Tape 2 Side A

Immediately, various solutions were proposed [for groundwater protection]. The first solution, whose planning was assisted by experts from Goskomgidromet and other regulatory organisations, as well as organisations such as Minvodkhoz, was to build an underground barrier surrounding all contaminated areas of the ChNPP, and to dig trenches, concrete them and make a kind of cuboid around the contaminated area to prevent contaminated water from leaving the site. Initially, even Italian equipment was purchased which would allow this project to be carried out at high intensity.

But then, more accurate surveys; more accurate evaluation of the radiation conditions in the water, of the migration of radionuclides in the water, together with tests on the Italian machinery itself and an assessment of its performance, showed that this solution was not justified. A more effective solution was put forward to the Minvodkhoz: to surround the entire contaminated territory with approximately 1450 wells, some of which would be measuring wells in which the radioactivity of the water flowing through wouldbe continuously measured; then, if necessary, contaminated water could be pumped out using special devices, preventing it from reaching the groundwater.

In practice, this then turned out to be the best decision, as all the wells had been built and the measuring wells showed that there was practically no penetration of contaminated water into the ground. To this day, I haven't heard of a single case where contaminated water had to be pumped out. So the barrier was built in the ground in only one place; the most contaminated area, and that was all. The wells are in place, are monitored and are functional.

Since the cooling pond at ChNPP ... Since after the release, some of the radioactivity got into the water, the next step to protect, say, the Dnieper sea [sic] and the entire water basin, was the construction of dams that included Celites, that is, substances capable of absorbing radioactive particles and radionuclides should they appear in the water in small or large rivers. Such protective dams were built and had a positive effect. So, water contamination never exceeded maximum permissible concentrations.

It must be mentioned that Ukrainian comrades initially came up with a plan to create a bypass canal that would divert all the water from the Pripyat river away from the Dnieper sea. This project would have cost billions and such a canal would have passed through Belorussia. It would have been very expensive. However, it would guarantee that no contaminated water got into the Kyiv Sea. But again, a commission led by comrade Voropaev was created. It thoroughly analyzed the situation. Even before this commission was created, I had been charged with assessing this project. Based on the simplest estimates that I could make, this commission seemed redundant, because with the system of wells and dams in place, the exchange of radioactivity between the water and silt would not pose any significant danger to the Dnieper sea. But then the commission did a much more thorough assessment and concluded the same thing as I did. Therefore, this project was rejected and as reality has shown, the project would have been economically impractical and would not have brought any additional benefits towards protecting the Dnieper basin.

People from Kiev took the correct measures at this time. They began to prepare for the possibility of using water from another source, from the Dniester, to supply the city and made all possible efforts to create additional artesian wells. In case the Dnieper’s water became contaminated above the permissible concentrations, the city could be supplied using alternate sources of water. All the preparatory work was done in a very quick and very organized manner. All this was readied but never went into action. Because neither before nor after the high water in spring did the waters of

the Dnieper basin contain dangerous levels of contamination that would pose a threat to human health. What I mean is that, generally, there was no contamination in the river basin.

In the first few days, on separate spots of the river basin, it must be said, activity of up to 10^{-8} curie per litre was detected in some water samples. Secondly, silt, including that in the Dnieper basin, turned out to be contaminated. The most heavily contaminated silt was in the cooling pond beside the ChNPP but also further downstream along the Pripyat and the Dnieper. Radionuclide content in the silt is considerably elevated even today. But fortunately, nature itself acts in a way that silt holds the individual particles of radionuclides quite firmly. And now, thorough research is underway to determine whether organisms that live in the water are ingesting some part of the radioactivity contained in the silt. This research is still underway and will continue for quite a while. The initial conclusions are that fish living close to the riverbed do, without a doubt, carry some radioactivity in them but no disturbing symptoms have been discovered.

And the second situation, protecting the shore and rivers against the melting water [in spring] which carries away various debris contaminated with radioactive elements—wood chips or needles that fell in the contaminated forest—that could lead to rather significant radiation damage. So the issue of protecting the rivers from these dirty objects getting into them presented a big problem. And here, the Soviet Army played a big role in minimizing the possibility of these contaminated objects getting into the rivers, and in tackling the problem of cleaning and gathering [contaminated objects] from such contaminated areas. It was a serious problem* and it was resolved by the army with great intensity.

