REVIEW ARTICLE

HISTORY OF BIOCHEMISTRY IN LVIV

DOI: 10.36740/WLek202204124

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ABSTRACT

The aim: The purpose of this literature review is to shed light on the development of biochemical knowledge in the Lviv region and on prominent figures in the development of biochemistry during the Second World War.

Materials and methods: Review of literature published before 2020. We searched the literature using the search terms 'biochemists,' Lviv National Medical University', 'second World War'.

Conclusions: The development of biological research in Lviv can be divided into two historical stages: 1) from the beginning of the founding of Lviv University in 1661 to the First World War; 2) between the First and Second World Wars and after the Second World War.

Biochemical research was initiated at the Medical Faculty of Lviv University. In 1939, the Lviv State Medical Institute was established on the basis of the Medical Faculty of the University, where a powerful department of biochemistry functioned, which was headed by a worldclass biochemist – Jakub Parnas.

KEY WORDS: biochemists, Lviv National Medical University, second World War

Wiad Lek. 2022;75(4 p1):881-890

INTRODUCTION

Biochemistry is a relatively young science that emerged at the turn of the XVIII and XIX centuries, but its roots go back to antiquity. The natural desire of people to understand the causes of diseases and find a cure for them has aroused interest in the processes that occur in living organisms. The use of new drugs and treatments, the most complex surgeries and resuscitation measures require constant biochemical monitoring of the body. Methods of biochemical analysis in the clinic are used to diagnose or study the dynamics of the pathological process. Diagnosis of acute diseases of the liver, kidneys, pancreas, heart, hereditary diseases, beriberi, intoxication, etc. is impossible without biochemical studies.

The first stages of biochemistry coincide with the development of organic chemistry. Later, with the development of synthetic chemistry of carbon compounds, the term "organic chemistry" acquired its modern meaning – the chemistry of carbon compounds, and the science that studies the chemical composition of living organisms and chemical processes occurring in them, began to be called physiological and then biological chemistry. Biological chemistry studies not only organic but also mineral compounds contained in organisms, as well as their role in biological processes.

A significant contribution to the development of biological: science has been made by Ukrainian scientists. In particular, Academician of the USSR Academy of Sciences V.O. Belitzer, who owns scientific developments in the field of biochemistry of oxidative reactions, protein chemistry, is one of the founders of the doctrine of oxidation of phosphorylation; Academician of the National Academy of Sciences of Ukraine M.F. Guliy, who studied the problems of balanced nutrition and carbohydrate metabolism in muscles, studied the relationship between purine metabolism and malignant growth, the regulation of protein and lipid biosynthesis, made a fundamental contribution to modern compounds. in heterotrophic organisms; it is directly involved in the emergence of native molecular biology and immunochemistry.

I.Ya. Gorbachevsky first synthesized uric acid, discovered the enzyme xanthineoxidase. Corresponding Member G.V. Donchenko is known for his achievements in the field of biochemistry of vitamins and coenzymes, in the search for ways of regulation by low-molecular biologically active compounds of intracellular metabolism in humans and animals in normal and various pathologies. in specialized cell structures. Academician of the NAS and AMS of Ukraine SV Komisarenko develops mechanisms of molecular immunology. Corresponding Member of the Academy of Medical Sciences of Ukraine Yu.I. Gubsky owns scientific developments in the field of xenobiochemistry – the direction of research of transformation and molecular mechanisms of physiological effects of foreign substances, molecular pharmacology.

However, there is practically no data in the literature that would cover the development of biochemistry in particular in Lviv and about prominent figures in the history of biochemistry during the Second World War.

THE AIM

The purpose of this literature review is to shed light on the development of biochemical knowledge in the Lviv region and on prominent figures in the development of biochemistry during the Second World War.

MATERIALS AND METHODS

Review of literature published before 2020. We searched the literature using the search terms 'biochemists', 'Danylo Halytsky Lviv National Medical University', and 'second World War'. The work envisages measures to enure human health, human dignity and moral and ethical standards in accordance with the principles of the Helsinki Declaration of Human Rights, the Council of Europe Convention on Human Rights and Biomedicine and relevant laws of Ukraine (opinion of Danylo Halytsky Lviv National Medical University Bioethics Commission).

REVIEW AND DISCUSSION

During the search, 40 publications were analyzed. Each publication was evaluated individually, and only those that contained original data and photographs were included. A total of 20 publications were processed for viewing.

Sccientific research in various fields of biology in the western region of Ukraine was conducted mainly at the University of Lviv. The history of Lviv University dates back to the seventeenth century. In the sixteenth and seventeenth centuries the centers of cultural life in the Ukrainian lands were church fraternities.

Through the support of the burghers and the clergy, they contributed to the spread of ideas of humanism, the development of science and schooling. The oldest in Ukraine was the Stavropigian Brotherhood in Lviv, which became a prominent Ukrainian cultural center. Since 1586, a fraternal school has been operating in Lviv, which was a secondary school. It has studied Church Slavonic, Creek, latin, Polish, mathematics, grammar, rhetoric, astronomy, philosophy and other disciplines. Members of the Lviv Brotherhood planned to turn this school into a higher education institution.

