

Lev Theremin: Alien in a Sandbox

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I MET HIM in 1993, two months before his death. He was talking about his life in a quiet, flat voice, deprived of even slightest emotional intonation. His memories were clear and precise. His concept of time was strange. He asked me if I knew Sergei Rahmaninov and how often I met him. He still was in early 1930s – the climax point of his artistic career when he was one of heroes of the century. A hero who somehow imperceptibly turned into a victim...

One can easily find all sorts of information about him on the Web, in numerous articles published in almost all languages; many exciting myths, lots of wrong dates and bad mistakes. Freelance artist and musician, physicist and inventor, businessman and spy, prisoner and KGB expert, biologist, psychologist, expert on hypnosis, irresponsible experimenter, absent-minded professor, uneducated technician, great patriot, traitor of the Motherland, poor pensioner, rich millionaire, beggar etc.

«Among Termen's myriad prescient brainstormings were the first electronic surveillance system, a gadget that opened doors at a hand signal and a 1920s version of television that broadcast 100 lines of resolution onto a five-foot-square screen – far superior to any competitor. For decades he worked in «mailboxes», top-secret Soviet research centers, on countless, still-undisclosed projects for the vast Soviet security apparatus. Those we know of include the listening device hidden in the Great Seal of the U.S. Embassy in Moscow and exposed in 1960 at the United Nations by Henry Cabot Lodge.»¹ But in the West Termen became famous as Leon Theremin, who in 1919 created the instrument named after him. As composer Albert Glinsky rightly insists in his exhaustively researched and revealing biography, «this frequently clumsy instrument was the first foray into the brave new world of electronic music.»³

«Military Intelligence executed Lev Theremin, creator of the first Soviet TV system and the thereminvox.»²

«In October 1921, an acoustical engineer, Lev Termin played Glinka's *Lark* on his electronic musical oscillator, the Aetherophon, before a fascinated Lenin... Although similar signal generators existed elsewhere, Termin's invention, later called the theremin, or thereminvox (to match the Soviet physicist's new francophied name, «Dr. Leon Theremin»), was the first high-frequency electronic instrument to gain fame and widespread acceptance.»⁴

So who was Lev Theremin? What was he?

In my personal opinion – Lev Theremin was a conspired-against Alien.

«I remember myself prior to the day of my official birth. I remember that no light yet existed – the same sensation one experiences in darkness. And I do not know precisely whether I lay or stood in this darkness. It seems then I did not have hands or legs. Darkness. I saw nothing except for a small red speck of light, and heard many different

sounds from different directions. Sometimes sounds were very close, almost in me. It was inconvenient, something was turning all the time, and then I was falling down into another neighboring place. And I suddenly saw that this small red speck had started to extend gradually, becoming brighter. I was frightened. Something from behind was pushing me out through a hole. It became bigger and I was pushed out of it. There was a light, so bright that I tried to close my eyes, I felt pain, I heard many sharp sounds. And I saw many new things including such things that now I name humans...»¹

Reading his writings and interviews one always feels the gap between him and the world of humans. His approach was global. Theremin was not really interested in details. He wanted to discover all the basic relationships and fundamental laws governing the system we call «the World». He wanted to investigate and take under control the phenomena of life and death.

I am not sure he was much interested in people. I don't know if he really understood any political or social regulations and relations. Like the alien-child playing in a sandbox on a global playground, building, investigating and destroying this artificial world of sand, occupied by toys and insects, living in fragile sand fortresses. He was definitely a citizen of the world, but which particular world?

He was very talented in his childhood. «At the age about two I could read pretty well, asking father numerous questions. In his office I remember a rotating shelf with books, among them the Brokgaus and Ephron dictionary. I began to examine the dictionary and was convinced that it was much more interesting than fairy tales. It was my first strong impression: all other books seemed to me artificial...»¹

After gymnasium young Theremin entered simultaneously St. Petersburg Conservatory (as a cellist) and University (Department for Physics and Mathematics) [in 1914 St. Petersburg was renamed Petrograd, in 1924 – Leningrad, and in 1991 back to St. Petersburg]. He finished Conservatory with a «Freelance Artist» diploma, but World War I was at the threshold and his formal education came effectively to a halt. Ironically it is almost impossible to find any mention of him playing cello (except fingerboard theremin).

