



*International periodic scientific journal*

—*ONLINE*

*www.sworldjournal.com*

# SWORLD Journal

ISSN 2227-6920

History

**Volume J11505**

**May 2015**

*Published by:*

**Scientific world, Ltd.**

*With the support of:*

**Moscow State University of Railway Engineering (MIIT)**

**Odessa National Maritime University**

**Ukrainian National Academy of Railway Transport**

**State Research and Development Institute of the Merchant Marine of Ukraine (UkrNIIMF)**

**Institute for Entrepreneurship and morehozyaystva**

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Please use the following format to cite material from this book (*italics indicate the fields to change to your data*):

*Author(s), "Title of Paper,"* in SWorld Journal, Vol.J11505 (Scientific world, Ivanovo, 2015) – URL: <http://www.sworldjournal.com/e-journal/j11505.pdf> (date:...) - *page - Article CID Number.*

**Published by:**

**Scientific world, Ltd.**

e-mail: [orgcom@sworld.education](mailto:orgcom@sworld.education)

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J11505-001

Sadovsky A.S., Pietsch Barbara

**HEAVY WATER. HISTORY OF ONE PRIORITY. Part 3.***Karpov Institute of Physical Chemistry, Moscow**France, Le Vigan*

*Abstract. In the previous Part 2 of this series [1] came, as it turned out, distorted information about the fate of Karl-Hermann Geib and Paul Herold. In the sources used fictions were present. Given here a detailed biographical sketch of Dr. Geib is based on documents from the archives of his family, published for the first time and the personal memories of authors. To facilitate identification of the essay to those who will learn or already reviewed earlier parts, it is presented in the form of Part 3 of this series. Of necessity, it entered already published material in abbreviated form.*

*Key words: heavy water, history, isotope exchange, Karl-Hermann Geib, Leuna-Werke, Liskhimstroy, Paul Harteck, Paul Herold, sulphide method*

**KARL-HERMANN GEIB (biographical essay)****Way to science**

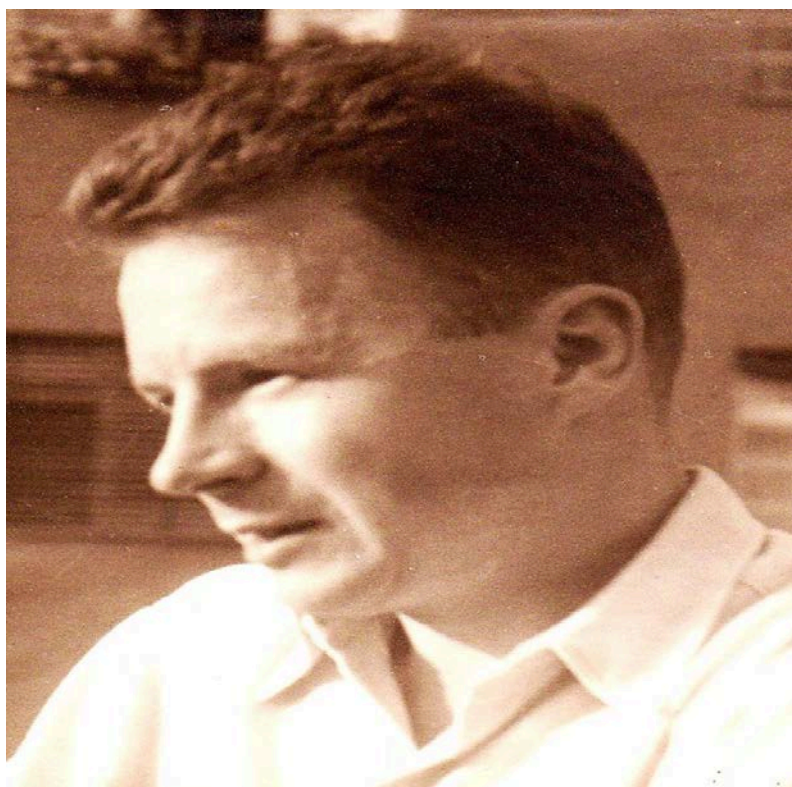
Life of Karl-Hermann Geib began in Berlin on March 12, 1908 in the family of employees, his father Karl Geib was a high-ranking official (regierungsrat), Geib's mother Maria (geb. Buddee), a housewife. In 1931, he graduated from the University of Leipzig [2] and joined the Institute of Physical Chemistry and Electrochemistry of Kaiser Wilhelm Society (now the Fritz Haber Institute of the Max Planck Society) in Berlin-Dahlem. There the research was focused on the theory of chemical bonding, hydrogen served as a model compound. The most important result were the first quantum-mechanical calculations of chemical bonding in this simplest molecule (Fritz London, Walter Heitler, 1927) and the activation energy of the elementary reaction between hydrogen (Fritz London, 1928-1929), as well as opening its spin isomers, ortho-para (Carl Friedrich Bonhoeffer, Paul Harteck, 1929).

Geib's first scientific work was carried out under the supervision of Harteck; it was devoted to hydrogen and its compounds. [3,4,5,6,7,8,9] David Irving called him the most gifted Harteck's pupil. [1,10] Here, Geib met Bonhoeffer, who have developed close and friendly relations. Shortly after leaving Harteck in Cambridge, he returned to his *alma mater* - the University of Leipzig (1935), where Bonhoeffer had already become a professor of physical chemistry.

Geib took up the study of reactions involving deuterium. Alone [11,12,13] and together with E.W.R. Steacie, [14] A. Lendle, [15] Bonhoeffer [16] and L.D.C. Bok [17] he explored the deuterium isotope exchange with water, ammonia and methane; the interaction of deuterium and iodine; absorption of heavy hydrogen growing organisms; an exchange reaction of resorcinol, pyrogallol, acetic acid and heavy water; exchange between hydrogen sulfide and methanol. The main results of these studies are reflected in his review. [18] In 1937 he defended his doctoral thesis. [19]

As the World War II started, professorial career of Geib had to be abandoned. Since 1940 he continued to be engaged in research on heavy water at Leuna-Werke. It gave check the correct translation mobilization, which for him was significant.

Karl and Hedwig Geib at the time had four children from the age of five and below: Katharina (1937), Barbara\* (1938), Ruprecht (1939) and Ulrike Heise (1940).



**Karl-Hermann Geib**  
(1908-1949)

Geib sometimes is supposed to be a member of the National Socialist German Workers' Party, apparently confusing him with his brother. Karl-Hermann was far from the fascist ideology and act openly condemned brother, which according to the fears of his wife Hedwig Geib (geb. Delbrück) could lead to serious troubles. In his views on what was happening, he, presumably, was close to Bonhoeffer, whose relatives were known as anti-fascists.

