5. Radical New Research

Science is an amazing creation of the human mind, and the science community worldwide devotes its energies to its advancement. That sounds fine, but there are problems to consider. One of the most important is the demarcation between scientific and nonscientific forms of thinking in establishing knowledge of the world about us. Of course, the aim of science is to gain scientific truth, but scientists do not have any special claim to say what is true. There exist only research standards that demand the validity of results. Not every scientific statement is a correct one, although science has developed a system of freeing itself from false but scientifically credible statements. This system is called peer reviewing. But sometimes this system works as a "voting machine" that eliminates not only ideas that are too silly for serious consideration but also those that are considered too novel for the current paradigm. Nevertheless, it is due to this system that science makes constant and reasonable progress and is not just rushing about between different and mutually inconsistent positions.

Yet this progress is being achieved under certain social and cultural conditions. Because resources allocated by society for the needs of the scientific community are limited, money will go to those scientists working on subjects within the accepted paradigm. So the lion's share goes to the "socially strong" scientists – to those with good contacts in the established institutions that allocate the money. This applies especially to the so-called "big sciences" of the twentieth and twenty-first centuries, such as particle physics and molecular biology. Big science is science needing big money to function, and this can only come from government institutions and large corporations, which are advised by the science establishment. Not unexpectedly, under such circumstances, the search for scientific truth may at times be relegated to the background.

The Soviet scientific community was *very* bureaucratized and therefore very dependent on the intellectual and moral integrity of

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individual scientists. In that system a truly gifted scientist could pay all his or her attention to research and make really important discoveries without being distracted by the need to fight for research grants.[1] At the same time, more mediocre colleagues could also find suitable niches in the system, strangling (or at least exploiting) the gifted scholars. This feudal system of Soviet science was built under Stalin and remained practically intact until the very disintegration of the Soviet Union. The Academicians (that is, full members of the USSR's Academy of Sciences) were not just equal fellows of the scientific community. They were, first of all, the bigwigs of science, both disposing considerable amounts of money and controlling the system of rewards, such as higher degrees and prizes and the appointments of directors of research institutions. Right behind the full members of the USSR's Academy of Sciences followed in descending order corresponding members of the same Academy, full members of Academies of Union Republics, and so on. More often than not, the personal qualities of an Academician determined the whole atmosphere in the research field he or she was in charge of. If the Academician was an honest and talented person much good might be done, including the advancement of science; otherwise the harm done might be immeasurable. All the enormous achievements and no less enormous failures of Soviet science and technology were due to this system.

In theory such a system might have collapsed very swiftly, with rapacious dullards eliminating all the gifted people and occupying all the profitable positions in science. But in practice this did not happen. The number of true scientists in the Academy of Sciences of the USSR always remained considerable. This was due to two factors. First, in the 1920s and 1930s, there remained in the Academy a considerable layer of scientists who had become its members before the October coup d'état of 1917. As a whole, they maintained high intellectual and moral standards. Academician Vernadsky was an outstanding example of one of these. The second factor was the crucial role of nuclear physics in military technology after World War II. Biology did not look too important to Stalin and his mob and could be sacrificed in the name of Marxist theory. After all, Academician Trofim Lysenko solemnly promised the highest authorities of the USSR to develop a new and purely Marxist biological science that would be extremely effective and would help to breed an

unbelievably high-yielding wheat. The attempt to do so appeared worth trying, although it meant liquidating classical genetics in the country. Even if the promise failed (as it did), at least representatives of the other sciences would understand who was boss. But Stalin did need the atomic bomb, which was impossible to make without real science. It couldn't be done with ideological incantations. Both Joseph Stalin and the chief of the Soviet secret police, Lavrenty Beria, who supervised the atomic project, realized this. They also understood that a dull scoundrel pretending to be a real scientist would not understand the equations of quantum mechanics and be able to use them appropriately.

Of course, freedom for the Soviet scientist in his research work was limited. While he or she was engaged in solving a problem that the State had ordered (say, developing a new thermonuclear charge) the scientist was free to pursue this search and well rewarded for success. The scientist could also put into his or her plan of scientific research work (for a five-year period, or for a year or a quarter) the themes that were of personal interest, provided this did not divert attention from the "main" task, even though rewards for successes in such fields were more modest.

However, any attempts to look into "forbidden" fields (such as conventional genetics under the reign of Academician Lysenko or problems of cybernetics in the years when it was considered in the Soviet Union as a "reactionary pseudoscience") were stopped immediately and resolutely. In the 1980s, according to official statistics, about a quarter of all scientists in the world worked in the USSR, although its population did not exceed one-twentieth of the world. Every morning, hundreds of thousands of Soviet scientific workers entered the doors of their scientific research institutes and continued to examine the recommended, or at least allowed problems. In fact, most of them were just skilled fitters at a scientific assembly line, something not foreign in other countries too.

So this "silent majority" was occupied with scientific routine, accumulating small pieces of information about the world we live in. This is necessary in itself – where else would the science geniuses find empirical data for their generalizations – but for some individuals it was not enough, and they were constantly searching for problems that would be interesting to them personally. Science had originated from simple human curiosity about the inner nature

of the world around us, and only recently has it become important for production in modern society, losing simultaneously much of this early spirit of free enquiry. The Independent Tunguska Exploration Group (ITEG) that became the center of Tunguska studies for several decades arose from just this thirst for an unrestricted scientific quest. It was born half a century ago as a union of people who gathered together of their own free will, and it remains such a union.

These people proved to be gifted and purposeful. The ITEG is in some sense an exemplary scholarly community, since its members are untouched by thoughts of material or social reward for their work. On the contrary, they have spent their free time and monies earned elsewhere to satisfy their scientific curiosity concerning the enigma of the Tunguska catastrophe. What is even more important, ITEG members have been satisfying this curiosity at a highly professional level. The ITEG has become a new research organization devoted to the scientific investigation of a hard-to-solve interdisciplinary problem.

So the "inner" impetus for organizing the ITEG came from a wish for freedom of scientific investigation. But were there any other influences? Certainly, yes. It was Alexander Kazantsev's idea that the Tunguska space body (TSB) had been an extraterrestrial spaceship that prompted hundreds of professional scientists to work in this field. The launch of the first *Sputnik* in October 1957 also played an important part in this process. Just two weeks before this historic event, none other than the former British Royal astronomer Sir Harold Spencer Jones solemnly declared: "Space travel is bunk." But this first step into space made people understand that ideas that formerly looked "absurd" might in fact become a real part of life. Physicists, mathematicians, rocket engineers, and other professionals who formed the ITEG approached Kazantsev's hypothesis with rational interest. At first they simply wished to "find fragments of a spaceship," but then, when it turned out that somehow such a thing was lacking in the Tunguska taiga, their research orientation changed. Since then the ITEG has been investigating all possible traces of the Tunguska phenomenon.

A new stage in Tunguska investigations started when two teams of young Siberian scientists and engineers independently and simultaneously took an interest in the problem of the Tunguska "meteorite." These people lived and worked in the city of Tomsk,

known as the "Siberian Athens." In 1878 the first university in Siberia was established in this city. By the end of the 1950s it had developed into one of the largest scientific and military-industrial centers of the region. With its population of only 250,000 there were some 25 scientific research bodies and 6 colleges, plus the State University and the Siberian Integrated Chemical Mill, which produced weapons-grade plutonium.

