between Soviet and German scientists were reported as cordial but cool to "the end", which came in 1954 when the last of the Germans were separated from Soviet rocket work. In mid-1955 L. Sedov, leading Soviet rocket expert, is quoted as asserting "I know of no German specialists in Russia working in this field." Folowing a 2½-year "cooling off period", designed to make the Germans "forget all they had done for Russian rocketry," most of the engineers and scientists were returned to Germany. A few, however, were forced to stay, especially those who possessed a broad picture of the vast Soviet rocket and space program (most Germans worked "in such narrow zones that they at the time failed completely to see the main implications of Moscow's rocket program and achievements").

The last handful of Germans left in early 1958. They were "given a Lucullan farewell banquet by their guards. Toasts were raised to Soviet-German friendship and to further successes of both Soviet and German science. Suits, made in Berlin on a special Soviet order, were flown to Sukhumi. Russian fur coats and leather overcoats were also issued. A final payment of 15,000 rubles were given each German. Then the entire group, in railroad sleepers, were sent to Moscow. From here, with no chance for them to meet with the Bonn embassy staff, they were routed--via Brest-Litovsk and Warsaw--to West Germany. At the Soviet-Polish border the Russian officials examined the repatriants' baggage perfunctorily: 'Do you have Russian money on you? Ah, silver; it's yours. Here is your passport. Danke schoen.'"

It is interesting to read that, in the opinion of these experts, Russia owed perhaps 8 to 10 percent of their successes to the Germans; "90 to 92 percent of (overall rocket achievements) may have been Russian merit alone."

"Red Rockets as Artillery": Chapter 9 provides a capsule of rather well known thoughts on Soviet IRBMs and ICBMs, their performance, and location of some launching and testing bases. Although no startling information is contained in the chapter, it does summarize the type of knowledge appearing from time to time in U. S. and Western European open literature. Some details are given of the new Soviet Rocket Command, established by the recently deceased Marshal Mitrofan I. Nedelin.

Missile Threat from the Sea: Two chapters are devoted to Soviet underwater-launched missiles, surface ship-launched missiles, and the ships on which missiles are installed. Parry says that "it is known that today a Soviet submarine tows three missiles and a launching canister. The missile is loaded into the canister as a shell is put into a mortar gun. When the launching site is reached, the canister at the missile's end is filled with water to make the missile stand up vertically; gyro stabilizers are used to hold the canister in a comparatively steady position. Soon after the firing, the canister (or, as some of our experts call it, chamber) breaks away from the submarine."

Parry divides Soviet submarine-fired missiles into two categories, underwater-to-surface and underwater-to-air, and gives some details on several examples (Golems 1, 2, and 3; J2; Comets 1, 2, and 3).

Passing on to the missiles launched from surface ships, Parry reports 27 cruisers are fitted with Talos-type SAMs. He adds that these same cruisers were to have been fitted to fire IRBMs, but that plans to do this were abandoned. Indeed, according to a statement by Khrushchev, the Soviets find it no longer feasible to use cruisers ("....it is nonsensical to have large warships nowadays").

In analyzing the Soviet missile threat from the sea, two conclusions are drawn: (1) Red ballistic-missile launching submarines have preceded American models by periods varying from six to nine months, and (2) the Soviet undersea fleet is much larger than ours (estimates run from 450 to 575 U-boats).

Sputniks: Events leading to the launching of Sputnik 1 are well summarized: Parry continuously underscores the fact that the Soviets had, since mid 1955, virtually assured the world that it was working on an ambitious satellite project. Leonid Sedov, head of the Interdepartmental Commission of Interplanetary Communications, announced in August 1955:

"Recently in the U.S.S.R. much consideration has been given to research problems connected with the realization of interplanetary communications, particularly the problems of creating an artificial Earth satellite.... In my opinion, it will be possible to launch an artificial Earth satellite within the next two years, and there is a technological possibility of creating artificial satellites of various sizes and weights."

In May 1957, five months before Sputnik 1 was orbited, the astronomical publication of the USSR Academy of Science requested readers "to get

ready for the job of observing the satellite so soon to be launched". A month later, the magazine Radio (monthly journal of the Soviet Ministry of Communications) devoted two articles to radio transmissions from the forthcoming satellite, and gave the frequencies to be used (20 and 40 mc). According to Parry, "these articles were at once spotted by certain lower-echelon intelligence experts in the United States, who immediately sent the gist of the data up to their superiors. But the warning was not heeded."

