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Scientific Intelligence Report
CIA/SI 2-57

CONTRIBUTIONS OF GERMAN SCIENTISTS TO THE ATOMIC ENERGY PROGRAM AGUDZERI

CIA/SI 2-RS III-57

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WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

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.

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 IV-57	Contributions of German Scientists to the Soviet Atomic Energy Program - ELEKTROSTAL Secret
CIA/SI 2-RS V-57	Contributions of German Scientists to the Soviet. Atomic Energy Program - OBNINSKOYE 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.

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SCOPE

The role played by the German scientists at Agudzeri in the development of the Soviet atomic energy program is examined in detail below.

CONCLUSIONS

The following significant contributions were made by the groups of German scientists working at the Agudzeri Institute from 1945 to 1952.

1. The development of the analytical mass spectrograph by Werner Schuetze satisfied a very urgent need of the Soviets for an analytical control system for their gaseous diffusion isotope separation plants.

2. Development by the Reichmann group of the extruded type diffusion barrier and a process for its production provided the Soviets with a method whereby they could increase the quality as well as quantity of diffusion barriers for their isotope separation plants.

3. The corrosion research conducted by Boris Ikert and Karl Franz Zuehlke contributed to the solution of the general corrosion problem inherent in a gaseous diffusion isotope separation cascade.

4. The awarding of a Stalin Prize to Heinz Barwich in 1947 for his mathematical calculations relative to cascade theory suggests that these contributions were significant to the Soviet atomic energy program.

DISCUSSION

Scientific Research Institute at Agudzeri.--The scientific research institute at Agudzeri was established in 1945 as a rather loose group of individual laboratories within the Sukhumi complex of laboratories. These laboratories were quite isolated from the Fall of 1945 until the departure of the German scientists in March 1955. The initial organization prevailed from the Fall of 1945 until 1950 when there was a reorganization. Another and final reorganization occurred in the Fall of 1952 when most of the Germans from the various locations of the 1037P complex were sent to Sukhumi for research assignments. The major scientific personnel were ordinarily allowed to work on projects of their own choosing. Less important personnel were assigned to a general Chemical Laboratory under Nikolaus Riehl. Tasks in this Chemical Laboratory dealt mostly with some phase of semi-conductor research. In 1952 all work of a classified nature is said to have been stopped or transferred from the installation. The German scientists toward the end of their stay did little but supervise the work of the Soviet trainees that had been moved into each laboratory. These Soviet assistants were to be trained in every phase of the work which the Germans had been doing and were being groomed to take over the continued operation of the institute after the forthcoming repatriation of German scientists.

In the initial organization of the Sukhumi complex, the Sinop and Agudzeri Institutes were completely separated and separately administrated. In the complete reorganization which took place in 1950 the administration of the institutes was combined and the administrative offices established at Sinop. At this time it was rumored that the complex was designated an NII but the number assigned was unknown. Regardless of the combined administration, each institute continued to operate as an individual organization.

The general scheme seemed to be that of assigning a minimum number of German scientists to each laboratory or section and the assignment of a maximum number of Soviet technicians as assistants. On the other hand support and service units had more Germans than Soviets working on the various tasks.

A general outline of the Organization during the 1945-50 period was as follows:

1. Barwich Laboratory
   Function: Theoretical physics and mathematical calculations
   Personnel: Barwich, Heinz: Chief
   - Krueger, Hans (temporarily)
   - Krutkov, Prof. Dr. (Soviet)
   - Kucherov (Soviet)

2. Hartmann Laboratory
   Function: Design and construction of alpha counters
   Personnel: Hartmann, Werner: Chief
   - Sensky, Herbert
   - Bokuchava, Tina (Soviet)
   - Gvendzhiliya (Soviet)
   - Kucheryayev (Soviet)
   - Leontyeva, Irina (Soviet)

3. Schuetze Laboratory
   Function: Design and construction of a Mass Spectrometer
   Personnel: Schuetze, Werner: Chief
   - Hottmann, Ernst (Design work)
   - Aleksandrov (Soviet)
   - Bolotnikov (Soviet)
   - Chekhovtsov (Soviet)
   - Chernov (Soviet)
   - Chernova (Soviet)
   - Karpanko (Soviet)
   - Leontyev (Soviet)
   - Ordzhonikidze, K. (Soviet)
   - Sinyavskiy (Soviet)
   - Subarev (Soviet)

4. Zuehlke Laboratory
Function: Corrosion measurements and separation factor tests or barrier
Personnel: Zuehlke, Karl Franz
Zuehlke is believed to have been working alone on his projects.

5. Bumm Laboratory
Function: Design of barrier, research on vacuum soldering.
Personnel: Bumm, Helmut: Chief
Loehr, Hans

6. Kvartskava Laboratory
Function: Barrier production research, electric current bombardment.
Personnel: Unknown except that there were no Germans therein.

7. Hertz-Gverdtsiteli Laboratory
Function: Isotope separation research; counter current and gaseous diffusion.
Personnel: Hertz, Gustav: Chief

Ordzhonikidze, A	(Soviet)
Ordzhonikidze, R	(Soviet)
Popov, S	(Soviet)
Poroshin	(Soviet)
Reyskiy, I	(Soviet)
Tskhakaya	(Soviet)
	(Soviet)

8. Muehlenpfordt Laboratory
Function: Research on technical probelms involved in isotope separation.
Personnel: Muehlenpfordt, Justus: Chief
Mueller, Gerhard
Knabl, Walter
Gugua (Soviet)

9. Reichmann Laboratory
Function: Design and production of tubular barrier. This laboratory was absorbed by the Chemical Department after mid-1947.
Personnel: Reichmann, Reinhold: Chief
Pock, Richard
Fischer, Helmut

Bigvaya	(Soviet)
Bokuchava	(Soviet)
Mitronin	(Soviet)
Morozov	(Soviet)
Yermin	(Soviet)
Yermina	(Soviet)
	(Soviet

In 1949-50 there was a general reorganization at Sukhumi. The position of Deputy Director for Technical Problems was created to provide Soviet direction of the technical and scientific section at Agudzeri and at Sinop. This position was initially filled by Kvartskhava, former deputy technical director to Hertz.

The general outline of the unified administrative command was as follows:

Director: NII
1950-53...Migulin
1953-55...Isayev

Dep. Dir. for Tech. Problems at Agudzeri	Dep. Dir. for Tech. Problems at Sinop	Dep. Dir. for Admin. Problems	Dep. Dir. for Political Problems
1950-55 Kvartskhava	1950-53-Isayev 1953-55-Isayev serving in a dual role	1950-52-Chelidze 1952-55-Fedorenko	1950-52-Unknown 1952-54-Zhivatovski 1954-55-Sinyavskiy

Gustav Hertz's Work on Isotope Separation.--Gustav Hertz was chosen to be the German Scientific Director of the Research Institute at Agudzeri. He was placed in charge of all scientific research that was done at the institute and had a private laboratory in which he carried on research directed toward the separation of the isotopes of uranium.

Hertz had received the Nobel Prize in Physics in 1925 for demonstrating that isotopes of elements could be separated by gaseous diffusion. He did his work with light gases such as neon. At Agudzeri, he continued his work with the hope that he would be able to adapt his method to the separation of the isotopes of heavy metals such as uranium permitting the concentration of the isotope U-235.

Quite an elaborate laboratory was set up for this work and from the many reports that have come out about this laboratory and the work done it is impossible to tell just what method Hertz was attempting to use to separate the isotopes of uranium. Some reports have called it gaseous diffusion, others have referred to it as counter-current diffusion. An analysis of the information obtained on this subject has indicated a possibility that the method was actually a modified form of <u>mass</u> diffusion. None of the informants to date have been able to give an exact picture of the apparatus as used by Hertz nor a description of the method of its use. Various pictures have been obtained, all differing in some major point. When questioned further, all sources have admitted that they were not absolutely certain about the point but all seemed certain that Hertz had never succeeded in separating the isotopes of uranium to an extent that would be applicable to an industrial plant. This failure of Hertz probably resulted in his "loss of face" with the Soviets.