**Wartime.** The idea of building an atomic bomb appeared in different countries almost simultaneously at the beginning of World War II. Harteck had pioneered the development of the bomb in the Germany and was an active participant of army program. Leadership in creation in Germany of heavy water belonged to him too. Harteck worked for a short time with at Ernest Rutherford, having discovered during this time tritium with Marcus Oliphant. To Germany, he was returned because of his patriotism, which he did not hide from his colleagues at Cambridge and wrote about it to Bonhoeffer. Bonhoeffer expressed his support and advised to return to Germany. [20] So Harteck did and took Chair of Physics at Hamburg University (1935), which during the Nazi anti-Semitic campaign was forced to be released by Otto Stern, a future Nobel laureate.

During the work on the military program Harteck inevitably came into in close contact with Paul Herold, Director of Science Leuna-Werke: dry ice (as a neutron

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\* Co-author of this article Barbara Pietsch

moderator in a nuclear reactor), uranium hexafluoride (raw material for separating uranium 235 by ultracentrifuge) and, that we are interested in first of all, heavy water. Creation of a uranium-heavy water nuclear reactor to produce weapons-grade plutonium was the main focus of the efforts of German physicists.

After the occupation of Norway (1940) heavy water production by electrolysis method of company Norsk Hydro came under control of I.G. Farben, which included Leuna-Werke. (It is possible that this circumstance was associated with Geib relocation there.) Harteck believed that Germany needed to develop alternative methods of electrolysis, which did not require large amounts of electricity. [21] At the University of Hamburg, he became engaged with Hans Suess in isotope exchange in the water-hydrogen system. Suess similar to Harteck was Austrian, he moved to Hamburg in 1938, two years after graduating from the University of Vienna. To develop this method, Harteck besides Herold and Geib attracted also Bonhoeffer, who remained at Leipzig University and previously worked with Norsk Hydro on electrolysis of water, as well as Karl Wirtz from Institute of Physics of the Kaiser Wilhelm in Berlin-Dahlem. Wirtz had to test samples of hydrogen from different production plants at Leuna-Werke: ammonia, methanol, synthetic gasoline. [22]

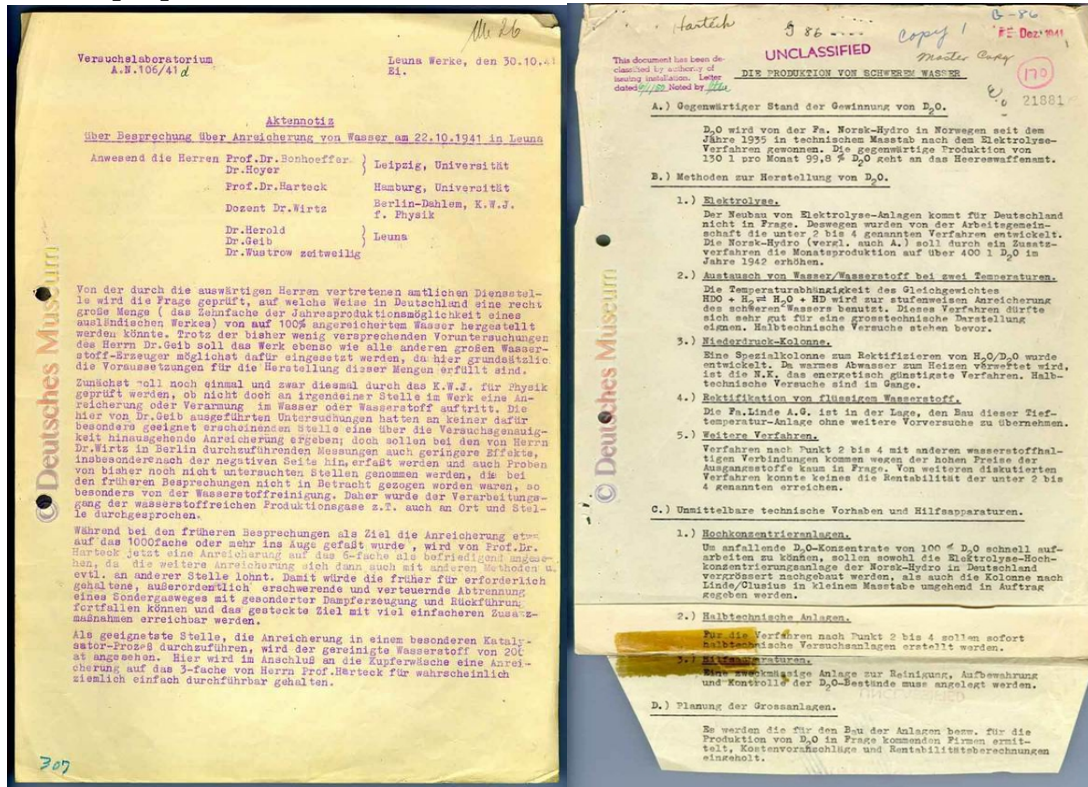
A launch of pilot plant by the method names of Harteck-Suess process and industrial testing in mid 1943 passed almost simultaneously. I.G. Farben had a prospect to invest their own capital for the construction in Leuna-Werke pilot plant got dual-temperature scheme. Its size was small, but for 1% D<sub>2</sub>O took 10 pairs (steps) devices operating at temperature 100<sup>0</sup>C and 600<sup>0</sup>C. Acceleration of the isotope exchange between water and hydrogen required a catalyst that significantly complicated the scheme. Ni-catalyst was used. Due to the vertical arrangement of a plurality of devices, interlocking pipelines the pilot plant was called "Stalin's organ". With the active participation of Suess Norsk Hydro began operating a unit for "one-temperature" scheme with extraction of deuterium from hydrogen discharged and returning it to electrolysis, which significantly increased the production of heavy water. Isotope method in generally is effective for initial enrichment to 1 - 10% D<sub>2</sub>O, and its use is rational to combine with other methods.

The fate of both plants was frustrating. At the beginning of 1944 from the Norwegian heavy water source under the pressure of sabotage, subversion and intensive bombing Norsk Hydro factories was abandoned. Equipment was partially transported to Germany. That summer, Leuna-Werke underwent a particularly massive raid. The "Stalin's organ" was completely destroyed. There was no question about it; moreover the board of I.G. Farben generally abandoned the intention to create a large-scale production of heavy water in this way. The reasons were different. Besides General Director of Leuna-Werke Heinrich Bütetisch and Harteck could not agree on the patent rights. Harteck was forced to look for other ways to create the production of heavy water. [23]

Obviously, along with the duties of the leading expert on heavy water Geib was developing another version of the isotopic exchange method - non-catalytic exchange in the dual-temperature hydrogen sulphide and water. During the previous year (1943) Geib and Harteck concluded that this option for capital expenditures and energy was much more economical than Harteck-Suess process. Obviously, at the



request of Harteck in Leuna-Werke design studies were performed for heavy water production capacity of 5 tons of this new way. [23] However, due to the strong corrosiveness of the environment its implementation was to meet great difficulties. In the U.S., at the same time Jerome Spevack developed a similar method, which for the same reason was not implemented on an industrial scale. Most of literature with some variations indicates that the method for obtaining heavy water by hydrogen sulphide had been developed independently Spevack in U.S. and Geib in Germany, but because of the difficulty of overcoming corrosion was not implemented into production. [24]



