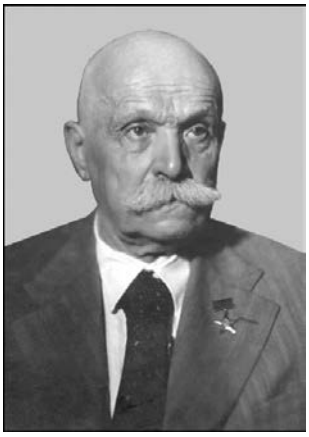
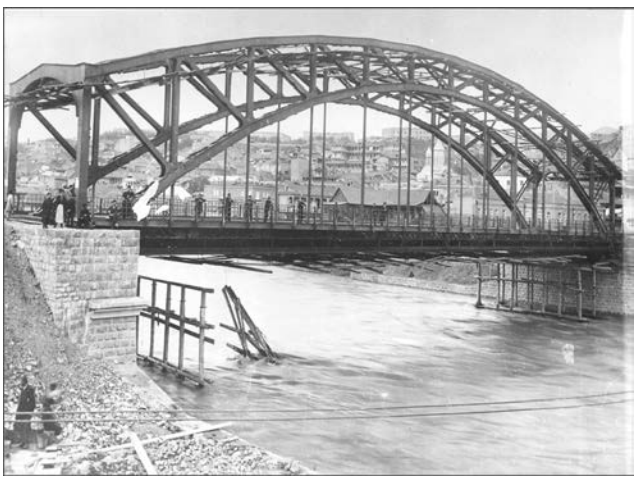
EVGENY O. PATON, THE OUTSTANDING SCIENTIST IN THE FIELD OF WELDING AND BRIDGE CONSTRUCTION (on the occasion of the 145th birthday anniversary)



Academician E.O. Paton

Evgeny Oscarovich Paton went down in history of science and engineering as a scientist, engineer, organizer of production, public figure, founder of scientific schools of bridge construction and welding. His publications became the basis of many scientific directions, which retain actuality until now. His life and activity are described in «Reminiscences», in articles and narratives of colleagues, associates, literary men, historians.

Activity, deeds, decisions taken by Evgeny O. Paton, expressed thoughts did not often coincide with existing standards and formed circumstances, due to which they were not always perceived at once even by the colleagues. He had to live and work in hard and troubled periods of history, to experience the change in political regime and two World Wars, to undergo risk and to fight for his work, to stand up for ideas and to establish a justice. However, he was always, not thinking, governed by such principles as a love to homeland, labor, honesty in everything, strictness to himself and pupils, colleagues, attention to people, calm attitude to awards. Fortunately, his works in the field of bridge construction and welding production solved the large-scale problems on the way of scientific-technical progress, made a great contribution to the governmental programs of industrialization, armament production, after-war reconstruction of the economy. Pedagogical, organizational and social activity of E.O. Paton was highly appreciated by the government and recognized abroad.

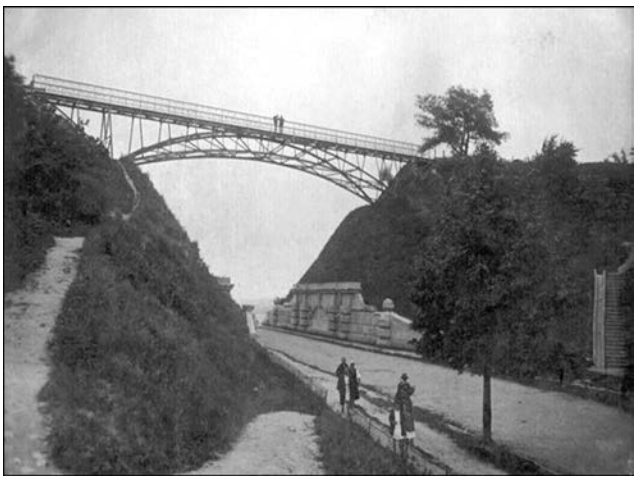


Mukhransky bridge across the Kura river, connecting two regions of Tbilisi in 1911. Evgeny Paton designed the bridge with arch single-span structure instead of ordered three-span structure