No new information on Sputnik 1, 2, or 3 comes to light in the book, but good summaries of their characteristics and of scientific findings obtained from them are provided. We learn that since 1947 the Soviets have been studying cosmic radiation with the aid of rockets; by 1951 they were able to measure cosmic ray-induced ionization up to over 60 miles. This experience was found most applicable when it came time to instrument the Sputniks. In April 1960 Vernov and Chudakov were awarded Lenin prizes for their radiation and magnetic field researches based on findings from these satellites. Needless to say, no mention was made of Van Allen.

"Dogs in the Sky": Parry devotes an entire chapter to Russian dog-carrying rockets and satellites. Work in this field is reported to have begun as early as 1951, when two dogs were flown to around 60 miles; by May 1957 altitudes of over 130 miles were common, attained by rockets carrying up to 4,850 lb of payload. Dogs were regularly recovered from their space voyages. In November 1957 Sputnik 2 took its passenger Laika ("Barking Girl") out to over 1,000 miles from the Earth at apogee.

To retrieve the animals carried in high altitude rockets, "catapulting wagons" and "parachutes" are employed. The dogs are placed in "special round glass cases in the rocket's forward compartment" which are "automatically detached....at specific heights. After three seconds of free fall, the parachutes open, safely lowering the animals and instruments to the ground." Each glass case is airtight and contains the "instruments of oxygen nutrition" along with the entire apparatus to register the animal's physiological functions during the flight. The so-called "oxygen nutrition" consists of three cylinders (two liters each), fed by a 900-liter reserve tank. The rocket head detaches at trajectory peak (at a speed of less then 1/3 mile/sec). When it has fallen to some 50 miles, the right-side "catapulting wagon" with its dog is thrown out. Three seconds later the parachute opens. Then, at an altitude of between 20 and 30 miles, at a speed of 1/2 - 2/3 mile/sec, the left-side "catapulting wagon" with its dog is detached, and free-falls to about 2 miles (at which altitude the parachute opens).

Manned Space Flight: Following a discussion of the Sputnik 2 - Laika experiment, a chapter is devoted to man into space. It reviews Soviet medical literature and statements made by a number of experts in the field of bioastronautics. While Parry concludes there is a "man-in-space" training program going on in the USSR, he is not able to pinpoint a specific program like the US Mercury. He speculates that the fourth Sputnik launched in May 1960 may have carried a live passenger.

Lunar Probing: Chapters on lunar probes (the "Luniks", or "Lunniks" as the Russians prefer) provide good accounts of our knowledge of Luniks 1, 2, and 3. One item coming from a Czech magazine late in 1959 describes the Lunik carrier vehicles as producing 600,000 lb thrust, consisting of 400,000 lb in the main engine and 200,000 lb in two auxiliary engines that were ignited at an altitude of 2,000 meters. Propellants were liquid oxygen and hydrocarbon with boron additive. For a second stage "a modified IRBM" was used, which "parted from the booster two and one-half seconds after ignition. The same interval was observed for the third stage. This pause gave each stage an opportunity to achieve its full thrust."

Other details given by the article include:

"Tungsten lined the exhaust nozzles and combustion chambers. Burning temperature approached 3,200 degrees Celsius, yet the rocket fuel acting as a coolant, by circulating through special channels around the combustion chambers, kept the temperature of the combustion chamber walls and exhaust nozzles at a level below 600 degrees Celsius. The flow of the coolant fuel was regulated by thermocouples. The coolant, when warmed, returned to the fuel tanks and once more was mixed with the cold fuel.

"Magnetic needle valves, controlled by perforated program cards, were among the equipment of the injectors for fuel and oxygen in the third-stage rocket motor. In all three stages, the fuel pumps were driven by steam turbines. These, in turn, were driven by diverting burning gases from the combustion chamber.

"All pre-launching functions were automatic. A special compressor was employed at launching. The Lunik's trajectory had previously been fed into perforated aluminum cards. The latter, with the help of two electronic computers, directed the rocket's third-stage guidance system.