In 1916 he was called up for military service and he was fortunate enough to serve at the most powerful radio station in Russia, located near Petrograd. But the October Revolution changed his life. According to documents, he spent time in a prison during 1919-1920 accused of being a participant in the White Guard plot.

In 1915 he the good fortune to meet Abram Ioffe, the great physicist, skilled also in management and business, who shortly became Theremin's main curator. After the October Revolution, Ioffe was the most authoritative scientist, a kind of mafia boss, who actually helped many young Russian scientists. «Papa Ioffe» as they called him for fun.

«And suddenly once in the evening, when I'd almost lost hope, I got a phone call and I heard the voice of the «Supreme Essence» – Abraham Ioffe.»⁵

In 1919, Professor Ioffe invited Theremin to his Institute for Physics and Technology in Petrograd to be the head of a new laboratory, where during the physical experiments with gases the thereminvox was invented. But in fact the range of experiments was much wider:

«We discussed two means for increasing our sensual perceptions: adaptation and increase of sensitivity threshold by means of hypnosis... I have started to experiment with hypnosis – the practice I was familiar with from a young age. My experiments with an estimation of a personal error of visual readout on scales of measuring devices as well as definition of variations of intensity, chromaticity, and also acoustic parameters – pitch, intensity, timbre – showed that the accuracy of reports and comparisons increases dramatically with hypnosis. For the majority of subjects, personal mistakes while in a hypnotic dream state decreases by 40 - 60 times for sight and about 30 times for hearing.»⁵

In 1922 Abram Ioffe organised a meeting with Lenin at the Kremlin in Moscow to demonstrate Theremin's inventions. At the end of the meeting Lenin advised Theremin to join the Communist Party and to demonstrate his instrument to people as often as possible to promote the ideas of the «electrification of Russia». He also wrote a note to the Commissar of Military Affairs Lev Trotsky: «To discuss whether it is possible to reduce number of Kremlin cadet sentries by means of an electric security system? (An engineer, Theremin, showed us in the Kremlin his experiments...)»¹ Quite possibly this was the exact moment of invention of the first burglar alarm system.

As any eternal child, Theremin was always under supervision. And as long as he was supervised by father the lawyer, mother-musician, «papa» Ioffe the «Supreme Essence», strong women, Big Brother, or careful wife he was safe. And each time he went out of his sandbox – he was lost and punished. The range of Theremin's interests did not really fit his playground.

«I was fascinated with the idea of the struggle against death. I studied research works on the life of biological cells of animals buried in permafrost. I was interested what would happen to people if their bodies were frozen, and then defrosted again.

I had on the staff of my laboratory a young woman assistant. Unexpectedly, she fell ill with pneumonia and died. I decided that it was necessary to bury her body in permafrost. I asked Ioffe to help to discuss this possibility with her parents. But Ioffe was very much confused and told me that, possibly, I was right, but my offer would offend the mountain-dwelling parents of this woman. It was certainly very insulting for me: she was only twenty years old, and I believed in my own ideas so much!

And then Lenin died in 1924. As soon as I found out about it I made a decision: Lenin should be buried in a frozen ground, and in a while I shall restore him! This time I didn't speak to Ioffe. I had a reliable assistant, whom I sent to Lenin's residence in Gorki to find out how to manage it. He came back very soon: it was too late to do anything. Lenin's brain and heart had already been removed and placed into a vessel with alcohol and thus all cells were already killed. I was strongly affected. It seemed to me that, having caught Lenin's body, we could understand any defects on a scientific level and restore it. I was ready to do this.»¹

In June 1926, Theremin finished his diploma project *The System of Dalnovidenie* – the first Soviet TV system with 64-line resolution. As a result, he got a diploma of Engineering-Physics. Shortly after that Ioffe patented the Thereminvox and managed an international trip for Theremin.