Hertz attempted to use a fluorinated hydrocarbon as a carrier for uranium hexafluoride(UF_6) or some other uranium compound and, through a counter flow method, caused a slight separation of the isotopes, he was never able to reach a useful enrichment of U-235.

Much work was done on the corrosion problems involved in this work and it is assumed that the problem was finally minimized by heavy plating of all parts with nickel.

Some discussion occurred as to the necessity for 250 units in a separation cascade. This was a calculated figure and not one that had been actually put into practice.

Hertz continued working on his project until he left Agudzeri in 1952 when all classified work was halted. It is not known if he continued this work after he left or if it was abandoned. It has been indicated that a modified version of this project was developed and adapted for use in the enrichment of BF_3 in B^{10}. It is reported that they were able to obtain material that had an enrichment of 80 percent or rather contained 80 percent $B^{10}F_3$.

As has been stated, the final disposition of this project is not known but it is certain that this particular method of isotope separation was never adapted to industrial scale for uranium isotope separation by the Soviets.

<u>Development of the Mass Spectrograph at Agudzeri</u>.--When the Research Institute was set up at Agudzeri (Sukhumi) in 1945, one of the many tasks assigned was the development and construction of a <u>mass spectrograph</u>.

Werner Schuetze was assigned to this project. He was employed at Siemens in Berlin in the spring of 1945 when the Soviet forces moved into the city. Upon his arrival in Agudzeri he took part in the general overall assignment of "isotope separation" and also served in the capacity of Deputy Scientific Director under Dr. Gustav Hertz. In the fall of 1945 he received his first individual assignment regarding the work on the mass spectrometer. With this assignment he stopped his work on the general problem of isotope separation and started working on the new project. In addition to this new assignment, he continued to serve as deputy to Hertz until the urgency for completion of the mass spectrometer project became so great that the Soviets permitted him to spend full time on the research necessary for the development and completion of the mass spectrometer project. A completed technical mass spectrometer (MS-2) was completed and shipped to Verkhneivinsk in the period between September and December 1948. The second technical mass spectrometer (MS-3) for Verkhneivinsk was completed and sent to the plant in May 1949. Other models of the spectrometer were completed and sent to the places as indicated on the timetable shown at the end of this section of the report. Emphasis is placed on the construction and delivery of the mass spectrometers to Verkhneivinsk since this is the location of one of the gaseous diffusion plants in the

Soviet Union. These are the plants used for the separation of uranium isotopes and concentration of the isotope U-235 to the point where it is usable in the enriched fuels for reactors.

When Schuetze visited the production plant in 1949, he was given a verbal assignment (later officially confirmed) to develop an automatic gas analyzer for continuous check on flow through the plant. This was to be as simple as possible without external cooling. The project failed and was abandoned.

Even after the acceptance of the mass spectrograph by the Soviets and its application in the nuclear energy program, Schuetze continued to work on improvements to the instrument. In August 1955 a model of this improved mass spectrograph was displayed at the "Atoms for Peace" Conference in Geneva. Western observers who had a chance to examine this instrument have stated that it was to all appearances, an excellent piece of equipment and would compare favorably with similar instruments produced in the West.*

Although Schuetze did not attend the "Atoms for Peace" Conference, he was shown photographs taken in Geneva and definitely identified the instrument as being a model of the mass spectrograph that he had designed and constructed at Sinop.

The following timetable shows the history of Schuetze in the USSR but it also shows the chronological development of the mass spectrometer and its application ot the nuclear energy program in the USSR.

*See Report EG-1586 Mass Spectroscopy in the Soviet Union dated 29 May 1956 for description.

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TABLE 1 - Chronology of Events

Approximate Date	Event
April-June 1945	Initial contact of source by Soviets.
June 1945	Transfer to Ozery, USSR.
June-Sept 1945	Scheduled meeting with Beriya. Transfer to Agudzeri, USSR.
Sept-Dec 1945	Issuance of assignments by General Zavenyagin of the Ninth Directorate.
March 1946	Conferences at Ninth Directorate, Moscow. Visit to Kikoin's Laboratory 2.
July 1946	Visit to Agudzeri by Gasperin, of the Ministry of Chemical Industry.
Dec 1946-Jan 1947	Attendance at meeting of the Scientific-Technical Council, Moscow. Meetings at Ninth Directorate, Moscow.
February 1947	Inspection by Gen. Zavenyagin followed by Inspection Commission headed by Pervukhin. Ministry of Chemical Industry.
June 1947	Three months investigation of mass spectrometer project by Gen. Zverev and Leypunskiy in Agudzeri.
September 1947	Successful completion of laboratory model, mass spectrometer (MS-0) and the arrival of the Receiving-Inspection Commission headed by Popov.
December 1947	Attendance at meeting of Scientific-Technical Council, Moscow.
April 1948	Successful completion of first technical mass spectrometer (MS-1) for NII-160 and arrival of Receiving-Inspection Commission. (NII-160 was the institute responsible for serial production of the mass spectrometer).

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Approximate Date	Event
Sept-Dec 1948	Technical mass spectrometer (MS-2) completed for Verkhneivinsk. Attendance at the meeting of the Scientific-Technical Council, Moscow.
May 1949	Technical mass spectrometer (MS-3) completed for Verkhneivinsk.
July 1949	Technical mass spectrometer (MS-4) completed for Geo-chemical Institute headed by Vinogradov.
Sept 1949-Dec 1949	Source participates in Receiving-Inspection Commission for mass spectrometers manufactured at NII 160, Fryazino. Visit to Verkhneivinsk and assignment of gas-analyzer project by Kikoin and General Zverev.
March 1950	Source participates in Receiving-Inspection Commission at NII 160, Fryazino.
April 1950	Mass spectrometer (MS-5) completed for an unknown installation (possibly Artsimovich's Institute).
May 1951	Mass spectrometer (MS-7) completed for Hertz's experiments.
July 1951	Gas-analyzer Commission and failure.
August 1951	Mass spectrometer (MS-8) completed for Steenbecks experiments.
January 1952	Cessation of classified projects at Sukhumi. Source assigned to mass spectrograph project (non-classified) and visits by Zadorozhniy from Geo-chemical Institute headed by Vinogradov.
July 1952	Nuclear Moments-Measuring Colloquium in Agudzeri.
December 1952	Departure of Hertz, Thiessen, and Steenback from Sukhumi.

Approximate Date	Event
February 1953	Mass Spectrometer Colloquium in Agudzeri.
August 1953	Visit by Artsimovich and discussion of lithium measuring problems.
January 1954	Soviet Commission from Kharkov assigned ion-source project for polarized hydrogen.
July 1954	Ion-Source Colloquium at Sinop.
December 1954	Arrival of NII 160 mass spectrometer at Agudzeri.
Feb-April 1955	Departure from Agudzeri and arrival in Leipzig, DDR. DDR atomic purchasing commission to Moscow and Leningrad.
August 1955	Schuetze's mass spectrometer presented as part of the Soviet exhibition at the "International Conference on Atomic Energy for Peaceful Purposes" which was held in Geneva.

Extruded Tubular Diaphragms.- Richmann Barrier.--One of the tasks assigned to the group at Agudzeri was the development and production of an extruded barrier to be used in the gaseous diffusion program. The chief responsibility for this development was assigned to Reinhold Reichmann. Some information on this program has become available but the final results and the final disposition of the project are not definitely known. There apparently never was any mass production of the finished product at the institute at Agudzeri since neither the tools nor the equipment was available there for a project of this nature. Small quantities of the tubes were produced for test purposes and possibly for pilot plant studies but it is not known where the facilities for the serial production of these tubes was located. It is rumored that they were produced in pilot plant quantities at Elektrostal. The final form of these tubes was a tube of sintered nickel that could be used in a diffusion cascade.

The initial introduction of nickel was in the form of the oxalate. This oxalate was received from the Ninth Directorate in Moscow but the actual point of origin is unknown. This oxalate had to be converted to the oxide before it could be used in the production of the tubes. The oxalate was heated in an electric furnace to a temperature of 800°C and decomposed into nickel oxide and a series of off-gasses. The resulting nickel oxide was in the form of a very course powder and unusable in that form. In order to prepare the oxide for use it was milled in a ball-mill for eight days. The exact size of the resulting particles is unknown but the powder was now finer than flour. No apparent attempt was made to determine the grain size of the powder.