Since I've already started talking about the army, then I must say that from the moment when the Soviet Army was charged with organizing the work, the scope of work was quite extensive, but the deployed chemical forces first had to scout and establish the contaminated area. The army was responsible for the work at the station itself and decontaminating villages, houses and roads in the 3-kilometre zone. They did a colossal amount of work.

While individual researchers had proposed various solutions for dust suppression, in the summer of 1986, one of the main challenges was preventing the spread of contaminated dust over large distances. To do this, a wide range of chemical solutions were tested that had to be practical, could cut off the contaminated areas while letting water through but, prevent considerable spread of dust. The creation of these solutions, their testing and their introduction across large areas—all this work fell to the army. This work was very meticulously organized.

An enormous amount of work was done by the army to decontaminate Pripyat. Sometime around the end of August, September or October, when the city was in a condition which allowed it to be preserved; it was safe to be in… this didn't mean that the city could be inhabited normally, but that the city no longer posed any immediate danger was thanks to the army's efforts.

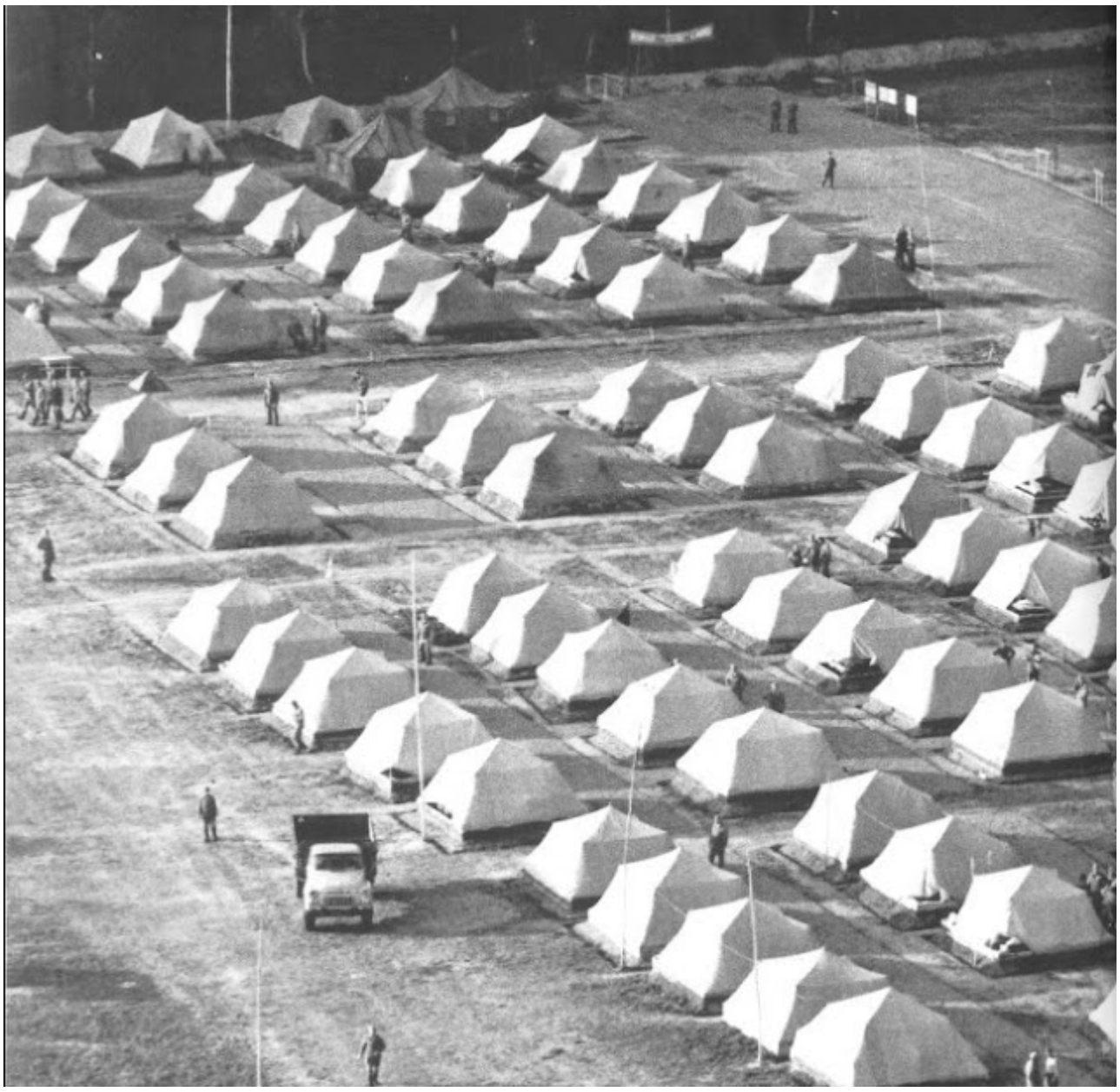
Of course, the decontamination of the 1st and 2nd reactor buildings in preparation for their reactivation was also something the army was involved in. Decontamination of the interior, cleanup of the area, and of the roof, all this was done very actively and in difficult conditions, all while ensuring that not one of the soldiers or officers received [radiation] doses exceeding 25 rem . Later, the maximum dose was reduced.