According to the articles of the Hadiach Agreement (1658) between Ukraine and the Commonwealth, the Polish government promised in the future to open two higher education academies in Ukraine: one in Kiev and the other where it would find a suitable place for it. The academies were promised the same university rights as the rights as the University of Krakow enjoyed. The Jesuits appeared in Lviv at the end of the sixteenth century, and in 1608 opened a high school there. The Jesuits understood the possibility of establishing a fraternal school in Lviv, so they constantly sought to transform their college into an academy. After repeated reguests, King Jan II Casimir signed a diploma on January 20, 1661, which gave the Jesuit college in Lviv the title of university with the right to teach all the then university disciplines, awarding the degrees of bachelor, license, master and doctor (Fig.1). The university consisted of two departments (faculties) – philosophical and theological. Historical sources testify that in 1667 about 500 students studied at the philosophical and theological faculties, and the teaching process was provided by eight teachers.

The education pricess at the University of Lviv was conducted according to the Jesuit school curriculum developed at the end of the 16th century. Changes to this program began to be made only in the middle of the eighteenth century. The Faculty of Philosophy studied Aristotle's philosophical system, which was the essence of lodic, physics, and metaphysics; physics also considered elements of mathematics, astronomy, biology, meteorology, and psychology and ethics in metaphysics. The teaching philosophy department lasted two to three years.

After graduating from this department, it was possible to obtain a obtain a theological education. The teaching department lasted four years. Here were the history of the church, the Old and New Testaments, dogmatic and moral thelogy, canon law, casuistry, ancient Hebrew. All university disciplines were taught by professors.

After the dissolution of the Jesuit Order in 1773, the University of Lviv was closed. However, until the University closed in 1773, a full-fledged medical faculty was never formed.

The first professor of chemistry and botany at Lviv University was Burkhardt Zatsbert Shiverek (1742–1807). B. Shiverek's main services are the study of the mineral waters of the Precarpathian Mountains and the establishment of a botanical garden.

During the second half of the nineteenth century there was an expansion of the university premises. Since 1851, the University has been housed in a building on the street Nicholas (now Grushevsky St.). In 1891 on the project of atchitect Y. Brownsoin on the street. A separate building for chemical, geological, mineralogical and pharmacological institutes was erected in Dluhosha (now St. Cyril and Methodius St.). In 1894, the construction of a building for the newly established Faculty of Medicine (Pekarska Street) was completed.(Fig. 2,3). Almost until the end of the nineteenth century there were three faculties at the Universioty: Law, Philosophy and Theology. The Faculty of Law was a leading university in both the number of students and teachers and the state priorities. In November 1891, the Austrian Emperor Franz Joseph I issued an order to open the Faculty of Medicine, which was solemnly September 9, 1894.

During the years 1891-1898 new educational buildings and clinical bases of the University were built and started to function: anatomo-physiological, pathological, anatomical, chemical, obstetrics and gynecology, surgery, internal diseases, dermatovenereoljgy, otolaryngology and others.

In November 1918, the Polish Ministry of Education, which after the collapse of the Austro-Hungarian Empire, became Galicia, granted the University the name of the Polish King Jan Casimir.

In the 1970s, Ivan Franko, a world-renowned Ukrainian thinker, writer, scientist, translator, psychologist, political and public figure, one of the geniuses of Ukraine who be-

Fig. 1. Lviv University in 1661

Fig. 2. Emblem of Lviv Medical University

Fig. 3. Lviv Medical Institute in 1784

came a "titan of labor," studied at the Faculty of Philosophy at Lviv University. By a decree of January 8, 1940, the Presidium of the Supreme Soviet of the USSR gave the name of Ivan Franko to Lviv State University.

In 1939, after the entry of Western Ukrainian lands into the Ukrainian Soviet Republic, the Faculty of Medicine of Lviv University was separated from the University and reorganized into Lviv State Medical Institute with two faculties: medical and preventive and pharmaceutical. Since 1961, along with national training, the University has been providing training to foreign nationals from Europe, Asia, Africa and America. On October 17, 1996, by decree of the Cabinet of Ministers of Ukraine №1262 the Lviv State Medical Institute was granted the status of a higher educational institution of the IV level of accreditation and was renamed Lviv State Medical University. On October 21, 1998, the University was named Danylo Halytsky Lviv National Medical University, the first King of the Halych-Volyn state.

Among the biochemists who come from the western region of Ukraine, the figure of Ivan Gorbachevsky stands separately. Although his true career growth took place outside Ukraine and was significantly slowed down by the events of the First World War, I. Gorbachevsky never betrayed his Ukrainian roots for a moment [1-5]. Ivan Gorbachevsky is a prominent Ukrainian scientist in the field of organic chemistry and biochemistry (Fig. 4) Also known as a political and educational figure.

Ivan Yakovych was born on May 15, 1854, in the village of Zarubyntsi, which is in Zbarazhchina, in the family of a priest. His path to science was defined in the Ternopil Gymnasium. Here, the future scientist showed great interest, agility and love for the knowledge and his history of his native people.

After graduating from high school, he studied medicine at the University of Vienna. While still a student, he was involved in social and scientific activities. Together with M.Dragomanov, he was chairman of the "Sich" Student Society and began research in medical chemistry.

He graduated in 1877 with a Doctor of Science degree from the University of Vienna. He worked in Vienna at the Chemical Institute and later at the Physical Institutes. In 1882 he synthesized uric acid for the first time in the world, established the source and ways of its formation in the body. In 1883 I.Ya. Gorbachevsky worked at Charles University in Prague.