**Fragment of the Harteck’s report production of heavy water 1941 [21]**

**Fragment of the memorandum of the meeting on the enrichment of water in Leuna 10.22.1941[22]**

History of developing hydrogen sulfide method in Germany Irving ends just as it is written in the textbooks, and explains: "Further information on the Geib process derived from talks with Harteck." [10] However, by some reasons Harteck did not tell everything. In recent years, a number of commentators and historians made a revision of the achievements of Nazi Germany in the creation of the atomic bomb. They believe that the achievements are strongly underestimated. With regard to heavy water, a forgotten communication about its preparation plant in Kiel is reexamined. A note about it of the Associated Press correspondent Charles Chamberlain appeared in Canadian [25] and American [26] press in the days of the atomic bombing of Hiroshima and Nagasaki. Chamberlain accidentally stumbled upon an impressive, well-preserved building, nestled in the forest at a distance of 4 kilometers from Kiel. It was a heavy water production: eight tanks enmeshed in plastic pipes. On the

"object" fortnights were American and British experts. Chamberlain, without special permission, was arrested, but later released on a promise to keep silent about what he saw. Three months later, the correspondent still broke the promise and wrote about the success of Germany in the creation of super-bomb. The occasion was extremely suitable - the bombing of the U.S. showed the world the danger represented by the Nazis, the victory over which became particularly timely.

Simon Gunson, referring to Harteck's report of 11.22.1943, writes that the installation in Kiel worked by Geib's sulfide method. [27] It seems Harteck and Geib overcome the difficulties of corrosion, using plastic pipes and fittings. It was a novelty, and immediately struck Associated Press correspondent. One might think that was implemented a four-stage scheme dual-temperature isotopic exchange for two devices with high and low temperatures on the stage. This scheme was applied later (1952) in the United States at on the huge plant in Dana for primary enrichment up to 10% D<sub>2</sub>O. Chris Waltham in the survey "An Early History of Heavy Water" (1998, 2002) was a place for retreat. "North American scientists were not aware of Geib's work for many years after the war; Maloney et al. in their book "The Production of Heavy Water" (1955) complain that relevant German wartime work was still classified". [28] After starting the postwar production of heavy water in this way in the USSR (Aleksin) and the USA (Dana) has been more than 60 years, but for the world's first installation in Kiel still is judged only on small press clippings from 1945.



Notes from newspapers «The Milwaukee Journal» on 08.09.1945[26] (right) and «The Maple Leaf» on 10.08.1945 [25]



Geib dreamed of going back to university. However, after the war, his work on the Leuna-Werke continued. Now his fate was decided in Moscow. Originally it was supposed to take equipment to the USSR pilot plants producing heavy water

remaining after the bombings. But then with Leuna-Werke received just as with other strategic objects aircraft and rocketry. In October 1945 group on heavy water led by Herold was formed. [29]

At the same time at a meeting of the Technical Board of the First Chief Directorate, delivered at the head of the Soviet atomic project, it was decided to "invite" to the USSR colleagues of Geib from the University of Leipzig - Bonhoeffer and Friedrich Hund, and leave him at the Leuna-Werke to restore installations and resumption of studies on heavy water. [1] A year later, the plans changed again. It was feared that the Allies would require inspections of strategic military purposes. Therefore, in the strict secrecy of the NKVD prepared operation "Osoaviakhim" for the export of such objects in the USSR and the personnel needed for their service. The operation was performed on the night 21-22 October 1946, a week after the elections to local authorities in the Eastern zone. So during a special operation group Herold, perhaps in the new composition, turned out in Moscow. Dismantled pilot plants producing heavy water isotope exchange water-hydrogen were taken to the Karpov Institute of Physical Chemistry, where further work of German specialists was planned. [1,29]

The Herold's group, besides himself, included 11 people. They were Drs.: Friedrich Asinger, Karl Bode, Heinz Elm, (?) Fruhlich, Wilhelm Falkenberg, Karl-Hermann Geib, Luis Gemassmer, Helmut Jochinke, Kurt Kosterhon, (Franz?) Scheuer and Walter Schmidt. All arrived with their families except Asinger and Herold. For residing specialists were provided cottages in what was then the suburb - the city Babushkin. Apart from heavy water they should have been doing of propellant under Asinger leadership who was administratively as a deputy of Herold.

Already in Leuna, on the restored catalytic isotope exchange of water-hydrogen plant (formerly known as "Stalin's organ") the data were obtained and the design work was performed. But all this only confirmed previously made Harteck and Geib conclusions about a low efficiency of such method. Parallel on another installation a study was launched of a noncatalytic variant of water-hydrogen isotope exchange under high pressure. In Karpov Institute it was planned to mount pilot plant from taken out equipment and to continue this work. Its status has risen. It was included in the Soviet atomic project, and 's group became a part of the classified secret sector number 8, newly created in the Institute.

The CIA report [29] states that the Harold's group at the time of evacuation produced a preliminary draft of heavy water plant by the sulfide method capacity of 5 tons per year. However trophy technical documentation for this method was transferred to Soviet specialists much earlier, when no evacuation of personnel from Leuna was considered, and when it was decided to involve Geib in installations for isotope exchange between water and hydrogen. So the decision of the Council of Ministers on the establishment of pilot plant number 471 capacities 0, 1 kg per day of D<sub>2</sub>O in NII-42 Ministry of Chemical Industry<sup>†</sup> and pilot plant number 472 capacity of 5 kg per day D<sub>2</sub>O at the plant number 100<sup>‡</sup> was signed already 2.0I.1946. Both plants

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<sup>†</sup> Now it is the State Research Institute of Organic Chemistry and Technology (GosNIIOChT).

<sup>‡</sup> Now it Aleksin's Chemical Combine, Aleksin, Tula region.



had to work on the sulfide method. As can be seen, despite the known difficulties of this method with corrosion it was immediately selected to industrial testing. In the course of the studies and working design a status of the installation number 472 was changed to industrial output with an annual design capacity of 4 tons on a 100% D<sub>2</sub>O. Single-stage process flow diagram (with two columns) was adopted allowing enriching the raw water to 1% D<sub>2</sub>O. [1]

A volume of works on heavy water, Herold's group performed in Karpov Institute, is not known. It was not large, as there have not been able to quickly build and run a pilot plant for isotope exchange of water-hydrogen under high pressure. Building of the special housing for the installation and maintenance facilities (mechanical workshop, electric substation) had begun. Construction dragged on, respectively, a rip off implementation of the approved program of special assignment. By order of the Minister of Chemical Industry M.G. Pervukhin, who was also the chairman of the section on heavy water in the Technical Board of the First Chief Directorate, in the summer of 1948 sector number 8 was disbanded. Its Head and the Director of the Karpov Institute N. M. Zhavoronkov was removed from these positions. [1]

Since German specialists were working on secret topics they could return home only two years later. After elimination of the sector № 8 half of the group led by Asinger was transferred to Dzerzhinsk (Nizhny Novgorod region.), the rest – Bode, Geib, Gemassmer, Herold, Kosterhon and Schmidt went to Liskhimstroy, Donbas.