Although, of course, there were cases, some amusing and some tragic, that I witnessed with my own eyes. One such unfortunate case was when some groups of soldiers had only a single dosimeter

carried by their commander, who would estimate the [radiation] dose received by each soldier. These were rare cases, but they did happen. In one case, a commander was recording higher doses for soldiers who were working well—perhaps as an incentive to work harder and as an opportunity to complete their stay in the zone faster—and lower doses for soldiers who were working poorly. But when such cases became known, a scandal broke out. Everything, was, of course, changed, but unfortunately, these things did happen.

I never witnessed a single case where specialists from the SA [Soviet Army] or a USSR citizen, somehow trying to do their work, or felt like they were forced to do difficult or dangerous work. There could have been such cases but I never saw anything like it. On the contrary, I myself went to the dangerous areas of the 4th reactor building several times, to clarify reconnaissance data or to estimate the amount of work remaining for certain operations, and always had to take soldiers with me for help. I always asked them. When a group of soldiers was brought to me, I explained the conditions under which they would be working and said that I only wanted to work with those who were comfortable with it. And there never was a case—and there were many such occasions [when soldiers were asked to help]—where someone, as they say, remained in the ranks, and did not step forward to help us carry out various, sometimes very difficult, tasks. In these cases, a soldier was no different from a civilian who took part in these efforts.

As proposed by General Damiyanovich, a military centre was quickly established in the area surrounding the ChNPP to ensure that military specialists—the military units in charge of decontamination, measurement, and any other operations that the army had to do—would not act randomly; by trial and error, but more consciously. This military centre was organized, and worked on selecting appropriate measuring equipment, the most appropriate conditions and routes, on developing technological methods for decontamination. The presence of such a military centre played a large positive role as it allowed the work to be done sufficiently quickly and with minimal [radiation] doses. Although, generally, the cumulative doses were doubtless quite high due to the enormous amount of work, and the enormous number of people involved. But nevertheless, they were minimized thanks to the actions of the military centre, that worked in collaboration with scientific organisations of the USSR Academy of Sciences, the Institute of Nuclear Energy and Kiev research organisations. So, this centre played a big role.



Not only were the decontamination tasks performed incredibly quickly, the construction of the new residential villages, where the evacuees were moved, was also incredibly quick. The construction of the village Green Cape was astonishingly swift where the 1st and 2nd block staff, who were forced to work in shifts, were accommodated. The work was done not only quickly, but they also sought to do it properly and, in my opinion, tastefully.

At this point, I want to say that, particularly in the initial period, considering the tragedy of the situation, considering such despair, I would say, considering the lack of technical means, lack of experience in handling such a large scale catastrophe, confusion and uncertainty could have easily arisen in decision making. But it was not so. Somehow, irrespective of rank, irrespective of the task at hand, everyone worked like a finely-tuned team, especially in the initial days. The scientific part of the team, who were responsible for the correctness of decisions, made these decisions without the support of Moscow, Kiev, or Leningrad. Support in the form of consultations, in the form of various experimental verifications, in the form of the immediate arrival of any specialists called in ... Whenever we came to some reasonable scientific decisions, the leadership of the Government Commission was able to, with the help of the Operative Group or one of its members, instantly

obtain all the necessary materials that we needed in order to implement it in a fantastically short time, literally within days, and sometimes hours.