"The Lunik was fired from a base near the shores of the Aral Sea in Russian Central Asia, a short distance northeast of the town of Aralsk. Thirteen ground stations, one of them main and twelve auxiliaries, stood ready throughout Russia to monitor the Lunik. All thirteen were interconnected by cable and equipped with three systems: Doppler, radar, and phototheodolite instruments."

"Lunar Cities": The chapter entitled "Lunar Cities" cites a number of proposals developed by Soviet scientists for lunar bases and large settlements, and reviews some Soviet theories about the nature of the lunar surface and subsurface, crustal movements, life, etc.

"Beyond the Moon": Advanced spaceship and propulsion proposals are summarized in this chapter. There is no limit to man's ultimate abilities to explore the universe according to the Russians; Shcherbakov goes so far as to say that one day it may be possible to fly "not alone to the other stars of our own galaxy, but perhaps to other galaxies, too".

The "Tungus Mystery": Without doubt the most fascinating chapter of the book has to do with the so-called "Tungus Mystery", the unkown circumstances surrounding a tremendous explosion that occurred in the wastes of Siberia on the morning of 30 June 1908. According to Parry, Soviet scientists and science enthusiasts have, since 1946, continuously been asking the question: Was the giant messenger a meteorite from space or perhaps rather a spaceship from some other planet? It has been proposed that during a landing attempt the spaceship exploded because of certain tragic circumstances that the crew was unable to foresee.

Speculation, which has grown to become controversy, arose from the fact that while a huge area of devastation was discovered in the wilds of Siberia (and has been the target of many expeditions from Tsarist times), no evidence has been unearthed to prove it was caused by an impacting meteorite. However heated the arguments may be in the pages of Soviet journals, there are three points regarding this mystery on which everyone seems to agree: (1) the Tungus explosion is a mystery, awaiting a complete scientific explanation; (2) its force has no parallel in the known annals of our planet; (3) it is lamentable that the Tsarist Government of Nicholas II failed to explore the site of the explosion immediately after it occurred. It must be added that even the Soviet Government (until very recently) has not thrown significant research talent into the solution of the enigma. Only on the 50th anniversary of the explosion, in June 1958, was a well organized team of geologists, chemists, geochemists, astronomers, physicists, and other specialists sent by the Academy of Sciences into the Tungus region. In the Summer of 1959, a second expedition explored the area, followed by non-academy expeditions in the Summer of 1960.

According to top Soviet scientists, if the Tungus devestation had been caused by a meteorite, the size of this meteorite must have been tremendous, at least several thousands of tons and probably (in the view of Academician Vasily G. Fesenkov) many millions of tons. The force of the explosion was probably equal to about one million tons of man made explosives. F. Zigel wrote that it was impossible to argue "the facts that the explosion was equal to that of several tens of atomic bombs".

The impact of the explosion was so great that it produced air pressure waves throughout Asia and Europe, which were registered as far west as London. The director of the Kew Observatory noted that, in addition, there was an unusual airglow over England at midnight following the Siberian explosion. Professor Kirill P. Florensky, a geochemist, records that many seismological observatories in the world registered subterranean jolts emanating from central Siberia, and also states that during the three nights following the Tungus explosion there was hardly any darkness in Europe, North Africa, Central Asia, and Western Siberia (great luminous clouds were seen thousands of miles from the Tungus area; there was also a strong murkiness in the upper strata of the Earth's atmosphere).

On the night of the great explosion many people "saw the fiery body as it sped at a fantastic rate across the skies, leaving a luminescent trail

behind it, from south toward north until it descended over the Taiga near Vanavara, a tiny trading post on the Podkamennaya Tunguska shore. A number of terrified on-lookers saw its shape as elongated: like a huge chimney, some said; resembling an enormous log, thought others." The explosion came with an energy estimated conservatively at about 10^{21} ergs, a force equal at least to that produced by the greatest natural catastrophes known to man: volcanic earthquakes, the most severe hurricanes, etc.