In order to extrude the powder it was necessary to add tragacanth a binding agent. Tragacanth was chosen because it decomposes upon heating into several gaseous components and leaves no carbon residue. If any carbon residue were left behind the carbon would combine with the nickel and cause the tubes to become brittle. A certain amount of lavender oil was added to the mixture, but the reason for this addition is unknown. It is possible that it was added as a lubricant to facilitate the extrusion of the tube and to lessen the wear on the extrusion nozzle.

The tragacanth was purified and dissolved in water. The lavender oil was added and the nickel oxide mixed in until a dough of the consistency of polishing rouge was formed.

The extrusion press used in this operation weighed three tons and was actuated by a Soviet double-action pump producing a pressure of some two hundred atmospheres and requiring five kilowatts of electric power for its operation. The extrusion piston was made of cloth reinforced phenolic plastic and the extrusion nozzle was made of hardened steel. This press required only one man for its operation and was never used for series production of the tubes. In 1951, the press was disassembled and moved to Sinop probably to permit Thiessen to use it in his attempts to produce a modified type Reichmann barrier superior to that produced at Agudzeri.

When the materials were mixed, the resultant was adjusted to the proper consistency for extruding and then placed in the receptical of the extrusion press. When the material was of the proper consistency a force of approximately 50 tons had to be applied to the piston to extrude the tubes. The maximum extrusion lengths of the tubes were slightly over one meter.

The soft tubes were extruded vertically into glass vessels containing distilled acetone. The acetone would promptly absorb the water from the tube thus hardening it and permitting it to be handled. When the tube became hard enough to handle, it was cut into 50 centimeter lengths and slipped onto german-silver tubes slightly less in diameter than the extruded tubes. This german-silver tube had previously been coated with aluminum oxide or magnesium oxide powder to prevent the extruded tube from sticking to it. The tubes were then placed in a steel containing tube through which hydrogen was passed continously and the entire assembly placed in an electric furnace for sintering. The sintering was carried out at 770°C temperature for a period of two to three hours. This was a critical step in the process of manufacturing the barrier tubes. It was necessary to use a high enough temperature for a long enough period of time to assure proper bonding of the particles and to assure the

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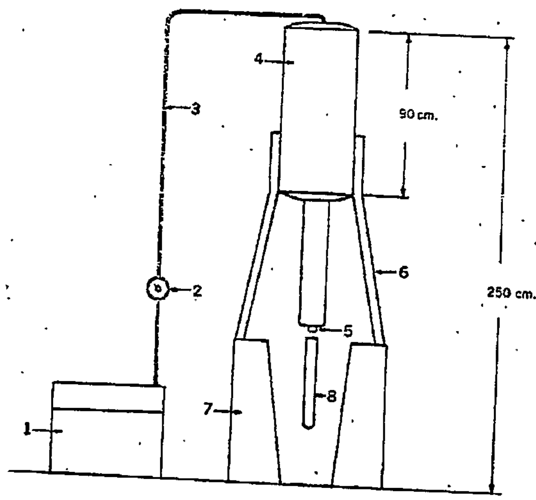
Figure 1

EXTRUSION PRESS FOR TUBES



1. Hydraulic compressor
2. Measuring and controlling device
3. Hydraulic pressure line
4. Compound tank and hydraulic gate jack
5. Mouthpiece of the tube extrusion press
6. Scaffolding
7. Concrete foundation
8. Glass receiver filled with acetone for the reception of the tubes

Procedure: The plastic tube was pressed through the mouthpiece at a rate of 1 centimeter per second, received by hand in the glass container and cut flush with the container rim. Several assistants worked in line. The tube was preconsolidated by the acetone, which attained a greenish tinge and had to be purified continuously. The tubes were of green color; after sintering they turned greenish-gray and consolidated but were extremely brittle.

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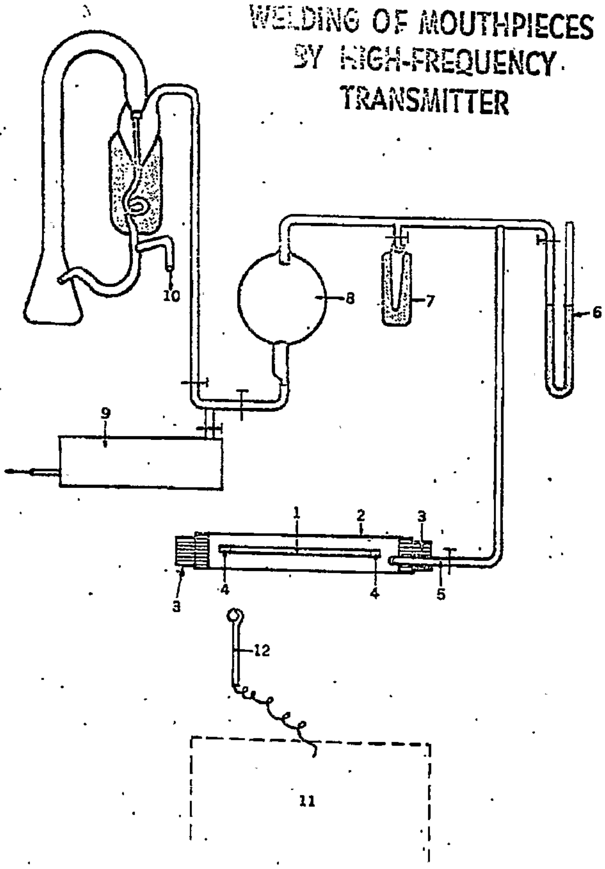
Figure 2

WELDING OF MOUTHPIECES BY HIGH-FREQUENCY TRANSMITTER



1. Diaphragmatic tube
2. Glass tube (vacuum)
3. Rubber plug
4. Nickel sheet mouthpiece
5. Discharge
6. Manometer
7. Cooling device with a removable jacket filled with liquid air
8. Five-liter glass balloon
9. Pumping system for medium vacuum pumping
10. Mercury vapor jet pump for high vacuum pumping
11. High-frequency transmitter
12. Radiator operated by hand

Procedure: After creating the vacuum, the radiator was approached to the welding spot which bonded after glowing briefly. This procedure was repeated at the second welding spot. Then the diaphragm was removed and the next tube inserted. The changing of the tubes, the pumping and welding took about 15 to 20 minutes.

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complete reduction of the nickel oxide to the metal state and yet, fusion had to be prevented so that the porosity of the material would not be impaired. After the proper period of sintering the assembly was removed from the furnace and the tube allowed to remain in an atmosphere of hydrogen while cooling to a temperature of 100°C before being removed from the assembly.

After the tubes were sintered, one end was fitted with a sylphon bellows and the other end with a straight nickel tube. Each fitting was welded into place by a special weld. These attached fittings made it possible to connect the barrier tubes into a stage assembly. The special welding was done in a vacuum and by means of a small induction heater. Upon completion the tubes were ready for packing and shipping to an unknown location.

While Reichmann was alive and in charge of the project, no methods of standardization of the process were worked out. Reichmann determined if the powder was fine enough by rubbing it between his fingers. He determined the proper consistency of the extrusion dough by punching with his finger. By merely looking at the tubes he could tell if they were to be used or not. After the death of Reichmann it was necessary to develop some system whereby the process would become standardized. This took approximately two years to develop and even then it was such that it could not be introduced into a mass production system but was only suitable for use on a laboratory scale. As a result of the necessity of preparing this set of standards, the entire program of the development of this type barrier tube suffered a great deal.

The only tests run on the tubes at Agudzeri were tests to measure the permeability. Little is known about these tests but the results were expressed at the $\Delta\gamma/\gamma$ value. The general concensus was that the best obtained values were still below the results obtained with the Thiessen wire mesh backed barrier.

Although there is no evidence to indicate that the Reichmann barrier was ever put into mass production it is probable that a modified form of this type barrier was put into production and introduced into an existing plant by modification or into a new plant entirely.

