

## Eavesdropping the Universe

Art and politics, inspiration and defense often have the same origins and use the same tools for self realization and development. Many well known artists, inventors and specialists in music technology were involved in military and intelligence activities and research, balancing on a sharp “blade” separating the realms of creative energy and art on the one hand and destruction and defense on the other. What motivations did they have? What were their intentions?

Perhaps one of the most charismatic figures on the crossroads of art, technology and espionage was Lev Theremin (1896–1993), well known as an inventor of the first electronic musical instrument – the Theremin.

“Among Termen’s myriad prescient brainstormings was 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. [...] But in the West Termen became famous as Leon Theremin, who in 1919 created an 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.” [The Great Seal Bug Story]

When Olivia Mattis in her interview asked Theremin about his relations with Albert Einstein, Theremin’s answer was exact and fair: “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 Ilyich [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.” [Mattis]

Theremin’s approach was global. Similarly to a medieval alchemist looking for Alchemical Gold and Philosophers’ Stones, he wanted to find out the Sense and the Meaning of the fundamental laws, which form and conduct the system we call the Universe, filled by all sorts of vibrations – electromagnetic, mechanical, biological, acoustical etc., which are related to all sorts of mater. These vibrations, reflecting natural processes, are carriers of hidden meanings, similarly to the shortwave radio ether in the sixties, which was filled with coded messages in numbers, phonetic letters, noises, transmitted by stations, and related to numerous intelligence agencies. Anyone could receive these messages, nobody could deduce their destination or content.

Both, spy transmissions as well as natural hidden messages have very much in common with the enigmatic uttering of the ancient oracle of Delphi – ancient centre of intelligence and espionage. The unintelligible babble of the ‘Pythia’ (the priestess with whom Apollo was believed to be in contact) uttered in a state of ecstasy, was translated into hexameters by the prophet of Delphi, position which was often susceptible to corruption and political manipulation.

Pythia... Perhaps that was destiny of Lev Theremin and people of his type!

At the age of 97 Lev Theremin was still talking about his life in a quiet voice, without even the slightest emotional intonation. His memories were clear. His relations with time were strange. Mentally he still was in his early 30s – the climax point of his artistic career when he was one of the heroes of the century. Hero which somehow imperceptibly turned into victim...

Reading his writings and interviews one always feels the gap between him and the world of humans. He wanted to investigate and take under control phenomena of life and death.

In 1919 professor Abram Ioffe (Papa Ioffe as young scientists called him) invited Theremin to his Institute for Physics and Technology in Petrograd as the head of new laboratory, where, during the physical experiments with gases, the Thereminvox was eventually invented.

"I was fascinated with the idea of struggle against death. I studied research works on life of biological cells of the animals buried in permafrost. I was interested what would happen to people if their bodies would be frozen, and then thawed. I had young woman assistant on my staff in the laboratory. Unexpectedly she fell ill with pneumonia and died. I decided it would be necessary to bury her body in permafrost. I asked Ioffe to help discuss this possibility with her parents. But Ioffe was very confused and told me that in theory it would be possible, but my offer could offend this woman's parents. It was certainly very insulting for me: she was only twenty years old, and I very much believed in my own ideas!

And then Lenin died in 1924. As soon as I found out about it I made a decision: Lenin should be buried in frozen ground, and after some time 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 were already removed and placed into the vessel with alcohol and thus all cells were already killed. I was strongly afflicted. It seemed to me that, having caught Lenin's body, we could understand defects of it on scientific level and then restore it. I was ready for this." [Hyde]

"We discussed two means for increasing our sensual perceptions: adaptation and increase of threshold of sensitivity by means of hypnosis. [...] Under impression of these conversations I have started to experiment with hypnosis – the practice I was familiar from youthful age." [Schonberg]

I am not sure Theremin was much interested in people. I don't know that he really understood any political or social regulations and relations. He was 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.

As any eternal child Theremin was always under supervision. And as long as he was supervised by his father who was a lawyer, his mother-musician, "Papa" Ioffe, strong women, Big Brother, careful wife – he was safe. And each time he went out of his sandbox – he was lost and punished.

In June, 1926 Theremin finished his project "The System of Dalnovidenie"- the first Soviet TV system with 64 line resolution and received a diploma of Engineer-Physicist. Shortly after that Abram Ioffe patented Thereminvox and managed the international trip for Theremin.

At that time in the USSR no international activities could be developed without direct supervision of Soviet intelligence services. According to Theremin's memories, in his trip to U.S. he had a good financial support from "Military Ministry" as he called it later.