### **The third vertex of the chemical triangle**

Chemical plants in Sievierodonetsk, Rubezhnoye and Soda Plant (Donsoda) in Lisichansk formed the basis of "chemical triangle" Donbas (coal mining area), which can be compared with the triangle Geisel lignite basin or Middle German Chemical Triangle: Halle (Schkopau) - Merseburg (Leuna) - Bitterfeld. Plant in Rubezhnoye was the first domestic production of organic dyes JSC «Russko-kraska», it was built during World War I, at the initiative of N.A. Vtorov. Before that (1887) of JSC "Lyubimov, Solve and Co" plant started up Donsoda. By the way, co-founder of the company was a family of Russian Germans Wogau, on which land property in Moscow Karpov Institute is located. The third angle – Liskhimstroy was renamed in 1953 in to Sievierodonetsk, it had suffered during the war, most of all. In 1941 the first stage of Lisichansk chemical plant was ready to be launched, but instead the evacuation began. What was not rescued, was destroyed by the war, the village was almost completely destroyed.

According to P.F. Novikov, manager of the trust "Liskhimpromstroy", *"in 1948 on the construction sites in cities Sievierodonetsk, Rubezhnoye and Lisichansk - worked 5500 German and Hungarian prisoners of war and two thousand Soviet prisoners."* [30] Liskhimstroy was a zone; in 1949 there were no longer PoW, other the prisoners were still there (Vlasovites, criminals, women's camp). Residues Herold's group joined a number of German experts involved through other channels to restore the chemical industry in the area. *"In addition to the German prisoners of war, there was a group of German experts of 60 persons, including 14 Doctors of Chemistry, who worked in Rubezhansky NIIOPiK (Research Institute of Organic Products and Dyes) .... Taking into account that German equipment was removed six*

*plants converted into five Lisichansk Chemical Combine, for each plant experts have been invited to the rank of chief engineers, chief technologists chief power engineers, main mechanics, chief specialists of instrumentation and automation and designers. All they supervised the installation and setting up of equipment and trained Soviet workers and technical workers and management technology of chemical production, chemical production plants on nitric acid, fertilizers, carbon dioxide, ammonia and alcohol. If until 1959 the production processes were poorly automated (only simple recording devices), thanks to German specialists in flow diagrams were established hundreds of automation devices." [30]*

Herold and his colleagues were in a different position than the main group (let's call it so) German specialists. They worked with the technical documentation not on site, but in the city. In winter, when a strong cold and offices lacked heating, specialists were allowed to take work home. As in Moscow, they were given cottages ("Finnish houses"). Life in the postwar years was difficult, all knew it. Neither then nor later, has anybody expressed any dissatisfaction with the conditions. Perhaps their colleagues from the Asinger's group in Dzershinsk were in the best position - there was a specialized German school. In Liskhimstroy children went to school only in the village and all besides Russian learned Ukrainian language. §

The main part of the German specialists left Sievierodonetsk in 1959, and the rest of Herold's group much earlier - in 1953, two years after the official start of the chemical combine. They were warned that they should not spread information about their stay in the USSR, in GDR they were watched by people from the Stasi. Among those who returned there were neither Geib or his family nor Herold. Asinger with colleagues was back in the GDR about the same time (1954), in his words, after "8 years and 9 winters." [31] Contrary to the heavy water plans exported from Leuna-Werke, Herold or his group are nowhere mentioned in the declassified documents on the Soviet atomic project. (Records of Geib refer to 1945.)

The Western press has appeared is a legend that after a painful stay in the USSR Herold was promoted to Director Leuna-Werke, but in 1958 escaped to West Germany. [1,32] He in 1951, as then told colleagues, left Liskhimstroy to Kiev, where he died in hospital from a heart attack. It was quite believable. Herold was older than other team members, he had a bad heart and legs ached. On the night 21-22 October 1946, when the special operation "Osoaviakhim" was implemented, Herold's family was not in Leuna and he was sent to the USSR alone. Then NKVD offered his wife to come, but he felt that she should stay with children who were students and wait for his return.

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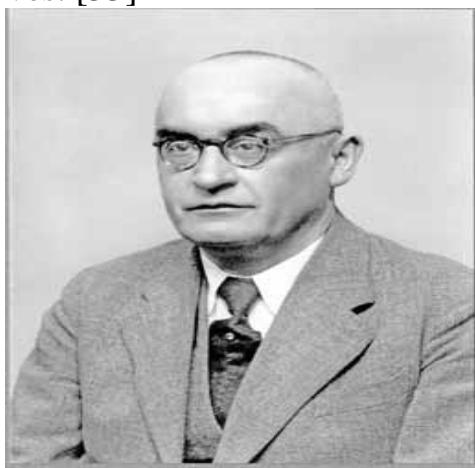
§ The authors of the essay both studied at this school, obviously, having the same teacher, but at different times. One of the authors was transferred from the Chrchik school to the first class, since his father S.V. Sadovsky in 1945-46 was the director of chemical combine under construction. Barbara Pietsch, the youngest daughter of Geib, in 1948 moved into fourth class.



Ukraine 1950



However, Herold's relatives received other information. It was revealed by the radio Bayerischer Rundfunk 2 broadcast (2012) dedicated to German experts - participants of the Soviet atomic project. In the parcels, Herold sent to Germany, secret information was discovered. He was placed in the camp. Attempts of his relatives to gather information about him GDR authorities interpreted as anti-Soviet activities. Date of death and the place where he is buried are not known to his relatives. [33]

**Paul Herold [36]**

**Fatal call.** Probably Geib was happy to move to Liskhimstroy. Even if it was not science, but the classified work on his long-lethal weapons was a heavy burden to him, especially after the bombing of Hiroshima and Nagasaki. When a year later, in July 1949 only he had been requested to come to Moscow for one week, he felt that all of this could have been just the breathing space. Time to start the plant by sulfide method had come. A personal inquiry could be associated with this. According to the regulations, the German experts involved in the atomic project, could be involved in

the classified issues only possible to permit the secret problems only at the research stage. Everything about production - power, 'know how ', location and so on were not available to them. However, this rule immediately had to have an exception. Nicholas Riehl already in 1945 was assigned to the production of uranium metal. Later (1948) an exception was made for Gustav Hertz and other professionals from the Research Institutes of Sukhumi. [34] Perhaps, in 1949 when starting the production of heavy water on ammunition plant number 100 an urgent question for the author, having a practical experience, had suddenly appeared. Geib shared his concerns with his wife. From Moscow, he was able to send a telegram addressed to her that he was forced to work on heavy water, but he will refuse. Thereafter the connection was lost. All requests of Hedwig Geib in Vorochilovgrad (Lugansk), i.e. to regional authorities remained unanswered. It was made clear to her that her husband was arrested, and nothing more. That lasted for a year up to July 1950 when she with children were allowed to return home, first in East Germany, and then to FRG (1952).