<u>The Chemical Research Laboratory at Agudzeri 1945-55.</u>--The Chemical Laboratory at Agudzeri, from its inception in the fall of 1945 until the departure of the German scientists in March 1955, underwent constant organizational change. This continual change was necessitated by the functional aspect of the laboratory. Contrary to the general concept of the functional organization for a chemical research laboratory, this laboratory was not organized into research groups dealing with the well established classical phases of chemistry. Instead, the organization fluctuated to meet the needs of the Hertz research group and to afford complete chemical research support to the tasks assigned to the Hertz group.

In [illegible] of the [illegible] involved in the organization of the Chemical Laboratory, there has evolved a general plan that can be classified into five major organizational phases. A very general discussion of these five phases follows.

<u>First Phase (1946-mid 1947)</u>.--Boris Ikert was the German chief of the chemical laboratory during this period with Yermin, a Soviet chemist, assigned to report the work of the group to the Soviet Administration. A general outline of the organization is shown in Figure 3. Several other Soviets were assigned as assistants but the names and assignments are unknown.

<u>Second Phase (mid 1947-end 1949)</u>.--With this second phase reorganization, Ikert was removed from his position as chief of the Chemical Laboratory and was replaced by the Soviet Vsevolod Aleksandrovich Karzhavin. Yermin was also removed from his previous position. During this period Karzhavin served both as the Technical Chief under Hertz and as the Administrative Chief under the Soviet administration. As the Technical Chief he received technical instructions from Hertz and in his subordinate role to the Soviet Administration he was responsible for the discipline, material supply, and personnel problems.

It was during this period that the newly prepared quarters were occupied by the Chemical Section and the Section greatly expanded. The closing of this phase saw the transfer of Yermin and the extruded barrier project to the Moscow area and the transfer of Karzhavin, Berezin, and Berzina to Kerfirstadt (Verkhneivinsk). Thus it becomes apparent that this period saw the initial moves toward the transer of important projects from the area, indicative of the peripheral nature of the work of the German scientists in the Soviet atomic energy program. A general organizational outline of the group during this period is given in Figure 4.

The following Soviets were identified but their assignments within the laboratory was unknown:

Assotiani, Ya	Kozakova	Lomova
Mozgovaya	Tumanova, Ye	

<u>Third Phase (1950-November 1952)</u>.--The third distinct organizational phase was during the period of 1950 to November 1952. When Karzhavin was transferred at the close of the second phase, Lebsadze was made chief of the Chemical Laboratory for a period of from six months to a year. She was then replaced by Varlaam Ivanovich Khachishvili. He remained chief of the Chemical Laboratory until late 1953 or early 1954. Heretofore the Chemical Laboratory had consisted of three sections, each with apparently equal importance. With the initiation of this organizational phase only two sections retained their positions of importance with the third section becoming rather minor in nature. With the closing of this phase of the work, all classified work at Agudzeri was discontinued. A general organizational outline of the Chemical Laboratory during this period is given in Figure 5.