I remember that on-site at Chernobyl was the chairman of the Government Planning Committee of Ukraine, Vitaly Andreyevich, working as part of the Operative Group—a remarkably calm person, energetic; who would understand things perfectly even before we had finished talking. He always listened to our scientific discussions—what we would talk about, what we would need—and reacted instantly. We needed liquid nitrogen to cool down the block after we concluded that we were dealing with a cyst, he responded with a smile that the required trains had already been ordered. The same was true for all materials, say, magnesium oxide, containing carbon. He got them all from the metallurgical factories of Ukraine or somewhere else, and all of these materials were delivered. It is difficult to overestimate the work of the supply group, which was organised by the chairman of the of the Gossnab of Ukraine—working on behalf of Vitaliy Andreyevich Solov, the chairman of Gosplan of Ukraine—who, sitting in Kiev, worked miracles to ensure that all the work was carried out in Chernobyl with all the needed materials even though the amount needed was, of course, ridiculous.

Along with technology and scientific materials, the huge army of people brought to the zone had to be provided with food, water, clothes, and dressing areas; laundry and cleaning had to be provided; inspections... This colossal task was organized; even now it is hard to imagine how. Of course, all this reminded me of the the —which I remember from my childhood, and from accounts told by soldiers—that the logistics were certainly as, if not more, important than the work of those at the front lines, who worked on the decontamination itself, on measurements, diagnostics and various other things. They were responsible for providing all needed materials, living provisions; they played a vital role.

Speaking of such impressions, of such observations, I cannot leave unsaid that on the very first day of my stay at Chernobyl, I was struck by two things. Due to the nature of their work, I'm used to treating people in the KGB (Committee of Government Safety) as people that safeguard state secrets, that organize people who are cleared to work in especially secret and important roles, who coordinate services that allow for the protection of all documents, technical documentation, and correspondence, which ensures that state secrets are kept safe. This is how I mainly knew the KGB. However, from stories and literature, I also knew that a part of this committee was engaged in intelligence and counterintelligence work.

In Chernobyl, I met highly organized, very precise young people who fulfilled the tasks assigned to them in the best possible manner, and these tasks were not easy. The initial organization of clear and reliable communication; this was done practically within a day. On all [communication] channels, they worked quietly, calmly and very confidently. And I even saw a team of young people, led by Fyodor Alekseevich Scherbakov, working. But all this was done remarkably clearly and quickly. In addition, they were also responsible for ensuring that the evacuation was carried out without panic, without any sense of panic, any excess that would hamper normal work. And they did it. But how they did it, how they made it happen, I still cannot imagine because I only know the result of their work. Indeed, there was nothing that impeded the organization of this unusual and difficult operation. And I was just delighted with the technical equipment and the culture of competence within this group.

Source: wiki

The direct opposite to the work of this group was the work of, for example, the Civil Defence group in the composition in which they operated in the initial days. It simply shocked me. It seems that we all often learn, retrain; a lot of brochures are produced; a lot of time is spent on each erprise. But it means taking into our own hands issues that fall within the sphere of Civil Defence. General Ivanov, who initially commanded this unit, in my opinion, simply failed. They did not know what to do; and if they received direct instructions, they did not demonstrate any influence, management skills or ability to remedy the situation. And these weren't just personal impressions. This is how many felt, so to say, in a subtle way, that the work of the Chekists, though not conspicuous, was positive, whereas the negative, helpless work by Civil Defense was noticeable in the early days of these events. I cannot leave that unmentioned.