Evgeny Paton was born on March 4, 1870 in the family of Oscar Paton, the Russian diplomat, former military engineer. In 1884, he finished the engineering-building faculty of Royal Saxon Higher School of Technology in Dresden. But to work in Russia, Evgeny Paton had to pass exams and defend the projects in Petersburg Institute of Engineers of Communications. In 1896, he received the diploma of engineer, designed bridges, had teaching activity in Petersburg and Moscow. In 1901, he defended the thesis. In 1904, Professor Paton was invited to head the chair of bridges in Kiev Polytechnic Institute. He combined successfully the pedagogical and scientific work with designing and supervision of bridges construction. He made a great contribution to the creation of fundamentals of designing the span structures of bridges, the technology of their construction and test methods. According to the projects of Paton E.O., more than 40 bridges of unique designs were constructed, among which is the Mukhransky bridge across the Kura river in Tbilisi, bridges in Kiev across the Dnieper river and Petrovskaya alley, over- and underpasses in Moscow, roofing structures of halls of Kiev Polytechnic Institute and hotel «Metropol». At the beginning of the World War I, Paton E.O. developed the design of split bridges, won a victory over J. Eiffel, the French engineer, at the international competition.

In 1929, E.O. Paton was elected the academician of the All-Ukrainian Academy of Sciences (AUAS, now NAS of Ukraine) and that year became as a new stage in his creative activity.

In 1927, the bridge after Eugenia Bosh joined Kiev with worker's settlements and all the left-bank part of Ukraine. E.O. Paton had to solve the unique problems, such as to repeat contours of Nikolaevsky chain bridge, bombed during the war, which was liked by the kievites, and «to tie» the beams of its dismountable bridges of the war-period to the retained supports of the chain bridge

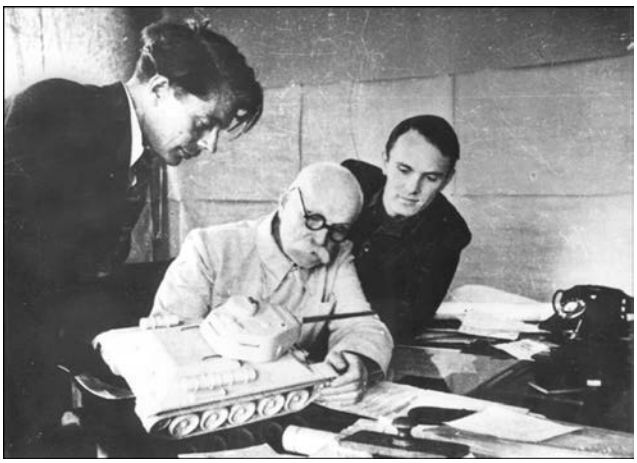


In 1909, E.O. Paton, participating in the competition, suggested to make alley in the Tsarsky garden and to construct the arch bridge. In accordance with his project the bridge was constructed on land and with readiness the ground was dug, structure was lowered and mounted on the prepared supports. Bridge became a decoration of Kiev

Paton E.O. inspired the idea to apply welding instead of riveting in construction of bridges. Intuition of scientist and experience of engineer suggested to him that the further progress in bridge construction and many other branches of industry on the base of riveting is impossible. On May 2, 1929 the Presidium of AUAS took a decision, by the suggestion of E.O. Paton, about organizing the Electric Welding Laboratory, and the government of the Ukr.SSR allocated the money for its development. The scientist widened the investigations on serviceability of welded structures, works of development of covered electrodes and investigation of process of metal melting in welding, designed the rational types of welded structures, rendered assistance in designing and implementation of welding at the enterprises. In 1931, E.O. Paton faced one more problem: to automate the process of arc welding. The volume of scheduled research investigations and industrial ordered works was rapidly widened.

It should be noted that in the mentioned period the laboratories of companies and higher-educational institutions were also dealing with separate problems of welding production. In 1932, E.O. Paton expressed the idea for the first time in the world about the integrated approach to the solution of welding problems taking place in metallurgical, electric engineering and many other branches of knowledge and establishment of institution, where it would be possible to solve independently all the problems occurring on the way of development of the new technologies. He worked out the structure of the institution, which included research departments, design bureau, workshops, experimental and implementation groups. In 1933, the establishment of the institute was approved by the AUAS Presidium. On January 3, 1934 the first in the world specialized research-design organization in the field of welding production received an official status by the resolution of the government — Electric Welding Institute. E.O. Paton was the director and scientific supervisor of the Institute until his last days of life. In 1935, the scientist organized the Chair of Welding in the Kiev Polytechnic Institute and headed it until 1939.