In October 1958 Victor Zhuravlev, a postgraduate student of Tomsk University (see Figure 5.1), visited Moscow, where he met Evgeny Krinov and Alexander Kazantsev. By that time, Krinov was already Deputy Chairman of the Committee on Meteorites of the USSR's Academy of Sciences (KMET) and Kazantsev a famous Soviet science fiction writer. Zhuravlev told them of his idea to arrange a "scientific-tourist" trip to Tunguska, and both the astronomer and the writer approved. Krinov even gave Zhuravlev a photocopy of a map of the Great Hollow and recommended that the group should try to reach the eastern border of the fallen forest area,

FIGURE 5.1. Dr. Victor Zhuravlev, a founding father of the ITEG – Independent Tunguska Exploration Group – near the epicenter of the Tunguska explosion (the ITEG expedition of 2001). Behind him one can see a "telegraph tree" – that is, a dead tree scorched and devoid of branches in 1908 as a result of the explosion, but still standing upright (*Credit*: Konstantin Shkutov, Vanavara, Russia.).

though it was still not clear where this was. The map was rather rough, but in the late 1950s it was valuable. At that time detailed maps of various regions of the Soviet Union were strictly secret.

About the same time in 1958 Gennady Plekhanov (see Figure 5.2), who worked both as a physician and as an engineer at the Betatron Laboratory of Tomsk Medical Institute, was wondering why nobody had tried to measure the radioactivity at Tunguska. If a nuclear explosion had taken place in 1908, there should still be a higher than normal level of radiation at the site of the event. Scholars, journalists, and writers had argued in newspapers and journals about this, but somehow no one had tried to check it in the field. Being experienced in measuring radioactivity, Plekhanov decided to invite some friends to go to Tunguska to settle the question once and for all. The Betatron Laboratory lacked portable radiometers, but it was rumored that the Geophysical Department of Tomsk Polytechnic Institute possessed

FIGURE 5.2. Dr. Gennady Plekhanov, the Commander of the ITEG (*Source: The Tunguska Phenomenon: 100 years of an unsolved mystery.* Krasnoyarsk: Platina, 2007, p. 44.).

such equipment, so Plekhanov visited the institute. The Geophysical Department's workers said that just a few days ago other interested people, Victor Zhuravlev and his friend Dmitry Demin, had come asking to borrow portable radiometers for a trip to Tunguska. Very soon, the two groups united to form the ITEG, which initially consisted of 12 people. So was the ITEG born. Gennady Plekhanov, then 32, became the chief of the group.

When preparing the first expedition (the ITEG-1 expedition), planned for the summer of 1959, Gennady Plekhanov, who his team called the Commander, got support from the local Party and State authorities both in Tomsk and Vanavara. Without this help it would have been difficult for them to work in the taiga. Only five years had passed since Stalin's death, and there were still concentration camps in Siberia, mainly empty but ready for any "enemies of the people." But Nikita Khrushchev's "thaw" was developing, and real people serving the monstrous state system were coming out from under its weight. When aware that the young scientists were going to the taiga to search for the remains of a hypothetical spaceship, even high-ranking Party bureaucrats began to look human and did their best to help the Tunguska researchers.

However, the expedition needed mine detectors, since in the late 1950s there still was hope that pieces of the TSB could be found with such simple instruments. (Leonid Kulik had written that some Tungus people had seen in the Great Hollow "some small pieces of silvery metal.") The military refused to give the ITEG members the detectors, which they said were secret and not available to civilians. The director of the factory producing the mine detectors told the KGB that "suspicious people" were looking for secret equipment. He wanted to know how they knew that his plant made such things? Plekhanov was summoned to Tomsk's city KGB office: "Everything that you happen to discover in the taiga will have to be immediately passed to us," they said, "especially if it is something from outer space. And a list of the expedition participants must be submitted for our approval. We forbid you to take anybody into the group without our explicit permission." Naturally, the Commander had to make a list of participants for the KGB. Strange though it may seem, that was all: the Committee for State Security neither gave permission nor prohibited the expedition to the taiga. So they left Tomsk with no official approval from the secret police. As for mine

detectors, Plekhanov got some by asking the Rector of the Medical Institute Dr. I. V. Toroptsev to send an official letter to the Commander of the Siberian Military District, asking him to provide them. Some other organizations – especially Tomsk Regional Tourist Club – also helped the researchers. So the ITEG's first expedition was something like a walking tour to the taiga.

The "reconnaissance detachment," consisting of Gennady Plekhanov and Nikolay Vasilyev, left Tomsk for Vanavara on June 30, 1959, on the 51st anniversary of the Tunguska explosion. They had to inspect the route and talk with local authorities in Vanavara about aid for the expedition. (Coincidentally on the same day the American physicist Giuseppe Cocconi had sent a letter to British radio astronomer Sir Bernard Lovell, founder and director of the Jodrell Bank Experimental Station, asking him to use the world's largest steerable radio telescope to search for radio signals from extraterrestrial civilizations. Sir Bernard thought that such a search did not justify the use of the radio telescope, but that letter led directly to the start of the "SETI programs" – the search for extraterrestrial radio broadcasts, a scientific line of activity that has been extensively developed in the United States and elsewhere.)

When Plekhanov and Vasilyev arrived at Vanavara a large forest fire was raging around the settlement, and the expedition helped the native people to fight it. Ten days later, 10 other explorers joined them. In Vanavara they talked with local inhabitants, including some living eyewitnesses of the Tunguska phenomenon or their descendants. Then the expedition slowly followed Kulik's path, measuring levels of radioactivity at various points and examining the ground with mine detectors. They expected to find some fragments of a gigantic iron meteorite – or to make sure that there were no such fragments at Tunguska. By the end of July the group reached Kulik's former base at the foot of the Stoykovich Mountain. A wall calendar in a house, built some 30 years earlier, informed them that today was August 31, 1930, instead of July 31, 1959. A whole historical period had passed since Kulik visited this place.

The ITEG-1 expedition worked in the Great Hollow for 38 days, looking for abnormally high levels of radioactivity and material traces of the TSB, as well as examining the fallen forest for traces of the Tunguska forest fire of 1908 and the accelerated growth of trees. Samples of peat were taken from the swamp, and samples of

wood were taken from the trees that had perished in the catastrophe and also from those that had survived. As we now know, no parts of the TSB were found. The taiga had already begun to repair and cover the consequences of the Tunguska explosion, although even half a century afterward the devastation remained discernible.

Despite the failure of the ITEG-1 expedition to find fragments from a meteorite – or a spacecraft – it did make two important discoveries. First, the level of radioactivity of soils at the center of the Great Hollow turned out to be twice that of its periphery. The level of radioactivity definitely receded in an outward direction. This was hardly a natural fluctuation. Second, in some soil samples, as well as in the ash of trees, they found an increased concentration of the rare earth elements lanthanum, cerium, ytterbium, and yttrium. Spectral analysis proved this beyond doubt. The important fact here is that rare earth elements are found in nuclear waste after atomic explosions. After the expedition, Victor Zhuravlev tried to draw the attention of specialists to this fact, but these scientists simply ignored the data. They believed that the TSB was a meteorite and therefore elements that do not occur in meteorites, such as the rare earths, cannot have anything to do with the subject. Indeed, the rare earths are not considered by astronomers as elements typical for cosmic bodies, their abundance in meteorites being about 25,000 times less than in Earth's crust. However, the explorers' research did not go unnoticed by the scholarly community and the general public of the Soviet Union and other countries. On August 28, 1959, before the expedition returned from Tunguska, the *Sovetskaya Rossiya* (*Soviet Russia*) newspaper ran an article about the unusual expedition.[2] Many other periodicals, here and abroad, soon reprinted this article. The smell of a true sensation appeared in the air. After returning from the expedition, Gennady Plekhanov found a lot of letters from interested people in the mailbox of the Betatron Laboratory. There was, for instance, a letter from Academician Vasily Fesenkov hoping to hear that the meteoritic crater had at last been found and also a letter from schoolchildren wishing to learn about the Martian space crew that had perished at Tunguska in 1908. And the well-known American newspaper the *Washington Post* asked for any unpublished materials and photographs from the taiga.