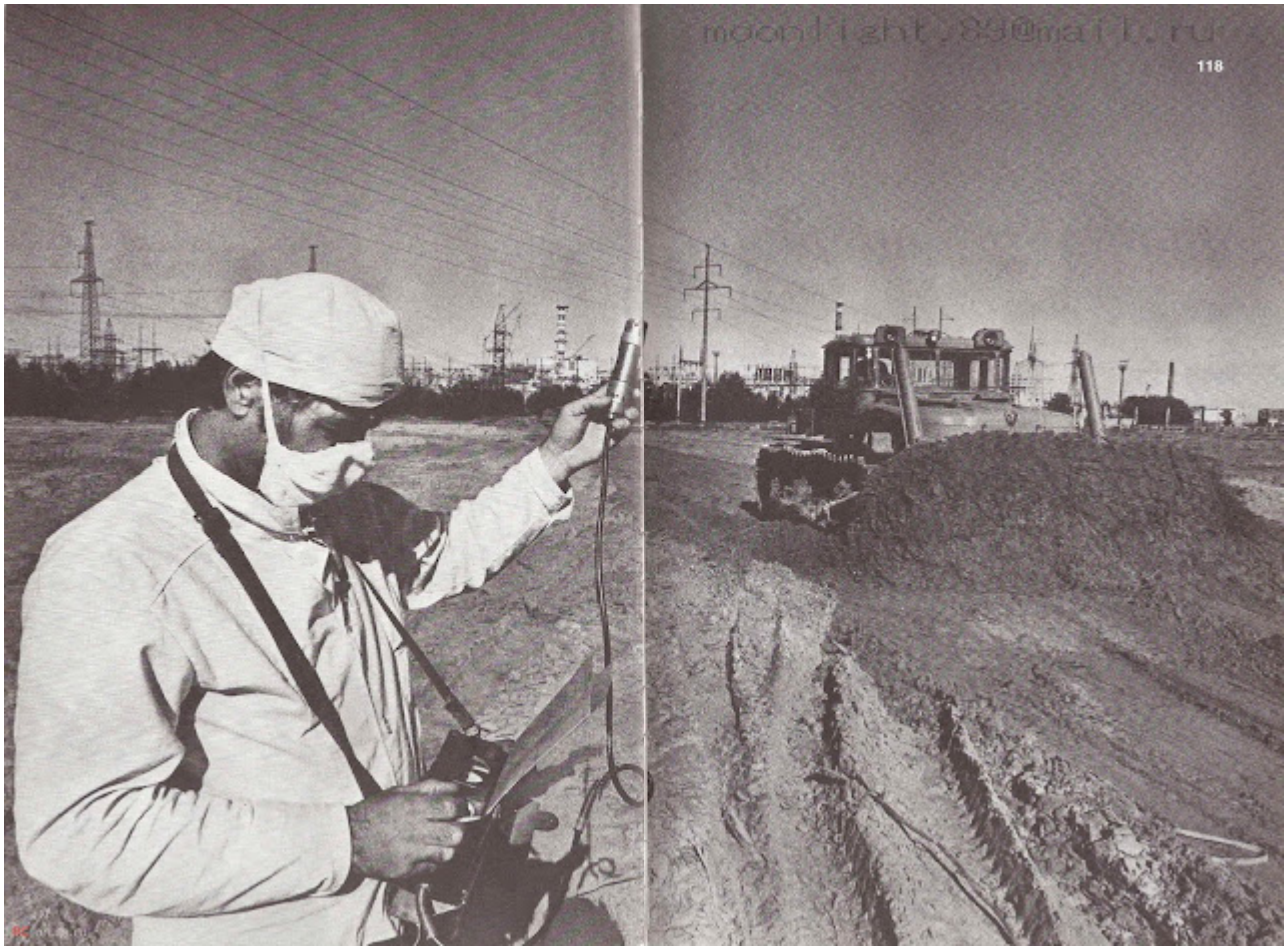
During the first days of the Chernobyl tragedy, the flaws in our information services were very evident. Even though we have Atomenergoizdat—formerly called Atomizdat—medical publishing houses, the "Knowledge" society, it turned out that prepared literature that could quickly be distributed among the people to explain, for example, what doses are extremely dangerous for humans, how to behave when a person is inside a zone of increased radiation exposure, a system that could correctly advise on what to measure, how to measure, how to treat fruits and vegetables, the surface of which could be contaminated with beta, gamma, alpha radiation—all this literature was totally absent. There were many books for experts, thick and accurate, well-written; these were stored in the libraries. But it was precisely such brochures, leaflets—same as the Japanese ships with their products like watches, voice recorders, video recorders—that were needed in those conditions. Which button to press, how long to wait, what to do. Almost no such literature was available, in the entire country.

I have already mentioned that I had proposed from the beginning to create a press group under the Government Commission that would correctly inform the population about the events that were happening, that would give the right advice. For some reason, this was not accepted. After Ryzhkov and Ligachev arrived at the disaster zone, journalists were allowed in. And a large army [of journalists] appeared there. But, you know, it is hard to say even now; it is probably good that it was allowed but it is bad that it was not organized properly. Why? The journalists arrived, a variety of them, most of them very good journalists. For example, a team from Pravda and the famous head of the science section Gubarev, Odinets, many good Ukranian journalists and documentary filmmakers appeared there. But I saw for myself how they would grab the most famous people there, and interview them about some specific issue. Sometimes, they managed to ask the Chairman of the

Government Commission, or one of the members of the Commission, about some particular, specific topic. They, of course, spent most of their time on-site. They talked to people that were evacuated or with people that worked on the 4th block, on decontamination and this information was broadcasted.