For distances of 20 to 30 miles from the site of the blast houses were shaken, glass broken, animals and people knocked down, etc. "At the fartherest known point.....at a place 50 miles south of the blast, a farmer named Semyonov was sitting that morning on the high porch of his house when he saw a great light of fire in the North. A hot wave came over him, and he feared his clothes would catch on fire. The light was gone, and oppressive darkness came momentarily, then a tremendous explosion sounded, and this threw him from the porch to the ground. He was knocked down unconscious, and when he awoke he saw ruins where his house had stood a while ago." A huge forest 700 to 800 square miles in area was totally devastated, and the sound of the explosion has been reported as deafening 400 miles away.

Despite all this, "there was no definite report of a crater, either at the time or any point since 1908". Furthermore, no metal or stone pieces of a possible meteorite have ever been found since the explosion, either by local Siberians or by visiting scientists.

The first official Soviet expedition to the Tungus area occurred in 1927, although its leader, Leonid Kulik had visited there in 1921 as a side trip during an Academy of Sciences meteoritic expedition to other parts of Siberia. At that time he had distributed 2,500 copies of a questionaire which were distributed to witnesses of the great explosion. During the 1927 expedition, Kulik (a foremost mineralogist and meteoritic expert) discovered that the rotted trees killed by the explosion were established in a curious radial fanlike pattern, tops pointing outward, the roots all toward a common center. Inexplicably, at the so-called common center many surviving trees stood upright; no crater whatsoever could be discovered. In the swamp where the explosion occurred a number of small pits were found, the largest being filled with water. Kulik and his men drained some of the water-filled holes, and drilled deeply into them but found nothing but peat and more water; no vestige of meteoritic remains could be discovered.

Kulik's group made four expeditions into the area, and even had to help build a 62-mile access road from a trading post to facilitate explorations. By 1938 aerial photographs had been taken of the central part of the striken forest, and some mapping occurred. This ended all efforts prior to the war.

During the postwar years expeditions were dispatched which resulted in the discovery of tiny globules of metallic iron as well as samples some five millimeters in size containing 7% nickel and 0.7% cobalt, plus

vestiges of copper and germanium (along with the iron). This, to many, seemed to prove a meteoritic origin of the crater; however, in 1958, Alexander H. Kazantsev presented a new set of arguments in favor of the spaceship origin. These are quoted below:

"One: No remnants of a meteorite, small or large, were ever found in the Tunguska area. The analysis of the soil samples done in 1957, far from proving any meteorite origin, completely vindicates the advocates of the spaceship theory. Iron containing nickel and cobalt? Why, that was a splinter off the nickel-and-cobalt steel shell of the spaceship! Traces of copper and germanium 'Quite naturally,' agrees Kazantsev. 'Remember that the ship must have had electrical and technical instruments, also copper wires, and surely means of communication--semiconductors containing germanium.'

"Two: No crater was ever found in the Tunguska area. And yet, according to estimates by astronomers, the meteorite (had there been one) must have had a mass of a million tons and travelled at the speed of 18½ to 37½ miles per second. It should have created our planet's largest crater--had it been a meteorite.

"Three: The advocates of the meteorite theory never satisfactorily explained the fact that, at the very center of the Tunguska explosion, some taiga forest remained intact, but with broken branches and with burns at points of such breaks.

"Four: The strange rays piercing thick clouds observed on the several nights following the Tunguska explosion were not typical of meteorite falls.

"Five: Nor was the picture of the explosion, as described by closest eyewitnesses on that June morning of 1908, usual for a meteorite: the fiery pillar with black smoke, going up into the cloudless sky, there to become a black mushroom.

"Six: The mushroom cloud, from what we know since Hiroshima, surely should make us think of an atomic explosion. And that is what the Tunguska blast of 1908 may in fact have been: an explosion of an interplanetary ship motivated by atomic power."

In bolstering the argument for an atomic spaceship catastrophe, Kazantsev accounts for the absence of the crater on the basis that the spaceship exploded in the air. Here is how he describes the situation:

"The explosion wave rushed downward, and the trees directly below the point of the explosion remained standing, having lost only their crowns and branches. The wave burned the points of those breaks on the trees, and hit the permafrost, splitting it. Underground waters, responding to the tremendous pressure of the blow, gushed up as those fountains seen by natives after the explosion. But where the explosion wave struck at an angle, trees were felled in a fanlike pattern.