In February 1960 Gennady Plekhanov went to Moscow and Leningrad to discuss the results of the summer expedition with

other scientists. First of all, he went to the KMET. Although Academician Fesenkov (the Chairman of the Committee) was absent, Evgeny Krinov and other specialists in meteoritics welcomed him. Even the increased radioactivity interested the astronomers, although they were more interested in the information about the leveled forest, the traces of the forest fire, and possible TSB substances in the soil.

Of course, it was nuclear physicists, and not meteor scientists, who could correctly evaluate the data on radioactivity. Plekhanov succeeded in meeting Academician Igor Tamm, the very scientist who had led Alexander Kazantsev to develop his idea of an extraterrestrial spaceship. Tamm was already a laureate of one Nobel and two Stalin prizes and was considered as probably the most authoritative Soviet specialist in nuclear physics. But as Plekhanov recalls, it was "just a mutually interesting talk between two colleagues."[3] Academician Tamm was fascinated with the measurements of radioactivity at Tunguska and invited the engineer to read a paper on this subject for atomic physicists.

After a short trip to Leningrad (where he got acquainted with Innokenty Suslov, the man who rescued Leonid Kulik in 1927 and whom the Suslov's crater in the Great Hollow was named after), Plekhanov went again to Moscow. There he visited the workshop in the apartment of the physicist Academician Mikhail Leontovich (1903–1981) who ran theoretical investigations in the field of controlled thermonuclear fusion at the Institute of Atomic Energy of the USSR's Academy of Sciences. Leontovich was also regarded by his science colleagues as the "Academy's conscience." For the elite of Soviet physicists, he was a model of honesty and adherence to principle. In the late 1960s and early 1970s, the highest Soviet authorities used to organize and publish in central newspapers "letters of protest" against Academician Andrey Sakharov and other dissidents in the Soviet system. It must be confessed that sometimes even worthy scientists signed such letters. But representatives of the State and Party *never* approached Mikhail Leontovich with such propositions. They knew he would call them all sorts of names. However, when in 1966 Igor Tamm and Andrey Sakharov asked Leontovich to sign a petition in defense of dissidents Yury Galanskov and Alexander Ginzburg, who were convicted on a charge falsified by the KGB, he signed it without hesitation.

Plekhanov recalls that participants of the workshop – some 20 people, mainly nuclear physicists – got together in Leontovich's apartment. They offered him their proposals, advice, and help for further Tunguska work. "Someone said: 'Mikhail Alexandrovich [Leontovich], it seems the guys are able indeed, let's give them two million rubles!' I was astounded. We in Tomsk would have been happy to get ten thousand rubles."[4] Finally, everyone agreed that a hundred thousand rubles would be an acceptable sum. Leontovich immediately phoned Academician Lev Artsimovich, the Secretary of the Branch of Physical and Mathematical Sciences of the USSR's Academy of Sciences, and the matter was settled. The Siberian branch of the academy was ordered to allocate the money for the next ITEG Tunguska expedition.

Preparations for Plekhanov's new expedition, which was to become the largest in the history of Tunguska, lasted the whole winter of 1959–1960. The main difference between the ITEG-1 and ITEG-2 expeditions was the participation of professionals. In 1960, as distinct from 1959, each research objective was assigned to a specialist. The accelerated growth of the taiga was examined by foresters from the Moscow Botanic Garden. In the Southern swamp a large team of specialists worked on the ecology of morasses. Moscow geophysicists measured levels of radioactivity under the direction of Lena Kirichenko, whose life's work was to monitor radioactive fallout after nuclear tests. Several physicists again studied the Suslov and Cranberry craters, as well as the Southern swamp and Lake Cheko (a small lake some 10 km from the epicenter of the Tunguska explosion) with new sophisticated magnetometers to see if Leonid Kulik had missed any magnetic traces. By the way, in 1999, a well-equipped Italian scientific expedition from Bologna University also studied Lake Cheko. In 1960 this attracted considerable attention among skin divers who submerged themselves in the lake, including the future cosmonaut Georgy Grechko, who subsequently participated three times in orbital flights around Earth in a *Soyuz* spacecraft and the *Salyut* orbital stations. But nothing was discovered in the lake.

The ITEG-2 expedition had 73 people working in the Great Hollow for almost two months. Small teams of two to five people would dissolve into the green sea of the taiga, but the paths of all the teams were carefully traced, and the time of their return strictly

controlled. There were then no mobile phones for emergencies. The Tunguska taiga remained a savage woodland with all its dangers, including bears. But thanks to an organized system of accident prevention, there was no serious accident in the forest during all 50 years of ITEG expeditions.

Academician Sergey Korolev, a great rocket engineer and Chief Designer of Soviet spacecraft, was very interested in the work of the expedition. Under his guidance the USSR built its first intercontinental ballistic missile and the first *Sputnik*, as well as launching automatic probes to the Moon to photograph the side that is never turned toward Earth. Even when the first manned orbital spaceship *Vostok* was being tested, Korolev was thinking about future interplanetary flights, and he considered Kazantsev's hypothesis about the crash of an exploding spaceship over Tunguska in 1908 worth some attention. After all, he thought, if this hypothesis was correct and debris of the machine was found, then might some elements of its design possibly be used in terrestrial rocketry? An "enormous meteorite" seemed far less interesting to Korolev. So he actually arranged for a team of 15 scientists and technicians to search the Tunguska site for spaceship debris and also provided them with a specially equipped helicopter.

As no one found any spaceship debris, Korolev lost his interest in the Tunguska problem. The launch of *Vostok* with Yury Gagarin aboard was approaching, so there were more important issues to think about. And in the autumn of 1960 the Siberian branch of the USSR's Academy of Sciences also decided to stop supporting new expeditions to Tunguska. Why did this happen? Probably because the results of the later expeditions, which were well equipped and numerous, were no more successful than those of Leonid Kulik or Kirill Florensky. However, they did confirm that in the Great Hollow there is neither a meteorite crater nor any remains of the TSB. Magnetometric examination of the Suslov and Cranberry craters, as well as of the whole Southern swamp, convincingly demonstrated that there were no large magnetic masses present. Members of the ITEG obtained the same result after using military mine detectors to scan an enormous territory, including the hills surrounding the Southern swamp. True, there was cosmic dust in the soil, but the total mass of the spherules, calculated for the whole Great Hollow, turned out to be just about a ton – too low to be significant. Also, the

presence of rare earth elements was confirmed, but in the opinion of astronomers none of these elements would likely have anything to do with the impact of a meteorite or a comet.

It also seemed that the specter of an extraterrestrial spaceship, so attractive to Academician Korolev and so repulsive to Academician Fesenkov, was again haunting Tunguska. Kirill Florensky and his colleagues from KMET, even having admitted in 1958 that the Tunguska explosion had occurred above ground, could still not believe in their own discovery and were therefore inclined to put the word "explosion" (but somehow not the word "meteorite") into quotation marks. So, according to them, what happened in 1908 over the Tunguska taiga was not an explosion in the full sense of this word. Indeed, how could a meteorite have exploded? For supporters of Kazantsev's hypothesis there was no difficulty in explaining this, but meteor specialists must have pondered the problem. A ballistic shock wave alone was not enough to explain all peculiarities of the area of the flattened forest.

There was also the question of radioactivity. Slight traces were discovered at the site in 1959, but neither Gennady Plekhanov nor his friends from the ITEG had ever dealt with measurements of radioactive fallout in the field, and they could have been wrong in their measurements. However, on the 1960 expedition professionals checked this result – scientists who had worked for years on Soviet nuclear testing grounds at Semipalatinsk and Novaya Zemlya – and they confirmed that the level of radioactivity was higher than normal, though only a little over the range of fluctuations of background radioactivity.

