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Nº 6

RESEARCH SUPPLEMENT TO
SCIENTIFIC INTELLIGENCE REPORT
CIA/SI 2-57

CONTRIBUTIONS OF GERMAN SCIENTISTS TO THE ATOMIC ENERGY PROGRAM OBNINSKOYE

CIA/SI 2-RS V-57
15 April 1957

CENTRAL INTELLIGENCE AGENCY

OFFICE OF SCIENTIFIC INTELLIGENCE

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Office of Scientific Intelligence

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PREFACE

This is one of a series of six reports dealing with the activities of the German scientists who were imported into the Soviet Union in 1945 to do work related to the development and expansion of the Soviet Atomic Energy Program. Details of research at Obninskoye pertaining to the development of a high energy accelerator will be reported in CIA/SI 6-57, Soviet High Energy Particle Accelerators.

A summary report CIA/SI 2-57, Contributions of German Scientists to the Soviet Atomic Energy Program, January 1957, Secret, deals with the over-all aspects of the German contributions. See also:

CIA/SI 2-RS I-57	Contributions of German Scientists to the Soviet Atomic Energy Program - SINOP Secret
CIA/SI 2-RS II-57	Contributions of German Scientists to the Soviet Atomic Energy Program - SUNGUL Secret
CIA/SI 2-RS III-57	Contributions of German Scientists to the Soviet Atomic Energy Program - AGUDZERI Secret
CIA/SI 2-RS IV-57	Contributions of German Scientists to the Soviet Atomic Energy Program - ELEKTROSTAL Secret

All information presented herein has been obtained from the testimonies of returned German and Austrian scientists and technicians.

Intelligence research ended 15 August 1956.

CONTENTS

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FIGURES

DISCUSSION

Administration.--The atomic research institute located at Obninskoye in Kaluzhskaya Oblast was formed in 1946 under the direction of the 9th Directorate of the MVD. Professor Aleksandr Ilich Leypunskiy was the scientific director until 1950 when the Institute became part of the 1st Chief Directorate attached to the Council of Ministers. It was at this time that Professor Dmitriy Ivanovich Blokhintsev became the director of the Institute, a position which he held until 1956.

The administration of the research program at the Institute after 1950 was conducted by Blokhintsev himself with the assistance of Andrey Kapitonovich Krasin, the deputy scientific director, and since 1956, the director. The administration of the German scientists working at the institute was handled from 1946 to 1952 by Professor Heinz Pose.

The administration of the general services was conducted by Colonel Petr Ivanovich Zakharev of the MVD, the deputy administration director. A complete description of the organization of the atomic research institute at Obninskoye is given in Appendix A.

Research Assigned by the 9th Directorate, MVD.--The initial role the research institute played in the 9th Directorate atomic energy program was twofold in nature:

(1) To develop a nuclear reactor;
(2) To develop a high energy accelerator.*

The development of a nuclear reactor was undoubtedly a prime objective of the institute. The scarcity of good fundamental physical data and the lack of research equipment and materials made it necessary for the group to start with very basic measurements. For all practical purposes the year 1946 was spent constructing the essential apparatus and purifying the required chemicals.

While the initial task of the Theoretical Laboratory under the direction of Helmut Scheffers was to determine the characteristics of a beryllium moderated Chicago type pile (CP-1), the Moderator Laboratory directed by Czulius was ordered by Leypunskiy in 1946 to determine the neutron moderation lengths in graphite. These graphite measurements were completed in late 1947.

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*The Obninskoye research pertaining to the development of an accelerator has been reported in CIA/SI 6-57. Therefore, the only reference in this paper to the accelerator will be of a administrative or organizational nature. No constructional or research details will be given here.

In 1948 all graphite research was stopped since it was being conducted at an institute of the Academy of Sciences.* Consequently, all reactor research was devoted to the development of a beryllium metal or beryllium oxide moderated reactor. During 1949 the moderation lengths of neutrons were measured in beryllium using the same methods as for the graphite.

Theoretical Research.--In the fall of 1946 the first assignment given to the theoretical group by Palivin and Krasin was to make the calculations for a Chicago-type reactor using natural uranium fuel and beryllium as the moderator. It was a simple plane reactor with air cooling; it operated at room temperature and had no control. The required amounts of uranium and beryllium were determined for different lattice structures. The necessary physical constants were obtained from about 50 old German reports. The group repeated their calculations using graphite as the moderator and obtained good checks with those published by Fermi. These computations were extended to a system using three-fold enriched uranium and beryllium oxide as the moderator.

The results of the above projects were presented at a Moscow meeting in August or September 1947 to about 10 people including Leypunskiy, Blokhintsev, Zakharov, Feynberg, Pose, Palivin, Zverev, Gurevich and Polyanskiy. After much discussion, Leypunskiy suggested that they become realistic and make the calculations for a cylindrical system. From August to December 1947, the effect of the reflectors was calculated using a spherical model to simplify the problem and still give the right order of magnitude. Various combinations of natural uranium, three-fold enriched uranium, beryllium and beryllium oxide as moderator and reflector were assumed for homo- and heterogeneous systems. The multiplication factors were generally between 1.1 and 1.4.

In 1948 the majority of the time was spent calculating cylindrical systems using both the one-group and the two-group methods of approximation for the various combination of fuel and moderator. Nemirovskiy at Laboratory II was making the same calculations on the main cases while the more numerous other cases were left to the Obninskoye group.

During 1949 the atmosphere and work of the Institute began to change when it became clear that the institute work was lagging and that the beryllium moderated reactor would not be ready in 1950. The main project of the Theoretical Group during 1949 was the calculation of the change in reactor operation when parts of the fuel rods were replaced by various coolants. The same reactor systems were considered, but such coolants as sodium, potassium, bismuth, pressurized air, and light water were introduced. The problem was

*This time checks with the date when Fursov operated the first graphite pile at Laboratory II. The Soviets extrapolated directly from this reactor to the 100 to 200 MW production reactor and eliminated the need of further work at Obninskoye.

to determine which coolant would have the least effect. They computed the conditions when the coolants were in the center of the fuel rods and around the outside. No temperature effects were considered. Leypunskiy, Blokhintsev and Nemirovskiy were extremely interested in this work and pressed for the final results. A Soviet engineer was brought in once by Leypunskiy and showed the group an elaborate drawing of a reactor cooled by air under a pressure of 50 to 100 atmospheres.

