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HISTORY OF ENGINEERING SCIENCES AND INSTITUTIONS OF HIGHER EDUCATION

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FOREWORD

The seventh volume of the scientific journal issued by the Research Centre for Engineering History of RTU (RCEH) was published in the year of the 160th anniversary of oldest faculties of RTU – the Faculty of Civil Engineering and Faculty of Materials Science and Applied Chemistry, which started their activities in 1863. The papers included in this volume of the journal are dedicated to former students and lecturers of these faculties.

This volume contains seven scientific articles. The authors of the first five papers have reported on their findings at international scientific conferences of RTU. The authors of the research are Latvian and North Macedonian scientists, historians of science, and faculty of universities, who introduce the readers to the performance of technical intelligentsia not only in engineering but also in pedagogy, linguistics, and culture, reflecting on the activities of graduates and faculty of RTU predecessor, Riga Polytechnic Institute (RPI).

This volume opens with a paper by *Māris Baltiņš*, Professor of the University of Latvia (UL), Director of the State Language Centre of Latvia, presenting his research on the contribution of the Latvian technical intelligentsia to the field of terminology until the establishment of the Republic of Latvia. The research was carried out within the project «*Mūsdienu latviešu valodas lietojums un attīstība*» (Research on the Use and Development of the Modern Latvian Language) of the National Research Program of the Latvian Council of Science (No. VPP-LETONIKA-2022/1-0001). *M. Baltiņš* mentioned 29 persons in the study – six graduates of Riga Polytechnicum (RP) and 14 graduates of RPI, as well as nine former students who did not obtain a university diploma. Each of them contributed to the development of technical terminology in the second half of the 19th century and the beginning of the 20th century.

The research on the pedagogical activity of an engineer, pedagogue, RPI graduate *Jānis Rupais* was carried out in collaboration with the Director of RTU RCEH *Ilze Gudro* and the Head of the Department for Historic Research and Scientific Publications *Alīda Zigmunde* with the employees of *Gulbene* Municipality Museum of History and Art *Ilze Ūsele* and *Ineta Bauere*. A comprehensive article about *J. Rupais* provides results of extensive research on this personality, revealing some lesser-known facts, including the account of the activities of *Jānis Rupais* in *Gulbene* City.

The third paper is dedicated to the twists and turns in the life of shipping engineer *Edgars Oto Pinka*, the study was conducted in archives and libraries by historian *Indulis Zvirgzdiņš*. *E. O. Pinka* entered RPI in 1914 but did not commence his studies and chose to study at the Naval Engineering School in Kronstadt. During the interwar period, he was one of the best specialists in the Latvian Navy, who popularized Latvian music in France. His daughter *Māra Pinka* is a graduate and a former lecturer of RPI.

The fourth paper by UL researcher *Svetlana Kovalčuka* and RTU Professor *Alīda Zigmunde* is dedicated to a former RPI Professor Mikhail Berlov, who lived in Tsarist Russia and the Republic of Latvia during the interwar period. Becoming disappointed in Soviet Russia in the first years of Soviet rule, M. Berlov and his family asked the Latvian authorities to allow them to settle in Riga and obtain Latvian citizenship. Professor left a significant pedagogical and scientific legacy, including many textbooks he compiled.

The fifth study addresses the scientific activity and contribution of *Voldemārs Dāle*, Honorary Doctor of the Latvian Academy of Sciences, to the development of power engineering. The author of the article, UL Associate Professor *Austra Avotiņa*, traces important stages of the scientist's activity throughout his life, also reflecting on his cooperation with the researchers of RTU Faculty of Power and Electrical Engineering.

The next paper presents the results of research on the first engineers and architects born in the territory of present-day North Macedonia conducted by Professor *Vladimir Ladinski* of the University American College Skopje in North Macedonia. Among dozens of engineers, the researcher also identified three RPI alumni who graduated from the university before World War I and whose diplomas were recognized by the Technical Faculty of the University of Belgrade in the 1930s.