For the sake of the meteor specialists, Gennady Plekhanov, when writing his report on the ITEG-2 expedition for *Meteoritika* annual (*Meteoritics*, the official organ of KMET), explained the increased radioactivity at the epicenter of the Tunguska explosion as fallout from recent nuclear tests. However, repeated measurements carried out 10, 20, and 30 years later did not confirm this conclusion, since the effect has remained about the same, but with time the radioactivity after atomic and thermonuclear tests decreases considerably. Even in Hiroshima just a few years after the atomic bombing, direct measurements showed no noticeable increase of radioactivity.

Finally, the ITEG members realized that one expedition, however large and well equipped, would not solve the enigma of the

Tunguska phenomenon. There was still much work to do, and this work had to be done without direct financing from the Academy of Sciences. The lack of convincing evidence of radioactivity at the site discouraged support from the nuclear physicists, and the missing alien technology from a spaceship –nicknamed "thruster" – was also not encouraging to the Tunguska enthusiasts. But perhaps it was for the best. If the "thruster" had been discovered, the KGB would have demanded that the alien debris be handed over to them. The KGB would then have passed the "thruster" to Academician Korolev or some other significant person, and the territory of the Great Hollow would have been declared a restricted area, guarded and fenced in by barbed wire. A fantasy? Well, perhaps – as regards the thruster – but definitely not regarding the barbed wire.

Luckily enough, this problem did not arise. But ITEG leaders found themselves with another difficult task. How could Tunguska studies be advanced after the Academy of Sciences withdrew its financial backing? Actually they found a quick and effective way out of the situation: the Tunguska Exploratory Group would have to continue its research work in close collaboration with the Committee on Meteorites – the meteor specialists had not as yet lost hope of proving the normal nature of the "Tunguska meteorite," while at the same time disproving the harmful inventions of all those fantasists.

So Kirill Florensky reacted positively to Gennady Plekhanov's proposal that the next expedition to Tunguska must be organized jointly by the KMET and ITEG. The Committee on Meteorites had already allocated funds for a new expedition planned for the summer of 1961, and it now appeared an opportunity to have for the same sum a much larger number of field workers. Kirill Florensky was appointed chief of this joint KMET/ITEG Tunguska expedition. Siberian researchers responded to KMET wishes, consenting to consider closed the questions about radioactivity, for which there was dubious evidence, and the lack of pieces of meteoritic iron, which was definitely correct. Plekhanov and his friends in the ITEG group were going to map the leveled forest and examine the traces of fire as well as search for various chemical elements in the soil and water. Florensky, who followed KMET's line, planned to search for magnetic spherules but did not object to the plans of ITEG to map the leveled forest.

However, shortly before the expedition commenced, his attitude changed and he wrote to Plekhanov: "Scientific researchers in the expedition are only those who are sent in the taiga by the KMET. As for all others (that was all ITEG members), they are just auxiliary workers, bound to carry out implicitly every order of the researchers." Plekhanov replied sharply, pointing out that to solve the problem of the Tunguska phenomenon, it was the ITEG specialists who were needed – their physicists, chemists, biologists, and mathematicians. As for specialists in meteoritics who belonged to the KMET, they had no object of study in the Great Hollow because it was already evident that there was no meteorite to study. He added that if Florensky did not wish to accept complete equality for the two parts of the joint expedition – the KMET's and ITEG's – he and his colleagues would go to Tunguska on their own. Kirill Florensky retreated, and the joint expedition turned out to be a great success.

The number of participants in the joint expedition of 1961 exceeded even that of the previous expedition. There were 51 people from the ITEG and 29 from the KMET, and they remained working at Tunguska from the middle of June to early October. The main aim of this expedition was to look for cosmic dust (first of all magnetite spherules) in the soils of the region. The researchers examined territory covering 10,000 km^2 and took some 150 samples, each weighing 20 kg. At this time the expedition had no helicopter, and the samples had been collected at tens and even hundreds of kilometers from the expedition's base, so they had to be carried in rucksacks. On a bank of the Khushmo River, in the very place where 30 years previously Kulik's expedition had disembarked from its rafts (the so-called Kulik's Pier), they worked night and day to separate magnetic components from the samples before examining these under microscopes.

The chief of the expedition thought the dust produced by the Tunguska explosion must have been driven by stratospheric winds for long distances. And some dust had been discovered. It was a normal meteoritic dust, with its maximum concentration in the soil at a distance of about 80 km to the northwest from the Southern swamp. In its shape this surface structure resembled a tongue, and members of the expedition labeled it the "mother's-in-law tongue."

Alas, it was impossible to determine the date when this dust had fallen. It could go back to 1800 or to 1950. It is known that

cosmic dust falls from the sky intermittently, and its concentration in different places of our planet varies considerably. If the "mother's-in-law tongue" had been reliably dated back to the year 1908, it would certainly have become a good reason for further research work in this direction. Then two questions would have been raised: what was the total mass of the meteor substance that was dispersed in this region after the Tunguska explosion and how could such a substance explode in the way it did? But with no reliable dating, it was premature for a scientist to posit these questions. First, the question that had to be answered was: when did this cosmic dust fall? A convincing answer had to be found. Alas, this did not happen.

Kirill Florensky's final report on the 1961 expedition didn't appear in *Meteoritika* until 1963.[5] During the two years that passed between the expedition and the publication of Florensky's report, he was unceasingly informing the Soviet Union – in newspapers – that the "so-called enigma" of the Tunguska meteorite no longer existed. Soon after his return to Moscow from the taiga, Florensky's articles and interviews appeared in several central newspapers in which the main result of the expeditionary works was proclaimed. It was that the substance of the TSB had been discovered – and "yes," it had been a comet. That autumn, the leading members of the ITEG sent Florensky a lot of indignant letters, refuting his claim. They pointed out that only a month previously he had personally admitted that it was premature to give any final answer to the Tunguska problem. So what had changed? Kirill Florensky maintained silence.

Despite his faults Florensky was a true scientist and a genuine Russian intellectual, and the leaders of ITEG were happy to collaborate with him, even admitting that in some of his articles he "made evident errors and even twisted facts."[6] The most likely cause of Florensky's fear of any deviation from the "Party line" in his investigations could have been the grim fate of his father, the famous Russian philosopher, theologian, and electrical engineer Pavel Florensky, who had been arrested by the NKVD ("People Commissariat of Internal Affairs" – Stalin's secret police) in 1933 and shot in 1937. Since his father was officially regarded as an "enemy of the people," Kirill had not been allowed to enter a university, and he went to the Moscow Extramural Prospecting Institute instead. Only thanks to the support of Academician Vladimir Vernadsky was he able to take up geochemical research and later to

defend his doctoral thesis. Should we blame him therefore for excessive caution when his childhood and youth were spent under the Damocles sword of Stalin's system? Until 1953, members of the families of "enemies of the people" could be subjected to State repression, so Kirill Florensky had been lucky.

Of course, the ITEG's life was in some sense easier than that of KMET. The Independent Tunguska Exploratory Group, though sadly lacking academic funding, was at the same time free from any outside commanders. But any expedition sent to the taiga by the Committee on Meteorites had to report back to the Presidium of the Academy of Sciences. Therefore, the research results and conclusions must have paid due regard to the expectations of the academic chiefs. A disadvantage? Yes, for sure. But also a possible advantage. Because if these results and conclusions happened to coincide with those expectations, the researchers might hope not only for verbal approval but also for more material benefits.

At the beginning of 1962 the Moscow geophysicist and nuclear physicist Lena Kirichenko informed the Siberian Tunguska investigators that Academician Vasily Fesenkov was preparing an official conference of specialists in meteoritics at which he was planning to declare that the summer expedition of 1961 had established the final truth: the TSB had been a comet. And this outstanding discovery would be presented by the conference for a State Lenin Prize of the USSR. The prize was not overwhelming – just 10,000 rubles (about $8,000) – but the money was not the main thing. More important was the title "Laureate of the Lenin Prize of the USSR," which raised considerably the social position of its holders. The list of the main players who had found the "true explanation" for the Tunguska event must have consisted of three names: Academician Vasily Fesenkov, Kirill Florensky, and Evgeny Krinov.