Another project in 1949 was the calculation of the effect that foil neutron detectors would have on the neutron balance of a reactor. These calculations were conducted for the Moderator Laboratory. Considerable interest was exhibited by Leypunskiy in the problem of the temperature dependence of resonance absorption. Greatest problem here was obtaining reliable constants as no one at the institute had worked on the problem and the Soviets did not appear to have any reasonable values. It was not until 1951 when the U. S. calculations on LOPO and HYPO appeared in Nucleonics that they were able to calculate any value for the resonance absorption cross section.

It was not until the end of 1949 that the theoretical group made the first calculations concerning the effect of control rods in the reactor systems. Neglecting cooling, the problem was to determine the change in the multiplication constant when a cadmium rod was introduced into the system. In early 1950 these calculations were switched to boron control rods due to the fact that cadmium melted at a relatively low temperature. However, by fall of 1950 a cadmium alloy which could withstand high temperatures was discovered and the boron work was suspended. Similar work was being conducted by Geylikman at Laboratory II during this period.

From the spring to October 1950 the theoretical group determined the optimum experimental arrangements for the measurement of moderator characteristics. These problems involved the distribution of neutrons on the surface of a sphere from a symmetrical arrangement of the neutron sources.

Research on Neutron Moderators.--It is apparent that the research conducted by the Moderator Laboratory headed by Czulius was either duplicated or supplemented by the Soviet group under the direction of Morozov and Krasin.

Beginning in 1947 an experimental determination of the moderation lengths of neutrons in graphite was initiated by Leypunskiy and completed in the latter part of 1947. For these experiments 300 to 500 millicurie Ra-Be neutron sources were used. The experimental arrangement consisted of pressed, reactor grade graphite blocks. These blocks were 40 x 40 x 120 centimeters and contained a measuring channel along the axis. The neutron source was placed on the axis a third the distance from the end. The indium and rhodium foil neutron detectors were used to measure the neutron density distribution in the measuring channels. The German graphite work was stopped in 1948 as it was to be conducted at another institute in the Academy of Sciences.

During the year 1949 the moderation lengths of neutrons in beryllium metal was studied in the same manner as described above. Here plates of cast beryllium or beryllium powder was used in place of the graphite. In 1950-52 these studies were extended to include beryllium oxide.

A measurement of the diffusion lengths of thermal neutrons in a beryllium metal sphere was also conducted in 1949-50. A 70 to 80 centimeter aluminum spherical shell was filled with a mixture of lump and powdered beryllium metal and had the neutron source placed in the center. Upon immersion in water, the fast neutrons which pass through the sphere become thermalized and scatter back. A dysprosium oxide detector placed in a channel was used to measure the neutron density distribution. From this data the diffusion lengths can be calculated. However, the beryllium itself moderated the neutrons to such an extent that the number of neutrons which backscatter into the sphere represented a small difference between two large numbers and thus the measurement had a large probable error.

To improve this method the aluminum sphere was placed in a 20 to 30 centimeter thick paraffin shell. There was a 5 centimeter gap between the metal sphere and the paraffin. In this gap, a neutron source was moved along a meridian in such a manner that the time for the source passed through a small increment angle at any given angle from the pole was proportional to the sine of the angle, thus making the velocity inversely proportional to the sine.

Research Program of First Chief Directorate, Council of Ministries.--The lag in the beryllium program was believed to be due to poor planning by Leypunskiy and others, inadequated supply of materials and equipment, and the failure of Pose to efficiently direct the German work. This failure together with the animosity of the Academy of Sciences towards the MVD probably brought about the reorganization of the institute and its subordination under the FCD in 1950. D. I. Blokhintsev became the director of the institute at this time.

When the FCD took over the Institute, the emphasis of the research program appears to have switched to a study of reactors suitable for the production of electric power. (This decision was probably influenced by the successful detonation of an atomic device in September 1949.) Undoubtedly the calculations of the Theoretical Laboratory concerning various coolants together with the intense interest of Laboratory II influenced the decision to construct a power reactor. The research conducted during this period indicates that Obninskoye was assigned to study and develop a beryllium moderated liquid metal cooled power reactor.

In 1950, Zaretskiy, under the direction of Nemirovskiy of Laboratory II, made the preliminary calculations for a 1000 kilowatt beryllium oxide reactor. The reactor designs called for uranium enriched between the limits of 2 to 20 percent and was to use helium cooling. They hoped to obtain a temperature of 500°C. in the fuel elements. Krasin and Malykh had the responsibility for the production of the beryllium oxide. Enough beryllium oxide was expected to be

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During 1951 the German theoretical group was increasingly excluded from the main work of the institute, and the Soviets showed less interest in their work. The first main project of 1951 was an investigation of the time dependent processes in reactors. Nemirovskiy asked them to investigate the increase of neutron density as a function of the time during startup and gave them a set of constants for a reactor. By this time the Soviets were giving the Germans only reactor constants to work with and not the entire reactor system. During this study it was observed that the reactor having the given constants would have an unusally high resonance absorption and hence produce a lot of plutonium and could be used as a "breeder" or converter.

This situation was discussed with Blokhintsev and he became quite perturbed and stated that he did not think that Nemirovskiy's constants were quite correct. [redacted]

Several months were spent determining the interference effects between cadmium control rods in a cylindrical reactor. This problem was brought to him from Blokhintsev's Department by Tsaretskiy. The arrangement given consisted of about 10 to 12 rods, arranged with one in the center and the remainder symmetrically spaced through the reactor. The Group was to determine the change in the multiplication factor. The moderator in this case was beryllium.

A third project conducted during 1951 was the calculation of various reactor models at higher temperatures. These calculations were made for a large number of cylindrical models at temperatures of 300°C. and between 500 and 600°C. Using beryllium and beryllium oxide data taken from the US literature, they determined the dependence of diffusion length upon density. Cooling was included in the calculations. Sodium and potassium may have been considered as their temperature density curves were requested. Leypunskiy appeared to be quite interested in the results of this problem and Blokhintsev's group was not. Therefore, it appeared [redacted] that these calculations were required in connection with design work in the technical part of the Institute.

Another project given to the group by Blokhintsev was the determination of the lifetime of reactors at various power levels. Assuming a cylindrical beryllium or beryllium moderated model with threefold enriched fuel, it was found that the reactor operating at a level between 5000 and 10,000 kilowatts would break down in two to three months.

In 1952, the chief project was the calculation of the influence of a control rod placed in the reflector of a cylindrical system upon the multiplication factors. This problem was assigned by Tsaretskiy and appeared to be assigned as a check on work conducted by the Soviets. The RPT reactor which was designed in September 1951 has its automatic control rods in the reflector.

