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## Enn Tyugu: a Deported Estonian and a Soviet Academician

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This work is dedicated to an Estonian scientist in Computer Science, Enn Tyugu (1935–2020). The two landmark events of his biography are his deportation in 1941 and his interest in computers. The topic appears relevant since in the post-Soviet (the same as in the USSR) environment research on the life paths of the representatives of deported nations was scarce; we know little about their life and the life of their progeny; there are no studies or ego-documents shedding light on the everyday aspect of their lives in deportation. We will not elaborate on the issue of access of science and technology specialists (technocrats) to political power and administrative decision-making and will limit our interest to their socio-professional identities.

**Keywords:** *history of informatics, Enn Tyugu, deportation, programming, STEM, PRIZ, Start*



### 1. Introduction

Though the focus of our study is Enn Tyugu, we are also going to dwell on the stories of two of his colleagues in Computer Science, the children of Baltic deportees born in the 1950s, who acquired their key competencies in the USSR/Russia. They are Irina Virbitskaite (born 1956) [22] and Algirdas Pakstas (born 1958) [3]. Their stories are the stories of success. Moreover, in his memories, Tyugu mentions several people of the same age as his elder brother Ants (1921–1996) [42]. Hopefully, that the story of the person who, as many his compatriots [14], managed to overcome the absence of freedom and deprivation when forced to accept the rules of other

people's game, will be informative and educational. It should shed more light on the system of the late-Soviet society, eloquently presented by A. Yurchak [49].

Several items shaping the context of our study are as follows. The first is the degree of liberty of a Soviet person and scientist, striving for self-improvement. Isaiah Berlin, discussing the correlation of “positive” and “negative” freedoms<sup>1</sup>, came to the conclusion that “... pluralism, with its demand for a certain amount of “negative” freedom, is a truer and more humane idea than the aspirations of those who try to find the ideal of the “positive” self-realization of classes, peoples and entire humanity in large authoritarian and strictly disciplined societies. It is truer at least because it acknowledges the diversity of human goals, many of which are incompatible with each other and are in the state of eternal competition” [5].

The approach followed by A. Yurchak, whose heroes – Soviet people – neither dissidents nor supporters of the Soviet regime, were the so-called “normal”<sup>2</sup> people, demonstrates that they managed to find the ways to exist and coexist that were different from the aforesaid types of freedoms, namely in communities and among the “fellow public”.<sup>3</sup> By studying the mentality of a small group of scientists, we will discover ways of existence discovered by Yurchak as well as some phenomena similar to a combination of Berlin's “positive” and “negative” freedoms, which also takes the mentality of scientists beyond the binary description (i.e. for or against the Soviet system).

In contrast to Yurchak, we reveal the stratum of “fellow people” basing on socio-professional principles, i.e. independent of biographical facts, such as being a deportee or a dissident/advocate.<sup>4</sup> Underlying this stratum were common professional interests and strive to become proficient in the new and then exotic field - computers. Moreover, being part of a broader stratum of scientific workers whose outstanding role in the industrial society is noted in the works of sociologists, futurologists and philosophers highlights Enn's belonging to a certain community

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<sup>1</sup> Negative freedom (characteristic for liberal societies, according to Berlin) is the “freedom from”, i.e. freedom from external intrusion, especially coming from the state bureaucracy. Violence is the main threat for freedom. This means that understanding “politics” is reduced to attempts of establishing a “peaceful order”, and settle conflicts between individuals, groups, and institutions. Positive freedom is the “freedom to”, i.e. freedom of self-development and self-expression. This freedom requires power (state or other) guaranteeing the process of personality formation and setting its parameters. Berlin considers this type of freedom to be typical for socialist societies.

<sup>2</sup> By “normal”, A. Yurchak means people of the late-Soviet period, whose life was relatively free from state control and ideology, and was not necessarily perceived as juxtaposition to socialism or the state. See A. Yurchak, *Everything was forever ...*, [49, p.193].

<sup>3</sup> Communities and the “fellow public” – in Yurchak's works, contexts of dominant ideology and authoritative discourse identified the “fellow people” not based on the same social origin or belonging to the same class, but by the perception of authoritative discourse (i.e. ideological slogans). [49, p. 249].

<sup>4</sup> The children of Baltic deportees were not subjected to repressions in their study, work and career. This is different from what happened to those who ended up on occupied territories during the Great Patriotic War. See refer. 24, p. 13–15.