Let's suppose it was a comet. Why then was the ITEG's contribution to this finding ignored? After all, it was a joint expedition, and the ITEG part was twice that of the KMET. All of them dug out, carried, separated, and studied the magnetic spherules that were considered the main proof of the cometary hypothesis. Academician Fesenkov not only refrained from inviting any of the ITEG members to the important conference but was trying to conceal from them his very intention to convene it.

There was some talk, though, that to prevent a scandal, the academician was going to include Gennady Plekhanov on the list of candidates for the State Lenin Prize.

One should, by the way, understand the procedure of presenting somebody for the State Lenin Prize in the Soviet Union. The planned conference of specialists in meteoritics was a façade, a fiction. In fact, candidates for this award were discussed and accepted by the true masters of the country, the highest Party and State bureaucrats (including some academicians) and only afterward were candidates declared as such at scientific conferences. By that time Fesenkov had obviously already enlisted the support of the authorities and all other procedures were mere technicalities.

In Tomsk, members of the ITEG regularly came together on Fridays to talk. Quite often other Tunguska researchers, from other places in the USSR – Novosibirsk, Krasnoyarsk, Moscow, Leningrad – joined them. This time, before the conference, they got together as usual. Everyone understood well that if the State Lenin Prize scheme materialized, the ITEG might forget forever about further serious studies of the Tunguska problem. The problem would have been officially solved. The devastation at Tunguska would have been caused by a comet, and that would have been the end of the matter.

In a few days Gennady Plekhanov arrived at Moscow and went to KMET, where he met his old friend Evgeny Krinov. "He was probably the most straightforward, honest, and benign person in the KMET team. The exact opposite of his immediate superior Academician Fesenkov."[7]

Krinov said: "You know that this evening Vasily Grigorievich [Fesenkov] will proclaim his plan to present the State [Lenin] Prize of the USSR to the group of scientists who solved the problem of the Tunguska meteorite by establishing its cometary nature. He is going to include Kirill Florensky and me in the list of discoverers, as representatives of the Committee on Meteorites, and yourself as the representative of the Tomsk exploratory group. So, don't you worry. Vasily Grigorievich [Fesenkov] did take into consideration your great contribution to the solution of the problem. He has already enlisted the aid of officials of the Committee on the State [Lenin] Prizes and members of the Expert Council who will certainly respond favorably."

Plekhanov replied that the problem of the TSB was far from being solved, and that there was nothing as yet worthy of any award. Evgeny Krinov was surprised. How could anyone decline the State Lenin Prize? He called upon Florensky for his aid. Perhaps the noted geochemist could persuade Plekhanov to change his mind? Florensky said that because Academician Fesenkov, the Chairman of the Committee on Meteorites, believed that the TSB was a comet, it was a comet. But somehow this did not impress Plekhanov, who promised Florensky and Krinov that if they officially attempted to nominate their cometary theory for the State Lenin Prize, then the ITEG would raise hell in the newspapers and journals. To convince the meteorite specialists that it was no joke, the ITEG published in the popular *Smena* journal a letter criticizing Florensky's position. Fesenkov and his colleagues at the Committee on Meteorites had to give up their plan to obtain the State Lenin Prize for the "Tunguska comet." But of course there could be no further collaboration between the KMET and the ITEG.

It is worth noting that Plekhanov had never been a fanatical supporter of Kazantsev's spaceship hypothesis. Having started his Tunguska investigations to verify that hypothesis, he in time came to the conclusion that the accumulated data testified against Kazantsev. In the summer of 1962, Plekhanov presented a paper at the Tenth Meteoritic Conference in which he returned to an old theory that had formerly been put forward by the Belgian astronomer Félix de Roy and Vladimir Vernadsky in Russia. According to this theory, the TSB might have been a "dense compact cloud of cosmic dust." This idea did not find much support, but Plekhanov should be praised for his integrity in turning down the State Lenin Prize and for his bravery in confronting the scientific establishment. His behavior was that of a true scientist.

In 1962, Kirill Florensky went to Tunguska without any Siberian researchers. Soon he made sure that the "mother's-in-law tongue," the shape of the distribution of space dust discovered by the joint expedition of 1961, stretched from the epicenter of the event to the northwest for a distance of more than 250 km, and he decided that everything was abundantly clear: it had been the icy core of a comet that had exploded in 1908 over the taiga. This conclusion brought to a close both his and the KMET's Tunguska investigations. Subsequently, Florensky took a job in the Institute

of Space Studies of the USSR's Academy of Sciences, where he studied moon soil until his death in 1982. As for the Committee on Meteorites, the expedition of 1962 was their final attempt to work at Tunguska.

Despite the rupture between KMET and ITEG, a report by Plekhanov about investigations that had been carried out in 1961 was published in *Meteoritika* three years later and refuted claims of increased radioactivity that could be dated back to 1908 in the region. He wrote: "It is found that around the epicenter [of the Tunguska explosion] exists some increase in the level of radioactivity, which is due to the fallout of recent years. Examination of parameters of the atomic decay demonstrates convincingly that the radioactive substance was brought to this region as a result of nuclear tests in 1958. No traces of artificial radionuclides from the event of 1908 have been discovered."[8]

But this was a half-truth at best. Some traces of this kind were discovered, although Plekhanov preferred not to draw the attention of meteor specialists to this issue. In his paper he also stated that there could have been no extraterrestrial spacecraft or even a natural solid body that caused the devastation at Tunguska. Rather, it must have been a swarm of coarse particles of cosmic matter moving at a great speed. In other words, no real explosion again, just a ballistic shock wave that leveled 30 million trees in the taiga.

Since normal meteorites or even clouds of cosmic matter never seriously interested Plekhanov, the leading member of the Independent Tunguska Exploratory Group, he tried to alter the research aims of the organization. After all, he said, there are in the world so many enigmas worthy of attention and investigation. The Abominable Snowman, the lost Atlantis, the library of Ivan the Terrible concealed in the vaults of the Moscow Kremlin. . . Since there appear to be no fragments of an alien spaceship at Tunguska, let's find another interesting research task.

This time the ITEG said "no" to its Commander. The majority of the Exploratory Group believed that the enigma of the Tunguska meteorite had not been solved – that its dusty nature had not been verified. At the initial stage of the ITEG's existence, Gennady Plekhanov had made a considerable contribution to its formation, but now he had to leave his post – for the sake of the ITEG's future. He did resign but continued his research in the Tunguska field, and a

year later discovered at Tunguska indications of genetic mutations in pines probably going back to the Tunguska explosion.

In 1963 Nikolay Vasilyev (see Figure 5.3) took the helm of the ITEG, running the group until he died in 2001, when Plekhanov took charge again. Today we can say with certainty that it was a wise choice both for the organization and for the Tunguska problem. Despite Gennady Plekhanov's later vacillations, the ITEG survived and moved on to a new stage of active life under the leadership of Nikolay Vasilyev.

FIGURE 5.3. Professor Nikolay Vasilyev (1930–2001), a member of the Russian Academy of Medical Sciences, the long-standing head of the ITEG and the leading Soviet specialist in the Tunguska problem (*Source*: Vasilyev, N. V. *The Tunguska Meteorite: A Space Phenomenon of the Summer of 1908.* Moscow: Russkaya Panorama, 2004.).