Research on Beryllium Moderation of Neutrons.--A series of basic studies on the nuclear properties of beryllium and beryllium oxide were carried out under the general direction of A. K. Krasin. The study conducted by Krasin, himself, was the measurement of the effective capture cross section of thermal neutrons for these substances.

The group under Czulius determined the neutron moderation length and the diffusion length in both of the above substances and, also, in a combination of the two.

The beryllium hydroxide, beryllium oxide, and the beryllium metal used in the experiments of the laboratories of Morozov and Czulius were all analyzed by the Chemical Laboratory under the direction of Keppel and also by the Spectrographic Laboratory under the direction of Krueger. The degree of purity determined both chemically and spectrographically permitted the calculation of the true capture cross section of beryllium. Their results were also used as the basis for the quality production control measures instigated at the Podolsk Branch of the State Institute of Rare Metals (GIREDMET). The purity requirements are given by the Germans and are also given in Krasin's Geneva paper P/662. The total amount of beryllium oxide and metal at Obninskoye at the end of 1952 was estimated by the Germans to be about 1½ metric tons. Significantly, Krasin in his paper states that he had 1500 kilograms of beryllium metal for his diffusion length measurements. In fact, the entire paper presented by Krasin at Geneva is an account of the beryllium neutron attenuation research conducted at Obninskoye.

The Ceramic Laboratory, directed by Malykh, was working to develop a method of producing a high grade sintered beryllium oxide. His work was guarded closely by the Soviets. However, it was reported that he had considerable difficulty in maintaining the purity requirements throughout the sintering process. The sintered blocks tended to pick up traces of iron from the presses. The density of the sintered beryllium oxide produced by this group was about 2.4 to 2.7. Although the results of his work was unknown to the Germans, the methods used and the density of the sintered product are very similar to those given in the Geneva Report P/633 by G. A. Meyerson.

Research on Liquid Metal.--A large portion of the Soviet liquid metal research was concentrated at the Obninskoye Institute. At the time of the reorganization, a large group of Soviet metallurgists were moved from a large city on the Volga River, possibly Saratov or Kuybyshev, to Obninskoye where they formed the Metallurgical Department under the direction of Ageyev. Lashenko took over the department in late 1951. This was a highly classified project and was primarily staffed with Soviet personalities. Because the German analytical groups conducted the static testing of the metals to be used for the coolant pipes, enough information was obtained to identify portions of the Geneva Paper P/638 as work conducted at Obninskoye. This work indicates that Soviet technology in the field of liquid metal cooling of nuclear reactors has reached the point where they are capable of producing a liquid metal cooled power reactor for the production of electricity.

During 1950-52 various laboratories at Obninskoye were conducting research on liquid metals and pipes in connection with the design of a liquid metal reactor. This project was included in the Institute plan of 1951 as proposed by Krasin. He outlined a two-fold corrosion problem of studying the corrosion of pipes of various materials by the liquid metal, and the diffusion of liquid metals into the pipes. By 1952, the Metallurgical Department had about 100 scientists working on these problems. This number included the chemical laboratories of the Institute.

The problem of studying the effects of pumping liquid metals through stainless steel pipes was handled by the Laboratory of Fluid Metals under the direction of Pupko. The laboratory contained about 100 meters of YaIT stainless steel pipe of 3/4 to 1 inch diameter. The electro-magnetic liquid metal pump was designed by Von Oertzen and was a modified version of the pump described in the American Liquid Metals Handbook. A 100 kilowatt high frequency heater-transmitter was used to heat the liquid metal. The pumping speeds were unknown but the times of the tests varied from a few hours to several days.

Static tests were also conducted on the effects of liquid metals on various pipes. In these tests 3 to 4 inch cylinders made of the desired steel were filled with the liquid metal and held at a temperature of 350 to 400°C for periods of 8 to 14 days.

After the above tests were conducted, samples of both the pipe and the coolant would be taken and analyzed to determine the extent of the diffusion of the interaction between the pipe and the coolant. A description of the analysis procedure is given in the report EG-1526.

The complete results of the program are not known as the work was expanded in 1954. However, early indications showed that in contact with lead-bismuth alloy, carbon steel was better than stainless steel containing nickel, as the nickel dissolved out the stainless steel.

The RFT first test loop for testing pressurized water cooling became operative in December 1952. The liquid metal loop was not installed until sometime in the latter part of 1953 or the early part of 1954.

The Metal Laboratory of Ageyev worked on X-ray experiments for the study of the structure of the metals subjected to the corrosion tests. X-ray studies of the above type were reported in the Geneva Paper P/638 as one of the methods of studying the type of corrosion caused by lead-bismuth alloy on stainless steel.

However, from the reported increase in the size of the analytical section and the number of iron tests which had to be run in 1954, it can be concluded that the liquid metal research was expanded from 1952 to 1954. The classified nature of this work prevented the Germans from learning about the results of the program.

The results of a portion of the liquid metal program were presented at the Geneva Conference in Paper P/638 by L. I. Tsuprun and M. I. Tarytina. While this work was not identified with Obninskoye the research methods and conditions fitted those described by the Germans. It is therefore assumed that a great portion of the work reported in the paper came from Obninskoye.

In the period 1950-51, Leypunskiy ordered the measurement of differential scattering cross sections of (d. d.) neutrons on lead, bismuth and uranium. The neutron souce was a 1 MEV cascade generator which had been brought from the Kaiser Wilhelm Institute. The angle dependence of the scattering on rings of uranium, lead and bismuth were measured and later sodium and potassium were also included. When the Germans left the institute in September 1952, the project was still incomplete.

Rexer's group tried to run liquid lead-bismuth through a sintered beryllium oxide pipe. However, when the pipe broke the project was dropped.

Professor Ageyev was transferred to the Moscow Metallurgical Institute in late 1951. This can be interpreted either as an expansion of the liquid metal program; as a promotion; or possibly as a result of the slow progress at Obninskoye. Lashenko succeeded Ageyev as the head of the Metallurgical Department.

Apparently the liquid metal research at the institute did not proceed rapidly enough to allow the Soviets to tuilize this method of cooling in their first atomic power station reactor. The decision to switch to or adopt normal water as the coolant appears to have been made sometime in the first part of 1952. As the order to determine the impurity content of the Obninskoye water was given in the summer of 1952.

Research on the Cladding of Uranium Rods.--From 1950 to 1952 the Germans of the Chemical Laboratory worked on the problem of electrolytic cladding of uranium rods with various metals. This cladding was to withstand contact with various coolants at given temperatures.