"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 the new invention, it is easier to find out what they are working on. Certainly, I could find out the information required, however tasks were too simple: for example, there is a plane, it is necessary to find out diameter of its muffler. For what? It was not clear to me. The majority of questions were insignificant. Once a week two or three young men invited me in a small restaurant, we sat down together and there I had to tell them all types of confidential things. In order to not hide something I was required to drink at once at least two glasses of vodka. I did not like to drink at all and I started to think how to protect myself. I figured that if one eats approximately 200 grams of butter, the alcohol produces almost no effect. Thus in the mornings of the day of these appointments I ate approximately half a kilogram of butter. First time it was very difficult to swallow, but then I got used to it." [Hyde]

In his New York studio he developed numerous artistic tools. Among them commercial RCA Theremins, Rhythmicon, Terpsitone. But one of his favorite research projects was the Microscopy of Time. His idea was that the time flows with different speed in macro- and micro- worlds. In other words, he did a research of microstructure of time by "eavesdropping" to the life of spermatozoids.

By 1938 Lev Theremin got in big debt and also had serious problems with the immigration service. He had nothing to do but to escape illegally from the U.S. When he landed in Leningrad in the fall of 1938 he found himself as an alien on unknown planet. He was totally alone. All his former friends had if not disappeared, were avoiding him as if he was a leper. Having better understanding of political realities he could avoid future troubles: it was a big change in Soviet intelligence services. Lavrenty Beria came into power and, as always, being new generation of NKVD employee was very busy arresting and shooting their predecessors. Nevertheless, Theremin started to search for a job, calling and visiting his former colleagues. It is not surprising that on March 10th, 1939 he finally was arrested and condemned to 8 years of labor camps in GULAG to work in stone quarries in Kolima. Fortunately after one year he was moved to Moscow "Sharaga" – special prison for scientists. It was a great present for him. Finally he had a working place, good equipment, technical information. He could do research and develop new technologies. 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 nonsense" – recollected Lev Theremin.

According to Rem Merkulov's memories: "My boss was Lev Sergeevich Theremin – tight, accurately dressed person always with a tie and a jacket. In a big room filled with equipment, several officers-radio-technicians worked under his supervision. We always were in civil dress during work hours.

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

We made radio-detonators for acts of terrorism in rear of the enemy. We also developed a detonator for an aviation bomb which provided explosion at height about two

meters above surface of the ground. The destruction ability of a bomb 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 recognize him as a condemned person without knowledge that after the working day he wouldn't be getting out this place." [Жирнов]

The real climax point of Theremin's inventions happened in 1945 with the development of "Buran" eavesdropping system, supervised personally by both Stalin and Beria. That was a real microwave thereminvox! For this invention Lev Theremin was awarded with the 1-st Stalin Award, which was almost not possible for the "normal" condemned person.

On August 4, 1945, during the conference in Yalta, Soviet pioneers 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, at least part of the time in the ambassador's study. [...] 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." [Петрушанская]

This came to the attention of the world when it was displayed at the United Nations in May, 1960. 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. Inside a cavity it held a small cylinder called a Hi-Q resonant. The cylinder contained a diaphragm at one end and an antenna at the other. Voices in the room caused the diaphragm to move 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. [The Great Seal Bug Story]

About ten years later the national news media revealed that there was a serious health risk for employees of the U.S. embassy Moscow posed by the continuous bombardment of the embassy by microwaves, it was mentioned that the exposure resulted from the microwave beams of microwave eavesdropping devices operated by Soviet intelligence agencies. In fact this trouble was also caused by Theremin's invention made in 1947. At that time he used a 330 MHz microwave radiation directed on windowpanes which then behaved like microphones: sound vibrated the surface of the window and produced interference patterns in the reflected beam. The interferometer and photo-detector in the receiver converted these interference patterns to voltage fluctuations which were electronically manipulated and reconstituted as sound.

However, Lev Theremin never did any calculations to get desirable effect, or to minimize possible risk. Simply owing to his genuine intuition he always was giving out correct decisions, although possible mistakes could sometimes be literally incompatible with life. Obviously, he never took into consideration the possible harm he could produce to other people. It is no surprise that employees of the U.S. embassy in Moscow were almost grilled.