What they collected, what was published, of course, is of tremendous importance from a historical and archival point of view as live documentary material. And this is necessary and essential. But at the same time, because the information was presented from a particular, specific point of view each time, the nation did not get a daily or maybe at least weekly, depending on the state of events, idea of what was going on. Because information came out in separate blocks. The miners are working heroically there but there is no information about the level of radioactivity they work in; what is happening in the Brest region nearby, who is measuring it, and how. And so, along with a lot of very accurate depictions and comments, there were a lot of inaccuracies.

For example, the press spent a lot of time on the so-called “needle” which was fiddled with for a long time. It was an integral device that had to be placed into the belly of the wrecked 4th block and would have provided continuous information about the temperature there, about radiation fields and some other parameters. But, in practice, the effort to put this needle in the right place from a helicopter was huge; and nearly no information was received from it. There was zero information; well, it only confirmed what had been obtained by other simpler and more reliable methods. So this episode of installing the needle was described very elaborately and very, so to say, extensively.



At the same time, the enormous amount of work done by the dosimetrists, the modest work of young people, say, from Kurchatov Institute led by Shekalov or Borov or Vasiliev, the work of

“Ryanovskaya” [РЯновская] group led by Petrov, the work of Kombanov who was there many times to test his dust suppression solutions, the logic of all the work, an analysis of the projects that were undertaken—this wasn’t described properly. And mainly, the chronology of the events themselves was not presented. In this situation, many people overheard things here and there and this led to exaggerated rumours; naturally about the number of people affected by radiation sickness, about the levels of and the extent of the affected area. Any pause in the subsequent construction of the sarcophagus was frequently interpreted as some sort of catastrophe, as a collapse of some structure, as the appearance of new emissions, or as proof that the reactor is suddenly working again, etc. So, no proper systematic information was provided on these questions. And this, of course, gave rise to all sorts of wrong and sensational, sometimes maybe not sensational but still inaccurate, depictions.

For several months, the extent of the emissions from the 4th block was debated, even in the science community. The fact is that experts—those working directly at the station, experts from Hydrometeorology service—had precisely measured the fallout dynamics. The first, the most powerful emission was the one that threw millions of curies of radioactivity in the form of noble gases and iodine at high altitude. And this emission was registered by almost all the countries of the world. Subsequently, there were a few days of active emission of radioactive particles, fuel, mainly due to the graphite burning. Then the emission of these fuel particles ceased around the 2nd of May. Then the fuel began to heat up due to a bead there; and there was a release of already fission products such as Caesium and Strontium until the 20-22 of May when the contaminated areas were known. And starting from the 3-4 to 5th of May, there was a constant decrease in the total radioactivity emitted from Reactor Building 4.

However, because radioactivity had been thrown out earlier, a large number of vehicles were spreading it on their tires across various areas. Dust transfer because of a dry summer was also enlarging the contaminated areas. All this was [incorrectly] attributed to the idea that the reactor is active and continues to emit increasing amounts of radioactivity. This created, so to say, a stressful environment for those who were working there, who were doing the decontamination.

Until such time as something was being thrown out of the 4th block, redundant projects kept appearing, like creating a sort of a skull cap over the 4th block. I fought against this project from May; an absolutely useless project. Nevertheless, various organisations were doing such things, creating such projects for an external shell that, if installed, would only complicate subsequent work on the construction of the shelter, and would not have had any effect on the release of aerosol radiation. But this talk of the reactor “smouldering”, emitting radioactivity in considerable amounts, were so strong that orders were given to manufacture various types of covers for it. They were designed, tested, but the matter ended when one of the last such constructions immediately crashed down while it was being lifted by a helicopter for testing, and was completely destroyed. That put an end to this sort of thing. These projects were devised under the influence of rumours, inaccurate information, and attempts were made to implement them. God forbid, had any of them been implemented, they would only have complicated future work.

I remember how during there were two types of daily communications which were published in our newspapers or TASS reports: where we recaptured German-occupied points, where we retreated, where we took a large number of prisoners, where we suffered a partial defeat. This was precise official communication which provided an account of the joyous and bitter developments on the front lines. That was accurate TASS information but along with it were many journalistic articles

about specific battles, about specific people, about heroes at the home front, etc. So, [in Chernobyl] our press reported a lot of information of the second type, about people, about their impressions, about what was happening there, but reported very little, unlike the TASS regular, about what has happened so far and what has changed. This, in my opinion, was a defect in the communication system, firstly. And secondly, there were too few statements by expert scientists.