In 1947, in order to accelerate and make the construction of gas pipeline Dashava–Kiev–Bryansk–Moscow less expensive Paton E.O. suggested to create the field stations, where separate pipes could be joined into sections using the submerged arc welding



Evgeny O. Paton and his sons Vladimir and Boris with model of tank-34

At the end of the 1930s the associates of the Electric Welding Institute developed the domestic method of submerged arc welding under supervision of the scientist. Taking into consideration the great importance of the new progressive technology, the government issued the special resolution in December, 1940 about implementation of the submerged arc welding at the 20 largest enterprises of the country.

E.O. Paton was appointed the Adviser of Government on machine building. In March, 1941 Paton E.O. was awarded the State Prize of the first degree for the development of method and equipment for high-speed submerged arc welding.

At the beginning of the Great Patriotic War the Electric Welding Institute was evacuated by the initiative of the director to the Urals, to Nizhny Tagil. There, the plant and design bureau from Kharkov, the creators of tank-34, the best medium-weight tank of the World War II, were evacuated to the territory of «Uralvagonzavod». For the first time in the world the problem of automatic welding of armor steels was solved under supervision of E.O. Paton, technology and equipment for welding of tank bodies, artillery armament, ammunition were developed, the mass production of tanks was arranged. The efficiency of the automatic welding of armor bodies was 10 times higher than that of manual welding, the net volume of products from the unit of industrial area was several times increased. At the beginning of 1945 the submerged arc welding was widely used at 52 plants of the country. On March 2, 1943 E.O. Paton was the first one among the Ukrainian academicians who was awarded the title of Hero of Social Labor.

In April, 1944 the Institute returned to Kiev. In the post-war years E.O. Paton concentrated efforts of associates for the solution of problem of restoration and development of the country national economy. Under his supervision and direct participation the planned implementation of submerged arc welding in industry, construction and transport was beginning, technology and equipment for automatic and semi-automatic submerged arc welding were developed, the production lines were manufactured.

It was managed for the first time in the world to solve the problem of submerged arc welding of vertical welds. The Institute made a great contribution to the development of new industrial methods of manufacture of pipes, ships, railway cars, mine cars, construction of main pipelines, oversized tanks, blast furnace structures and other objects. Application of new technologies of assembly-welding works contributed to the complete restoration of fuel-energy complex and mining-metallurgical industry of Pridneprovie, Donbass and other regions. Invention of a new type of joining at the Institute, i.e. electroslag welding, solved the problem of manufacture of structures of semi-products of unlimited thickness.

At the same time, Paton E.O. began to widen the scope of research works. The Institute was enlarging, new advanced equipment was designed and purchased for a successful work of laboratories, young highly-skilled specialists were recruited for operation in this equipment. In that period the leading scientific directions were formed. Physical-metallurgical and thermal fundamentals of welding, scientific bases of mechanization and automation

Erection of large-size tank (1948)

Evgeny O. Paton with associates

The E.O. Paton bridge across the Dnieper river in Kiev

of welding processes were developed, theory of strength of welded structures and joints was created. With participation of Paton E.O. and under his supervision the fundamental works were published on different aspects of welding science and technology. More than 300 published works belong to E.O. Paton.

Dealing with the problems of permanent joining of metals, Paton E.O. continued to work in the field of bridge construction. In 1953, the traffic was open in Kiev along the all-welded road bridge across the Dnieper river, having the length of more than 1500 m, which was named after E.O. Paton. This road bridge was constructed completely, for the first time in the world, by applying the automatic (up to 90 %) and semi-automatic welding.

Evgeny O. Paton died on August 12, 1953, less than three months before the gala opening of this bridge. The American Welding Society has recognized the bridge as an outstanding welded structure of the XX century. At present the bridge is under service at a load, 10 times exceeding the design one. In the project of his last bridge Paton E.O. applied completely the potentialities of technologies, developed under his supervision, without using arch, lattice or suspended structures.