To prevent Soviet eavesdropping some time in 1946 American auditors were invited to Moscow by foreign embassies to check the state of security. Trying to avoid a possible scandal Soviets cleaned up all embassies, but due to time constraints failed to clean up the one of New Zealand. There was no time left and Lev Theremin was asked for advice. He suggested to produce a strong microwave emission in the direction of the embassy to prevent the auditor's equipment to detect Soviet gadgets. According to Merkulov's memories: "In a courtyard of the embassy the yard keeper was breaking ice with a metal crowbar. When equipment was switched on, he threw away the crowbar and his cap, proceeded to shout: "Oh my God! Oh my God!" – and rushed to the embassy. When asked what had happened "The crowbar flew upward!" – was the answer" [Жирнов]

In 1962–1963 Theremin retired from KGB and moved to Moscow State Conservatory. Occasionally he was found by his American friends and the article was published by the New York Times on April 26, 1967:

"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.

[..] 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.

[..] 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 Elegy on nothing at all.

The room was filled with sound, and it was positively spooky. No wires, no gadgets, nothing visible. Merely electromagnetic sorcery." [Термен]

Even at the Conservatory Theremin was "eavesdropping" pianists by means of hidden wireless gadgets: "Here is some work I have been doing on the pedals of the piano. With this you can see by colored lines the pianist's pedaling. Very important. We have compared and graphed the pedaling of many great pianists in the same piece. Very interesting. [..] Richter uses more left pedal than most pianists." [Термен]

This article was followed by the avalanche of correspondence from former colleagues from the U.S. and caused fast and the only possible reaction: Lev Theremin was removed from his position and kicked out from Moscow Conservatory. In early 1970s, during repairs, the remainder of his bulky tools was destroyed and thrown out as junk.

The rest of his life Theremin spent working at Moscow State University in a position of technician at Physical Department. In fact, he never was a professor again, he didn't even get a degree in his scientific life!

In 1991, he finally entered the Communist Party. Communist leaders didn't really want him during the Communist era. He had to wait until the Communist Party will collapse to enter it. "I promised to Lenin" – he explained.

Lev Theremin passed away on 4, November, 1993. In the end of his life he dreamed to be buried in permafrost to be recovered when science will reach appropriate level. Instead he was buried in Kuntsevo Cemetery in Moscow.

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Andrejs Smirnovs

## **Visuma noklausīšanās jeb Stāsts par ASV Lielo valsts zīmogu**

Mākslai un politikai, iedvesmai un izlūkošanai bieži vien ir kopīgi avoti, un tās izmanto līdzīgus instrumentus, lai realizētos un attīstītos. Vairāki plaši pazīstami mākslas un mūzikas tehnoloģiju izgudrotāji ir bijuši iesaistīti militārās un spiegošanas darbībās un to izpētē, balansējot uz "naža asmens" un nošķirot, no vienas puses, radošās enerģijas un mākslas pasauli un, no otras puses, iznīcināšanas un aizsardzības pasauli. Kāda bija viņu motivācija? Kādi bija viņu nolūki?

Iespējams, viena no harismātiskākajām figūrām tehnoloģiju un spiegošanas krustpunktā bija Ļevs Teremēns (*Лев Сергеевич Термен; 1896–1993*), labi zināms kā pirmā elektroniskā mūzikas instrumenta *thereminvox* izgudrotājs.

Viens no izgudrojumiem Teremēna neskaitāmo spožo un gaišredzīgo ideju virknē bija pirmā elektroniskā novērošanas sistēma, kas deva iespēju uztvert netālu raidītu signālu un ļāva īstenoties 1920. gada televīzijas versijai, kas pārraidīja 100 līniju rezolūcijā piecu kvadrātpēdu lielā ekrānā, un šī aparatūra tolaik bija krietni pārāka par jebkuru citu līdzīgu ierīci. Desmitiem gadu Teremēns strādāja t. s. pastkastītēs, ārkārtīgi slepenos padomju pētnieciskajos centros, kuriem nebija konkrētas adreses, vien pastkastītes numurs. Tur viņš strādāja pie neskaitāmiem, joprojām slepenībā turētiem projektiem, kas bija domāti plašajām padomju aizsardzības struktūrām. To projektu vidū, kuri nonākuši atklātībā, ir noklausīšanās ierīce, kas bija paslēpta ASV vēstniecības Lielajā valsts zīmogā Maskavā un kuru 1960. gadā Henrijs Kabo Lodžs demonstrēja Apvienoto Nāciju Organizācijā. Tieši Rietumos Ļevs Teremēns kļuva slavens kā Leons Teremīns (*Theremin*) – cilvēks, kurš 1919. gadā radīja instrumentu, kas tika nosaukts viņa vārdā.