[47]. It stemmed from the technological determinism typical of the Soviet society, technocracy, and absolutization of scientism. Anthropologically, these ideas formed the image of the “technocratic man”, armed with knowledge and capable of modifying nature and society on the basis of scientific and rational approaches [34]. These phenomena formed in the wake of modernization, which was accompanied by excessive expectations of the society addressed to science and technology. We will not elaborate on the issue of access of science and technology specialists (technocrats) to political power and administrative decision-making, and will restrict ourselves to their socio-professional identities; however, we must remark that this stratum failed to avoid the so-called “public addresses” (slogans) urging the workers of science to become active participants in building the communist society – this goal was included in the Program of the Soviet Communist Party of 1961. The community of those involved in software development formed during the Cold War and atomic projects. Though the development of computers in the USSR was not directly connected to the national atomic project, it shortly became a key customer [23]. Computer development in the USSR in the fifties was yet another major Soviet project, on a par with the atomic project, albeit on a lesser scale. Understaffing, as pointed out many times by academician Andrei Ershov (1931–1988), the informal leader of Soviet programmers [6], indicated the limitations of this project, and Ershov did his best to handle this problem. Among other things, the Department of Programming, Computing Center, SB AS USSR, in Novosibirsk, which he led from 1957 to 1988, trained programmers of the highest qualification as the national departments of the Soviet Academy of Sciences did not have Dissertation Councils specializing in system programming or software engineering. Few programmers chose to defend dissertations: their priority was keeping pace with the development of program systems. Nevertheless, Ershov encouraged defending dissertation theses in programming and hand-picked the most talented programmers. His extensive ties in the academic world and the reputation of the Novosibirsk programming school helped him to solve this task.

This paper is based on the memories of E. Tyugu published in Estonian [42], memories of other programmers, as well as materials from the Academician A. P. Ershov Electronic Archive [2]. The memories of Enn Tyugu can be divided into several periods: first, from his childhood to deportation in June, 1941; second, being in Bashkiria as a deportee until April 1946, when he managed to return to Estonia thanks to the efforts of his father’s sister, aunt Amanda. His memories of this period provide rare evidence of the life of the representatives of the Baltic peoples deported to Russia. The third period is his life in Haabersti, a suburb of Tallinn, which lasted until 1959, when he began his two-year training course in computing sciences in the Leningrad Polytechnic Institute. The longest period of his life in the Soviet Union (1959-1991) is

closely connected with computers. The final, post-Soviet period, began on January 1, 1992, when Tyugu went to Sweden as a professor of software engineering to work in the Royal Swedish Technological Institute (Kungliga Tekniska Högskolan, KTH), and lasted until 2000. Afterwards, he returned to Estonia, to the Tallinn Technological University, and combined his tenure with working in the Center of Collective Cyber-defense Competency until his retirement in 2016. While working abroad, Tyugu maintained a close connection with his Estonian colleagues through joint European scientific research projects.

## **2. How it begun**

Enn Tyugu was born in a family of telegraph workers. His father, Harald Tyugu (1891–1942), came from a family of farmers. He moved to the city of Paide, where he studied telegraphing. Here, he met his future wife, Elfride Nael (1899–1945). Her mother was the manager of a ham and sausage factory in Põltsamaa. In Paide, Elfride also learned telegraphing (she was ambidextrous and could operate the Morse key equally well with both hands). This was probably the very beginning of the establishment of the national scientific and technical intelligentsia in Estonia.

When she was 16, Elfride left home with her sweetheart, who had been ordered to work in Tambov, a town southwest from Moscow. While they were in Tambov, the Revolution happened and the Civil War began, which made the return to Estonia problematic. Telegraph operators were in high demand by the Reds, the Whites and the Greens alike. There is a family legend that Harald tried to stop the use of telegraph poles for firewood by one of the war parties; as a result, he was arrested and sentenced to execution. His wife saved him by bribing the guards with two loaves of bread. When they returned to Estonia in 1920, they saw that the hair of Enn's father, aged 29, had gone completely grey. Soon, their first son, Ants, fourteen years older than Enn, was born. Back in his home country, Harald completed a correspondence course and got a degree in Law at Tartu University. He became a lawyer in the Main Post Office; he made laws and resisted the attempts of illegal connection to the radio.

Enn's memories of his early childhood were joy-filled and calm; they had plenty of food; his nanny, and elder brother took good care of him. The family spent winters on the Kunder Street in Tallinn, and summers in their summerhouse, then under construction, in the suburbs of Haabersti. The area is now part of the city. The wooden house in Tallinn, with a shared hall and stone staircase, was a product of the pre-war construction boom. Enn recollected: "Our apartment was small by modern standards, but back then, my mother and father said, somewhat proudly, that we had a "two-room apartment with commodities". This meant that we had tap water and our own

toilet; the house was heated by a wood stove. There was a shared bathroom and laundry room in the basement” [42, p.21]. Both the city apartment and summer house had telephones installed (sic!). The first stage of Enn’s life was coming to its end.