Vasilyev had been a key figure in his own field of medicine – immunology. And due to his achievements in immunological studies he was elected in 1978 a member of the Academy of Medical Sciences of the USSR (now the Russian Academy of Medical Sciences). Professor Vasilyev had run state programs on the medical

and social consequences of Soviet nuclear testing at Novaya Zemlya and Semipalatinsk, as well as one dealing with the radiation problems after the Chernobyl disaster. During the 40 years that he led ITEG he transformed it from a team of enthusiastic amateurs into an informal, interdisciplinary research institute aiming at solving the enigma of the Tunguska phenomenon. Having saddled himself with the leadership of the ITEG in the early 1960s, he guided the organization both through the relatively calm periods of the 1970s and 1980s and through turbulent post-Soviet times. Even though the ITEG was a viable team, quite capable of self-organization, the energy and wisdom of Academician Vasilyev were needed to overcome many problems – large and small, external and internal – that not infrequently confronted the group.

This author was fortunate to collaborate closely with Nikolay Vasilyev in the "stormy '90s," when he moved from Tomsk to Kharkov to take a job at a large Ukrainian immunological institute. His ties with Siberian colleagues did not loosen, and soon he became the Scientific Director of the National Nature Reserve *Tungussky*, established in 1996 in Russia. But the path to the creation of this important organization protecting the Tunguska region began several decades earlier.

After their State Lenin Prize fiasco, the KMET people were inclined to rid themselves of the Tunguska meteorite affair and looked for a neutral pretext to do so. At the Tenth Meteoritic Conference (the same meeting at which Gennady Plekhanov attempted to reanimate the cosmic-dust model of the TSB), the Siberian scientists proposed to establish under the aegis of the Siberian branch of the USSR's Academy of Sciences a Commission on Meteorites and Cosmic Dust, which would have taken official responsibility for the Tunguska problem. Fesenkov, Krinov, and their colleagues understood that it would be a cover organization for the ITEG, but wisely agreed to the idea. Consequently the conference applied to the Presidium of the Academy of Sciences with an official proposal. The academic authorities knew well that a number of leading Soviet physicists were interested in the Tunguska problem and supported the nuclear hypothesis. Therefore, they immediately responded favorably to this appeal. Dr. Vladimir Sobolev, a well-known Russian geologist and an investigator of the Yakut diamond deposits, agreed to take the post of the Commission's Chairman, and Nikolay

Vasilyev and Gennady Plekhanov became his deputies and did all the work of organizing the new commission. As Vasilyev wrote several decades later, the controversy between KMET and ITEG "had been settled in a very sensible and probably the only possible way."[9] The Committee on Meteorites washed its hands of the Tunguska problem, and the Exploratory Group obtained official recognition. In 1963 the ITEG published its first collection of scientific papers, *The Problem of the Tunguska Meteorite*, which contained the findings of its expeditionary works for the preceding 5 years.[10]

Having freed themselves of the responsibility to work out the Tunguska problem any further, the meteor specialists did however reserve the right to watch over the ideological purity of this field of investigation. Of course, Kazantsev's hypothesis still remained a terrible heresy, but the ITEG, thank heavens, practically ceased to talk aloud about the "alien thruster," and on its banner were the five acceptable words for astronomers: "a cloud of cosmic dust." In his report at the Tenth Meteoritic Conference, Plekhanov even emphasized: "Our conception, explaining the Tunguska phenomenon as a collision with Earth of a cloud of cosmic dust, does not seem to differ radically from the cometary hypothesis which is being developed by Academician Fesenkov. Perhaps, there are just terminological differences which will disappear after the nature of comets is ascertained."[11]

It seemed that ITEG people were beginning to forget about their initial aspirations and that the ghost of the extraterrestrial spaceship was gradually disappearing. However, as far back as 1959 there appeared a new force in the field of Tunguska studies. This was geophysicist Alexey Vasilyevich Zolotov (see Figure 5.4), a scientific worker of the Volga-Urals branch of the All-Union Scientific Research Institute of Geophysics, who then lived and worked in the Russian town of Oktyabrsky. He did not hide the main aim of his investigations – to check up on Kazantsev's hypothesis: was the TSB an extraterrestrial spaceship that had exploded when trying to land on our planet? The first stage in his checking had to be the verification of the nuclear character of the Tunguska explosion. ITEG people generally liked Zolotov's position, but meteor specialists were utterly irritated by his investigations and bold statements. Especially shocking was the surprising fact that Zolotov's works were actively supported by the Ioffe Physical-Technical Institute (one of the largest

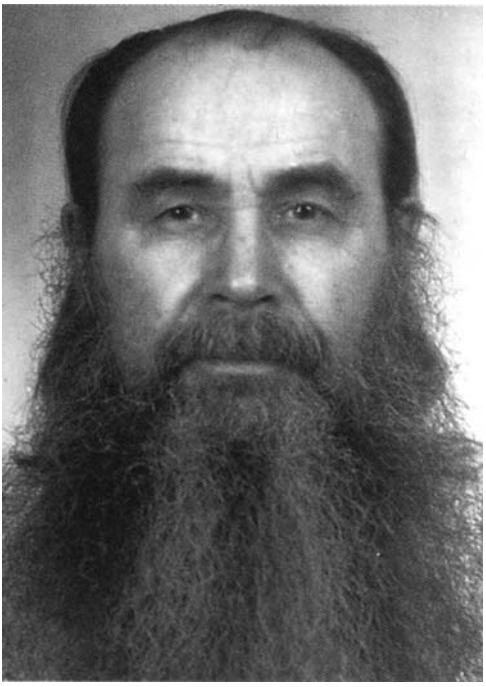

FIGURE 5.4. Dr. Alexey Zolotov, (1926–1995), the famous student of the Tunguska problem, who dedicated all his energy to the search for scientific proof of Kazantsev's starship hypothesis and made a very important contribution to its further development (*Source*: Plekhanov, G. F. *The Tunguska Meteorite: Memoirs and Meditations*. Tomsk: University Publishing House, 2000, p. 211.).

Soviet scientific centers of investigations in the fields of nuclear physics and nuclear chemistry), which made it possible for him to publish the results of his investigations in the *Reports of the USSR Academy of Sciences*. This journal was the most authoritative and highly rated scientific periodical in the Soviet Union. And it is well known that the place of publication of a research paper is the first and one of the most important criteria used by the scientific community to evaluate it.

As distinct from the "collectivistic" ITEG, Zolotov was an "individualist" in his studies, which both helped him (since, unlike Vasilyev, he did not need to seek a compromise among different viewpoints on the problem) and sometimes prevented him from collecting as much data as he really needed. While the ITEG was systematically gathering data about the Tunguska phenomenon,

trying to build its "well-balanced" model, Alexey Zolotov was saying openly that it was, most probably, a nuclear explosion, and that an alien spaceship was not inconceivable. For KMET people this was too much, and they did their best (and worst) to discredit the scientific views that he published. Since their criticisms had little effect, they began to hurt him by methods more typical for the over-established Soviet science – in particular, by trying to stop the defense of his dissertation and publication of his scientific monograph on the Tunguska problem.

As Alexey Zolotov confessed subsequently, he had taken an interest in this problem quite accidentally. That is, some small pieces of information about the "meteorite fall" in the taiga in 1908 did reach him from time to time, but he sincerely believed that there was no special enigma in this event. But in April 1959, while working on a voluminous research report in his professional field (radiation logging of oil wells), he got so tired that he decided to seek relaxation in some easy reading. The book Zolotov came across was the recently published collection of science fiction stories by Alexander Kazantsev – *The Guest from Space* – in which was reprinted the short story of the same name that had appeared eight years earlier in the *Tekhnika-Molodyozhi* journal. Although it was not the initial source of the spaceship hypothesis (which had been published in 1946 in *Vokrug Sveta*), it proposed a tenable method for the verification of Kazantsev's idea: the searching at Tunguska for artificial radionuclides, radioactive isotopes that are formed during nuclear explosions.[12] And Zolotov suddenly had a violent urge to go to Tunguska, to take samples of soil and vegetation in the taiga, and to check these samples for radioactivity at the Volga-Urals branch of the Institute of Geophysics, where he worked, which had the necessary equipment and experienced specialists in this field. Zolotov himself worked with sources of radiation and knew well how to measure the levels of background radiation.