"At the moment of the explosion, temperature rose to tens of millions of degrees. Elements, even those not involved in the explosion directly, were vaporized, and, in part, carried into the upper strata of the atmosphere where, continuing their radioactive distintegration, they caused that luminescent air. In part, these elements fell to the ground as precipitation, with radioactive effects."

The Soviet aircraft designer A. Yu Manotskov brought in the science of aerodynamics and trajectories to support the spaceship theory. According to him, the body was approaching our planet at a speed not typical for meteorites. He feels it significant that as it neared the Earth "it braked its speed to 0.7 kilometers per second..." (1,500 miles an hour, approximately). In order for a meteorite to have done the damage recorded, approaching at that speed, it would have had to weigh not a million tons but several billions of tons. "The size of such a meteorite...would have been more than one kilometer in diameter, and such a meteorite would have certainly covered the whole sky...and certainly, such a tremendous body could not have disappeared without a trace."

Some of the arguments for the spaceship theory border on the fantastic. One hypotheses has been promoted that an interplanetary rocket coming to this planet may have consisted of anti-matter, and when it reached our atmosphere reacted explosively with it.

Whatever the truth may be, one can summarize this present state of affairs by the statement of I. T. Zotkin, astronomer and member of the Florensky 1958 Expedition: "all members of the expedition unanimously concluded that (the area of the 1908 explosion) is not a meteorite crater and holds not a single trace of a meteorite crash against the ground."

In the last few years the nuclear explosion theory (whether it was caused by a spaceship or not) has gained added credence, since for the first time the soil in the explosion area has been carefully tested for radioactivity. More and more Soviet scientists are coming to the conclusion that the explosion was atomic in nature but not necessarily man-made. Some go so far to say that a collision with an asteroid occurred.

Even more recently, a theory has emerged that a crater may one day be found. Prof. Kirill Stanyukovich, the well known Soviet astrophysist, has shown that the center of the ballistic wave explosion and the place where the remnants of the meteorite finally strike the ground may not necessarily coincide. "Such remnants having fallen at a much more diminished speed than the meteorite had traveled before its ballistic wave explosion, and a small crater possibly having been formed by this fall, this crater may well lie a long way from the place where that Tunguska forest was demolished, and where most of the previous searches had been made." Despite this, expeditions have searched out to 500 miles from the center of the explosion and found not a trace of a crater or any meteorite ores. Modern scientists are even denying that the tiny amounts of meteor type ores found (iron and the nickel-cobalt-germanium globules) were not meteoritic but "secondary dirt-formation".

The last expedition reported by Parry was headed by Dr. Gennady Plekhanov on the staff of the Betatron Laboratory of the Tomsk Medical Institute. He and his researchers covered more territory than any explorers before them, taking more than 300 samples of soil scores of miles from the epicenter of the 1908 explosion. They brought out nearly 100 plants to be tested for radioactivity and nearly 80 samples of ashes for similar analysis. Dr. Plekhanov showed that "in the center of the catastrophe radioactivity is 1½ to 2 times higher than along the 30 or 40 kilometers away from the center". He could offer no explanation for the radioactivity.

SOVIET CONTRIBUTIONS TO THE XI INTERNATIONAL CONGRESS. The following is a brief summary of the Soviet papers presented at the XI congress.

S. N. Vernov: The Exploration of Outer Space: Discussion of radiation in the vicinity of the Earth and the results of investigations carried out with Soviet Sputniks and space probes.

A. A. Mikhailov: On the Reverse Side of the Moon: Discussion of the third interplanetary rocket launched by USSR which successfully photographed the reverse side of the Moon. Some details of how this feat was accomplished are given and the appearance of the reverse side of the Moon is discussed with regard to its difference from the visible side. Various theories for this difference are also discussed.

A. Sh. Dalginov et al: Studies of the Magnetic Field of the Earth and the Moon:

1. Brief information about instrumentation and means of detection and measuring the field.
2. Results of measurements of the Earth's magnetic field in the outer radiation belt.
3. Exploration of magnetic effects observed in the outer radiation belt.
4. Measurements of the Moon's magnetic field.

T. N. Nazarova: Results of Exploring Meteoric Matter with Instrumentation of Sputnik III and Space Probes: Detailed discussion of meteoric impact experiments carried out by Sputnik III and the Soviet space probes. Results obtained were used to determine the density and distribution of meteoric matter in the vicinity of the Earth.