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Figure 3

GENERAL OUTLINE OF CHEMICAL LABORATORY ORGANIZATION, 1946-47

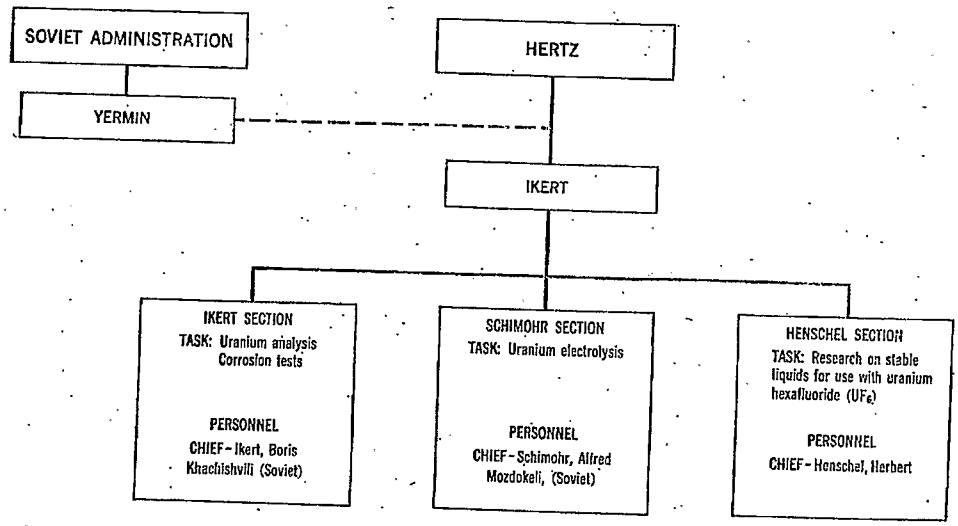

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Figure 4

ORGANIZATION OF THE CHEMICAL LABORATORY, 1947-49

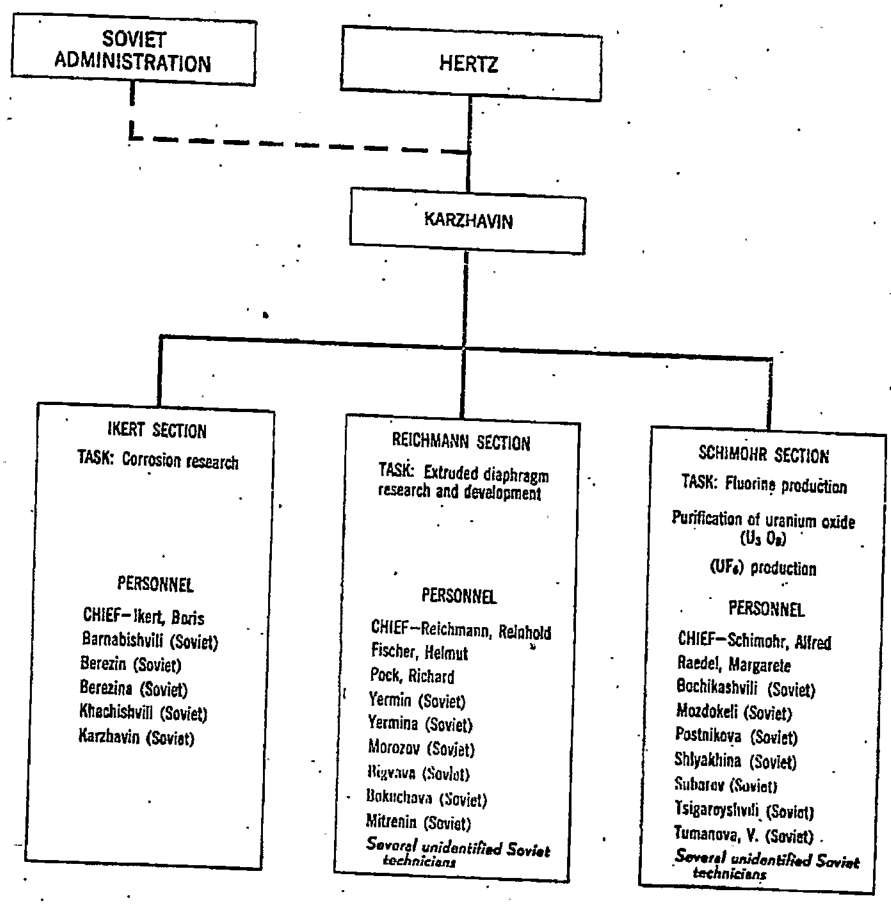

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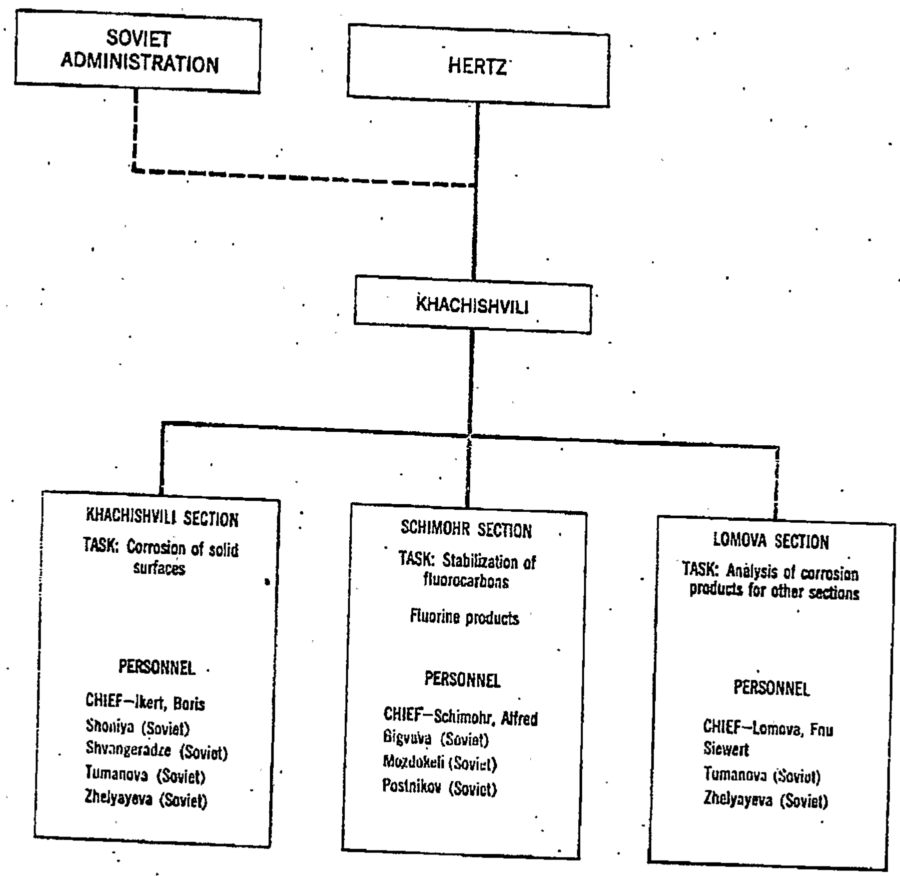
Figure 5

ORGANIZATION OF THE CHEMICAL LABORATORY, 1950-52



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The following Soviets were also identified but their assignments are unknown:

Afomina	Korvyrzina	Mozgovaya	Vasilenko
Kobaladze	Kozakova	Rayskaya	
Korvyrzin	Lebsadze	Shlyakhina	

Fourth Phase (November 1952-end-1953).--The fourth organizational phase of the Chemical Laboratory lasted from November 1952 until the end of 1953. This reorganization was brought about by the cessation of classified work and by the large influx of German personnel into the institute along with those persons that were to continue working on the projects. Nikolaus Riehl was transferred from Sungul and took over as the German chief of the institute in the place left vacant by the transfer of Hertz. During this phase, practically every scientist was assigned a different task and had several Soviet assistants and technicians assigned to work with them. It was also the task of each scientist to train the Soviet personnel working with them in the respective problems, procedures and techniques.

Some of the more important assignments and those working each are given below:

TABLE 2 - Assignment at Chemical Laboratory 1952-53

Soviet Administration — RIEHL

Khachishvili

1. Khachishvili
   Task: Purification of indium and galium
   Personnel: Vasilenko
   Two other unidentified Soviets

2. Guenther Wirths
   Task: Separation of rare earths
   Personnel: Tobien, Heinrich
   Summerfeldt, Walter
   Postnikuva
   Several unidentified Soviets

3. Alfred Schimuhr
   Task: Purification of germanium for transistors
   Personnel: Mozdokeli
   Bigvava
   Several unidentified Soviet assistants

4. Herbert Thieme
   Task: Separation of thorium and hafnium; hafnium free zirconium
   Personnel: Lange, Hannelore
   Tumanova, V.

5. Henry Ortmann
   Task: Development of luminescent materials
   Personnel: Riehl, Nikolaus (Dual role)
   Kirst, Werner
   Kozekova

6. Hans Born - Karl Weise
   Task: Radio-chemical analysis
   Personnel: Przybilla, Walter
   Kobaladze
   Kovyrzin
   Lomadze

7. Johann Keppel
   Task: Analytical work on luminescent materials; photogrammetric work
   Personnel: Lomova
   Zhelyayeve

8. Hans Krueger
   Task: Spectral Analytic service for all labs
   Personnel: Shvengeradze
   Moagovaya

9. Johannes Pany
   Task: Organic chemistry projects for Karl Zimmer (Sinop)
   Plastics (polystyrole)
   Personnel: Afonina
   Shoniya

10. Eugene Baroni
    Task: Rare earth separations by electrophoresis; organic chemistry
    Personnel: Lebsadze
    Kovyrzina

11. Helmut Bumm
    Task: Metallurgical research. Zone-smelting processes
    Germanium - silicon
    Personnel: Inozemtseva
    Two unidentified Soviet assistants

Fifth Phase (early-1954-March 1955).--The fifth and final organizational phase at Agudzeri covered the period from early 1954 to March 1955. This phase saw a change in Soviet administration in that Khachishvili was replaced by Ivan Petrovich Prokudin as Chief of Agudzeri. There was little change in the technical organization other than the reduction in work. The Germans did little, if any, work during this period. The Soviet technical personnel were taking over the tasks in preparation for the coming departure of the Germans. Riehl retained his position as German leader of the group. Prokudin was

Responsible to Riehl for technical matters and to the Soviet administration at Sinop for administrative matters. The only groups continuing their research functions were:

1. Schimohr - Silicon Research
2. Born - Weiss - Radio-chemical analysis
3. Krueger - Spectral analysis
4. Baroni, Pany - combined group worked on organic compound preparation for Zimmer, of Sinop
5. Bumm)
6. Wirths) Silicon purification and crystallization
7. Prokudin)

The work done at Agudzeri during this phase was of little apparent importance and of little interest to the Soviets. Essentially it was a "make work" program to occupy the time of the German scientist while they were awaiting their repatriation. However, as stated earlier, the Soviets took advantage of this period to train Soviet personnel in the techniques and laboratory procedures employed by the Germans.

The mass exodus of the Germans started in March 1955. Within a short period of time, all Germans at Sukhumi were returned to Germany. The Austrians remained at Sukhumi until early fall 1955, at which time they too were returned to their own country. Thus the 10-year tenure was ended.

<u>Minor Developments at Agudzeri</u>.--Besides the chief research project assignments at the research institute at Agudzeri there were several research project assignments of lesser importance. The projects were not alien to the overall project assignment but were of a peripheral nature and tended to implement the regular research program. Among these minor developments were:

1. Corrosion Studies by Ikert and Zuehlke
2. Barwich's Contribution to the Soviet Atomic Energy Program
3. Alpha Counter Development by Hartmann
4. Air Separator Development by Muehlenpfordt
5. Activities of Zuehlke Dealing with Barrier Testing
6. Post 1952 Research at Agudzeri

<u>Corrosion Work by Ikert and Zuehlke</u>.--The corrosion work was done by Ikert and Zuehlke who found that nickel was highly corrosion-resistant. These two working together developed a procedure whereby the separation unit could receive a preliminary treatment to minimize the corrosion when the unit was placed on-stream. The unit was evacuated and heated to a temperature of some 85 to 100 degrees centigrade. Fluorine fed into the unit reacted violently and the temperature rose to 200°C. The unit was then allowed to cool and the remaining fluorine removed. In the fall of 1949 Karshavin went to Kefirstadt (Verkhneivinsk) and took with him the above procedure. When he returned in 1950 he indicated that the procedure had been well received and that he had been granted a number of bonuses.

Ikert measured corrosion by the increase in weight of a sample adsorption of the gases being tested against. This was in contrast to the work being done on the same problem by Zuehlke. Zuehlke determined the amount of corrosion by the loss in pressure in an enclosed gas in which the sample being tested was placed. Later in the program both Ikert and Zuehlke cooperated in striving to reach a solution to this important problem.

The final solution to the corrosion problem in a diffusion cascade is unknown but it is probable that the Soviets adopted a system of fluoride passivation to minimize corrosion.