The official response the family was able to get through the authorized representative only in 1993 after the abolition of the Soviet regime, three years before the death of Hedwig Geib. Letter of the Central Archive of the Russian Federation stated: "... Geib Karl Herman arrested 07.10.49 on suspicion of committing offenses under Article 58-6 of the Criminal Code of the RSFSR (espionage), died July 21, 1949 at 8 am in the hospital of Butyrka prison USSR Ministry of Internal Affairs of tuberculosis cervical vertebra. Not rehabilitated». The death certificate of REGISTRY OFFICE was issued to someone in 1952.

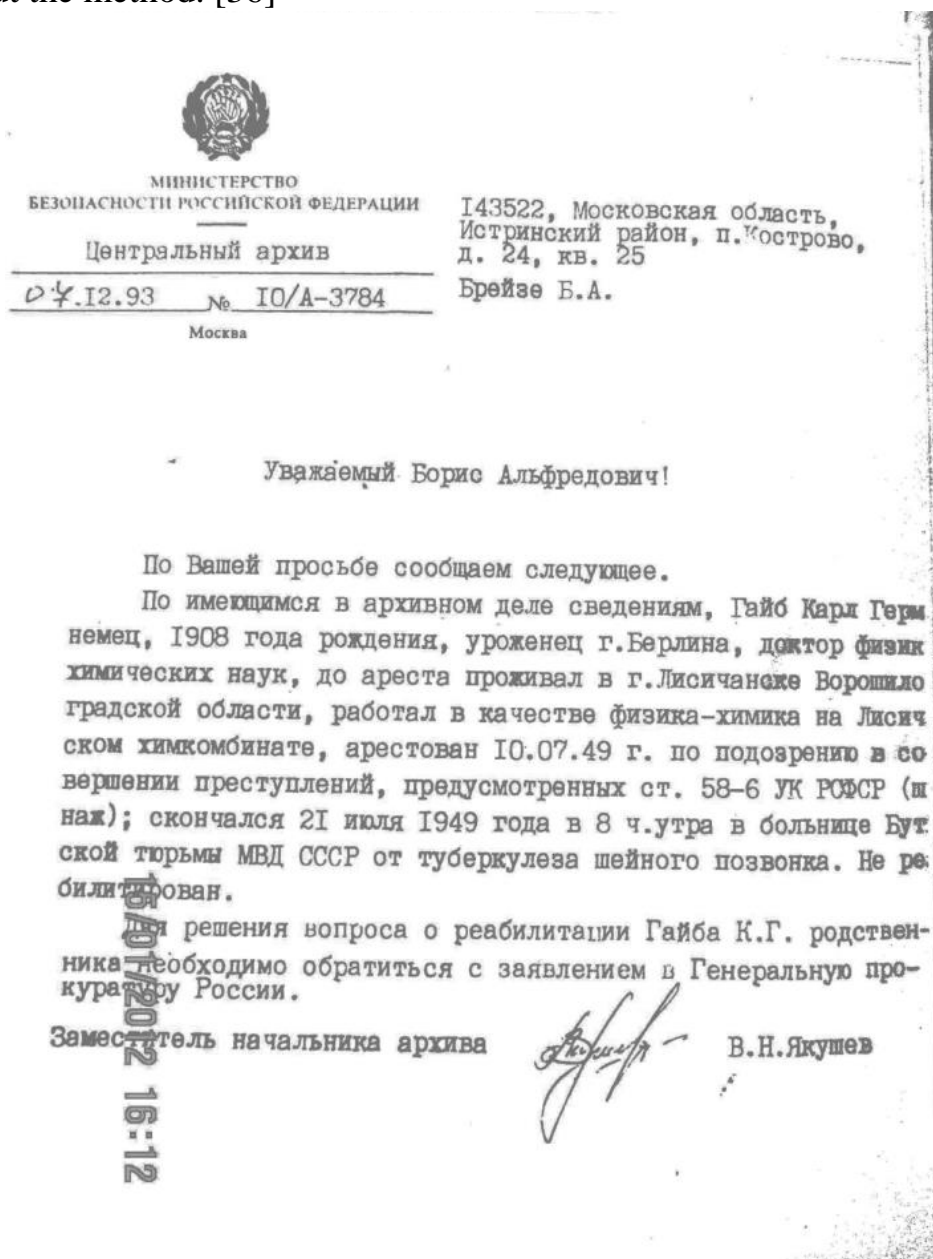
Transience tuberculosis cervical vertebra – is a doubtful medical fact. Before being called to Moscow Geib was in good health and did not complain on anything. Espionage for some countries is probably a legend similarly to an escape of Herold to the West. Could Geib ever move to Moscow unaccompanied and get to the Canadian embassy, as wrote Irving, [1,10] or all what he could do - was to go to the post office to send a telegram to his wife? From the telegram it can be understood that somebody was trying to convince Geib to join the implementation work of his invention with such passion that inadvertently broke his neck. Circumstances of Geib’s death are still not clear.



Among a number of German experts (about 300), involved in the Soviet atomic project, the fate of Geib and his family was one of the most tragic. In Soviet times, no mentioning at all about attracting German experts to the project in the press was



allowed due to censorship. Times have changed, and lately several publications appeared.[35] It is regrettable that the faceless authorities in the Russian Federation and the United States, concerned about preserving the security of their prestige, still have not declassified all materials related to the development and use of the process of heavy water production by the sulfide method in Germany. By hiding and misinformation on the subject involved and quite concrete individuals who do this on their own faith or other reasons. Among them Harteck (see above), developers of the Soviet version of the technology A.M. Rozen and V.F. Kalinin tried to arrogate to themselves priority [1,24] or, for example, an Leuna archivist Ralph Schade, who in a series of articles on the development of heavy water in the period 1938-1945 at Leuna-Werke only briefly mentions the name of Geib, but did not mention at all anything about the method. [36]



Biography Geib is inextricably linked with the history of the priority for the production of heavy water by the sulphide method. After a start-up of the production in Dana involving company Girdler this method is called GS-process (Girdler-Sulfide), however in commemoration of the inventors an alternative interpretation of

abbreviations - Geib-Spevack process has appeared. [37] Let us hope that the plume of the distorted and hidden information on this story will eventually fade away.

The authors are grateful for the assistance and support of D.Yu. Murzin.

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J11505-002

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**IMPLEMENTATION OF THE MAIN DIRECTIONS OF AGRARIAN REFORM IN GALICIA DURING THE INTERWAR PERIOD***SHEI "Carpathian National University named after V. Stefanik  
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The main goals of the agrarian reform of the Polish government in the interwar period help to reveal the content and consequences of the Polish government's agrarian policy. Polish politicians stressed that this reform was a matter of national importance. Many of Polish citizens offered various options for solving agricultural problems, but they were all in favor of the Poles. Thus, Polish Prime Minister Mr. V. Vitos said: "We consider land reform, not only as a socio-economic but also state and national problem, resolution of which will extend the borders of our country" [5; p. 226].