In 1898 for successes in scientific activity I.Ya. Gorbachevsky was honored with the highest award of Austria-Hungary – the Order of the Iron Crown. In 1911 he was a candidate for the Nobel Prize in Physiology and Medicine. In 2004, UNESCO proclaimed with the 150th anniversary of his birth). In 1900 he participated in the International Medical Congress in Paris, where he headed the Ukrainian delegation. During the congress, he was elected vice president of the chemical section. Hororary President of the Ukrainian Medical Society (1910), initiator and organizer of the First (1926) and Second (1932) Ukrainian Scientific Congresses in Prague.

The credibility and veneration of a scientist in the Czech Republic is evidenced by the fact that he is elected a member of the Sanitary Council of the Czech Kingdom.

I.Gorbachevsky participated in the creation of a monument to the fighter for the will of the Czech Republic Jan Hus, whose discovery was entrusted to the Ukrainian Ivan Gorbachevsky.

In 1917-1918 I.Ya.Gorbaczewski was appointed Austria's first minister of public health. In this post, he conducted a survey of Eastern Galicia and found the situation: poverty of the people, need, hunger, devastation, lack of hospitals, doctors, medicines.

In 1919 he was considered a professor at the Department of Chemistry, which he founded at the Ukrainian Univer-

Fig. 4. Gorbachevsky Ivan Yakovych

Fig. 5. Stanislav Ludwig Philip Bondzinski

Fig. 6. Vaclav Morachevsky (1867-1950) (center). The late 40's

Fig. 7. Parnas Jakub Karol

Fig. 8. Sobchuk Bogdan Antonovych

Fig. 9. Shlemkevych Mykhailo Petrovych

Fig. 10. Tymochko Mykhaylo Fedorovych

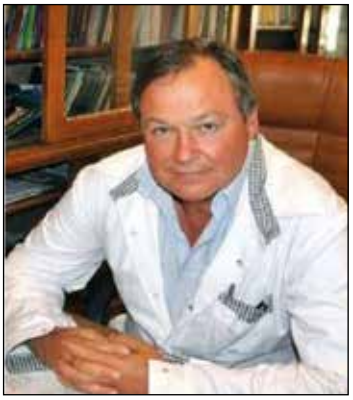

Fig.11. Sklyarov Alexander Yakovych

sity in Vienna, in 1921 – as a professor, and in 1923– as the rector of the Ukrainian University in Prague.

Together with I.Pulyuy, he organized a "Ukrainian" community in Prague and created a student assistance fund. Since 1925 – academician of the All-Ukrainian Academy of Sciences (Kyiv).

He started his scientific activities at a young age. The first publication was published in 1875, dedicated to the nerve on which the balance of a person depends. He is one of the first to prove that amino acids are an integral part of proteins.

Scientist has also worked productively in the fields of general chemistry, epidemiology, forensic medicine, toxicology.

The participation of I.Gorbachevsky in the scientific life of the Czech Republic and Slovakia is so significant that in some Czech encyclopedias it is noted that he was a Czech scientist of Ukrainian descent.

However, Professor I.Ya. Gorbachevsky never forgot his ancestry. In 1924 he prepared several textbooks on chemistry – "Inorganic chemistry," "Organic chemistry," "Physiological chemistry." The books were written in Czech and Ukrainian. One copy of his "Organic Chemistry" is in the Ternopil Museum of Local History as a gift from a sister of a scientist from the village of Zarubintsi.

I.Ya. Gorbachevsky is the author of 66 scientific works. Most of them have not lost their scientific importance today and their priority is recognized by the scientific community of the world. Many forces I.Ya. Corbachevsky invested in the creation of chemical terminology. He is also the author of more than 100 scientific papers in the field of sanitation.

He was a man of simple temper: gentle, good-natured. With colleagues and acquaintances, he was extremely modest and approachable. He spoke in a quiet voice, unpretentious and simple, with some special attention to the interlocutor.

According to the characteristics of people who personally knew Gorbachevsky, he was tall, good-looking, with a noble face, with clear eyes, kind and sensitive, always ready to help.

He constantly emphasized his Ukrainian origin.

I.Ya. Gorbachevsky was acquainted with Alexander Barvinsky and his son Vasily (composer), Vladimir Hnatyuk (ethnographer), Ivan Pulyu (mathematician).

Out of a sense of great reverence he treated D.I. Mendeleyev, maintained close contacts, made friends, corresponded with eminent scientists, statesmen and church figures, artists, writers, in particular with Lesya Ukrainka. It was on the recommendation of Ivan Yakovich that his cousin I.I. Bilynsky – a pharmacist from Cairo–helped treat the

brilliant poetess in Geluan, as well as the countryman from the Ternopil region – singer of worldwide fame – Solomiya Krushelnytska, the historical Cossacks –D. Yavornitsky and other.

The Medical Faculty of Lviv University, which opened in 1941, invited 88-year-old professor Ivan Gorbachevsky to work, but the death of a prominent scientist and public-political figure prevented it. I.Ya. Gorbachevsky died on May 24, 1942 at the age of 88. He was buried at St. Matthew's Cemetery in Šarka near Prague.