The uranium rods, which were obtained from Elektrostal, were cleaned mechanically and electrolytically inphosphoric acid. The rods went directly into an electrolytic bath where they were plated by the double-dip process (each end dipped). For complete coating, the rods were immersed in the baths and agitated on a mechanically driven shaketable. Coatings of iron, chromium, copper, nickel and silver were tried, but never aluminum. It was very difficult to obtain a true metallic plate and most of the coatings were porous.

However, the best results were obtained with a 120 micro layer of iron and chromium with a 10 micron precoating of copper and/or nickel.

In 1952 experiments were being conducted in which a chromium layer deposited upon the uranium by the decomposition of $CrCl_3$ in a hydrogen atmosphere at about 800°C.

The coated uranium rods were tested by heating them in a vacuum furnace at 600 to 900°C. Two hours were taken to bring the rods to temperature at which they were held for two hours and slow cooled for two hours to room temperature. If peeling of the coating did not occur the rods were given to Lashenko for further testing. Later the rods were tested by immersion in Pb-Bi alloy baths at temperatures of 300 to 400°C. Failure was measured by the amount of uranium that dissolved in the bismuth. Lashenko also used a liquid Pb-Bi bath for testing. No samples passed all of the Soviet tests (one lasted for 60 hours) and were often returned in a crumpled state.

The above plating experiments were considered to be a failure by the Germans. Their attention was then turned toward enclosing the rods in stainless steel and filling the gap between the uranium and the steel with liquid sodium. This work also appeared to be unsuccessful as the rods were returned after testing by the Soviets. The rods were burned through due to a test which involved the passing of a heavy current through them.

Construction of the Atomic Power Station.--New construction in the area south of the institute was reported by nearly all of the Germans. However, the date at which this construction began has been reported anytime from 1949 through 1952. It is believed that the actual construction began in 1951. This area was evacuated in 1949. The site is located about 600 meters SSW from the Institute in the direction of the Protva River. Colonel Ovechgin, MVD, was in charge of all of the construction activities. Scaffolding for a building was observed in the summer of 1952. By 1954, the Institute was connected with the gas pipeline from Saratov which improved the heating system. A. N. Grigor'yants was reported as the chief engineer.

Liaison with Other Soviet Institutes.--Members of the German group were constantly being called in to confer with representatives of Laboratory II on various problems throughout the period prior to 1950. This indicates that the Soviets were not sure of their methods and sought the opinion of the Germans during this early period. After the reorganization of the Institute, the German group was consulted less and less frequently by people from other Soviet Institutes, as well as by the Soviets stationed at Obninskoye. It is believed that an excellent liaison was always conducted between the Soviet group at the Institute and Laboratory II and other institutes concerned with the same problems.

APPENDIX A

ORGANIZATION OF THE ATOMIC RESEARCH INSTITUTE AT OBNINSKOYE

<u>Location.</u>--The Atomic Research Institute (also called Object V) is located at Obninskoye (N 55-01; E 36-29) in the Kaluzhskaya Oblast. It is $2\frac{1}{2}$ kilometers west of the 117 kilometer road marker on the Moscow-Maloyaroslavets highway. This places the Institute about 10 kilometers northeast of Maloyaroslavets.

<u>Organization.</u>--The Institute was composed of two primary sections: the Administrative Section and the Technical Research Section. The organizational breakdown of these two sections [redacted] are presented in [redacted] was selected as the best representative of actual organization. Figures 3a and 3b contain a sketch of the floor plans of the institute, and Figure 4 a sketch of Institute site.

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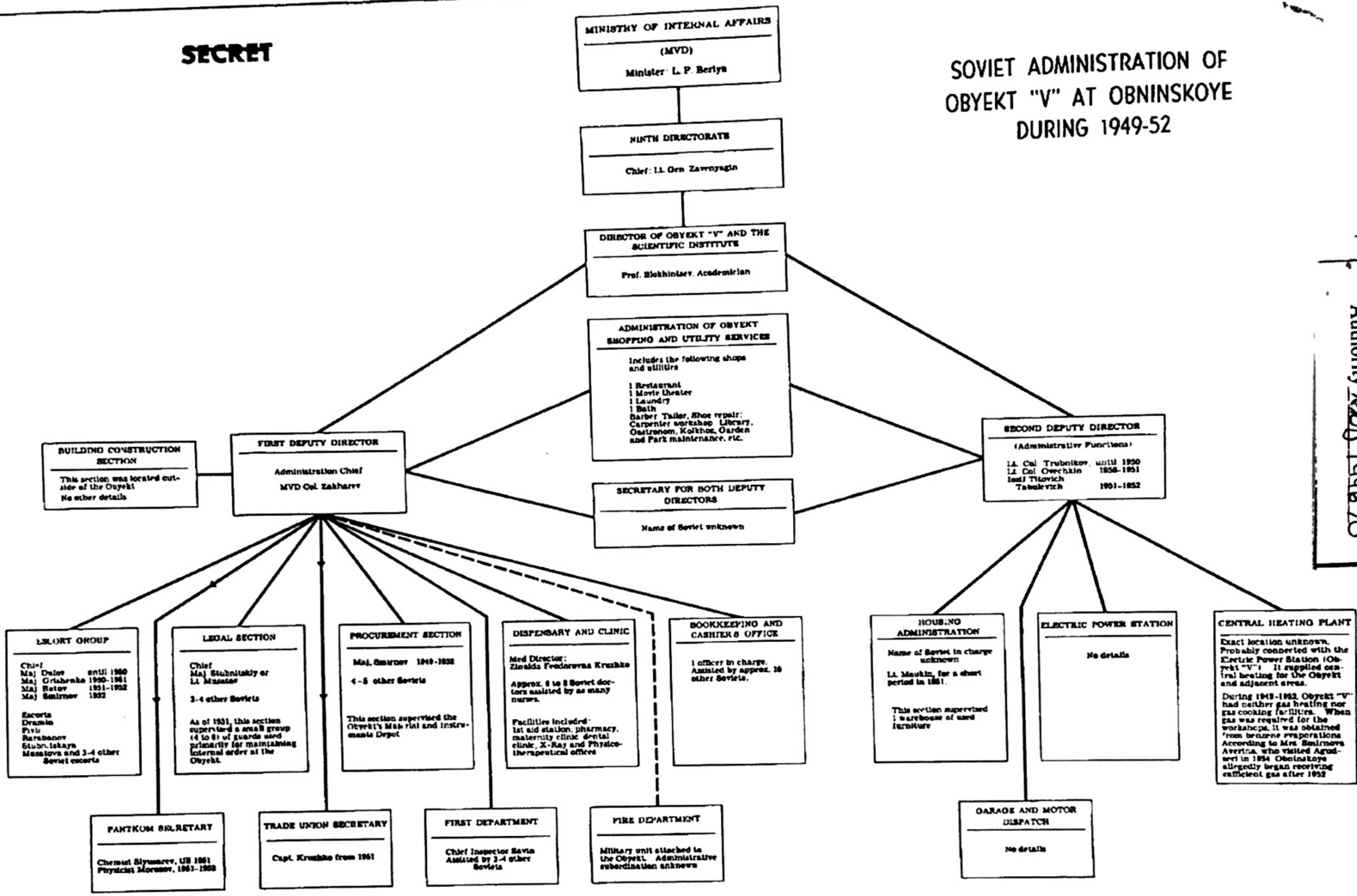
SOVIET ADMINISTRATION OF OBYEKT "V" AT OBNINSKOYE DURING 1949-52