At that time and later no international activities could be undertaken without direct supervision from Soviet intelligence services. Theremin was not an exception. According to his own memories, he had good financial support from the Soviet «Military Ministry» as he called it later.

In his New York studio he developed numerous tools. Among them commercial RCA Theremins, the Rhythmicon – first Rhythm machine ever made, and the unique dancing platform, Terpsitone.

«By means of Prof. Theremin's latest device, a dancer may create music by the movements of her body. A capacity device in the floor is mainly responsible. (...) The inventive genius of Professor Leon Theremin has at last justified a famous poet in his license. Many years ago, Tennyson wrote: «The dancers dancing in tune.»»⁶

Although Lev Theremin developed numerous really futuristic artistic tools, perfect for experimental avant-garde practices, he was never involved in any experimental music projects, playing only a traditional, classical repertoire. He had a lot of contacts with many great representatives of twentieth century art and music, but he was not able to remember even the most important names!

In 1941 Edgard Varese wrote a letter to Theremin. He was not aware of Theremin's destiny. He wanted to continue their collaboration:

«Dear Professor Theremin, On my return from the West in October I tried to get in touch with you. I wanted very much to see you again and to learn of the progress of your work. I was sorry - on my account - that you had left New York... I have just begun a work in which an important part is given to a large chorus and with it I want to use several of your instruments - augmenting their range as in those I used for my Equatorial - especially in the high range... I don't want to write any more for the old Man-power instruments and am handicapped by the lack of adequate electrical instruments for which I now conceive my music. (...)»⁷

When in 1989 Olivia Mattis asked Theremin about Varese, he couldn't even remember him!

Theremin: «Some pieces by Edgard Varese could have been played, but I don't now remember our acquaintance. Sometimes we met, but I don't precisely remember. There were a lot of composers. (...) I was in New York for nine years. I might have met him towards the beginning of my stay. I had concerts in New York many times, and people came to the concerts. We had gatherings of people who were interested in my work. Social get-togethers were organised; about 30-40 people would attend. All sorts of interesting composers and scientists like Einstein, etc. would talk to me, and I talked to many of them. I can't enumerate them. There were some composers, but also some instrumentalists, violinists or cellists, who would meet with me and who were interested in new music.»⁸

Before 1933, the co-founder of Theremin's company was Solomon Fillin – an employee of the Soviet trading company Amtorg. It is known that many Soviet employees of Amtorg were engaged in espionage. When in 1933 the United States established diplomatic relations with the USSR, the embassy was opened in Washington and a consulate in New York, and agents of Soviet secret services located under their roof established direct con-

tact with their well-known compatriot. After some intimidation, Theremin was forced to agree to weekly meetings with Soviet agents.

«I also had many assignments from intelligence services. I developed special tactics for that: to get new secret information it is necessary to offer something new as well. When you show a new invention, it is easier to find out what they are working on. Certainly, I could find out the information required, however the tasks were too simple: for example, there is a plane; it is necessary to find out diameter of the muffler. What for? It was not clear to me. The majority of questions were insignificant. Once a week two or three young men invited me to a small restaurant, we sat down together and there I had to tell them confidential things. To gain their trust, I was required to drink at once at least two glasses of vodka. I didn't like to drink at all and I started to think how to protect myself. I found that if one eats approximately 200 grams of butter, the alcohol has almost no effect. Thus in the morning of the day of appointment I ate not more than half a kilogram, but still a lot of butter. At first it was very difficult to swallow, but then I got used to it.»¹

In 1937 Theremin married dancer Lavinia Williams. Politically, this decision was totally wrong: Lavinia was black, which was not accepted in America of the 1930s. The scandalous marriage closed many doors to him. He lost most of his information sources, and got into debt. Finally Theremin attracted negative attention from the U.S. immigration service. He was asked why he'd lived in the country for almost ten years but remained a Soviet citizen, even though he could, without problems become an American citizen.