Guth Vladimir: Calculation of the Impact Point of the Carrier Rocket: A simple, approximate method for the calculation of the impact point of the Lunik II carrier rocket on the Moon surface, using the orbital elements of the container, was elaborated. As a result of the calculation the impact point was obtained in selenocentric coordinates.

V. T. Krassovsky: Some Problems of Physics of the Upper Atmosphere: A detailed discussion of the effective means of exploring the upper atmosphere by spectral analysis as carried out in the Institute of Physics of the Atmosphere under the USSR Academy of Sciences in connection with the International Geophysical year.

FROM ROCKETS TO RUBLES: The report by the Soviet press agency Tass that the Soviet Government has decided to revalue the ruble in terms both of gold and of the United States dollar could be the heralding of a new offensive in the battle for world supremacy. Under the decree announced by Tass, the new heavy ruble to be issued January 1 apparently will be equal to 0.987412 grams of gold.

The ruble-dollar exchange rate has been established as ninty kopecks per one United States dollar, therefore, the new ruble will be worth $1.11.

The actual significance of this development is the Soviet Government may be laying the groundwork for making the ruble an international currency. Should the Soviet Union at some later date make the ruble a convertable currency usable in international trade and financial transactions, it would represent attainment of a long cherished Soviet dream. That dream has been to attain the economic strength to permit the ruble to challenge the dollar for primacy among world currencies in international economic life.

The decision to revalue the ruble seems to have been prompted by the recent difficulties of the dollar in the London gold market which has been dominated in the past month by trading in which an ounce of gold has sold substantially higher than the $35 official United States price.

A more vivid example of the impending economic battle is the recent complaint by M. J. Rathbone, president of the Standard Oil Company (New Jersey) in which he deplored the Soviet Union's thrust into Western markets with cut-rate oil. Mr. Rathbone singled out the Italian-Soviet barter deal which he said was completed for all practical purposes, as an example of the Russian oil thrust. He said that the oil would be traded at the equivalent of $1 a barrel, f.o.b. the Soviet Union, chiefly for Italian 40 inch pipe. The comparable f.o.b. price for U. S. oil would be $2.75 and for Middle Eastern oil it would be $1.85, he said.

As free world progress in space science gradually takes the sting out of the sputniks, it may observe a switch on the part of Soviets in cold war tactics from "rocket rattling" to money bag jingling.

DID THE LAST SOVIET SPACE ATTEMPT END IN TRAGEDY? Informed sources believe that the Soviets attempted a spectacular space shot, as anticipated during Premier Khrushchev's stay in this country, which ended in failure and the loss of their missile chief Marshal Mitrofan Nedelin. It was reported earlier that Nedelin was killed in a plane crash October 24, but intelligence officials believe he and other Rocket Command officers and missile experts - perhaps a hundred or more - were killed by a rocket explosion. It is believed the mishap occurred somewhat earlier than October 24 which would tie it in with the Khrushchev visit of late September and early October.

Hints that the Soviet Union was planning a new diplomatic space feat came on September 14 while the Baltika (Khrushchev's ship) was crossing the Atlantic. Two Soviet ships - a large tugboat and a tanker, both heavily instrumented - were spotted in the north central Atlantic. At the same time, three Soviet ships that had been used in long range missile firing tests were seen moving toward their usual target area, 1,000 miles southwest of Hawaii.

SOVIET LEAD SEEN IN A SPACE STUDY. A Government report said Thursday the Russians might lead the West "in the study of the effects of cosmic radiation on life in outer space."

"But," the report added, "they are five to ten years behind the West in certain aspects of experimental cosmic ray physics."

The report was prepared by an unidentified agency, apparently the Central Intelligence Agency, and distributed by the Commerce Department. It said Soviet work on radiation from space "does not have the breadth, flexibility and imagination of the Western efforts in this field."

But, the Commerce Department said, "the report recognizes the likelihood of a Soviet lead over the West in the study of the effects of cosmic rays on organisms because they have had available rocket vehicles and effective propulsion systems enabling them to use animals to test life-sustaining systems in space to a greater degree than have the scientists in other countries." (New York Times, November 19, 1960)