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ORGANIZATION OF INSTITUTE "V" AT OBNINSKOYE DURING 1949-52

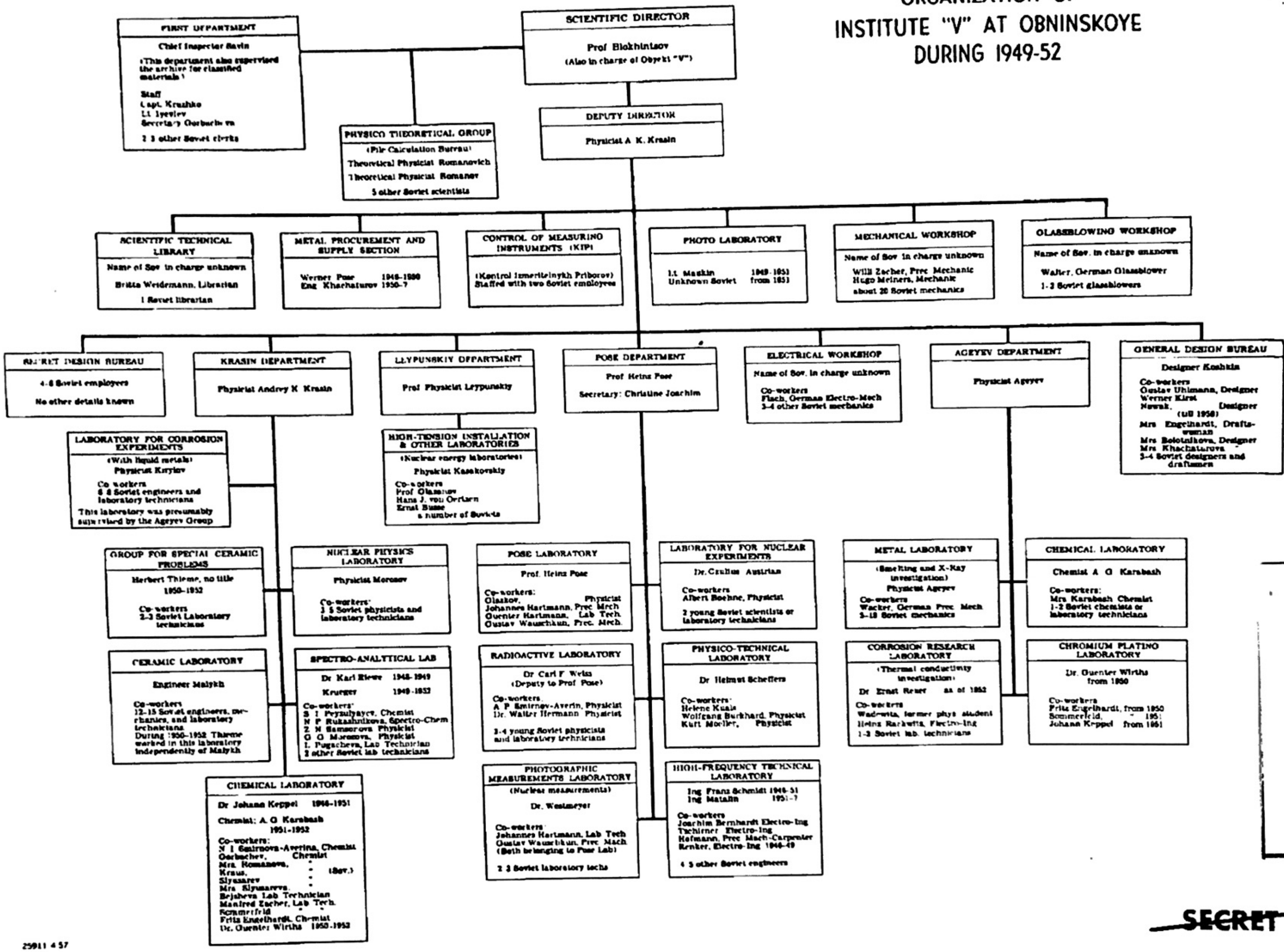

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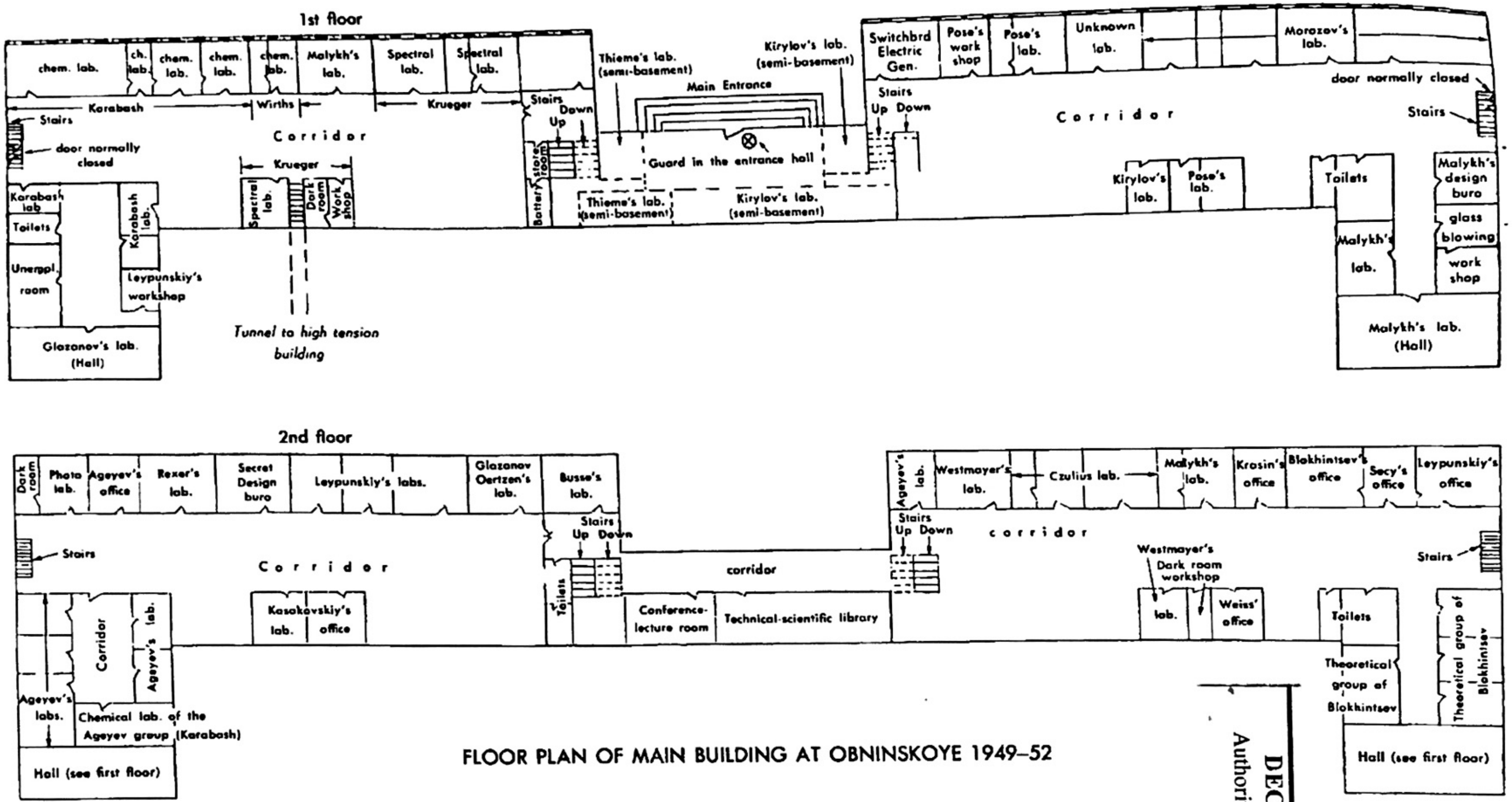
Figure 3a