He could do nothing but escape. August 31, 1938 he was illegally taken on board *Starry Bolshevik* ship. According to the memories of a veteran of the Soviet intelligence services, it was a standard way to transport people. In a cabin of the captain there was a secret door in a special closet with just one narrow cot. During customs inspections, secret passengers could be moved to more secluded places like coal-bunkers.

Because of the illegal nature of his travel, he had to keep it an absolute secret even from his own wife. Conspiracy – that was the reason why his friends and colleagues lost him for almost 50 years!

According to granddaughter Maria, Lev Theremin transported about 2000 kilograms of electronic equipment to Russia. His intension was to develop a studio. It is not surprising that all this stuff was stacked at Soviet customs, and Theremin found a part of it only several years later in the *Sharaga* – a special prison for scientists, where he spent next eight years of his life.

After landing in Leningrad, Theremin once again found himself an alien on unknown planet. He was totally alone. All his friends were, if not disappearing completely, avoiding him as though he had leprosy. Even the former «Supreme Essence» Abram Ioffe was avoiding all direct contact.

In fact, if Theremin had perhaps had more understanding of political realities, he could have avoided future troubles. There was a big change in Soviet intelligence services, Lavrenty Beria had just come into power and new generation of NKVD [NKVD, MGB, KGB, FSK, FSB – names of Russian secret services in different times], employees were very much busy arresting and shooting the older ones.

But Lev Theremin didn't recognise that he just fallen out of his playground. He started to search for a job, visiting his former friends and colleagues. It is no surprise that on March 10, 1939 he finally was arrested and condemned to eight years hard labour in the stone quarries of the GULAG.

Fortunately after one year in Kolima (the worst place in Siberia and perhaps in the world) he was moved to Omsk and then – to Moscow, to *Sharaga*, which had just been created by Lavrenty Beria. It was a great present for him. Finally he had a working place, good equipment, and technical information. He could research and develop. As he recollected later: «I was permitted to work even during the night. They just put a guard near the door of my laboratory.» He was almost happy.

«KGB was a good establishment, and people there were good. It is a pity only, that while I worked there they occupied my time with different nonsenses,» recollected Lev Theremin.

As one of Theremin's subordinates Rem Merkulov (a son of assistant of People's Commissar of Internal Affairs, also condemned), recollected:

«My chief was Lev Theremin a smart, neatly dressed person in a jacket and tie. In the big room filled with equipment, several officers-radio-technicians worked under his supervision. But we always were in civil dress during work.

We were working on the development of different gadgets, mainly for intelligence and investigation purposes. We worked with tiny transmitters which were widely used at that time. We used only American components and conspired to conceal the origins of the equipment in case of failure.

We made radio-detonators for acts of terrorism behind enemy lines. And we also developed a detonator for an aviation bomb which triggered explosion at a height of about two meters above the ground. The destruction capability of bombs essentially increased. We used a theremin principle in this system.

In general Lev Theremin was a cheerful person. He liked to joke and nobody could recognise him as a condemned person without the knowledge that after the working day he wouldn't get outside the fence.»⁹

The real climax point of Theremin's inventions happened in 1945 with the development of the *Buran* eavesdropping system, supervised personally by both Stalin and Beria. That was a real microwave thereminvox! For this invention Lev Theremin was awarded the first Stalin prize, which was almost not possible for «normal» condemned people.