Famous Polish activist Earl S. Los emphasized such inappropriate of agrarian reform as well. He urged the government to implement it according to the following factors: 1) the real state of things; 2) justice; 3) common sense, as part of the Polish military and civilian colonists were engaged in outright fraud and speculative actions, considered the colonization as a way easy personal gain. According to S. Los, in the case of ignoring the abovementioned factors greatly exacerbated "national and social problems in rural areas" [4, p.64]. And this at the time when Galician village keenly felt land hunger and overpopulation, with 48.7% of farms being landless or land-poor, that is they owned plots of land to 2 hectares [1, p. 92].

Politics polonization and colonization of the region, served even more social stratification of the peasantry, caused an interethnic conflicts, intensified assimilation processes in Ukrainian society.

The political nature of agrarian reform aimed to hand over the land completely by the military colonists and settlers. The main objective of Agrarian Policy of Poland was to establish a quantitative correlation of the Polish population to non-Polish.

By 1938 on the Ukrainian lands which belonged to Poland over 800 thousand hectares of land were mostly spread between Polish colonists. Over twenty years of Polish rule, about 300 thousand people of Polish nationality came to rural areas and 100 thousand to the townships of Western Ukrainian territory [2, p. 320]. In 1921 of all Ukrainian lands Polish large landowners owned by 5,189,100 hectares; among them ethnic Poles were 2783 persons, 237 - Ukrainian, 154 - Jewish people, 40 - Germans. As we can see more than 85% were the Poles [3, p. 80].

Polish rulers, applied in Western Ukraine land reform, viewed it as a national political issue in the solution of which they hoped to turn the Polish national minority in most of the stage and to achieve their strategic objectives - assimilation and polonization of Ukrainian population. Consequently, in many provinces were formed extremely complex national and socio - economic relations, accompanied by sharp political struggle.

In general, in 1919-1929 in Western Ukraine more than 77 thousand farms of Polish peasants were established who possessed more than 600 thousand hectares of land [9, p. 167].

Spread land of large landowners, compact settlements created economic competition of Polish colonists farmhouses. At the end of 1935 in three provinces in Eastern Galicia were created almost 37 thousand farms to the ownership of which was transferred about 315.6 ha of land [5, p. 226].

If taken into account the trend towards further growth of such farmlands (acting and reversible resettlement process took place as well, at the end of the period we study, similar ratio of Ukrainian and Polish farm housing land was within “two to one”). Some of the colonists offered their plots of land to rent and did not participate in economic activities. Viewing these circumstances in most agricultural counties, especially in Stanislavsky province, the ratio of Ukrainian and Polish farms was “three to one” or even more.

Ukrainian peasantry unbearable situation was aggravated by high taxes that were three times higher than those of native Polish lands, and as compared with the pre-war taxes, they increased twice. For most peasant farms to pay taxes, which reached the number of 70 kinds, the income from their farms was not enough [8, p. 32]. State anti-Ukrainian agrarian policy of the Polish government deepened agrarian crisis. Small and medium-sized farms in the 30th of the XX century become even more flawed and doomed to ruin.

Landowners using poverty of Ukrainian villagers gave the land on lease on onerous terms. For example, for 40 pastures, leased for six months, they demanded that farmers work back 460 days, [7, p. 9] and many other instances like that.

Thus, the state held a course for destruction of Ukrainian agricultural producers. Landlessness, low level of life, usury and other social and economic problems caused by the Polish colonialist policy in Galicia, have caused mass emigration to Central Europe and America. Moving process demanded considerable finances, which most immigrants didn't have. Therefore, the companies provided a loan of the amount of future earnings, resulting that the family, who remained at homeland actually became a hostage of this situation.

In 1919-1925, 71 904 persons emigrated to the United States, among them 42280 Jews, 25,526 Poles, 1653 Ukrainians, the rest (2445 people) were Germans, Russians, Czechs, Belarussians. This year 1184 people from Stanislavsky province, - 1747 persons from Lviv province, and 2322 people from Ternopil moved to Argentina. In 1926 relocation to Canada was also numerous. To this country over 11,146 people emigrated from the mentioned above provinces. Emigration tension reached its peak in 1928 [6, p. 42-43].

V. Smoley noted that dividing land was conducted by landowners or the relevant unions and banks supervised by land offices. Selling and division were made by the company “Land”, Galician landowner Credit Bank (established its Department in Lviv), Agrarian farmland Society, Polish Office of land division, Discount Bank of the Company “Polska Gleba”, the union “Parcelia” promotional company in Lants with subdivisions, People's Union, the Bureau of land cultivation and others [10, p. 32].

Galician peasant had small results of his hard work. The lion's share of profits settled in the owners – “speculators who lived lordly”. Ukrainian peasants' farmhouses under conditions of market-industrial civilization remained backward in terms of application engineering and science.

Galicia due to its underdevelopment and insecurity was most vulnerable to crises that primarily affected the Ukrainian peasantry. Poland took care of the protection and economic interests of its landowners and colonists. Generously subsidized, they had full government support, and this fact laid many conflicts in the countryside.

The economic crisis of 1929-1933 led to reduced production, lower product prices and narrowing of the market, as a result commodity industry suffered losses in agricultural production. In villages and towns grew unemployment, which led to the tense political situation in the region. The crisis has undermined basic agriculture industries and deprived rural incomes of small producers, especially Ukrainian and Jewish. The policy of land colonization from the very beginning laid the conflict in the economic system. Alongside with the Ukrainian “strong masters” whose land plots were around the village and formed outskirts areas or hamlets began to emerge Polish ones.

Agricultural policy of interwar Polish state was aimed at reforming the agricultural system and led to profound changes in the countryside. Government policies on these lands, which was to conduct farmland colonization did not solve the problem of agrarian overpopulation on their own Polish territories, did not create a solid support of Polish authorities in Galicia either; thus, caused aggravation of interethnic relations.

Thanks to state support Polish community in the interwar period grew rapidly. Instead, government actively encouraged the Ukrainian emigration overseas. This state policy was hostile to millions of local Ukrainian population.

Despite the acute social and national relations between Ukrainians and Poles in 30s of the XXth century which subsequently grew into armed struggle. But throughout the whole interwar period farmland colonization remained the main focus of Poland's Agrarian Policy.

Thus, when evaluate the agrarian reform in Galicia in terms of economic efficiency, then on the basis of statistical data on the socio-economic development of the region in the interwar period, it can be concluded that it contributed to the rise in overall productivity of agricultural production. The rise of agriculture contributed to the revitalization of industrial development, intensification of the cooperative movement, the broader scope of domestic and foreign trade.

However, a number of important social and economic problems remained unresolved, and the agrarian reform itself could hardly help it. The problems could be solved only if parallel implementation of reforms were realized in other spheres and they had to be focused on economic recovery on the whole.