FLOOR PLAN OF MAIN BUILDING AT OBNINSKOYE 1949–52

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Figure 3b

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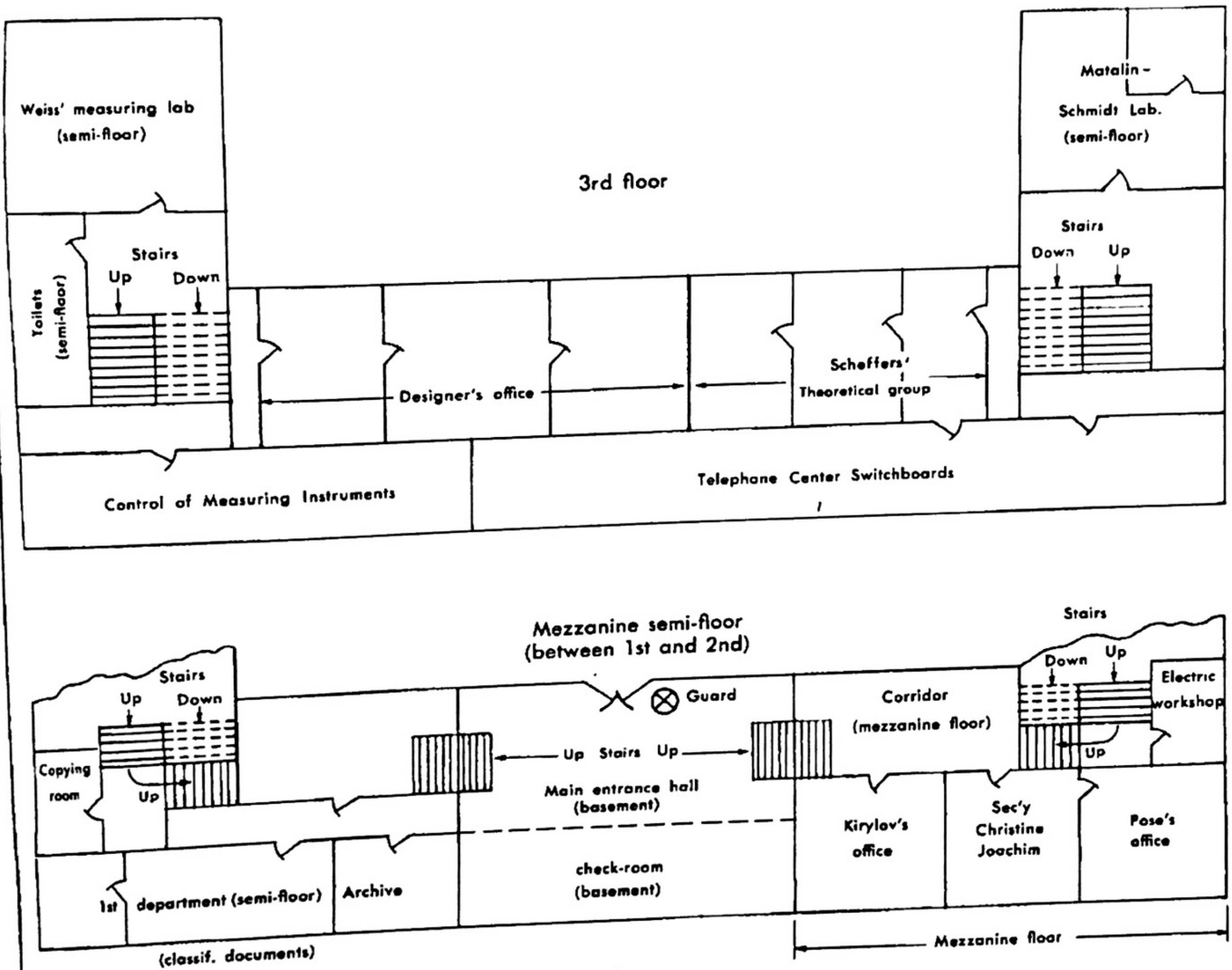

The mezzanine and the third floor cover only the center part of the building.