On August 4, 1945, during a conference in Yalta, Soviet pioneers (school age children) presented a carving of the Great Seal of the United States to U.S. Ambassador Averell Harriman. It hung in the ambassador's Moscow residential office until 1952 when the State Department discovered that it was «bugged». According to Henry J. Hyde, Republican of Illinois: «It hung prominently for years... The ordinary, standard devices for the detection of electronic eavesdropping revealed nothing at all, but technicians decided to check again, in case our detection methods were out of date. «Quivering with excitement, the technician extracted from the shattered depths of the seal a small device, not much larger than a pencil... capable of being activated by some sort of electronic ray from outside the

building. When not activated, it was almost impossible to detect... It represented, for that day, a fantastically advanced bit of applied electronics.»¹⁰

This came to the attention of the world when it was displayed at the United Nations in May 1960. It was a cylindrical metal object that had been hidden inside the Great Seal. At first, Western experts were baffled as to how the device, which became known as 'the Thing', worked, because it had no batteries or electrical circuits. Peter Wright of Britain's MI5 discovered the principle by which it operated. It held buried inside it a small cylinder called a Hi-Q resonant cavity. The cylinder contained a diaphragm at one end and an antenna at the other. Voices in the room caused the diaphragm and then the antenna to vibrate. U.S. officials surmised that Soviet technicians across the street kept a high-power microwave beam trained on the seal to measure the vibrations, allowing them to reconstruct the conversations. MI5 later produced a copy of the device (codename SATYR) for use by both British and American intelligence.³

About ten years later, the national news media revealed that there was a serious health risk for employees of the U.S. embassy in Moscow posed by the continuous bombardment of microwaves – the beams of microwave eavesdropping devices operated by Soviet intelligence agencies. Similar trouble was caused by a 1947 Theremin invention. At that time he used 330 MHz microwave radiation directed on windowpanes which then behave like microphones: sound vibrates the surface of the window and produces interference patterns in the reflected beam. The interferometer and photodetector in the receiver convert these interference patterns to voltage fluctuations which are electronically manipulated and reconstituted as sound.

When Olivia Mattis asked Theremin about his relationship with Albert Einstein, Theremin's answer was exact and fair: «...As for him personally, Einstein was a physicist and theorist, but I was not a theorist – I was an inventor – so we did not have that much in common. I had much more kinship with someone like Vladimir Il'yich [Lenin], who was interested in how the whole world is created. Einstein was a theorist, so he knew all the formulas, etc. I cannot say that I was very much interested in him as a physicist.»⁷

Lev Theremin never did any calculations to get desirable effect, to minimise possible risk. Simply owing to his genuine intuition he always was giving out correct decisions. Possible mistakes could sometimes be literally incompatible with life. And obviously he never took into consideration possible harm he could produce with his microwave attacks. And it is no surprise that employees of the U.S. embassy in Moscow were almost grilled.

To prevent Soviet eavesdropping, sometime in 1946 American auditors checked the state of security in all embassies. Trying to avoid possible scandal, the Soviets cleaned up all embassies except New Zealand's. There was no time left and Lev Theremin was asked for advice. He suggested directing a strong microwave emission toward the N.Z. embassy to prevent the auditor's equipment detecting Soviet gadgets. According to Merkulov's memories: «In a court yard of the embassy the yard keeper was breaking ice with a metal crowbar. When the equipment was switched on, he threw away the crowbar and his cap and started shouting: «Oh my God! Oh my God!» – and rushed into the building. When asked what happened, he answered only, «The crowbar flew up!»⁹

Theremin recollected: «At that time everybody was under suspicion, and Stalin was under suspicion as well... The overhearing devices were installed at his apartment and in his office. In my laboratory I had equipment for restoration and improvement of sound recordings... So, there were recordings made while he was signing papers related to executions. I had an impression that he was a rather obedient, indifferent person: after receiving those lists, he signed them without any hesitation...»¹

Meanwhile, Theremin's business at the KGB was gradually fading out. He could not switch fast to new transistor technology. Problems developed with his new KGB chiefs.

As daughter Elena recollected, Lev Theremin was a careful father. The problem was in official papers, required sometimes at daughter's school. In the item «place of work» it had always been written only that he was an employee of the KGB. «But it is necessary to specify your position» was the objection. Theremin laughed kidding: «I am the younger assistant of the senior yard keeper.»