Barwich's Contribution to the Soviet Atomic Energy Program.--Barwich's most important contribution was a theoretical study on cascade theory drawn in 1946 and based on American publications. His paper was a fundamental study outlining the principles of corrosion, degree of enrichment, and energy balance. He contended that circulation continues and separation is achieved irrespective of the velocity of the gas. He was awarded a Stalin Prize in 1947 in appreciation of this report. Barwich also carried out mathematical calculations for Hertz' counter-current flow diffusion ~~method and~~ for the early thermal diffusion experiments carried out at Agudzeri. He was apparently given many of the constants of the Soviet diffusion plant to enable him to make certain calculations that were needed by the Soviets.

In addition to the work on general cascade theory Barwich worked on the following specific aspects of gaseous diffusion cascades.

1. The determination of the staging arrangement.
2. The type extraction from the cascade: continuous or non-continous.
3. Fore and back pressures used, including optimum barrier dimensions.
4. Removal of impurities from leaks or corrosion.
5. Loss of efficiency due to corrosion.
6. Influence of the departure from ideal to finite cascade.
7. Automatic regulation of the cascade.
8. Approach to equilibrium of the cascade.
9. Propagation of pressure variations through the cascade.

Barwich was also working on the problem of the control of the gaseous diffusion plant. At first it was thought that a very strict control would have to be maintained over each and every stage but he said that he did not think this was the case. It seems that he proved his point and was thus responsible for relieving the Soviets of the necessity of manufacturing many thousands of extra instruments.

Alpha Counter Development at Agudzeri.--Hartmann was in charge of a laboratory concerned with the development of an alpha counter for the determination of the enrichment of uranium samples. Details of the instrument are not known but it involved the measurements of the energy of the particles as well as the range. Enrichment was determined by comparison with a standard sample. The major portion of the time for determining the enrichment of a sample was taken up by the preparation of the sample. This took approximately five hours while the actual measurement took only 45 minutes. Hartmann was required to make enrichment determinations on samples received from Moscow as well as on any samples obtained from the work within the Sukhumi complex. Hartmann worked on this instrument in competition with several other persons including Soviets. It is said that his instrument far outclassed all other instruments except one built by one of the Soviet groups. Even this instrument was inferior to that built by Hartmann but was much better than the rest of the instruments submitted for judgment. Hartmann did not receive a bonus for this work.

Hartmann's Alpha Counter.--Hartmann was in competition with Bernhardt of Simon in the development of this instrument. Various reports have indicated that the Soviets showed great interest in this development but it is apparent that they give credit to a Soviet for having developed the method which they employed since they gave no bonus to a German for this development.

Air Separator-Muehlenpfordt.--Since it was expected that air would leak into the production cascade, Muehlenpfordt was asked to develop a method of removing the air without losing the enriched uranium hexaflouride (UF_6). He devised the following method: the gas mixture was to be drawn from the out-put chamber at the end of the cascade into a freezing chamber. The walls of the freezing chamber were to be cooled by liquid air and constituted such a large area that practically all the UF_6 condensed on them. The remaining gases would then be drawn off by a mercury vapor pump and if necessary, subjected to chemical investigation after compression. After the removal of the extraneous gases, the condensed UF_6 could then be reclaimed by mechanical means and reintroduced into the cascade. This would provide a method of removing any foreign gases that might be in the cascade stream.

This apparatus was constructed to work on a continuous basis. The apparatus was ordered taken to Kefirstadt in 1949. Muehlenpfordt took it there and remained for a period of three months. When he returned he indicated that the apparatus was used in the cascade after considerable modification, but he was not awarded any prizes nor bonuses for the work.

Activities of Zuehlke.--Zuehlke was originally given the assignment of designing and constructing an apparatus for testing the separating powers of diffusion diaphragms. He worked on this project until Spring 1947 when he discontinued his work since Bartel had developed such an apparatus of equal efficiency and more simple construction. In late 1948 it was reported that the apparatus constructed by Bartel gave unreliable results and thus Zuehlke was again set to work on the problem. The final disposition of this project is not known.

In 1947-48 (in the period when he was not working on the testing apparatus) Zuehlke worked on problems pertaining to corrosion. At first he worked on a project parallel to that on which Ikert was working but later they cooperated in attempting to arrive at a unified solution. Zuehlke's method was based on a measurement of pressure loss in an inclosed gas, caused by adsorption while Ikert based his work on the weight gain due to adsorption of the gas by the diaphragm being tested.

Zuehlke has indicated that Thiessen barrier always tested to be better than the Reichmann barrier.

After Zuehlke had finished his study on the corrosion of barriers he worked with Muehlenpfordt on corrosion problems involved in the work being done by Hertz. This work took place in 1951 and 1952.

In the period of 1953-54 Zuehlke worked with Dr. Siewert on the separation of B^{10} and B^{11} by distillation. After a period of research and development they developed and constructed a separation unit that would produce 2 litres per day of 80 percent B^{10} in a boron trifluoride (BF_3). The estimated period of operation for this apparatus was six months. When Zuehlke left Agudzeri in March 1955 the plant had been running trouble-free for 2 to 3 months. The Soviets had said that they would need 10,000 litres per year of B^{10}. This apparatus was displayed at Stand 6 in Geneva during the "Atoms for Peace" conference.

Post 1952 Research at Agudzeri.--After the Germans were removed from classified work in the fall of 1952, many projects were started at the two institutes in Sukhumi, Sinop and Agudzeri. It is almost impossible to separate the work that was done at one from the work that was done at the other. Both institutes were under a unified administration and worked on a more or less unified program of research. It seems that there was a complete exchange of information and sharing of the projects.

Schuetze continued to work on the mass spectrometer and came up with an improved model that was shown in Geneva, as has been stated before. Many of the scientists were involved in spectroscopic research or chemical research directed along a general line of rare-earth separation and purification. The group that came to Agudzeri from Obninskoye brought with them the research project directed toward obtaining hafnium-free zirconium. They managed to obtain zirconium containing only .01 percent hafnium while the specifications called for a purity of only .02 percent. It is apparent that no work of any great significance was done at Agudzeri after November 1952.

Technical Support Facilities.--The Research Institute at Agudzeri had a well organized service group. In the beginning it was staffed with German technicians who had been recruited either from Germany itself or from the prison camps controlled by the Soviets. These German technicians were assisted and at times supervised by Soviet technicians assigned to the various sections. It must be remembered however, that the German technicians were removed from the sections in late 1948 and early 1949 and returned to prison

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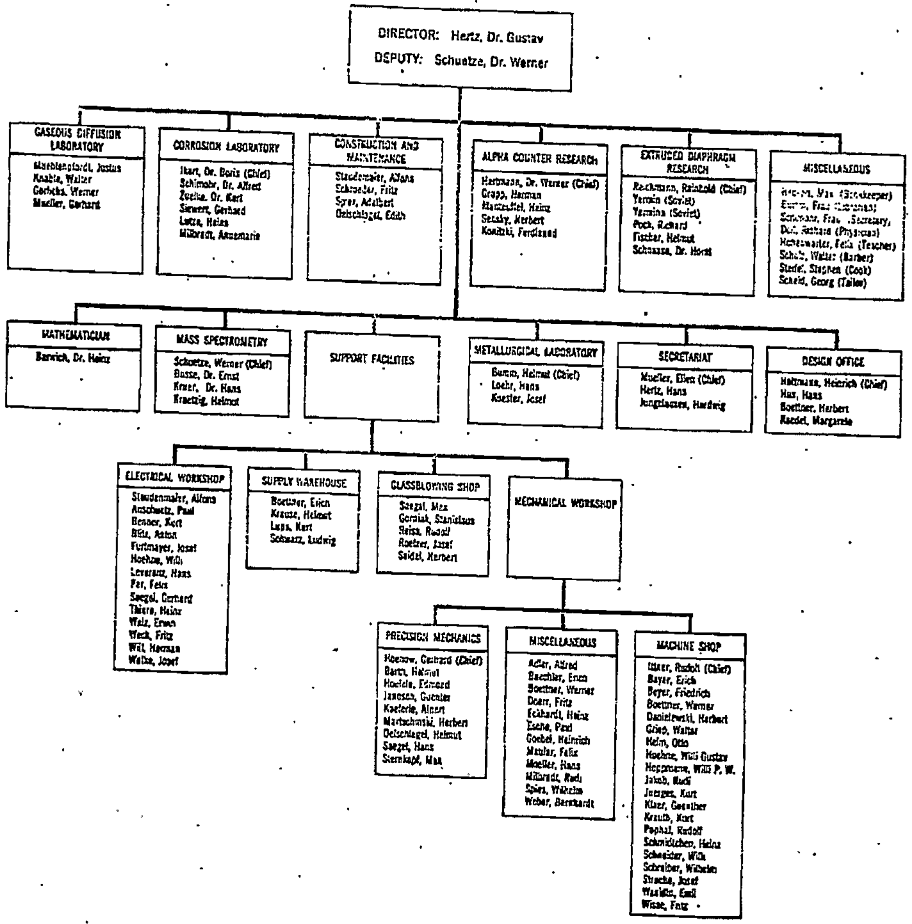
Figure 6