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J11505-003

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**PECULIARITIES OF GERMAN PROPAGANDA IN UKRAINE  
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*Abstract. In the history of the Ukrainian nation World War II became one of the most significant events. No other nation has experienced such awfulness of war that the Ukrainians had to endure. The historical background of the state, its geopolitical situation, and certain internal and external factors caused the tragic succession of events full of inherent contradictions and dynamic development. In addition, the population of Ukraine found themselves in the epicenter of information propagandistic influence of Germany, aimed at manipulating the minds of people on the occupied territories.*

*On the basis of integrated analysis and synthesis of publications the paper expands on the essence and nature of propagandistic activity of the German occupation regime among the population of Ukraine during World War II by means of periodicals, radio propaganda, cinema, visual art and verbal communication.*

*Ukraine, World War II, the German occupation regime, psychological warfare, German propaganda, propaganda techniques, periodicals, Nazi radio propaganda, visual art, moral and psychological state.*

**Introduction.** More than seventy years have passed since the time when Hitler's troops were driven out of the Ukrainian lands. Nowadays, Ukraine has again found itself at the epicenter of the events which have global geopolitical significance for civilization. Our ordeals today once again demonstrate how fragile the peace may be, how many efforts we need to exert in order to protect it, and what responsibility lies upon each of us to safeguard peace. The Ukrainian society has to refer to the experience of World War II, and in this case, unfortunately, not only as a purely scientific problem, but rather in the applied context.

The issue of ideological confrontation in Ukraine during World War II has always attracted close attention of scientists and still remains relevant to date.

The twentieth century happened to have been the time when the humanity was first faced with new technologies of political and military confrontation which could exert powerful influence over the great mass of people. The relevance of the research is called forth by the fact that when forming the information space of any society today it is necessary to take into consideration the practical experience of information policy of the twentieth century, including the experience of Nazi Germany, its miscalculations faults. It is also important for modern Ukrainian society to understand the influence of Nazi propaganda and information policy on the consciousness and moral and psychological state of the population on the occupied territories of Ukraine, and the consequences of this policy.

The public significance of the topic is determined by the need to take into account the experience and lessons of ideological confrontation in the past as well as the barest necessity to consolidate the Ukrainian society in the difficult period of the

information warfare against the population of Ukraine and ideological influences of different political forces.

Before World War II, Germany had planned to conduct an intensive information-psychological warfare by means of agitation and propaganda. The purpose of the propaganda campaign was to break down and demoralize the enemy psychologically, to distract them from fighting and thereby accelerate the surrender of the country.

For a long time the topic rested on the periphery of the research, but later the theme of German propaganda appeared in the studies of D. Tytarenko, M. Mykhailiuk, M. Koval, I. Verba etc.

In recent works of the Ukrainian historians such as V. Korol, I. Vietrov, O. Potylchak, P. Rekotov, O. Lysenko, Yu. Voloshyn, Yu. Voitsekhovskiyi, the German propagandistic activities are considered in various areas of life of the population on the occupied territories of Ukraine - social, cultural, educational, economic. They analyzed the moral and psychological impact of propaganda on the Red Army troops and the population of Ukraine, the role and place of propaganda in establishing cooperation between the native population and occupation authorities.

The issues of propagandistic activities were also covered by Russian scientists, A. Nekrych, L. Naumov, V. Krysko, G. Pocheptsov, I. Panarin, N. Volkovskiyi, O. Hogun, A. Okorokov, S. Drobiazko. They suggested the holistic coverage of methods, tools and techniques of information warfare.

The propagandistic policy of Nazi Germany during the temporary occupation of Ukraine and its impact on the psychological state and morale of the population was also touched upon in the works of Western European scholars and American historians E. Hadamovsky, D. Armstrong, N. Muller, I. Kershaw, P. Longerich, J. Fest, W. Wippermann etc. These works are characterized by a fairly extensive use of archival materials of European countries.

The problem of ideological struggle has become the subject matter of PhD and doctoral dissertations of Ukrainian and foreign scientists, including M. Mykhailyk, O. Salata, V. Shaikan, M. Slobodianiuk, T. Vronska etc.

Thus, the ideological aspect of struggle in Ukraine during World War II was considered in the historical literature. However, many components of the topic need more detailed coverage, including propagandistic activities of the German occupation regime among the population of Ukraine by means of periodicals, radio propaganda, cinema, visual arts, and verbal communication.

**Main part.** *The aim of the research* - on the basis of an integrated analysis and synthesis of published works to identify all spheres of influence of German propaganda among the population of Ukraine during World War II and determine their effectiveness.

*Research methods* - a set of special methods of historical knowledge, namely: problem-chronological, comparative historical, systematic, comprehensiveness.

Before World War II, Nazi Germany dared conduct a psychological warfare in a new way, without repeating past mistakes. Firstly, the Germans tried to approve the time of propagandistic and military actions. Secondly, they followed the recommendations of experts in scientific psychology to achieve military objectives.

Thirdly, they created a well-trained and well-branched apparatus for psychological operations, which had included up to 14 propaganda companies by September 1, 1939. And by the time of the invasion of the Soviet Union, the Wehrmacht had included 19 propaganda companies: twelve - in the Army, four - in the Air Force, three companies in the navy. Besides, there were six platoons of SS war correspondents. In addition to these forces that were focused on the local Soviet population, each of the three army groups (North, Center, South) had a special propaganda battalion, engaged in publishing newspapers in the languages spoken by occupied nations, broadcasting radio propaganda through captured radio stations, demonstrating films. By April 1943 the number of Wehrmacht propaganda units reached 15 thousand people [3, p. 165].

The strategy and tactics of conducting psychological warfare were mapped out in June 1935 at a meeting of the working committee of the Reich Defense Council, which was attended by representatives of all bodies of the Nazi state apparatus. It was foreseen to organize permanent propaganda reconnaissance to study the psychology and political bias of future enemy, their vulnerabilities, in order to effectively manipulate their consciousness during the war.

Since April 1941 the Wehrmacht propaganda machine began preparations for psychological warfare against the Soviet Union. In the army battalions they assigned special positions of propaganda officers responsible for the indoctrination of their soldiers, as well as "spiritual enslavement" of the population on the occupied territories. "The spiritual enslavement" was expressed primarily in embedding the idea about the futility of fighting against the enemy, the need to obey the "new order" established on the occupied territories.

The published propaganda was the main form of psychological warfare of the Wehrmacht. Its content was characterized by unscrupulousness in methods. The German Ministry of Propaganda prepared "Proposals for drafting leaflets for the enemy troops." At the same time the Wehrmacht High Command issued a "Directive for front-line propagandists." It emphasized that, when planning propagandistic activities against the enemy, it was necessary to clearly define: the purpose of propaganda actions; the group of people the actions were targeted on; the location and area of future actions; the basic methods of influence and the main theses; technical means of dissemination of information materials, the most appropriate time of propagandistic actions [3, p. 168].

The most common propaganda techniques during the war were periodicals. In the newspapers published in Ukrainian, Russian and German, the term "Ukraine" was recommended to apply only in the territorial aspect and not in the meaning of a state; the Reich was inferred as a defender and not an enemy of Ukraine; the Wehrmacht troops were considered to be the saviors and not occupiers, and Adolf Hitler was called as "Führer Liberator." The press had to cover the disadvantages of the collective farm system, to promote the idea of private ownership of land, which coincided with the provisions of the Nazi agrarian policy. As U. Samchuk stated, it was forbidden to use Bolshevik names of cities or replace the concept of "Russia", "Russians" by "the Soviet Union" etc. [6, p. 90].