The name of Professor Ivan Gorbachevsky is a symbol of a true scientist, a patriot who has devoted his entire life to science, service to the people, the ideals of humanism. Among many other great people of Ternopil Ivan Gorbachevsky glorified our region. By the resolution of the Cabinet of Ministers of Ukraine № 303 of July1, 1992 the name of Ivan Yakovich Gorbachevsky was given to the Ternopil National Medical University. In 2004, a monument to Ivan Gorbachensky was erected near the Morphological Building of this university.

The Department of Biological Chemistry was founded in 1894 at the Medical Faculty of Lviv University by Professor Vladislav Nemilovich (1863-1904), who in 1891 came to Vienna from the University of Vienna to work as an Assistant Professor of Pharmacognosy and at the same time lectures on chemistry.

From 1906 to 1919 the department was headed by Professor Stanislav Ludwig Philip Bondzinski (1862-1929) (Fig. 5). From 1919 he headed the Department of Phisiological Chemistry at the University of Warsaw, and was also the organizer of the Academy of Medical Sciences (Poland) and its first president.

S. Bondzinski was born on April 30, 1862 in Poland. In 1881-1883 he studied at the Faculty of Mathematics and Natural Sciences of Warsaw University, the Faculty of Philosophy in Lviv (1883), Bern (Switzerland) (1885), from 1892 at the Medical Faculty in Zurich, 1895–Heidelberg. In 1887 he received the title of Doctor of Philosophy ("Ueber Sulfhydrylzimmtsaure und einige ihrer Derivate". Sitzungsberichte d.Akad.d.Wiss.in Wien i Monatsheft fur Chemie; Bern, Switzerland) and in 1895–the title of Doctor of Medicine for the performance of work – "Prace te dotyczyty zachowania sie w ustroju kwasu salicylowego, scladnikow zolci, w szegolnosci cholesteryny, w przewodzie pokarmowym, wreszcie nieznanych dotad produktow roskladu bialka w uskoju" in Heidelberg. In 1897-1898 he foundedand became the first head of the Institute of Food Research (Krakow).

For a short time from 1919 to 1922 the department was headed by Professor V. Morachevsky, the future rector of the Medical Veterinary Academy in Lviv (Fig.6). Vaclav Morachevsky (1867-1950) was born on November 27 in Warsaw. After graduating from high school in Warsaw from 1885 to 1889, he studied chemistry at the Zuruh

Polytechnic, and from 1889 to 1894 studied medicine at a local university. In 1918 V. Morachevsky underwent a medical chemistry habilitation at Lviv University. [6,7].

From 1921 he began to work as a professor at the Medical Veterinary Academy in Lviv.[8-13]. Scientific papers: author of about 180 scientific papers.

The object of scientific research of the department under the direction of prof. S. Bondzinsky was the so-called oxyproteic acid, a protein metabolism product that is excreted in the urine in small quantities. Prof. S. Bondzinsky also studied bile pigments and products of their metabolism, determined the composition of phosphorus in the bones of teeth, cholesterol metabolism in the body, the influence of alcohol on metabolic processes, studied the composition of milk fats, metabolism of caffeine and theobromine in the human body, synthesized the drug "tanabine,"synthesized and conducted a clinical study of acetylsalicylic acid and its esters. Scientific works: author of about 30 scientific papers.

The second stage of biology development in Lviv in the period between World War I and World War II was marked by a shift of emphasis in biological research from the branches of the sciences dominated by obswrvational and descriptive approaches (botany, zoology) to the branches of science with the extensive use of experimental methods, in particular instrumental approaches (biochemistry, normal and pathological physiology, microbiology). Prior to this transition, scientists also encouraged the revolutionary discoveries in the field of physiology and medicine, for which their authors in the early XX century:were awarded the Nobel Prize. In addition to the personal prestige of the Nobel laureate, who gave high prestige to fellow scientists and society, such awards usually opened new directions for scientific progress. It is worth mentioning some Nobel laureates from beginning of XX century and until the end of World War II, whose work contributed to the development of new industries in biology and medicine (in brackets indicate the year of the Nobel Prize): Robert Koch (1905), Ilya Mechnikov (1908), Paul Ehrlich (1908), Archibald Hill (1922), Otto Mayerhof (1922), Karl Landsteiner (1930), Otto Warburg (1931), Thomas Morgan (1933), Albert Stcent-Gyorgyi (1937), Alexander Fleming (1945). Of course, this is by no means a complete list of Nobel laureates who have started new scientific fields in biology and medicine. Experts believe that among the biology scientists who worked in Lviv, the parasitologist Rudolf-Stefan Weigl (creator of the typhoid vaccine) and biochemist Yakub Parnas (who introduced vagomyphalysis in the pathway of Elymobilism), were closest to the Nobel Prize Parnassus).

Another feature of the development of biology during this period was the transition from research conducted by individual scientists, or one scientist with one or two assistants, to the research of large scientific teams, led by a scientific leader, who was the head of the laboratory or department. During this period, many scientific school emerged, an example being the school of the eminent Lviv. [14-20] (Fig. 7).

The world-famous biochemist Jacob Parnas was a native of Lviv region. J. Parnas 28 (according to other data 16) January 1884 in Lviv region near Drohobych, in the village Mokryany Podgayets Country in the landownet's family. There is still debate over the exact birthplace of Jakub Parnas. Polish scientist are of the opinion that Parnas was born

in the village Mokryany of Ternopil region, as it is stated in many scientific and biographical references. Ukrainian biochemist scientist prof. Ivan Golovatsky conducted a special study and found no such village in the Ternopil region (Prof. R. Stoyka) confirmed it. Instead , v. Mokryany is located near Drohobych.