GENERAL ORGANIZATION OF THE AGUDZERI RESEARCH INSTITUTE, 1945-50



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camps for eventual repatriation. The very few personnel remaining in the service units after this were mostly Soviet. For this reason it is reasonable to assume that the service facilities were greatly curtailed and the services rendered thus reduced. As might be expected, the chief service and support unit was the workshop. This workshop was a rather complex and fluid organization. This type organization was necessary to enable the workshop personnel to fulfill the highly diversified demands levied against their services. A general outline of the organization of the technical support facilities follows. This is more a general composite rather than for a specific period. Since this is true, there will be a difference in the list of personnel shown here and the list in the organizational table shown elsewhere in this report.

TABLE 3 - Organization of Support Facilities

1. Mechanical Workshop
   Function: Instrument and equipment construction and repair.
   Chief: 1945-47 - Staudenmaier, Alfons
   1947-51 - Kurochkin
   1951-55 - Tigishvili

   Personnel: German
   - Alder, Alfred
   - Baier, Friedrich
   - Boettner, Werner
   - Danielewski, Herbert
   - Doerr, Fritz
   - Eckhardt, Heinz
   - Hoenow, Gerhard
   - Janosch, Guenther
   - Juerges, Kurt
   - Klaer, Guenther
   - Krauth, Kurt
   - Milbradt, Rudi
   - Oelschlagel, Helmut
   - Peer, Felix
   - Schreiber, Wilhelm

   Soviet:
   - Blinova, Lyusya
   - Bobrikov
   - Boronilo, Ivan Makarovich
   - Goncharov, Vasiliy Ivanovich
   - Kankava, Vakhtany
   - Korostylev, Lenya
   - Koryavov, Petr Gavrilovich
   - Kozakov, Ivan
   - Makeyev
   - Mamurin, Sergey
   - Ryazentsev, Nikolay Sergeyevich
   - Solntsov, Yuriy
   - Vyatkin

2. Electrical Workshop
   Function: Construction and maintenance of electrical instruments and equipment.
   Chief: 1947-51 - Staudenmaier
   1951-55 - Razorenov
   Personnel: German
   - Hansch, Edith
   - Spier, Adalbert
   - Will, Herman
   - Schroeder, Friedrich
   - Thiere, Heinz

Soviets:

Kudryashev, Arkadiy
Rayskiy, Slava Vasilyevich — Moskovskiy

3. Glassblowing Workshop
   Function: To produce laboratory glassware and special apparatus for scientific experiments.

4. Liquid Air and Gas Workshop
   Function: To supply the entire Sukhumi complex with liquid air and other liquid gases as well as with highly compress gases.

5. Precision Mechanics Workshop
   Function: Construction of highly precisioned equipment and apparatus.

6. Design Office
   Function: Design of equipment for scientific experiments.

Personnel were listed on the first two sections only since they are considered the most important sections of the shop. Other than the scientific research groups and support facilities, the following sections, more administrative in nature, were identified at Agudzeri.

TABLE - 4 Administrative and Other Organization Support Facilities

1. General Supervision
   Function: Overall administrative control

2. Personnel Section
   Function: Normal functions of a personnel section..recruitment, maintenance of personnel records, etc....

3. First Section
   Function: Control and supervision of all classified work and storage of classified reports and materials.

4. Escort Section
   Function: To escort the Germans at anytime when it was necessary for any of them to leave the compound.

5. MGB Section
   Function: Covert police supervision of Germans and Soviets alike.

6. MVD Guard Detachment
   Function: Physical security of the installation.

7. Political Section
   Function: Communistic and political indoctrination of the Soviet personnel and to some extent, the Germans as well.

8. Technical Supply Section
   Function: Reception, storage, and distribution of all materials and supplies.

9. Bookkeeping Section
   Function: Normal functions of such a department..receipts, disbursements, salaries, etc........

10. Administrative-Maintenance
   Function: a) Administer real estate, furniture, household equipment, etc...
   b) Maintenance of buildings and grounds
   c) Maintenance of communal services..tailor, barber, etc.

11. Medical Section
   Function: Maintenance of the health of personnel and of the hygenic conditions of the installation.

12. Fire Department
   Function: Normal functions of such a group.

APPENDIX [illegible]

SOVIET PERSONNEL AT AGUDZERI

AFONINA, Aleksandra Ivanovna
Chemical Laboratory Assistant

AGANYAN
Glassblowing technician

ALEKSANDROV
Laboratory Assistant

ASSOTIANI, Pridon
Laboratory Assistant

ASSOTIANI, Yakov
Chemical Laboratory Assistant

BABAYEV, MVD Major
Chief of Escort Section

BALAKIN, Aleksandr
Glassblowing Technician

BARNABISHVILI, Donara Nikolayevna
Chemical Engineer

BELYAKOV, Yerginiy
MVD Escort

BEREZIN

BEREZINA

BIGVAVA, Fenya Ilarinovna
Chemical Laboratory Assistant

BLZAYEV, Aleksandr Dionisovich
Administration Chief

BLZAYEVA

BLINOVA, Lyusya
Office clerk

BOBRIKOV
Mechanic

BOBRIKOVA
Secretary-bookkeeper

BOCHIKASVILI, Nina Petrovna
Laboratory Assistant

BOKUCHAVA, Tina
Laboratory Assistant

BOLOTNIKOV, Aleksey
Laboratory Assistant

BOLOTNIKOVA
Designer

BORONILO, Ivan Makarovich
Mechanical Laborer

BUBKOV
Machine Construction Engineer

CHEKHOVTSOV

CHEKRYGIN, Nikolay Pavlovich
Chief, Admin. Maint. Section

CHELIDZE, Petr Varlomovich
Technical Supply Section

CHERNOV, Anatoliy Artenyevich
Laboratory Assistant

CHERNOVA, Lyubov Ivanovna
Laboratory Assistant

DREV
Chief, First Section

DUBROV, Ivan Gavrilovich
Chief, Supply Warehouse

DZHEVELIKYAN, Galina Ivanovna
Medical Technician

SECRET

DZ[illegible]A, Varlaam Lukich
Nuclear Physicist

DZ[illegible]A, Mikhail
MVD Escort

FEDORENKO
Admin.