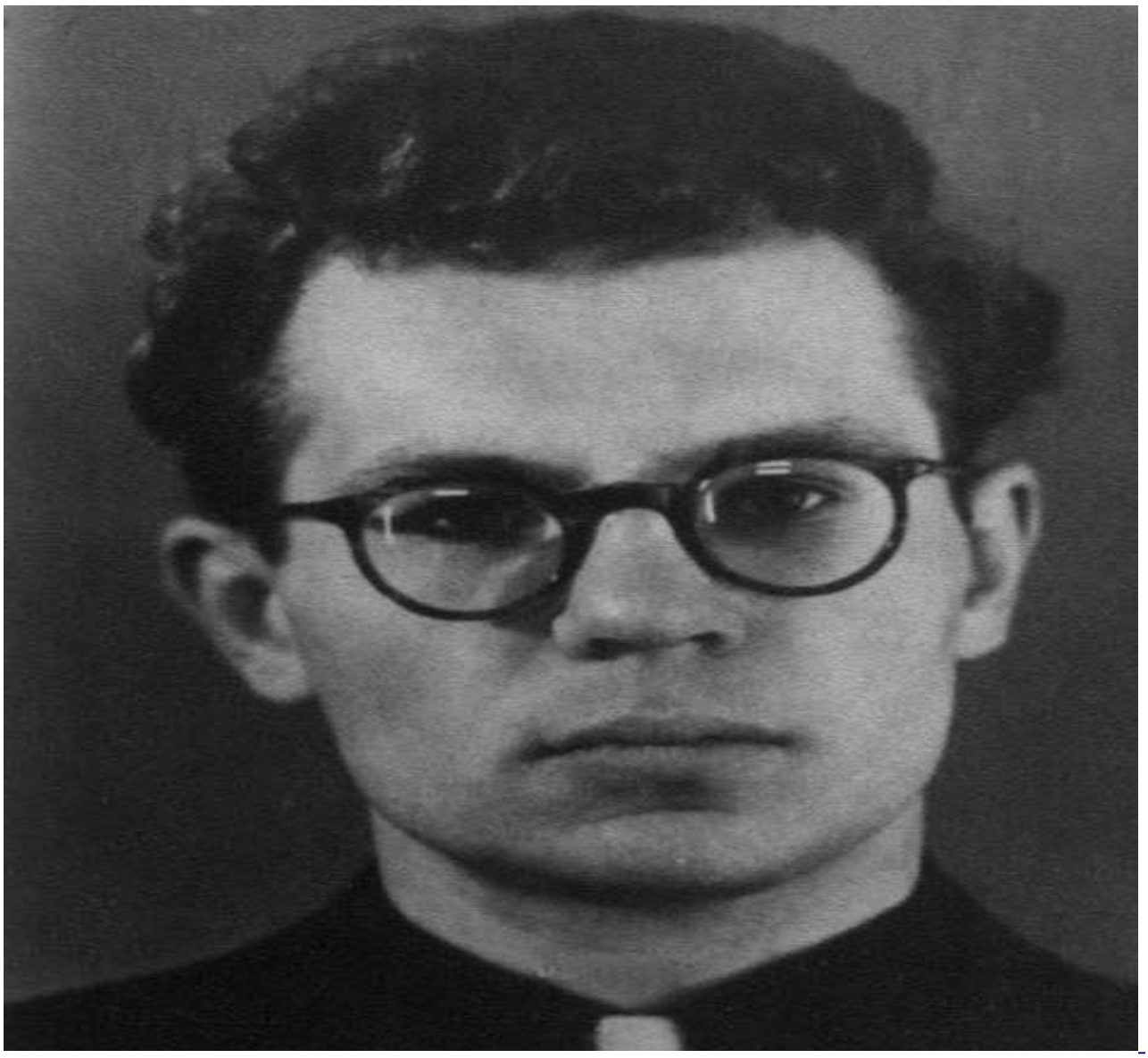
I recall, perhaps, only one statement by Professor Ivanov from Moscow Engineering-Physics Institute. A large article was published where he tried to simply explain what these REMs are, milliroentgens, at which levels they pose a real threat to human health, at which level they don't, how to behave in conditions with increased radiation levels. This, as far as I can remember, was the only article that had a helpful, calming effect on others. But the number of such articles could certainly have been increased.