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Figure 4

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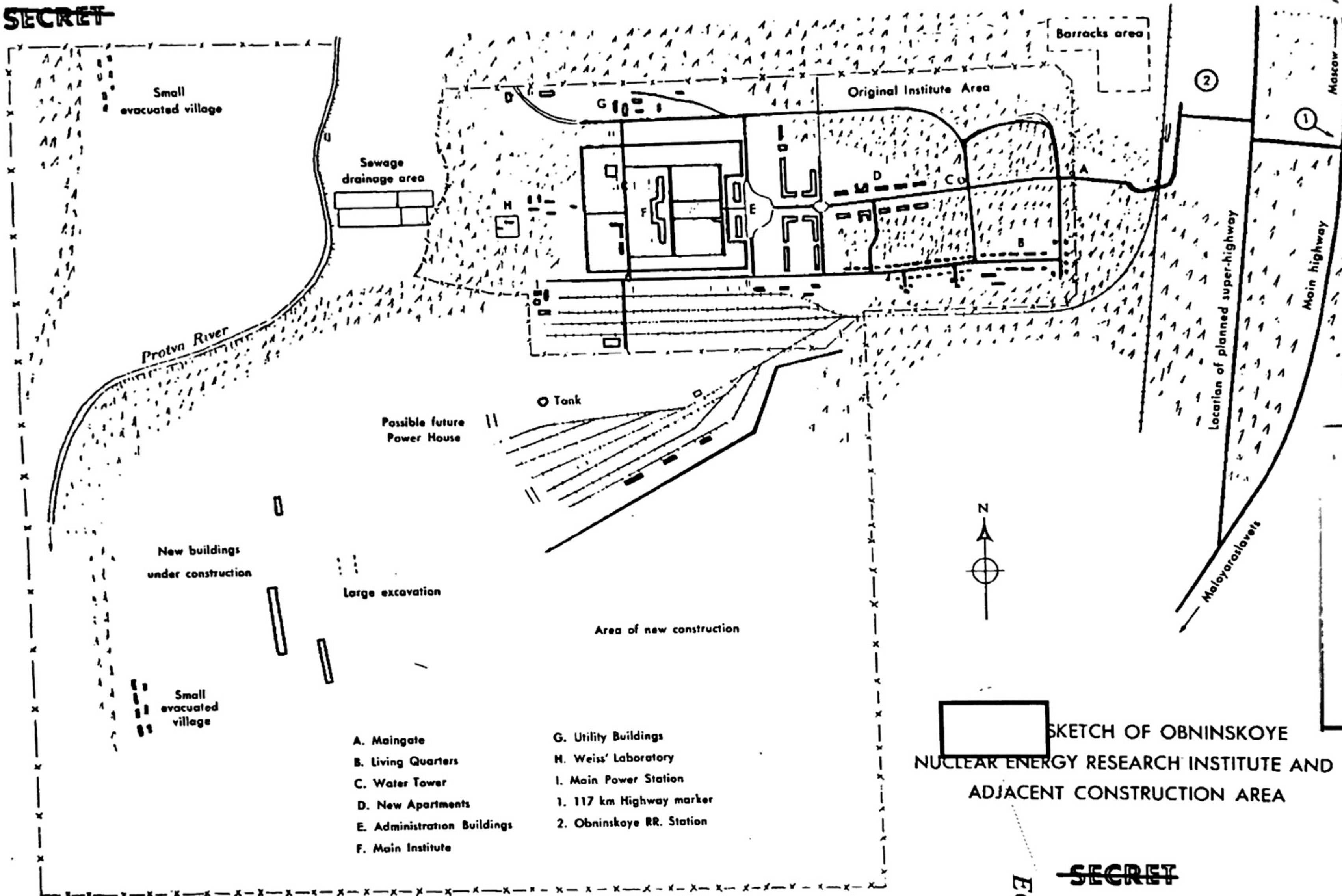

SKETCH OF OBNINSKOYE NUCLEAR ENERGY RESEARCH INSTITUTE AND ADJACENT CONSTRUCTION AREA

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APPENDIX C

Soviet Personnel Connected with Obninskoye Institute

AGEYEV, Prof. Dr.
Ch. Metallurgical Dept., '50 to 51

ALEKSANDROVICH, Prof.
Visitor '51

ALEKSEYEV
Lashenko's Lab.

ARZHBA, David
Escort

BABAYEV, Maj. MVD
Ch. Security Dr. '48-'49

BARABANOV
Escort

BARANOV
Ceramic Lab. '51

BAYSHEVA
Chem Lab. '49
Ch. Chem Lab. '51

BIZAYEV, Lt. Col.
MVD 9th Dir.
Visitor

BLOKHINTSEV, Dimitri Ivanovich, Prof.
Director '50-'56

BLUMKINA, Yula
Admin. Ch. of Busse Lab.

BONCH-BRUYEVICH
Visitor - Winter 47/48

BUTOV, Maj.
Ch. Escort Service '51-'52

BUYANOV, Gen. MVD
Admin Div. '46-'48

CHABTSOVICH
Accel. Group '47-'50

CHERNOV
Moderator Lab, Mar '53

DRAMIN (DRYAMIN), Boris, Lt. MVD
Escort of Pose '46-'52

DULOV, Maj. MVD
Military Commandant to '51

FLEROV, G. N., Prof.
Visitor '47

GLASKOV, Yu. Yu.
Pose's Lab.

GLAZANOV, Vladimir Nikolayev
Ch. HF Lab.

GOLIBYEV, Lt. Col., MVD, 9th Dir.
Visitor '50

GOLZ
Accel. Group '47-'50

GORBACHEV
Chem Lab., '49-'52

GORBACHEVA
Typist, Secret Dept.

GRIGOR'YANTS, A. N.
Ch. Eng. Power Station Construction '51-'52

GRISHENKO, Lt. Col. MGB
Chief MGB Unit, Escort to '51

IYEVLEV, Andrey
Ch. Secret Dept Interpreter '50

KALASHNIKOV, 9th Dir MVD
Visitor, '46-'48

KALESINIKOV
Busse Lab, HF Lab, '48-'50 and '50

KALININ, Col. MVD, 9th Dir., Visitor '49

KAMINIR, Lev Petrovich, Accel, Group '47-'50; Busse Lab. '51-'52

KARABASH, Aleksi Georgievich
Metallurgical Dept.; Chem. Lab '51

KATSKATSYAN, Major MVD, Visitor (Supplies) '48

KAZACHKOVSKIY, Tomara (KAZACHKOVSKAYA); Accel. Group '47-'50

KAZACHKOVSKIY, Oleg Dmitrivich, Dep. Accel. Group '47-'50

KHACHATUROV, Purchasing Dept. '50

KHACHATUROV, Dep. Fluid Metal Lab '52

KHACHATUROV, Khachatuv Abramovich
HF Lab '49-'50

KHACHATUROVA, Design Office '49

KIRILOV (KIRYLOV), Fluid Metal Lab '49-'52

KORNILENKO, Aleksandr Lavrentovich
Accel. Group '50

KOSHKIN, Ch. Design Office '49-'52

KRASSIN, Andrei Kapitonovich, Ch. of a Dept.