After graduating from Lviv Gymnasium Stanislav Staszyc Jakub Parnas (family name Parnes) studied chemistry at the Berlin-Charlottenburg Polytechnic, the University of Strasbourg and the Zurich Polytechnic (1902-1907), and received his doctorate in Munich (1907). From 1907 to 1916 Parnas worked as an associate professor at the Institute of Physiological Chemistry in Strasbourg, from 1910 to 1911 he was an employee of the Zoological Commission in Naples, in 1914 he became the head of the biochemical laboratory in Cambridge (United Kingdom).

During 1916-1919, Jakub Parnas (Poles called him Jacob Karol) lived in Warsaw, where he organized a department of physiological chemistry at Warsaw University.

After the First World War, Ya. Parnassus returned to Lviv. From 1922, Yakub Parnas headed the Department of Medicinal Chemistry of the Medical Faculty of Lviv University, and from 1939 to 1941 was the Director of the Institute of Biochemistry of the Lviv Medical Institute. Before the war in 1939, he created a powerful school of biochemists in Poland. In Lviv, he organized the Institute of Medical Chemistry at Lviv University.

Yakub Parnas proved the existence of a number of reaction of intermolecular transfer of phosphate residues with the participation of adenyl nucleotides. Under his leadership, the epartment actinely participated in the study of the processes of metabolism of adenylic acid in the muscles and its role in the formation of ammonia, conducted studies of the exchange pf purine derivatives and the characteristics of their metabolism in diabetes. He developed a micromethod for determining the content in biological tissues of ammonia using a device of his own design (Parnas apparatus). Under the guidante of J. Parnas, a number of topical issues of biochemistry were studied including the exchange of carbohydtates and nucleotides. With his assistance, a biochemical laboratory and library were created at the department. Professor Parnas School has become internationally known. Jakub Karol Parnas was also known as a renowned teacher and leader of many talented biochemists. He was referred to as as a wonderful teacher who easily found common ground with a student audience.

On September 1, 1939, Poland was divided between Germany and the USSR. The Red Army entered Lviv. Parnas had a choice: he could still go to London or New York, if he would be released. Its popularity was international. He stayed in Lviv. He found it impossible to drop his students and staff, the department, the institute, which he created a factory of pharmaceuticals. He received the utmost assurances of representatives of the Soviet authorities. He stayed. He was elected to academics (and he was already a member of many academies), then he was awarded the Stalin Prize of the first degree, the Order of Lenin, the Order of the Red Banner of Labor. During the first hours of June 22, 1941, German troops moved towards Lviv. There is a legend that in order to save Parnas, at the personal instruction of Stalin, Lviv was sent to the plane of biochemistry by S.E.Manojlov and V.A. Engelhardt. This is a legend. In fact, Parnas' spouses were taken the other way – there was a car on which they arrived in Kiev. From Kiev evacuated to Ufa. And when in 1943 there was a turning point in the war, Academician J.Parnas was summoned to Moscow.

That's how I mentioned these days Parnas, being in 1945 in Lviv. " I was able to go to Moscow, but the possibility of the device seemed even more hopeless than in Ufa. I have visited several professors and one of them has made it clear to me that I will not find a place if such an order does not come from the top of power. I listened to the oppressed, but there was at least some hope of salvation. Well, he told me that in the Kremlin, near the main entrance, there is a mailbox for letters sent directly to Stalin. Such a letter must necessarily relate to the war with Germany and include specific suggestions for actions that may lead to an advantage over the enemy. I thought about it in detail and used this information. At night, he wrote a letter to Stalin, addressing the situation of Soviet soldiers on the front lines in difficult conditions of food supply, noting that there is a chemical that can survive several days of starvation and exhaustion. This substance is caffeine. Well, I suggested trying to produce caffeine from raw materials, namely chicken manure. A few days later I was offered a room suitable for a chemical laboratory, but without any equipment".

I, Parnas, settled in the privileged Metropol Hotel, where I hosted students, staff, foreign diplomats, friends and acquaintances.(Such widespread communication has changed in "known bodies," especially the special desktop, but Parnas could not have this mind). In Moscow, he became one of the founders, founded in 1943, of the Academic Medical Sciences of the USSR, the organizer and first director of the Institute of Biological and Medical Chemistry of the Academy of Medical Sciences of the USSR.

In addition, as an academic he had the right to organize his own laboratory, it was a laboratory of physiological chemistry, in which he and his closest associates continued to study carbohydrates. At the same time Jakub Karol Parnas organized a laboratory in which he directed the study of isotopes.

In 1948, the first International Biochemical Congress was held in London. J. Parnas was invited as Vice President. In this regard, he received many letter from foreign colleagues, expressing joy over the alleged possibility of communication with him. But of course, the trip to England at the time could not be a question.

Parnas was recognized as the first in the scientific hierarchy of biochemists of the USSR. The center of biochemical thought in the country was the Parnassus "Thursdays"– seminars attended by not only Muscovites but also residents of other cities.

In the field of biochemistry J. Parnas was one of the most qualified specialists: Member of the Lviv Scientific Society,

Member of the German Academy of Natural Sciences "Leopoldina," Corresponding Member of the Polish Academy of Sciences, Full Member of the USSR Academy of Sciences and Medical Academy, 19 Stalin Prize Winner Member of the Medical Academy in Paris, Honorary Doctor of Sorbonne University (Paris, France) and Athens National University (Greece).