FEDOROV
Chief, Inspector, Technical Supplies

FOMENKO, Ivan Kondratyevich
Janitor

FOMENKO, Viktor Kondratyevich
Laboratory Assistant

GABYSHEVA, Tamara
Design Office

GAGU, Taras Arksentyevich
Physicist - Scientific Assistant

GALININ
Bookkeeper

GARBOSHOVA
Design Engineer

GASPA[illegible]V, Agas Nikitovich
Chief, Glassblowing Shop

GAVRILOVICH
Chief, Bookkeeping Section

[illegible]LOPORODKO, Major
Chief, MVD Guards

[illegible]NCHAROV, Vasiliy Ivanovich
Precision Mechanic

[illegible]
[illegible]

[illegible]V, Nina
Teacher

GORIZONTOV, Boris Arkadyevich
Metals Control Clerk

GORSKIY
Chief Bookkeeper

GRIGORASHVILI, MVD Major
Chief, Escort Section

GRIGORYAN, Lt. Col.
Chief, Escort Section

GVERDTSHILYA
Scientific Assistant

GVERDTSITELI, Irakliy Georgcrvich
Physicist - Administration

IGNATENKOVA, Aleksandra Ivanovna
Laboratory Assistant

INOZEMTSEVA, Irina Aleksandrovna

IYEVLEV
Chief, First Section

IZRAILEVSKAYA, Emiliya Lvovna
Librarian

IZRAILEVSKIY, Vladimir Mikhaylovich
Interpreter

KAKABADZE
Chemical Laboratory Assistant

KAKABADZE, Meri Georgiyevna
Chief, Medical Section

KANKAVA, Vakhtang
Chief Foreman - Mechanical Workshop

KAPANADZE
Chief, Personnel 1953-55

KAPUSECHENKO
Escort

KARPENKO, Ina
Physicist

KARZHAVIN, Vsevolod Aleksandrovich
Chemist

KHACHISHVILI, Varlaam Ivanovich
Chemist

KHOLODILIN, Aleksandr Ivanovich
Physician

KLIMENTYEV, Viktor Ivanovich
Chief, Escort Section

KOBALADZE, Zhuzhuna
Laboratory Assistant

KOCHLAVASHVILI, Aleksandr Ivanovich
MVD Chief, Agudzeri

KONOREYEV
Laborer - Supply Depot

KONOGRAY, Tasya
Secretary

KOROSTYLEV
Chief Mechanical Foreman

KOROSTYLEV, Lenya
Mechanic

KORYAVOV, Petr Gavrilovich
Mechanical Foreman

Kovalskiy, Aleksey Ivanovich
Fireman

KORVYRZIN
Chemist

KORVYRZINA
Chemist

KOZAKOV, Ivan
Mechanic

KOZAKOVA, Valentina Ivanovna
Chemical Laboratory Assistant

KRUTKOV, Prof. Dr.
Theoretical Physicist

KUCHEREV
Theoretical Physicist

KUCHERYAYEV
Physicist

KUDRYASHEV, Arkadiy
Electrician

KULAGIN, Ivan Vasilyevich
Glassblower-Chauffeur

KURASHVILI
Safety Engineer

KURCHKOV
Mathematician

KUROCHKIN, Sergey Mikhaylovich
Chief, Mechanic Workshop

KUROCHKINA, Irima Sergeyevna
Chief, First Section

KUZMIN, Ivan
Escort Section

KVARTSEDELI
Physicist

KVARTSKHAVA, Ilya Filippovich
Physicist

LEDSADZE, Tengela Nesterovna
Chemist

LEONTYEV, Nikolay
Physicist- Electronic Assistant

LEONTYEVA, Irina
Electronic Eng. Scientific Associate

LOMADZE, Angelina
Laboratory Assistant

LOMOVA, Valeriya Andreyevna
Chemical Laboratory Assistant

LU[illegible]IN, Arkadiy
Escort

MA[illegible]
Chief Foreman, Mechanic

MALTCEVA, Anga
Secretary-Bookkeeper

[illegible], Sergey
Laborer

[illegible]ARYAN, MVD Major
Chief, Admin. Maint. Section

MA[illegible]TAKOVA, Nina Karlovna
Librarian

MIRIANASHVILI
Experimental Physicist

[illegible]IN, Boris Petrovich
Physical Chemist

[illegible]NA, Olga
Medical Doctor

MOLCHANKIN
Personnel Chief

[illegible], Vasiliy
Chemical Laboratory Technician

[illegible]OVSKIY
Electrician

[illegible]LI, Tinatin Georgiyevna
Chemical Laboratory Assistant

[illegible]VAYA, Tamara Afanasyevna
Laboratory Assistant

[illegible], Georgiy
Chief, Motor Pool

[illegible], Boris Mikhaylovich
Chief, Escort Section

NIKOLASHVILI
Chief, Political Section

OLEYNICHENKO, Petr Maksimovich
Chief, Fire Department

ORDZHONIKIDZE, Avtandil
Chemical Laboratory Assistant

ORDZHONIKIDZE, Ketovan Georgiyevna
Physicist

ORDZHONIKIDZE, Rastom
Laboratory Assistant

ORLOV, MVD Major
Chief, Escort Section

PANIN
Design Office

PANINA
Political Section

PEREVALOV, Dima
Chief, Personnel Section

PEREVALO, Ira
First Section

PLUTON
Nuclear Physicist

POGREBNYAK
Political Section

POLIKHATKO
Dispatcher

POPOV
Mechanic

POPOV, Sergey
Physicist

POROSHIN, Oleg
Physicist

POSTNIKOV
Chemist

POSTNIKOVA, Zinaida Grigoriyevna
Chemist

PROKUDIN, Ivan Petrovich
Chemist

PROKUDINA
Laboratory Technician

PUTSENKO, Petr
Carpenter

RAYSKAYA, Marina Vasilyevna
Chemist

RAYSKIY, Igor Vasilyevich
Instrument technician

RAYSKIY, Slava Vasilyevich
Electrician

RAZORENOV, Ivan
Electrician

ROGANYAN
Chief of Depot

ROGAVA
Escort Section

RYAZANTSEV, Nikolay Sergeyevich
Mechanical Foreman

SARYAN
Chief, Supply Depot

SELYUTIN
Escort Section

SEREGIN, Vasiliy Ilyich
First Section

SHARIGA, Tamara Ignatyevna
Administration - Supply

SHLYAKHIN, Sergey Mikhaylovich
Chief, Personnel

SHLYAKHIN, Yura Sergeyevich
Glassblower

SHLYAKHINA, Tamara Sergeyevna
Laboratory Assistant

SHMAKOV, Ivan
Chauffeur

SHMAKOVA, Valentina
Bookkeeper

SHONIYA, Benno
Chemical Laboratory Assistant

SHUIESHKO, Aleksandr
Political Section

SHVANGERADZE, Rezo Rozhdenovich
Chemist

SINETSKIY
Fireman

SINYAVSKIY, Aleksandr
Electrician

SOLETSEV, Yuriy
Mechanic

STEPANENKO, Lt. (MVD)
Chief, MGB Section

STOIBOVSKIY
Medical Section - Personnel

STOLYAROVA, Nina
Secretary

STREBNITSKIY, Lt. (MVD)
Interpreter and Escort

SUBAREV, Gennadiy
Laboratory Assistant

TARTILSA, Zoya Ivanovna
Chief, Bookkeeper

TEKHNEDSHAN
Fireman

TIGISHVILI, Ilya Isaakovich
Chief, Mechanical Workshop

TKEMALADZE, Nikolay
Escort

TRENEV, Lt. (MVD)

TSIGAREYSHVILI, Nodari
Laboratory Assistant

TSKHAKAYA, Vakhtang Kalistratovich
Physicist

TSOMAYA
Radiological Physicist

TUMANOVA, Valentina Ivanovna
Laboratory Assistant

TUMANOVA, Yekaterina Ivanovna
Laboratory Assistant

TUPIKOVA, Nadya
Secretary

ULITENKO, Anya
Chief of Mess

ULITENKO, Sergey Ivanovich
Bookkeeper

VASILENKO, Motya
Chemist

VASILYEV, Ivan
Electrician

VOLIKOVA
Dentist

VORONETS, Georgiy Yevstafiyevich
Laborer

VORONKOV, Mikhail, Lt. Col. (MGB)
Chief, MGB Section

VOYTSENYA
Bookkeeper

VYATKIN
Mechanic

YERMIN, Vladimir Nikodimovich
Chemist

YERMINA, Natalya Nikolayevna
Laboratory Assistant

ZAYTSEV, Viktor Trifonovich
Mechanic Foreman

ZAYTSEVA, Natalya Romanovna
Kindergarten Worker

ZHELYAYEVA, Anastasiya Stepanovna
Chemist

ZHENOV,
Theoretical Physicist

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