Estonia was annexed to the Russian Empire in 1721, according to the Treaty of Nystad after the Great Northern War as part of two provinces – Estland and Livonia. In February 1918, Estonia became an independent parliamentary republic.<sup>5</sup> It remained one until the Soviet occupation of 1940, according to a secret supplementary protocol of the Molotov-Ribbentrop Pact of 1939 [41]. On September 28, 1939, the USSR forced Estonia to sign a mutual assistance treaty, which allowed the USSR to place its army, navy and air force bases and troops on the Estonian territory; the contingent of the troops was later increased. From June through August 1940, the state executive organs, police, army, financial and economic systems of the Estonian Republic were dismissed; education institutions were reorganized according to the Soviet model, and all public organizations were dissolved. On June 14 and 15, 1940, the “elections” of new parliaments, according to the directions of the USSR representatives, were held simultaneously in the three Baltic republics. At the simultaneous sittings of these “parliaments,” the three Baltic nations were declared Soviet Socialist Republics. They petitioned for acceptance into the USSR. The land became state-owned, banks and industrial enterprises were nationalized [15]. Tyugu recalled:

“That winter (1940) there was trouble in the air. My parents were fluent in German and Russian. Their speaking foreign languages, something that had not happened before, irritated me. Now I realize that they did not want to discuss the unpleasant events occurring in Estonia and other places with me around» [42, p.27].

His favorite children’s magazine, *Play and Enjoy*, was renamed into *Work and Enjoy*, and began to publish stories about pioneers and *kolkhozes*. Harald Tyugu was offered a job – head of a communications department in Western Estonia, but he declined.

By the summer of 1941, Estonia was completely sovietized. The process was accompanied by arrests, executions and deportations of citizens: like in the other two Baltic republics, it was the elite that got prosecuted: local and national-level politicians, prominent figures in economics and finance, military officers, active members of the Kaitseliit (Estonian Self-defense Union), wealthy peasants, professionals, etc.<sup>6</sup> Then came June 14, 1941. Over 10,000 people, whole families, were

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<sup>5</sup> On February 2, 1920, Russia acknowledged Estonia’s independence. On September 22, 1921, Estonia became a member of the League of Nations.

<sup>6</sup> The same is true about Soviet Russia/USSR in pre-war years [33].

deported from Estonia. About 3,000 men and 150 women were separated from the rest and placed into camps, where most of them were executed or perished. The remaining women and children were sent to special settlements in the Urals and in Siberia. According to the White Book, over 53,000 people were repressed in Estonia in June, 1941 [19, p.14–15].

### 3. Deportation

When a truck with soldiers and their commanding officer drove into their yard, Enn was alone with his mother. Elfride called her husband at work and her older son in his city apartment. They decided to stay together; some other families decided to disperse or hide. Enn and his mother were brought to the city, where the family reunited for a short period. Later, they were separated: men, youngsters and elderly people were placed into different trucks:

“My parents had a good idea of what life was like in Russia based on their experience, we took as many clothes as we could, and some food for the journey... My mother was happy because she found a place on the upper shelf, next to a barred window, where the air was fresh, and I could stay on the shelf and look outside through the bars” [42, p. 29].

Cars with men were separated midway. Enn never got to see his father again. Harald Tyugu died on March, 17, 1942, in the Sosva division of the North-Urals Camp (Sevurallag) in the Sverdlovsk Oblast: the high mortality of prisoners in the Sevurallag, especially in 1941–1942, was the result of harsh working (logging) and living (unsanitary) conditions, as well as of poor nutrition [37, p. 41].

The second stage of their travails began, but the little boy was oblivious to the tragedy. He enjoyed traveling by train, on a steamboat, and on a cart pulled by horses. His new friend, the 14-year old Karl Tiidus, carved wooden chess figures for him. Enn remembered the unfamiliar taste of the food that they were given during a stop in a school building. At last, they reached their deportation destination – the town of Urzhum in the Kirov Oblast, Bashkiria. His older brother Ants and other young men were taken to a logging camp on the river Vyatka, about 500 miles away from Urzhum. Enn and his mother settled in a shoemaker’s house. The population of the town was about 10,000; there were some stone houses and churches used as warehouses; roads, dusty in the summer, dirty in fall and spring, and snowy in winter. *Lapty*, starvation, lice, a vodka factory that supplied its product both to the nearby and remote villages.