J. Parnas had diabetes, heart failure. On October 17, 1947, he applied to be relieved of his duties as director of the Institute he had created. He would like to focus on working in the laboratory. An order to dismiss him was signed on May 28, 1948.

At the end of 1948 he was seriously ill. For the first time after his illness he was going to report to the Leningrad biochemist S. Bresler. However, he did not come to the report. Worried disciples of Jakub Karol after the meeting ran to his house and found a sad picture: his apartment was sealed, and his wife was sitting and crying in front of the door. The circumstances of his death remained unknown. He was said to have been poisoned immediately after his arrest. According to another version, he died in prison from a diabetic coma because he suffered from severe diabetes.

How did Jakub Parnas really die? At the request of Jan Jakubovych's son, Colonel of Justice V.M. Granenov wrote on July 20, 1993 (On behalf of the General Directorate for Law Enforcement in the Armed Forces) : "… On January 28, 1949, J.Parnas was arrested for carrying out intelligence activities against the USSR on the assignment of a foreign country. On the same day, he was placed in an internal prison of the MGB of the USSR, where he was examined by a doctor. The latter diagnosed with Arteriocardiosclerosis. Hypertension. Diabetes . Right inguinal hernia. In connection with the existing diseases he was prescribed treatment. January 29, 1949 at 15 h. 15 min. J.Parnas was summoned for the first interrogation by a senior investigation of the Investigative Unit on Particularly Important Cases of the Ministry of Defense of the USSR, Lietenat Colonel Ivanov. At 17.30 minutes Ivanov left Parnas in the office with the warden, and he left in connection with a job requirement. For 10-15 minutes he was told about Parnassus's poor health and a doctor's call for help. During the provision of medical care 5 pm 50 minutes J. Parnas is dead. An autopsy of J. Parnas was performed by a forensic expert who did not identify any injuries at the external examination. The death came from myocardial infarction. On April 3, 1954, a senior investigator of the KGB investigative unit of the USSR Ministry of Defense, Lieutenant Colonel Cheklin issued a resolution to suspend criminal proceedings against Parnas Jakub Karol in the absence of a crime in his actions. Documents indicating the place of burial were not preserved"

In Poland and Lviv it is mentioned. In 1986, Professor V.S. Ostrovsky published a short biography of Parnas and his memoirs about him. In 1993, a book of memoirs was published in Warsaw, edited by Irena Stasevich-Jasukova. However, just about the Soviet period of Parnassus's life there is almost nothing in these memories.

On September 9-11, 1996, a joint Ukrainian-Polish symposium was held in Lviv, dedicated to the memory of J. Parnas. The organizers- the Polish Biochemical Society, Lviv medical University, the chairman of the Organizing Committee was Professor R.S. Stoyka, Lviv.

Members of the Polish Biochemical Society arrived in Lviv. Among them was an associate of Parnassus, who worked with him until 1939, Professor Boguslaw Halikowski. The Poles brought an artistically made bronze plaque, which was solemnly installed in the lobby of the Biochemistry Department of Lviv Medical University. Headed by J.Parnas for over 20 years. At the same time, the First Parnas Conference on Biochemestry and Cell Biology was held, which initiated regular (once every 2 years) conferences. The third Parnas Conference was held in 2000 in Lviv.

Current News the year was joined by the Israel Society for Biochemistry and Molecular Biology, and the next Parnas Conference was held in 2013 in Jerusalem (Israel). The eleventh Parnassus Conference was held in 2018 in Kyiv, Ukraine. In Warsaw, the name of Jakub Parnas was named a street and is considered the founder of Polish biochemistry, and the prize of his name is the most hororable for Polish biochemists.

Bogdan Sobchuk (Fig.8) worked directly with Prof. J. Parnas in 1944 became the head of the department of biochemistry, which before the war was prof. J. Parnas headed the Lviv Medical University. Bogdan Antonovich was born on 15.03.1909 in the town of Stryi, Professor, Head of the Department of Biochemistry (1944-1973).

In 1933 he graduated from the Medical Faculty of Lviv University. In 1933-1936 he worked as an assistant at the Department of Biochemistry, Lviv University. In 1936-38 he was an assistant at the Department of Physiology of the Lviv Academy of Veterinary Medicine. In 1939-1940 he held a private practice in Ternopil. In 1940-1941 he worked as an associate professor at the department of animal husbandry, Faculty of Agriculture, Lviv Polytechnic Institute. 1942-1944 Associate Professor of the Department of Biochemistry of Medical-Natural Specialty Courses in Lviv. From 1944 to 1973 he headed the department of biochemistry of Lviv Medical Institute. I 1946 he became a candidate of medical sciences, in 1949 assistant professor of the Department of Biochemistry of the Lviv Medical Institute. In 1960 he became a doctor of biological sciences, in 1961 a professor. He is the author of 60 scientific papers, has prepared 23 candidates, 9 doctors of sciences.