The writer Shulgin V.V., the political figure, remarked: «The Paton bridge is a great achievement in the field of bridge construction. Its beauty is in the fact that the bridge even does not exist at all. It is as if one of Kiev streets is throwing over magically from the right to left bank».

The peculiar feature of all the activity of E.O. Paton was the continuous attempt to strengthen universally the cooperation of science with industry, to implement widely the scientific achievements into the national economy. He has excellently joined the talent of outstanding scientist and engineer in himself.

E.O. Paton participated actively in the social life of the country. For the prominent scientific, pedagogical and social activity E.O. Paton was awarded with the title of Honored Worker of Science and Technology, orders and medals. He was twice elected the Vice-President of the Academy of Sciences of the Ukr.SSR.

Occupying different positions, he personally contributed greatly to strengthening of cooperation of institutes of the Academy of Sciences of the Ukr.SSR with industry, widening not only fundamental, but also applied investigations, having a great importance for the solution of actual problems of formation and development of the national economy. E.O. Paton was the founder and editor-in-chief of journal «Avtomaticheskaya Svarka» («Automatic Welding»).

The Electric Welding Institute, founded by Paton E.O., today is also the powerful scientific-technical complex, the largest center in the field of welding, protective and strengthening coatings and special electrometallurgy, which includes, except the scientific and designing departments, the pilot plants, engineering and training centers.

Prof. A.N. Kornienko, PWI

MEETING OF BORIS E. PATON, PRESIDENT OF THE NAS OF UKRAINE, WITH CARLOS MOEDAS, EU COMMISSIONER

Presentation of «E.O. Paton Bridge» engraving to Carlos Moedas

Visit to PWI demonstration hall

On March 20, 2015, a meeting of Prof. B.E. Paton, President of the National Academy of Sciences of Ukraine, with EU delegation led by Carlos Moedas, EU Commissioner on Science, Research and Innovation, was held at the E.O. Paton Electric Welding Institute.

The meeting was connected with a significant event in the academic life of our country — signing of the Agreement on Ukraine's participation in «Horizon 2020», EU Program on research and innovations.

«Horizon 2020» is the EU 8th Framework Program on research and innovations. It started in 2014 and is designed for 7 years. This Program aimed at support of research and innovative activity in all the spheres of public life and unites all EU programs on funding research and innovations. Its overall budget is equal to about 80 bln Euros.

Having signed the Agreement, Ukraine gained access to the entire range of events, funded under the Program. Scientists can use modern scientific resources, electronic databases, and compete for

Meeting with EU delegation at PWI

Meeting participants in PWI demonstration hall

grants with European colleagues. «Horizon 2020» program participants can be academic institutes, research centers, higher educational establishments, science and production enterprises or small and medium businesses. Ukraine received from EU the unprecedented 95 % discount and annual postponement of the first fee for participation in the Program.

During the meeting Boris E. Paton welcomed signing of the agreement and thanked Carlos Moedas for supporting Ukrainian science and the possibility provided to Ukrainian scientists of open access to the European research space, and expressed his confidence that participation in the Program will promote widening of cooperation of the NAS of Ukraine with its numerous European partners.

Boris E. Paton noted the extensive positive experience of international cooperation. Just within the EU 7th Framework Program the institutes of the NASU fulfilled 92 joint projects with their colleagues from all the European countries. President of the NASU particularly emphasized the many-year participation of PWI in fulfillment of international programs, including the EU 7th Framework Program. The subjects of these projects are related to fundamental research in the field of welding technologies, materials science and new materials.

In his reply, Carlos Moedas expressed his deep gratitude to Boris Paton, and emphasized the special significance of PWI joint projects under EU Programs and noted the wide possibilities opened up by «Horizon 2020» for Ukrainian science.

Marite Seile, Minister of Education and Science of Latvia, delegation participant, also thanked Prof. Paton and welcomed the signing of the Agreement. She noted the special role of PWI in combining fundamental research with applied developments, and expressed her confidence that signing of the Agreement on Ukraine's participation in «Horizon 2020» Program will be a new stage in development of Ukrainian science that will provide an impetus for new innovative developments.

After the meeting, EU delegation visited PWI demonstration hall and was familiarized with PWI most recent developments.

From materials of the NASU press-service