Enn's mother was lucky to get a job at a ski factory: she knew Russian. Enn had to spend plenty of time alone. Elfride worked long hours, and every evening brought something to eat in a half-liter mason jar, her worker's lunch. Soon, Enn went to kindergarten. By learning poems by heart for the New Year show, he got his first Russian lessons. This was important, because he did not speak or understand Russian and so could not communicate. Food was becoming more and more difficult to procure. Elfride sold most of the things she had brought to the town and decided to move to a village. They stayed in the house whose owner had been arrested for taking wood planks from the *kolkhoz* yard to repair his cart. Their landlord and her daughter Galka, who was four years older than Enn, got on well. Enn quickly adapted to the new environment and made friends with local kids. They went to the forest to pick berries and to the little river Urzhumka, where he learned to swim; he herded the village cows. While the parents worked in the field, the children were on their own. They ate potatoes baked in embers with salt and garlic, young sprouts of horsetail, onions, and sorrel, and stole peas from the *kolkhoz* field: "We knew all the edible plants in the forest. I still know which herbs are edible and which are poisonous" [42, p. 44].

Elfride asserted her status among the villagers by helping illiterate women read and answer letters from the front. Sometimes, they went to see Ants. He was working as a lumberjack with other Estonian young men, and spent 16 years in Russia. The story of these men testifies to their perseverance and resourcefulness and to the lack of qualified male workers during the wartime. Ants was a blacksmith, an electrician, and a radio operator; he learned to drive a truck. He got a degree from the Sverdlovsk Polytechnic Institute (correspondence course) and worked as an automation engineer in Estonia. Ants' peers from the Jacob Westholm boys' school in Tallinn were with him in the logging camp. Later, they became known in various fields: Uno Kopvillem, a physics professor [7, p.36]; Juhan Tuldava (Haman),<sup>7</sup> a linguist, Doctor of Philological Sciences and professor of the Tartu State University; Juhan Zimmermann, a figure skating coach and a civil court judge [17] – almost all of them were educated remotely in the logging camp. On September 1, 1942, Enn went to school. Russian was a difficult subject for him, while mathematics was a success. Enn borrowed books from the school library. Despite the hardships, his mother did her best to educate her son: she invited an elderly Estonian lady to teach him German. Her strategy was understandable: she valued education and chose the language she herself knew well.

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<sup>7</sup> Juhan Tuldava (1922–2003, pseudonym Arthur Johan Haman) was an Estonian linguist and Soviet spy. Graduated from the Kirov Pedagogical Institute in 1948 with a degree in English language and literature. Started cooperation with the USSR National Security. The MGB and KGB gave him the agent names Voronin and Skvortsov. He published books in the Estonian language and memoirs under the name Arthur Haman "*Sõbrad ja vaenlased : mälestuskilde*" (Tallinn : "Kodumaa" väljaanne, 1967).

Enn was adapting well: he completed his third school year with distinction and was awarded an honorary certificate. Life was getting back on track. In the spring, they planted the garden, like all other villagers: potatoes, rutabaga and onions, valuable sources of food in winter. The fall harvest was excellent, and the mother was optimistic about the upcoming winter, as she wrote in her letter to Amanda in October 1944. This was when she learned that the Red Army had occupied Tallinn once again. In winter, Elfride's main chore was providing firewood. Then, the irreversible happened: she contracted a strep infection. Despite all efforts of the doctor, E. Tuldave, to save her by blood transfusions, she died of sepsis in Urzhum on April 5, 1945, aged 45 [42, p.45].

Enn was left under the care of his older brother, who was away most of the time. He continued going to school in Urzhum. His Russian teacher fed him, and he helped her correct homework. By that time, Enn had become good at Russian grammar; moreover, he read a lot: *Tom Sawyer*, *Treasure Island*... The pain of his loss was gradually going away... Soon, Enn did a very manly thing: he persuaded an employee of the city council to sign up him and his brother for a labor camp, like other Estonians; soon, they had moved to a new place. Here, lots of Estonians worked in the fields to supply the army. Ants got a job at the radio station, and Enn went to the neighboring villages to buy potatoes, bravely covering long distances. The Estonians established correspondence with their homeland and even got parcels with Christmas gifts. The head of the labor camp, colonel Schwartz, tried to arrange decent living conditions for his subordinates. A sort of a foster home was organized for the children who had lost their parents: it was warm, and there was food.

#### 4. Coming home

In the spring of 1946, Enn returned home: "What happened was that a quiet man named Stepan Shubin came to us, with compliments from aunt Amanda. He met colonel Schwarz and they agreed that the latter would take me to his regiment in Estonia upon his return from vacation. Stepan had a document stamped by the NKVD, stating that Enn Tyugu, born on May 20, 1935, was granted a permit to reside in the Estonian Soviet Socialist Republic" [42, p. 49]. Two girls who had also lost their parents, Airi Airing and Maret Looderaud, joined them. Enn and his aunt settled in the summer house built by his father. Every winter, the house had to be insulated. The parents' house in Tallinn had burned down in a bombing raid in 1944 during the advance of the Red Army.

Those were difficult times. In 1941, an anti-Soviet guerilla movement, the so-called "Forest Brothers" ("metsavennad") emerged in the Baltic States. In Estonia, over 40,000 people joined.