Main areas of research: Carbohydrate metabolism, including the role of pyruvic acid in muscle glycogenolysis; study of the effect of xanthopterin and some by-products of its synthesis on the growth and metabolism of experimental tumors; study of iodine metabolism in the course of thyroid function in norm and pathology; study of the effect of carbon monoxide on heme proteins. On the main directions of scientific work of the Department of Biochemistry under the direction of prof. B. Sobchuk, they concerned the study of carbohydrate metabolism in malignant tumors, biochemical processes in other human pathologies, and the effects of carbon monoxide (II) on heme proteins. Prof. B. Sobchuk is a full member of the Snevchenko Scientific Society. He died on April 9, 1974 and was buried in Lviv.

In 1973, the Department of Biochemistry of the Lviv Medical Institute was headed by Mykhailo Shlemkevych, who was born on April 29 in the village Serafints of Ivano-Frankivsk region (Fig.9).

In 1950 he graduated from the Medical Faculty of Lviv Medical Institute. In 1950-1951 he worked as a radiologist in charge of the district health department of Lokach, Volyn region. For ten years in 1951-1961 he worked as a military doctor. In 1961-1964 he was the head of the department of the Lviv hospital of war invalids. During 1964-1967 he studied at the postgraduate department of the Department of Biochemistry, Lviv Medical University. In 1968 he became a candidate of medical sciences. From 1967 to 1972 he worked as an aqssistant at the same department. In 1973 he became an associate professor at the Department of Boichemistry, Lviv Medical University. The same year he headed the Biochemistry Department of Lviv Medical University until 1995. In 1986 he became a medical doctor, and in 1987 received the title of professor. He is the author of about 80 scientific and initial-methodical works, has prepared 3 PhDs.

Main direction of scientific researches: problems of endemic dental disease of the Carpathian region, experimental and clinical oncology; methodical questions of determination of carbon monoxide in air and carboxyhemoglobin in blood; found the effect of potentiation of the antitumor activity of 5-fluorouracil on the background of the introduction of ascorbic acid.

He died on November 3, 1998 and buried in Bolekhiv.

In 1995, the Department of Biochemistry was headed by Mykhaylo Tymochko, who was born on September 25, 1935 in the village of the Ivano-Frankivsk region (Fig 10).

In the 1962 he graduated from the Biological Faculty of Ivan Franko Lviv State University. In 1962-1963 he worked as a laboratory assistant at the Department of Human and Animal Physiology. In 1963-1980 he was a researcher at the Laboratory of Radiation and Physicochemical Biology, Lviv University. In 1971 he became a candidate of medical sciences. In 1978 he became a senior researcher. From 1980 to 1987 he worked as a research at the Central Research Laboratory, and from 1986-1990 – an assistant at the Department of Biochemistry, Lviv Medical Institute. In 1991 he became an associate professor of the Department of Biochemistry, in 1993 he became a doctor of biological sciences, and in 1995 he received the academic title of professor. In 1995-1998 he headed the Department of Biochemistry of Lviv Medical University.

Main direction of scientific researches: studying of biochemical and physiological mechanisms of formation of adaptation-compensatory processes under conditions of action of various exteme influences (stress, physical overload, ionizing radiation, intoxication); study of correlative relationships between intensity and efficiency of energy metabolism, oxygen-dependent reactions, and oxygen homeostasis with free-radical and antioxidant reactions; one of the authors of the discovery of the phenomenon of intracellular generation of endogenios oxygen in humans and animals.

Myknailo Tymochko is the author of about 450 scientific and teaching works, among them 10 copyright certificates for inventions, a monograph. Has prepared 8 candidates, 3 doctors of science. He died tragically as a result of an accident on July 27, 1998 and was buried at the Lychakiv Cemetery in Lviv.

In 1998 Alexander Sklyarov was elected Head of the Department of Biochemistry (Fig11).

Alexander Yakovych Sklyarov was born on October 2. 1956 in Lviv, graduated with honors from Lviv Medical Institute, studied postgraduate studies, then – assistant, associate professor of the Department of Normal Physiology. In 1983 he defended his PhD thesis, and in 1993- his PhD .

Aleksandr Yakovych is making a lot of efforts to ensure that students' education meets the modern standards of European education. With his direct participation a textbook "Clinical biochemistry " (2006), a textbook for students of higher medical institutions of the first and second levels of accreditation " Biological chemistry with biochemical research methods" (2009), a textbook for dental students "Biological Chemistry" (2015), two national (for pharmacists (2014) and medical students (2016)) textbook. The education and scientific literature for students and physicians has been supplemented by a number of manuals and reference books (17), including two editions of the manual on gastroenterology (in collaboration with Prof. E.Ya. Sklyarov and Assoc. Prof. E.R. Kosim, 1997, 2011), "Workshop on biological chemistry" (2002), "Physiology and biochemistry of digestion of animals and humans " (in collaboration with Professors V.K. Rybalchenko, T.V. Beregova et al., 2002), "Biochemical composition of body fluids and their clinical-diagnostic value" (2004), "Biochemical parameters in norm and pathology" (2007), etc.

The close contacts between the Department of Biochemistry and the scientists of Poland have a long history. During its more than 100 years of existence, the Department of Biochemistry of Lviv National Medical University has cooperated with numerous foreign scientific institutions. Until 1941, the relations between the then head of the department – Academician Jacob Parnassus and his staff with Scientists from Great Britain, Denmark, Germany, Switzerland, were intense. After the Second World War, some of the department's teachers went to Poland, but still maintains contacts with the department.