It seems to me that they were overly modest and careful when writing about what happened at the station itself, why the accident occurred, whose fault it was, whether the reactor was defective or the actions of the staff were wrong. Of course, much has been written about this and I myself was involved in describing the events that preceded the accident. But, in reality, I think that the full picture of exactly what happened, and how, is not entirely clear to anyone. On the whole, this extraordinary situation—not a trivial situation, a tragic situation, a difficult situation of immense magnitude—has shown that it requires not only the mobilisation of considerable communication resources, but also a very creative and skilful use of these resources, to ensure that the population receives information in the needed sequence and quantity, who can refer to the information with complete confidence, and most importantly, be able to use this information for practical purposes; or to indicate when to worry, and conversely, when to stay calm so that it is quite regular and not sudden. Altogether, these were extremely important questions.

Sometimes, I even think that an event of this magnitude could have had a special television and newspaper section consisting of two parts. The Chernobyl part of this section would be exclusively official, to provide precise information from the Government Commission at the time when this section is released; and the second part should be an emotional part, narrative with personal opinions. This, altogether, is a serious question about how to, and to what extent, cover such large, very unpleasant and difficult events that affect and alarm almost the entire population of the country, and not merely our country.

Since I have touched upon communication a little, mentioned the reactor a bit, it may be time when I can express some personal opinions about how on earth I got involved with this story, how I was connected to it, how I understood the history and quality of the development of nuclear energy and how I understand it now. Rarely have any of us really spoken frankly and accurate about this.

I graduated from the Faculty of Physicochemical Engineering of the Moscow Institute of Chemistry and Technology named after Mendeleyev. This faculty trained specialists, mainly researchers, who were to work in the field of nuclear industry, that is, be able to separate isotopes, to work with radioactive substances, to extract uranium from the ore, bring it to the needed condition, make nuclear fuel from it, to process nuclear fuel that had been removed from the reactor having a strong radioactivity component, to extract useful products from it as well as the dangerous and hazardous parts, to be able to compact them, bury them so that they would not harm humans, and use parts of radioactive resources for the national economy, medicine maybe. This is the group of specific subjects I trained on.



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Then, I graduated from the Kurchatov Institute in the field of nuclear fuel reprocessing. Academician Kikoev tried to convince me to stay in postgraduate studies because he liked my graduate thesis. But my comrades and I agreed to work for a while at one of the nuclear plants to get some practical skills in the field that would later become the subject of our research. I was sort of the proponent of this idea and so I couldn't accept the offer of postgraduate studies and left for Tomsk. I got into one of our closed cities where I participated in launching one of the radiochemical plants. That was very interesting. The exciting time when a young man begins practice. I worked at this plant for about two years. And then I was pulled out with the permission of the party (I was already a communist since my time at the institute) for my postgraduate studies at the same Kurchatov Institute.

With the encouragement of my friend and comrade Vladimir Dmitrievich Klimov, who worked there, I passed the candidate exams at the Tomsk Polytechnic Institute and left after passing the exams to work on my candidate thesis. My first candidate thesis was proposed to me, to tackle the problem of such a gas phase reactor that would contain gaseous uranium hexachloride as fuel and such problems, namely the problem of interaction at high temperatures of uranium hexachloride with construction materials. These were the problems that I was researching. After obtaining a lot of

data, I wrote a large report that could have been the basis for my dissertation, or maybe it already was a complete dissertation.

But at this time, my comrade postgraduate Viktor Konstantinovich Popov informed me that in Canada, Professor Bartlett had done excellent, staggering chemist's work on obtaining a true xenon compound, one of the noble gases. This information captured my imagination and I devoted all my subsequent professional work to synthesising such unusual compounds, using various physical methods, that would be powerful oxidizing agents, have a number of unusual properties which I was happy to work on, and on the basis on which it was possible to build a whole range of technological processes.

And this is how my professional work was progressing, which gave the ability to successively defend the candidate thesis, the doctoral thesis, dissertations. Later, with the development of these works, they were evaluated to elect me into the Academy of Sciences. The research part of the work was awarded the USSR State prize. The applied part was awarded the Lenin prize. So, this was my own professional work to which I managed to attract most interesting young people who with style, with good education and understanding, are still developing this extremely interesting area of Chemical physics—from which I'm sure will originate very many developments, important for practice and for education.