Alexey Zolotov was soon in action. In August 1959, when on leave, he traveled to Tunguska with his old friend Iosif Dyadkin. Of course, they had to go from the Volga to Siberia by their own means, but as geophysicists they were well paid, so they could afford the trip. Dyadkin was also an experienced specialist in nuclear geophysics (neutron and gamma-ray logging). Subsequently he became a well-known political dissident and carried out a demographical

study in which he calculated how many people had perished in the gulags. His results showed that from 1928 to 1941 in the USSR 10–15 million people perished from all sorts of repression and famine. Dyadkin's paper containing these data was first distributed in *samizdat*, a system of clandestine printing and distribution of dissident literature, and then published abroad. Naturally, in April 1980 he was jailed, and those friends of his who dared to stick up for him, Zolotov included, also suffered.

But back in the summer of 1959 Zolotov and Dyadkin, having come to Vanavara, hired a small plane and made a two-hour flight over the leveled forest. In the late 1950s a flight over the taiga was no longer as difficult as it had been for Leonid Kulik, who in the late 1920s waited for years for an airplane. The flattened taiga impressed Zolotov very much, convincing him that the TSB had in fact exploded in the air. Having landed in Vanavara and rested, the friends set out by land and by August 31 reached the epicenter of the explosion. Here they explored the fallen trees for several days, collecting samples of soil and wood. Some wood samples were burned on the spot, since the radioactive substances would remain in the ash. In this way, the useful mass of the samples brought from the taiga increased considerably.

After returning to Oktyabrsky, Zolotov spent several weeks examining the ash, wood, and soil with the equipment in his institute. Simultaneously, he was writing a report about the expedition in which he described his and Dyadkin's observations of the traces of the post-catastrophic fire and the abnormally increased restoration of the forest. By the end of December 1959, Zolotov finished his measurements and completed his report, after which it was simultaneously sent to the Physical and Mathematical Branch of the USSR's Academy of Sciences and to the Committee on Meteorites.

Each responded rather differently. The KMET reviews completely rejected Zolotov's work as having no scientific value. The longest review was by Kirill Florensky, who stated, in particular, that even the fact of the overground explosion was not established beyond doubt. It appears that Florensky still could not believe his own eyes and the results he himself had obtained from the 1958 expedition.[13] As for the physicists at the Academy of Sciences, they invited Zolotov to a special conference devoted to Zolotov's investigations. This took place in January 1960 at the Physical and

Mathematical Branch of the USSR's Academy of Sciences. Zolotov read a paper in which he described his work in every detail. The conference participants adopted a resolution of complete approval of his research strategy and methods of investigation and recommended that he continue searching for artificial radionuclides in the Tunguska taiga.

However, the KMET people were not persuaded by this resolution from the USSR's Academy of Sciences, and they at once began to propagate their hypothesis of a thermal explosion of the icy comet core flying in the atmosphere at the speed of 30–40 km/s. Participants of the Ninth Meteoritic Conference that was held in Kiev in June 1960 also "blamed" Alexey Zolotov both for the way he conducted his "radioactive" research and for the results he obtained. "Zolotov's group," stated the meteor specialists, "has demonstrated an utterly irresponsible approach to collection of empirical data and its interpretation. After a short stay in the Tunguska region they presented a long report containing a number of pure inventions and proving that its authors are completely lacking elementary notions of the essence of the phenomenon under investigation. . ."

Zolotov, who also attended this conference, argued that judging from the lack of a discernible imprint of the ballistic shock wave on the wood, the TSB had flown at a relatively low speed – not more than a few kilometers per second. For a thermal explosion this was not fast enough. Subsequently he wrote: "However, our considerations were ignored. Criticism directed at our research work was so scathing, brutal, and unjustified, that instead of making us cease our investigations, it energized me and greatly intensified my desire to continue them."[14]

And Zolotov did in fact continue his work, not a bit embarrassed by attacks from the meteor specialists, while deriving additional inspiration from the active support of leading Soviet nuclear physicists. Since the research institute where Alexey Zolotov worked was not an academic institution, being under the USSR's Ministry of Geology, the then-president of the Academy of Sciences, Academician Mstislav Keldysh, sent an official letter to the Ministry, asking that the problem of the Tunguska meteorite be incorporated into the State plan of geological scientific research works. The Minister responded positively and Zolotov became the chief of a specialized Tunguska research group, obtaining finances from the

State budget and now having an opportunity to investigate the problem in his working hours. The Scientific Council of Leningrad *Fiztekh* – the Ioffe Physical-Technical Institute – approved Zolotov's program of work, and the document was signed by the Chief Learned Secretary of the Academy of Sciences and the Director of the Academic Institute of Applied Geophysics Evgeny Fedorov (1910–1981). This geophysicist won fame in 1937 working on the first drifting station *North Pole-1*, and during World War II he managed the USSR's Hydrometeorological Service.

Thanks to government funding, Alexey Zolotov went next year to the Great Hollow in a helicopter, wearing usual street clothes and with a briefcase in his hand. It is hard to imagine what Leonid Kulik would have said had he met somebody in the taiga dressed in such a manner!

Although some traces of the radioactive fallout from the Tunguska explosion seemed to peep out here and there, it proved difficult to establish its presence. So it was necessary to gather plenty of wood samples from the trees that had survived the Tunguska explosion, or perished, and to examine these samples using the most sensitive methods of measuring the low levels of radiation. Zolotov therefore decided to transfer his main attention from the search for artificial radionuclides to an analysis of the large area of leveled forest – something that certainly existed. Zolotov believed that all the important dynamical parameters of the TSB must have been recorded in the observed pattern of forest destruction. Consequently, as a preliminary step, the researcher had to choose between the three alternatives: had the taiga been leveled by a ballistic shock wave, by a blast wave, or by both?

Zolotov preferred to start with facts, not from hypotheses, and much less from paradigmatic ways of thinking. The "meteoritic paradigm" dictated that the TSB could only be an iron or a stony meteorite or a comet core. There was a slight chance that it could have been a carbonaceous chondrite (a class of meteorites characterized by carbon contents of up to 2 percent and more) or a "dense cloud of cosmic dust" for which there was no previous evidence. However, both Alexey Zolotov and the ITEG did not rule out these models while considering other possibilities.

Zolotov and Dyadkin first met with the Siberian researchers in the Tunguska taiga as far back as the summer of 1959. A food reserve

dropped for them from a plane had sunk in a bog, and the two geophysicists found themselves in a difficult position. Perhaps, not so dangerous as that which Leonid Kulik and Oswald Guelich had been in 1927, but unlike Kulik they didn't have a horse with them which could be eaten if their situation got really bad. Luckily enough, members of the ITEG-1 expedition shared their food reserves with them, so they finished their work and returned safely to Vanavara.