A new stage of development of close cooperation of the Department of Biochemistry with colleagues from the Department of Clinical Analytics began in 1999, when Professor Janusz Solski was in Lviv. Professor Sklyarov O.Ya. and Professor Solski J. started work on organizing multifaceted cooperation between the departments and in 1999 an agreement was signed between the departments, which was extended in 2007.

Particular attention of Professor Sklyarov O.Ya. and Professor Solsky J. devoted to the development of scientific contacts between scientists of Ukraine and Poland. This was facilitated by the organization and holding of Lviv-Lublin Conferences (Lviv-2000, 2004, Lublin -2002, 2006) on topical issues of experimental and clinical biochemistry that

occur every two years in Ukraine and Poland. Currently, the conferences bring together scholars from many cities in Ukraine and Poland and serve to develop good neighborliness between countries.

The First Lviv-Lublin Conference on Experimental and Clinical Biochemistry was held on October 12-14, 2000 in Lviv. The conference was inaugurated by its sponsors, Professor O.Ya., Head of the Department of Biochemistry of the Danylo Halytsky Lviv National Medical University. Sklyarov and Head of the Department of Clinical Analytics at the Lublin Medical Academy named after prof. Felix Skubichevsky Professor J. Solsky.

At the first section meeting "Topical problems of experimental biochemistry" was chaired by prof. O.Sklyarov and prof. V. Halyas and 20 oral reports were presented.

In 2002, the Second Lviv-Lublin Conference on Experimental and Clinical Biochemistry was held in Lublin on May 23-25. The number of participants from both Ukraine and Poland increased at this conference. The participants of the conference from different cities of Ukraine gathered in Lviv and took the bus to Lublin. The trip left many fond memories.

The section "Topical problems of clinical biochemistry," which was chaired by prof. O. Sklyarov, B. Skhidlo-Radomansky, prof. B. Lutsik, R. Matsyevsky 41 reports were presented.

Alexander Yakovych Sklyarov is known for his scientific achievements in the field of experimental gastroenterology. His scientific work is focused on the study of the mechanisms of cytoprotection and ulcerogenesis of the digestive system, diabetes, the study of the effects of gas mediators (nitrogen oxide, hydrogen sulfide), hormones, vitamins in terms of various functional states of the digestive tract and clarification "Naftusia" mineralized water in the processes of radioprotection. It was Prof. O.Ya. Sklyarov substantiated the concept of simultaneous action of neurohumoral substances in the regulation of digestive system functions; formulated the provisions of endoecology of the cavities of the digestive system; identified the metabolic processes underlying ulcerogenesis and proposed new approaches to understanding the mechanisms of cytoprotection.

He is the author of more than 450 scientific works, including 2 monographs, 10 declarative patents, 6 information sheets on new treatments and diagnostics.

The professor presents the results of his research at world European and national forums (Recoop HST Consortium, 15th, 16th United European Gastroenterology Week, 8th Meeting of France – New EU Members 16th JMRC Symposium, Lviv – Lublin conference of experimental and clinical Biochemistry, International symposium on Cell/Tissue injury and Cytoprotection/Organoprotection, Advances in pharmacology and pathology of the digestive tract), and his scientific works are published in domestic and foreign scientific publications (J. Physiol. Pharmacol., Regul. Pept., International Journal of Physiology and Pathophysiology, Stress, Digestive diseases and sciences, Current Issues in Pharmacy and Medical Sciences). He created a science school. Under his leadership 13 candidates were defended and one PhD.

Among his students are scientists, educators, doctors who work not only in Ukraine, but also abroad. Alexander Yakovych's social activity is also a multivector. He participates in the work of the specialized academic council, is a member of the editorial boards of several journals; is a member of the Physiological and Biochemical Societies of Ukraine and the World Hungarian Medical Academy (1996). O.Ya. Sklyarov- Associate Professor (1997), Academician of the Ukrainian Academy of Sciences (2004), Honored Professor of Danylo Halytsky National Medical University (2012), thanked the Mayor of Lviv for his significant contribution to the development of medicine.

CONCLUSIONS

The development of biological research in Lviv can be divided into two major historical stages:

1) from the beginning of the founding of Lviv University in 1661 until the First World War;
2) between the First and Second World Wars and after the Second World War.

The first stage of development of biology in Lviv, in particular at Lviv University, was characterized by the dominance of research in the field of botany and zoology with the predominant use of descriptive approaches that did not require complex instruments for experimental work.

The second stage of development of biology in Lviv in the period between the First and Second World Wars was marked by a shift of emphasis in biological research from branches of science, which were dominated by observational and descriptive approaches (botany, zoology), to branches of science with extensive use of experimental, including instrumental (biochemistry, normal and pathological physiology, microbiology).

Biochemical research was initiated at the Medical Faculty of Lviv University. In 1939, the Lviv State Medical Institute was established on the basis of the medical faculty of the university, where a powerful department of biochemistry functioned, which from 1921 to 1941 was headed by a world-class biochemist – Yakub Parnas.

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Research work: IMPROVING MONITORING OF OBSTETRIC CARE FOR IDIOPATHIC PREGNANCY MISCARRIAGE.
Terms 2017-2022. State registration number 0117U001080. Sources of funding within the framework of state funing of the research work of the Department of Obstetrics and Gynecology of Danylo Halytsky Lviv National Medical University

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Conflict of interest:
The Authors declare no conflict of interest.

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Received: 14.01.2021
Accepted: 22.02.2022

A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article