The movement remained active until the mid-1950's. At the same time, the national economy of the ESSR was being restored according to the Action Plan of 1944. The plan for the 4<sup>th</sup> *Pyatiletka* (five-year industrial plan), 1946–1950, provided an investment of 3.5 billion rubles into the economy of Estonia, which was 1.7–2.9 times greater than the amounts allocated to other republics, including Latvia and Lithuania with their bigger populations. Per capita investment into the Estonian economy exceeded the average for the USSR by around 30% in 1940-1950 and by 17% in 1951-1955. In the 1960s through 1990s, despite the general standoff with the West, Estonia had the most intensive economic connections with other countries, especially in the area of Computer Science [18]. It had good scientific connections with Denmark and Sweden, and good educational and trade connections with Finland. The Soviet-Finnish economic cooperation in the area of IT went through a joint Soviet-Finnish enterprise called Elorg Data, founded in 1974. 58% of the share capital belonged to Elektronorgtehnika, an enterprise of the USSR Ministry of Foreign Trade [36]. Estonian specialists in Elorg Data were able to learn foreign programming technologies. Thanks to the Finns, by the late 1980s, some elements of modern computer architecture, such as e-mail, appeared in the AS ESSR institute of Cybernetics. Scientific exchange benefited the process of training specialists in both countries: when in the late 1980s and early 1990s Finnish universities lacked teaching staff, they invited specialists from Estonia [18, p. 115].

Computing sciences got a boost in the Soviet Baltic in the late 1950s and early 1960s within the development of cybernetics; in a broader context, it was part of the scientific and technological modernization of the Soviet economy and rehabilitation of cybernetics. Cybernetics was perceived in the Soviet Union as the engine driving the building of the Communist society, as declared by the Communist Party Program in 1961 [20, p. 312]. This is yet another telling evidence of the technological determinism of the Soviet society of the time, facilitated by many eminent scientists [4]. A number of institutes of cybernetics were formed within the Soviet Academy of Sciences, including the institute in Tallinn in 1960; in 1976, a Special Design Bureau of Computing Machines was formed within the Institute.<sup>8</sup> Such institutions emerging in the system of the Academy of Sciences and higher education of the Baltic republics became basic

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<sup>8</sup> After the fall of the USSR, the AS ESSR Institute of Cybernetics became a semi-autonomous research institute of the Tallinn Technical University, and was closed after a structural reform. From January 1, 2017, specialists in phonetics and speech technologies and the laboratories of control systems and software were reassigned to the Department of Scientific Software at the New School of Information Technologies; specialists in wave technology, nonlinear dynamics, photoelasticity and from the Laboratory of Systems Biology were reassigned to the Department of Cybernetics of the New School of Science.

organizations for many computational sciences, programming, network technologies, and related special education.

The emergence of these institutions in the Baltics had internal economic reasons. The establishment of the Institute of Cybernetics in Estonia was dictated by explosive development of the chemical and energy industries (based on slate mining), where automation and controlling tools played a key role [16, p. 63]. Also, reforms aimed at the decentralization of the Soviet economy in 1957–1965 stimulated the development of the Baltic republics. New scientific and technical areas required new skills. A number of specialists in computer science for the Baltic republics were trained in the 1960s in the Leningrad Polytechnic Institute (LPI) and Moscow Energy Institute (MEI). Initially, there were about 25 students in Moscow and Leningrad. Specialists of the highest qualification were trained in Novosibirsk, Kyiv, and Minsk [12].

As mentioned above, Enn Tyugu had excelled in math in elementary school, which may have affected his choice of the Tallinn Polytechnic Institute as a higher education facility. Upon his graduation in 1958, he became a designer-engineer at the Tallinn Excavator Factory. According to his memoirs, it was then that he had his first experience with computers, which defined his future life and scientific career [43]. By the end of 1959, what Tyugu had believed to be impossible happened: he was accepted to the Leningrad Polytechnic Institute for a two-year course in computing, without leaving work. Ever after, he was grateful to Professor Aleksander Voldek,<sup>9</sup> who helped him to get to the Institute where he received a “fantastic” education in computer science. During this period, Tyugu’s work was connected with the Scientific Research and Technological Design Institute (1959–1976), where he grew from a staff researcher to the department head [10].