KRAUZ, Chem. Lab (Bi Chem) '49-'52

KRUTKOV, Yuri Aleksandrovich
Accel. Group '47-'50

KRUZHKO, Interpreter '49-'51

KURCHATOV, Prof., Visitor '47-'51

KUZNETSOV, Michael Michaelovich
Col. MVD Liaison with Zavenyagin
Visitor '46-'55

LASHENKO, Ch. Metallurgical Dept. '51

LAVRENCH, Aleksandr, Ch. Crystal Counter Lab

LEONTEV, Nikolay Ivanovich
Busse Lab '47-'50

LEONTEVA, Busse Lab '48-'50 to Agudzeri in '50

LEVRENTEV, Accel. Group '47-'50

LEYPUNSKIY, Aleksandr Ilyich
Director 1946-'50; Liaison to FCD '50

MAKAROV, E. G., Metallurgical Lab

MALISHEV, Radio Lab '49

MALYKH, Ch. Ceramic Lab '49

MALZEVA, Sec. to BUYKNOV '48

MATALIN, Ch. Electronic Lab '49-'50

MATYUSHENKOVA, Zingida Fedorvna (Married to Kruzhko), Chief Doctor

MAUKIN, Lt., Escort

MELNIKOV, Capt. MVD, Purchasing Dept.

MIKUSHKIN, Capt. MVD, Chief Purchasing '48-'51

MIKUSHKINA, Sec. to Chief of Admin to Zakharov

MOROZOV, I. G., Pres. Obnin. Communist Party

MOROZOVA, Galina Gavrilovna
Radio Lab '49-'50 Purity; Anal. Lab '50-'52

MUSATOV, Capt. MGB-MVD, Escort Went to Sinop '52

MUSATOVA, Escort to Sinop '52

NEMIROVSKIY, Visitor '47-'50, from Lab 2

NOVIKOV, Ivan Ivanovich, Dr., Ch. 9th Div MVD, Visitor '51 and '52

NOVIKOVSKIY, Boris, Power Plant '51-'53 HF Lab '53

OBCHINIKOV, Accel. Group '48-'50

OLEYNIKOV, Deputy Chief Admin.

OVCHENNIKOV, Evgen Petrovich, Busse Lab

OVECHGIN, Col. MVD, 1950-51; Chief Power Station Construction '52

PALIBIN (PALIVIN?), Petr Aleksandrovich, Chem. Lab

PEIZELAYEV, Purity Anal. Lab '50

PERVUKHIN, M. G., Min. Chem. Inc. Visitor May '47

PERELEGIN, R. G., Chief Electrical Eng. 1948

PETUKHOV, Valentin Afanasovich, Dep. Accelerator Group '47-'50

PEYSULAYEV, Shomet Isayevich Spectroanalytical Lab '51-'52

PIVIN, Lt., Escort

POLYANSKIY, Nikolay Georgiyevich Worked under Krassin

PUPKO, Chief Fluid Metal Lab

RAKHIMOV, Khamil Mirsaidovich Accel. Group, '48-'50

REPIN, Busse Lab '48-'50 to Sinop March '50

ROMANOV, Died '53, Theoretical Lab '50-'53

ROMANOVA, Chem. Lab. (Pb Chem) '49-'52

ROMANOVICH, Theoretical Lab.

RUKAVISHNIKOVA, Purity Anal. Lab.

SAMSONOVA, Purity Anal. Lab.

SAPSOVICH (ZAPSOVICH), Accel. Group '48-'50

SAVIN, Sr. Lt., Dep. Secret Dept.

SAVIN (A?), Moderator Lab.

SEMYENOV, 9th Dir. MVD, Visitor '51 and '52

SERBINOV, Arkadi Nikolayevich HF Lab '48

SHERMAN, Lev Yeremevich, Accel. Group '47-'50; HF Lab '50

SHPIGEL, Isaak Zamuelovich or Solomonovich, Accel. Group '47-'50 Busse Lab '50

SINOVEV, P. Petrovich, Accel. Group

SLYUSAREV, Secretary Partkom '49 Radio Lab '47-'49

SLYUSAREVA, Chem. Lab '49

SMIRNOV, Chief Escort Services '52

SMIRNOV-AVERIN, Dep. Radio Lab '47

SMIRNOV-AVERINA, Nina Ivanovna Chem. Lab '47

SOKOLOV, Vladimir I., Accel. Group '48-'50

STAVISKI, Crystal Counter Lab '51

STRELTSOV, Yegeniy, Dep. Ceramic Lab '50; HF Lab '48-'50

STUBNITSKAYA, Escort to Sukhumi '52

STUBNITSKIY, Chief Legal Dept. '49-'52

TABULEVICH, Lt. Col. MVD '51-'52 Dep. Chief Admin.

THYSSEN, Visitor Apr '47

TIMOSHENKO, Boris, Lab Attendant '47; Accel. Group

TRUBNIKOV, (fnu) Xylantovich, Lt. Col. Dep. Chief Admin. '48-'50

TRUBNIKOV, V. P., Engr. Officer

TSCHIRNER, Paul, Lab Tech. Electronic Lab.

UKRAINTSEV, Feodor, HF Lab '50

VANISHKUM, Pose Lab.

VASILYEV, Ceramic Lab.

VEKSLER, Visitor, Summer '49

YEMELYANOV, Vasiliy Simionovich, Prof., Visitor

ZAKHAREV, Petr Ivanovich, Col., MVD

ZAMOILOV, Major MVD, Dep. Admin, Dir.

ZARETSKIY, D. F., Theoretical Lab '49

ZAVENYAGIN, Avrasmi Paulovich, Visitor '47-'53

ZHILIN, MVD Security, Visitor '46

ZYERTEV, Visitor '47-'50

ZVERYEV, Brig. Gen., Chief 9th Div. to '51; Visitor '46, '48, '49

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