In the following years, Alexey Zolotov organized 12 expeditions to the Great Hollow and gathered a lot of important information about traces of the Tunguska explosion. Usually his team arrived at the taiga in the middle of August, when ITEG people were about to return, and remained there until the first snow. So, in the field they were at least not in the way of each other, and they closely collaborated when processing the collected data. It is no mere chance that the second large collection of research papers published by ITEG in 1967 and holding a prominent place in the literature on the Tunguska problem contains, in particular, four papers authored by Alexey Zolotov.[15]

From the mid-1960s, the ITEG was also leaning in its research toward real empirical data rather than to theoretical models. The Siberian scientists were exploring mutations in pines, parameters of the area of leveled forest, and chemical anomalies in the soil, as well as questioning the many eyewitnesses to the Tunguska catastrophe who were still living. In the course of these investigations, the problem of the Tunguska explosion evolved into a multidisciplinary field of investigations with its own research community and a large set of publications. As distinct from the "meteoritic establishment" (personified in the KMET), this community was ready to consider *every* hypothesis of the TSB's origin, even the nuclear one. Nevertheless, the ITEG (as well as Zolotov's group) used in their investigations absolutely normal and strictly rigorous research methods. They performed a normal scientific investigation of a highly anomalous phenomenon. This investigation can be considered a model of serious, objective science. If we associate science with these distinctive features and not with the automatic following of paradigmatic models even when they are inconsistent with the phenomena under investigation, then we are dealing here with nothing but normal science.

So by the end of the 1960s, Zolotov decided to defend a doctoral thesis, based on the results of his investigations. Here we should say that scholarly degrees in the Soviet Union were in fact conferred on scientists by the State, not by individual universities. Of course, at first a dissertation would be considered by a Scientific Council at a university or a research institute and members of such a council would decide whether or not its author deserved to receive the degree. But the final decision was approved and the certificate issued by the Higher Certifying Commission under the Council of Ministers of the USSR.

Of course, if Zolotov had wished to obtain a degree in the field of meteoritics, he would have had no chance of success. Academician Fesenkov and other members of KMET would have barred his way. That is why his specialty was "experimental physics," and the place where the thesis was defended the Leningrad *Fiztekh*. The thesis was entitled as "Estimation of physical parameters of the Tunguska phenomenon of 1908."

Data about the radioactive fallout that had supposedly occurred after the Tunguska explosion were excluded from Zolotov's thesis. He considered it, not without reason, as too raw. But even without any evidence of hard radiation, his conclusions sounded radical:

1) The TSB was moving over the area of the leveled forest with an average speed of only 1–2 km/s – not fast enough to produce the total energy of the Tunguska explosion of many megatons of TNT.
2) The forest was leveled only by the blast wave; the ballistic shock wave did not fell any tree because it was too weak – less than 1% of the whole energy.
3) The Tunguska explosion was caused by the conversion of an inner energy of some substance to mechanical energy of the blast.

These conclusions, being hardly a direct proof of Kazantsev's hypothesis, did however argue against the meteoritic and cometary hypotheses of the TSB – against KMET's position. And they must have been defended before the Scientific Council of *Fiztekh*, consisting of very competent scientists.

Usually in Soviet science the very term "*defense* of a dissertation" was somewhat metaphorical. During the defense of Zolotov's dissertation the polemics were absolutely real and sharp, and the

word "defense" had its true meaning. Academician Vasily Fesenkov sent in his utterly negative review of the work, but two other full members of the Academy of Sciences – Mikhail Leontovich and Lev Artsimovich – sent in very positive (and even enthusiastic) reviews. The leading Soviet physicists did consider the nuclear hypothesis as a plausible explanation of the Tunguska phenomenon. This was a battle that Alexey Zolotov had triumphantly won. The great majority of the members of the Scientific Council of *Fiztekh* supported conferring on him the doctoral degree, not paying too much attention to the opinion of KMET specialists. And this victory opened the way for more objective studies of the Tunguska phenomenon, not limited by the "meteoritic paradigm."

It was a great personal success for Alexey Zolotov. But he certainly owed a considerable part of this success to the ITEG and to Gennady Plekhanov in particular. If they had yielded to the KMET and allowed Academician Fesenkov and his people to officially close the Tunguska question with the help of the State Lenin Prize, hardly any scholar would have dared to support Zolotov's research. And certainly there could have been no defense of a dissertation dealing with a problem the Soviet State had decreed solved.

So research on the Tunguska mystery proved to be lucky yet again. First, Leonid Kulik did not allow it to be completely forgotten by the scientific community. Then it was Alexander Kazantsev who gave a new impetus to Tunguska studies. And now, at the third stage of these studies, the ITEG and Zolotov developed a true multidisciplinary attack on the problem. The fact that 40 years have passed since Zolotov defended his dissertation and the Tunguska problem has not been solved means that the task of doing so is much more difficult than anyone thought. After the expedition of 1961 Kirill Florensky concluded: "The work of the expedition can be summarized as having virtually completed the collection of materials which will provide descriptions of all the various forms of the physical effects produced by the Tunguska meteorite on the area of the fall."[16] This was much too hasty a conclusion. The gathering of empirical data and its examination were then in their infancy. By attempting to take the "Tunguska fortress" by storm the scientists had failed, and a long period of siege lay ahead.

With time, breaks appeared in the outer walls of the fortress, and the plan of its courtyard became partly visible to the eyes of the

besiegers. The "inner citadel" of the fortress – the nature of the TSB – still remained untaken, but many things had become more understandable. And many other things *less* understandable. Somehow, the number of Tunguska enigmas started to grow again – rapidly. Which ones? We will see in the following chapters.

Notes and References

1. Derek de Solla Price, the founder of scientometrics, once added to a paper of his the following note: "This paper acknowledges no support whatsoever from any agency or foundation, but then, no time wasted, either, from preparing and submitting proposals." Sounds fine, even if somewhat sad!
2. Koginov, Y. The Mystery of the Tunguska miracle. – *Sovetskaya Rossiya*, 1959, August 28.
3. Plekhanov, G. F. *The Tunguska Meteorite: Memoirs and Meditations*. Tomsk: University Publishing House, 2000, p. 64 (in Russian).
4. Ibid., p. 71.
5. See Florensky, K. P. Preliminary Results of the 1961 Joint Tunguska Meteorite Expedition. – *Meteoritika*, Vol. 23, 1963 (in Russian). By the way, in this paper he also attempted to reanimate Yavnel's findings – which had already been explained away by KMET itself as sample contaminations from the Sikhote-Alin iron meteorite.
6. Zhuravlev V. K., Zigel F. Y. *The Tunguska Miracle: History of Investigations of the Tunguska Meteorite*. Ekaterinburg: Basko, 1998, p. 44 (in Russian).
7. Plekhanov, G. F. *The Tunguska Meteorite: Memoirs and Meditations*. Tomsk: University Publishing House, 2000, p. 160 (in Russian).
8. Plekhanov, G. F. Some results of research work of the Independent Tunguska Exploration Group. – *Meteoritika*, Vol. 24, 1964 (in Russian).
9. Vasilyev, N. V. *The Tunguska Meteorite: a Space Phenomenon of the Summer of 1908.* Moscow: Russkaya Panorama, 2004, p. 25 (in Russian).
10. *The Problem of the Tunguska Meteorite*. Tomsk: University Publishing House, 1963 (in Russian).
11. Plekhanov, G. F. Some results of research work of the Independent Tunguska Exploration Group. – *Meteoritika*, Vol. 24, 1964 (in Russian).
12. See Kazantsev, A. A Guest from Space. – *Tekhnika-Molodyozhi*, 1951, No. 3, p. 34 (in Russian).

13. By the way, nobody should accuse him, in this connection, of narrow-mindedness. Quite the contrary, Florensky understood the difficulties of the normal meteoritic explanation much better than other meteor specialists.
14. Zolotov, A. On the trail of a guest from space: Fragments from a diary. – *Smena*, 1962, Nos. 17–19 (in Russian).
15. See *The Problem of the Tunguska Meteorite*. Vol. 2. Tomsk: University Publishing House, 1967, pp. 151–153, 162–186 (in Russian). Incidentally, in one of these papers Zolotov convincingly rebutted the "dusty model" of the TSB that was still cherished by Gennady Plekhanov.
16. Florensky, K. P. Preliminary Results of the 1961 Joint Tunguska Meteorite Expedition. – *Meteoritika,* Vol. 23, 1963, p. 28 (in Russian).