## 5. Science and a bit of politics

In the first half of the 1960s, the STEM microcomputer (Specialized Technological Electronic Machine) was designed and built in the Scientific Research and Technological Design Institute. Extremely reliable for the time, it was used in the technology department of the Kirov Factory in Leningrad (not in the computing center, though, as it required round-the-clock maintenance) [43, p. 13]. Similar computers were built for other major factories in the USSR. In 1967, the design received the State Award of the Estonian SSR. In 1966, Tyugu defended his thesis for the degree of the Candidate of Technical Sciences (supervised by Georgiy Konstantinovich Goranskiy, who

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<sup>9</sup> Aleksandr Ivanovich Voldek (1911–1977) – electrical engineer, Doctor of Technical Sciences (1957), Academician of the Estonian AS (1969), from 1950 through 1961, worked at the Tallinn Polytechnic Institute (currently Tallinn Technical University), then at the Leningrad Polytechnic Institute (now Peter the Great’s St. Petersburg Polytechnic University).

was the director of the Institute of Technical Cybernetics of the Belorussian SSR Academy of Sciences in Minsk in 1965–1970).

Eventually, Tyugu received a recommendation to enroll for the Doctorate studies of the SB AS USSR Computing Center in Novosibirsk Akademgorodok, to the Programming department led by Andrei Petrovich Ershov [28]. Tyugu had read the work on parallel programming written by V. Kotov and A. Narinyani in the early 1960s [21], and came to Novosibirsk Akademgorodok to get to know them closer and to speak at a seminar. In 1970–1971, he became a researcher of the Computing Center, and Ershov became his scientific consultant in his work on his Doctorate thesis. Ershov spoke highly of Enn’s progress.

Tyugu came to Akademgorodok when the Khrushchov Thaw (*Ottepel’*), ambiguous as it was, ended with the suppression of the Prague Spring in 1968 and arrest of the protesters against the military operation in Czechoslovakia on the Red Square. In the context of the Czech events, Akademgorodok became one of the centers of the opposition movement. It was caused by the Process of the four trial in January 1968, when several “dissidents” were prosecuted, including the journalist A. I. Ginzburg, poet Yu. T. Galanskov, activist A. A. Dobrovolskiy, and typist V. I. Lashkova. 46 researchers of the SB AS USSR and the NSU signed a letter protesting the lack of *glasnost* during the trial. On March 23, the letter was published in the New York Times, and on March 27, it was broadcast by the Voice of America [25, p. 7]. Valeriy Menschikov, a member of Andrei Ershov’s team, was among those who signed the letter. The reaction of various academic leaders to the actions of those who signed the letter was not unanimous: Menschikov got out of the turmoil virtually unscathed – Ershov vouched for him and accepted him as his postgraduate student.

On March 8-9, 1968, a bard festival was held in Akademgorodok. Alexander Galich, who was invited to the festival, performed his songs “Goldminer’s Little Waltz” (*Staratel’skii valsok*)<sup>10</sup> and “In the memory of Pasternak”. As a result, the Under the Integral club (*Pod integralom*),<sup>11</sup> which organized the festival, was closed. Galich’s socio-political satire was condemned by the Communist Party officials as “food for our ideological enemies”. Vladimir Davydov, a friend of Tyugu’s and an active participant of the club’s meetings, compiled a remarkable photographic gallery showing the life of the club members [38].

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<sup>10</sup> This ballad is a bitter reproach to the indifference of the Soviet society towards the repression of political freedoms and nonconformists. The majority basically approved the persecution of dissidents with their silence... “Be silent and you will become a rich man... be silent and you will become a hangman”.

<sup>11</sup> Café-club *Pod integralom* was a discussion club in Novosibirsk Akademgorodok hosting informal talks and meetings of scientists of different generations. One of the symbols of the Khrushchev’s Thaw; closed in 1968.

There were some problems of scientific nature, too. The team of Ershov's Programming Department was working on the BETA Multilanguage translating system.<sup>12</sup> The bottleneck was developing an internal language for the system, which upset the timeframe of the project. Another obstacle was conflicts between the people responsible for the task. Tyugu observed it all at BETA seminars [24, p. 44–51]. However, his own work progressed successfully, despite some problems with the living conditions: it was difficult for doctorate students from other cities to get decent housing in Akademgorodok. Tyugu made friends with his colleagues and discovered a passion for hiking and hunting, fostered by Vladimir Davydov's enthusiasm.

During his Doctorate studies in the SB AS USSR Computing Center, Tyugu presented his research at a number of high-ranking national and international conferences. In particular, Tyugu and his co-authors presented the paper called "A system of modular programming for the Minsk-22 computer" [40] at the Second All-Union Programming Conference (VKP-2) in Novosibirsk in 1970. The same material served as the basis for his talk at the IFIP-71 Congress in Ljubljana in Yugoslavia. The Computing Center gave a truly royal gift to Tyugu: he was included in the Soviet delegation to the Congress though the number of people allowed to participate in the Congress as the Institute's employees was strictly limited. The trip, formally qualified as "scientific tourism," cost 350 rubles, with a 10 rubles participant fee [27]. The head of the delegation, Academician A. Dorodnitsyn, signed a permit for the preparation of the necessary documents.