«In general, if there was something he did not want to speak about, he did not speak. At the same time he never kept silent, but spoke in a rambling way. Michael Gorbachev was easier to understand,» recollected the daughter.⁹ But in fact, his real position at that time was close to what he actually said in this conversation.

In 1962 Lev Theremin retired from the KGB and got a position as Head of research at the Acoustical Laboratory of the Moscow State Conservatory. During 1963-1967 he developed numerous acoustical tools and conducted many research projects.

Finally he was back to his favorite «sandbox»!

But success did not last. In 1967, he was found by his former American colleagues. As a result an article was published by the New York Times on April 26, 1967. A very nice article by the way! Very precise and objective:

«Leon Theremin who used to stand in front of an electronic contraption and conjure otherworldly sounds from the ether. Leon Theremin, the man described by Time magazine as having «the most beautiful hands in the world». Leon Theremin, whose instrument was played in recital by such spectacular ladies as Lucy Rosen and Clara Rockmore. Leon Theremin, the man who gave a concert at Lewisohn Stadium and created a theremin of such prodigious sound that nobody could hear the orchestra. Leon Theremin, who worked on new sounds with Leopold Stokowski and Henry Cowell.

Mr. Theremin disappeared from sight shortly before the war, and nothing more was heard of him. Only a few knew whether he was alive or dead.

But he is very much alive.

He is a spry, voluble man of 71, and he is a professor of acoustics at the Moscow conservatory.

The other day he took a visitor through his laboratory, talking a blue streak. He is a slim man with a large head and diminishing gray hair. He looks and acts like the prototype of the absent-minded professor.

«I have developed an electronic organ tuner,» he said, pausing before a knobbed, tubed contraption, «It can tune an organ to any scale, tempered or otherwise.»

«Here,» he said, turning to another collection of tubes and resistors, «is a machine to photograph sounds. It has 70 channels a half tone apart. And here is my rhythmicon. It can produce any combination of complex rhythms. Let me play you seven against nine. Or would you like to hear 5 against 13? Very important. A conductor can stand here and learn to beat four with one hand and five with the other...



Lev Theremin, 1975

Here is a Spectrograph to measure tone colors. Here is a machine to slow up sounds without changing pitch. Now I will show you something special.»

He ushered the visitor into a room in which a small dance floor had been constructed. Mr. Theremin stood on the floor, raised his arms, made motions, and started to play the Massenet Elogy on nothing at all.

The room was filled with sound, and it was positively spooky. No wires, no gadgets, nothing visible. Merely electromagnetic sorcery...»¹¹

This article was followed by an avalanche of correspondence from Clara Rockmore and other former colleagues from the U.S. and caused a fast and only possible in the USSR of the 1960s reaction: Lev Theremin was removed from his position and kicked out of the Moscow Conservatory. During repairs at the Acoustical Laboratory in early 1970s what was left of his bulky tools was destroyed and thrown away as a junk.

Theremin spent the rest of his life working at Moscow State University in a position of technician in the Physics Department. In fact, he never was a Professor; he didn't get even a degree in his scientific life! He was back in the sandbox, but the sand was almost gone like on most real Soviet playgrounds of 1970s.

In 1991, just after the interdiction of the Communist Party of the Soviet Union, he joined it. «I promised to Lenin,» he explained. In fact there was a serious reason: Com-

munist officials didn't really want him during the Communist times. He had to wait until the Communist Party was on the verge of collapse before he could join.

In 1989, after 50 years, Lev Theremin again got opportunity to go abroad: New York, performances and lectures at Stanford, meetings with Clara Rockmore and few old friends.

Thereminvox was coming into fashion. The luck was coming back. But...

Lev Theremin passed away on November 4, 1993. At the end of his life he dreamed of being buried in permafrost, to be recovered when science reached an appropriate level. But, instead he was buried in a cemetery in Kuntsevo, Moscow. At his funeral there were only his daughters with their families and pallbearers to carry the coffin...

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