The German-speaking press in the district "Galicia" was represented by the newspapers "Lemberger Zeitung", "Deutsche Ukraine-Zeitung", "Ukraine Post" [5, c.134]. These editions were provided by "German publishing and printing company in Ukraine" and propaganda department "U". Besides, the German editions of the Reich were also imported to Ukraine. The local German press highlighted the socio-political and economic processes taking place in the occupied Ukraine, as well as the issues on history and culture. The entertainment section contained caricatures of Hitler coalition leaders, jokes, satires and crosswords. Newspapers editors actively appealed to citizens to write articles and memories of their life during the Soviet time, in line with the basic ideological orientation. However, being a key element of the Nazi propaganda the press had little impact because the local authorities failed to solve the problems of delivering newspapers to remote locations. In general, the local press failed to fulfill this goal, because of a small circulation of the newspapers (on average one copy per 22 persons), and most propagandistic articles contrasted with the reality, and, therefore, were perceived by readers with distrust.

Berlin was the main center of the Nazi radio propaganda directed towards the Eastern occupied territories. The messages from Berlin were broadcast by radio stations in Warsaw, Belgrade, Bucharest and Helsinki. In Ukraine, their signals were received by radio centers in major cities and by military radios. In 1943 the information was periodically broadcast by 15 radio stations.

Most air time was assigned to military and political news, announcements by occupation authorities, press review, promotion of the German way of life and the work of Ostarbeiters. The use of radio for propaganda purpose was generally ineffective, as only the residents of large cities had an opportunity to listen to the radio, mainly from street loudspeakers. In small towns and villages of Ukraine radio network did not function at all.

Cinema was also used as a means of political and ideological influence and included 3 genres: German newsreel ("Deutsche Wochenschau"), documentary-propagandistic, and feature films of UFA (Universum Film AG), ZFO (Zentralfilmgesellschaft Ost) and other film companies of the Reich [5, p.136].

The native people were shown mostly German entertainment genre films translated into the Ukrainian (Russian) language, historical adventure stories that did not have propagandistic value. In autumn 1942 Kharkiv cinemas showed German comedies "A Hopeless Case", "Kora Terry", "A Night in May" and lyrical films - "Kongo-Express", "Seven Years Bad Luck", "The Bachelor's paradise" etc [5, p.137].

The population was mostly interested in military newsreels and documentaries about the life of Ostarbeiters. However, German newsreels were shown with long delays because it took time to translate them, and thus they lost its relevance.

The efficiency of propaganda by means of small printed materials depended on the timely delivery of propagandistic literature from Berlin, the possibility of producing it on the spot, providing bulletin boards and glass showcases. According to the report submitted by the management of the General Commissariat of "Kyiv", during the period from January 1 to July 31, 1942, there were 700 thousand brochures, 1100 thousand leaflets, 142 thousand proclamations and orders of the German authorities published in Ukraine. By the end of 1942 the Wehrmacht



Propaganda Department had had over three million copies of propagandistic literature [7, p. 167].

The psychological impact of the visual arts was intended to solve similar tasks as the propaganda by small printed materials. For example, the theme of photo wall newspapers was typical for German propaganda: "Führer and his nation", "German landscape", "The streets named after Adolf Hitler", "German Village and Industry", "Why will Germany win" etc. The majority of distributed posters promoted Hitler as a liberator of Ukraine. By September 1, 1942 in Ukraine they had released 1.2 million copies of poster products, including 250 thousand in Kyiv, 30 thousand in Chernihiv, 20 thousand in Mykolaiv, 18 thousand in Dnipropetrovsk [4, p.655].

To enhance the anti-Soviet and anti-Semitic propaganda, promote the economic opportunities of Germany, the occupation authorities organized exhibitions in the reading rooms, business organizations and museums in Kyiv, Kharkiv, Mykolaiv, Kremenchug. A vivid example of their thematic direction was the exhibition "Ukraine under the yoke of Bolshevism." In order to recruit people to work in the Third Reich they distributed posters and organized exhibitions like "How good the life of Ukrainian workers in Germany is."

The common method of German propaganda was verbal communication, the advantage of which was high efficiency and specificity that did not require the use of special equipment as well as enabled direct contact with the audience. Verbal agitation was conducted by representatives of the occupation and local administration, editors of periodicals, businesses, and school administration. They spoke on the radio, addressed the local population through the press, and made speeches in mass meetings telling about the loyalty of the new government towards the conquered peoples, about their efforts to improve the lives of Ukrainians. The texts of their speeches were usually simple in content, brief, and were repeatedly passed through loudspeakers. The announcers were chosen among prisoners of war, and often among Ukrainian girls (according to German experts in psychological warfare, women's voices were perceived by soldiers better).

As a rule, various forms of propaganda were used simultaneously, in a complex. It was often a combination of printed propaganda and verbal communication through loudspeakers.

A common method used by the German authorities to recruit new workers was to send Ostarbeiters on home leave with the purpose to get them round to inform the people about the satisfying conditions of life and work in Germany. At various meetings and gatherings Ukrainian girls who had worked in Berlin, Dresden, Nuremberg and other cities tried to dispel doubts about the mistreatment of Germans towards Eastern workers. But in fact, the life in Germany was not as wonderful as it was portrayed by propagandists. A former Ostarbeiter said they "were hiding in the woods, in stacks of straw, fled to other villages where no one knew them. Some parents bought out their children from policemen for vodka ..." [8, p.69].

German propaganda was focused on both the adult population of Ukraine as well as the younger generation. The purpose of school education was to instill love to Germany, friendly attitude to Hitler, the Wehrmacht and the German nation as the most civilized race in the world.

In February 1942 the Reich Ministry of the occupied eastern territories issued a decree "On compulsory education of the Ukrainian youth", according to which the general education had to last seven years ... Every child could give up learning after four years of school attendance if there was no necessity in further training due to their inclination or desire to work [1, p.68]. However, the Reich commissar of "Ukraine" E. Koch considered that education in Ukraine should have been at a much lower level. In the directive # 39 (26-28.08.1942) marked "Top Secret!", he stated: "The three-year schools provide too high education." Obviously, the Nazis were unwilling to provide complete education to local children. They regarded schools as a means of children's exploitation. G. Holysh convincingly proved this argument, stating that even "public schools" served as a kind of child's labor market, since pupils spent the bulk of their training time in forced labor "[2, p.314].

### Conclusion.

Thus, the problem of information and psychological impact on the population of the occupied territory of Ukraine was extended by the Nazis even before World War II. It was based on the principle of Goebbels propaganda aimed at manipulating people's minds. However, in spite of the fact that on the eve of World War II the German propagandistic system was more developed due to their historical heritage and practical experience in such operations, their propaganda in Ukraine was inefficient. The population of Ukraine did not trust the invaders and even the evident faults and mistakes of the Soviet leadership in the course of war could not radically change the political views of the residents of occupied Ukraine.

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Стаття відправлена: 9.03.2015 р.  
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