In 1973, Tyugu defended his Doctorate thesis in the Leningrad Electrotechnical Institute, entitled "Application of computational models in the software for machine-assisted design." His opponents were S. S. Lavrov, B. G. Tamm, and N. G. Bondarev. Tyugu remained engaged with Ershov's department. In 1979, he was invited to participate in a legendary event of the time – scientific pilgrimage to Urgench, the native city of Al-Khorezmi [46]. Eventually, Andrei Ershov, who was the vice-chairman of the Programming committee at the IFIP-1980 Congress and leader of the Software section, put considerable effort into making sure that the USSR would be properly represented at the Congress. Vadim E. Kotov and Enn Tyugu were invited speakers. As a member of the Program Committee, Ershov helped Tyugu with his talk, both in terms of content and stylistics. He asked R. M. Berstall, a professor of the University of Edinburgh, "to assist in assuring the high quality of style and content of Tyugu's talk [29]."

In 1979, when the AS USSR Coordinating Committee on Computing Machines formed the Commission on System Mathematical Support, headed by Andrei Ershov, Tyugu became part of its bureau [30] and head of the Workgroup on Program Synthesis [45]. Moreover, he was a

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<sup>12</sup> BETA, which was not even an abbreviation, was sometimes caustically explained as Big Ershov's Translator Adventurism (*Bolshaya Ershovskaya Transliatornaya Avantiura*).

member of the committee on the distribution and use of computing machines in the AS USSR [31]. In 1981, Tyugu was elected a Corresponding Member of Academy of Sciences of the Estonian SSR, and in 1985, he became a full member of the Academy and Secretary Academician of the AS ESSR Department of Informatics and Mechanics (1985–1991).

In 1976–1986, Tyugu headed the Laboratory of Software in the AS ESSR Institute of Cybernetics. The research program of the laboratory was aimed at problems of programming automation with applications to engineering calculations. Tyugu suggested an approach to developing instrumental systems for packaged applications based on automatic program synthesis (which later became known as “semantic computing networks” and “conceptual programming”). The idea was further developed by S. S. Lavrov (Leningrad) [26]. Tyugu’s approach was implemented in the PRIZ program [Russian abbreviation for *Program for Solving Engineering Problems*] [35]. Grigoriy Efroimovich Mints (1939–2014), a Soviet dissident mathematician, was part of the team; upon the termination of his tenure at LOMI (A. V. Steklov Leningrad Division of Institute of Mathematics), he was accepted to the AS ESSR Institute of Cybernetics (1980–1991), where he collaborated with Tyugu’s laboratory [44]. An important feature of the approach implemented in the PRIZ system was the possibility of integrating various software suites into a single system.

At the end of 1960s, Tyugu suggested organizing winter software schools in Viljandi. Its participants were the representatives of computer factories from Minsk, Zagorsk, Kyiv, and Kazan, as well as the masterminds of programming from the Lebedev Institute of Precision Mechanics and Computer Engineering, Keldysh Institute of Applied Mathematics, V. M. Glushkov Institute of Cybernetics, Dubna, etc. The agenda included the discussions of the participants’ own projects as well as the reviews of new foreign software: IBM OS, IBM DOS; by that time, it had been decided that the IBM 360 computer (1967) was to be copied in the USSR. The scope of the topics discussed at the schools expanded to include the automata theory (M. A. Gavrilov, Corresponding Member of the AS USSR) and artificial intelligence (G. Jakobson, Candidate of Technical Sciences,<sup>13</sup> and A. D. Pospelov, Doctor of Technical Sciences). Active participants of the schools was the team led by V. I. Varshavskiy,<sup>14</sup> specializing in mathematics, biology, automata theory, collective behavior, image recognition, information transfer, and creation of asynchronous electronic devices and systems, took active part in the schools.

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<sup>13</sup> Gabriel Jakobson is currently in the organizing committee of the CyCon conference devoted to cyber defense and is the honorable chairperson of the annual conferences CogSiMa (Cognitive Situation Management) in Estonia.

<sup>14</sup> Viktor Ilyich Varshavskiy (1933–2005) – cyberneticist, professor, Doctor of Technical Sciences, played a major role in the establishment of cybernetics and artificial intelligence studies in the USSR. From 1993, he worked in Japan and Israel.

In 1985–1988, the team led by Tyugu joined Start, – a Soviet project aimed at creating a 5<sup>th</sup> generation computer [9]. This was an attempt of the Academy of Sciences to regain Soviet positions in the development of computing machines, mainly by large-scale copying of American computers.<sup>15</sup> Participation in this project provided the Estonian team with good financial support for developing their own ideas. Enn was an active member of the working group that developed the concept of the project. His responsibilities included the choice of high-level tools for the creation of intellectual software for the programming system that would enable the creation of user-friendly user applications. Start teamed up with a large group of researchers and engineers from the Special Design Bureau of the Institute of Cybernetics. Its tasks included the implementation of the professional intellectual object-oriented workstation PIRS as part of a series of high-output modules unified by the Multibus-2 bus and an input-output machine. The modules of the workstation were the KRONOS processor, data filter, high-resolution raster display controller, specialized name processor and object memory control processor [39].

During the *Perestroika*, Tyugu took active part in the social and political life of Estonia. In 1989–1991, he participated in the Congress of People's Deputies of the USSR. Together with other Estonian deputies, he advocated the rescindment and condemnation of the secret protocols of the Molotov-Ribbentrop Pact. The People's Front of Estonia in support of Perestroika became increasingly insistent on granting independence to Estonia; in the summer of 1988, the Supreme Soviet of Estonia reinstated the blue-black-and-white national flag. In November, the Declaration of Sovereignty was signed, establishing the prevalence of the laws of the Estonian SSR above the laws of the USSR. On August 20, 1991, the Supreme Soviet of Estonia declared its independence, legally reinstalling the Estonian Republic. This resolution was followed by the restoration of diplomatic relationships and recognition of the Estonian Republic by many of the world's states [48]. In 1996, Tyugu ran for president, on suggestion of his colleagues from Estonian Business School and Tallinn Polytechnic Institute in addition, but did not receive enough votes. According to an interview, becoming a president was not a priority for him; he did not have a specific program, believing that “the role of the president is to find balance, compromise and moderation” (exactly the role of the Estonian Republic president today) [32]. Later, he admitted that there had been some degree of adventurism in his presidential campaign, assuming that his political ambitions could have interfered with teaching in Sweden. In 2001, he was awarded the White Star Order of the Third Degree [11]. Along with such masterminds of informatics as Ia. Penjam, M.

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<sup>15</sup> On December 30, 1967, the Soviet Communist Party Central Committee and the Cabinet of Ministers adopted the resolution “On further development and production of computing technology tools”. It installed the strategy of copying the technologies of IBM and DEC as the official technological policy [1].

Meriste, U. Pruuden et al., Enn Tyugu is one of the founders of informatics in Estonia, a country which has become the leader in IT applications in the Baltic region.

## 5. Conclusion

Estonians are usually characterized as calm, good-natured, substantial and business-like people. This is what Enn Tyugu was, judging by his ego document and memories. As a child, he suffered a serious trauma: lost his parents, home, and motherland. However, even if there is bitterness in his memories, it is well-concealed. The very form of the memories, written in several acts, like a play, as well as the name “Life as a Show” move the losses and bitterness into the background, both structurally and stylistically, and create an illusion of distance between the main character and the events. Details provided by Enn in his memories, as well as the skills acquired in his childhood, indicate that the experience was very deep-rooted. He put what nature had given him to the best possible use, and was persistent in pursuing his goals. Evidence left by Enn about his childhood is unique to the history of the Soviet multinational intelligentsia, even though the multinationality was not always by choice.

A look at the history of the study of the relationship between the Soviet scientific elite and government demonstrates the limitations of its factography and theory specifically in relation to national peculiarities. The approaches and metaphors used for the “Soviet scientific intelligentsia” do not apply here. We know that already in the pre-war period, the state became the only employer of scientific projects, the only source of their material support and the only customer of practical and scientific results. This situation drew them to the Big Deal of the post-war time – the reorientation of the Soviet regime towards satisfying the needs of the Soviet intelligentsia and middle-class bourgeoisie and the implicit return of middle-class values into the Soviet life in return for loyalty [8, p. 3–5]. The ambiguity of the relationship between the state and society allowed J. Hellbeck to formulate the concept of “Soviet subjectivity”, i.e. the external loyalty of Soviet citizens as a cover-up of their “personal core” and private life [13, p.17]. This idea is supported by the heterogeneity of the scientific elite, a key support of the modernization of the Soviet society. The relationship of the Soviet scientists and the state was influenced not only by the awareness of the former that they were in demand in but also by the memory of the trauma inflicted by the occupation, deportation, destruction of their statehood, and repressions against their loved ones – the private life component that had been temporarily hidden. As Laozi said, there is no need to avenge evil – just sit by the river, and eventually you will see the corpse of your enemy floating by. The resistance of the “Forest Brothers” was suppressed in mid-1950s. Life in the Baltic States went back to normal, and they became a sort of a showcase region of the

Soviet Union. They flourished, they became richer and more educated. But the memory of the past remained. As soon as there appeared an opportunity to regain independence, the Baltic States used it. Enn Tyugu, whose family had experienced the dread of the steamroller of the Soviet history, became a parliamentary deputy for the period when the urgent problems of the very existence had to be solved, but later returned to science. After all, it was his lifetime calling.

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