The article by aviation historian Guenther Sollinger concludes this volume of the scientific journal. It is dedicated to constructors and pilots – early developers of world aviation (1900–1914). The article was developed by analyzing the lives and professional activities of 14 142 personalities, it also reflects on the types of airplanes, helicopters, ornithopters, gliders, and other aircraft that were operated at the beginning of the 20th century until World War I.

The academic year 2022/2023 brought mournful messages – *Gunārs Asaris*, *Vera Gošteine*, *Vladislavs Grišins*, *Rihards Indriksons*, *Lūcija Kupče*, Peter Mensah, *Jānis Osis*, *Egils Pāns*, *Laimonis Šteinbergs*, *Gunārs Upītis*, *Jānis Valeinis*, *Visvaldis Vrubļevskis*, *Māris Zeltiņš*; lecturer and Honorary Doctor of RTU *Tālis Millers*, long-time leader of RTU folk dance ensemble «*Vektors*», choreographer *Uldis* Šteins; long-term employees – a clerk of the Office of Vice-Rector for Finance *Gunta Freiberga*, librarian of

RTU Scientific Library *Diāna Ielīte*, Chair of the Pensioners' Council of RTU Trade Union *Māra Lēruma*, an employee of the Department of Engineering Mathematics *Velta Šaicāne*, a former assistant of RPI / RTU Rector *Daina Zviedre* passed away. The obituaries of RPI / RTU lecturers who passed away during the academic year 2022/2023 are published at the end of the journal.

This issue of the journal is concluded with the chronology of the key events that happened at Riga Technical University in the academic year 2022/2023 (1 Sept 2022–31 Aug 2023).

Editor-in-Chief, Associate Professor *Dr. psych. Airisa Šteinberga*

PRIEKŠVĀRDS

Rīgas Tehniskās universitātes (RTU) Inženierzinātņu vēstures pētniecības centra (IVPC) sagatavotais septītais zinātniskais žurnāls iznāk RTU senāko fakultāšu – Būvniecības inženierzinātņu un Materiālzinātnes un lietišķās ķīmijas, 160. jubilejas gadā – tās savu darbību sāka 1863. gadā. Žurnālā ievietotajos pētījumos minēti šo fakultāšu bijušie studenti un docētāji.

Zinātniskajā žurnālā publicēti septiņi zinātniskie raksti, un piecu pirmo rakstu autori ziņojuši par tiem RTU starptautiskajās zinātniskajās konferencēs. Pētījumu autori ir Latvijas un Ziemeļmaķedonijas zinātnieki, zinātņu vēsturnieki un augstskolu mācībspēki, kuri žurnāla lasītājus iepazīstina ar tehniskās inteliģences veikumu ne tikai inženierzinātnēs, bet arī pedagoģijā, valodniecībā un kultūrā, ar RTU priekšteča, Rīgas Politehniskā institūta (RPI), absolventu un mācībspēka dzīvesdarbību.

Žurnālu ievada Latvijas Universitātes (LU) profesora, Valsts valodas centra direktora Māra Baltiņa pētījums par latviešu tehniskās inteliģences veikumu terminoloģijas jomā līdz Latvijas Republikas izveidei. Tas veikts Latvijas Zinātnes padomes valsts pētījumu programmas projektā «Mūsdienu latviešu valodas lietojums un attīstība» (Nr. VPP-LETONIKA-2022/1-0001). M. Baltiņš pētījumā minējis 29 personas – sešus Rīgas Politehnikuma (RP) un 14 RPI absolventus, kā arī deviņus bijušos studentus, kuri augstskolas diplomu neieguva. Katrs no viņiem devis savu artavu tehniskās terminoloģijas attīstībai 19. gadsimta 2. pusē un 20. gadsimta sākumā.

Pētījums par inženiera, pedagoga, RPI absolventa Jāņa Rupā pedagoģisko darbību veikts, sadarbojoties RTU IVPC vadītājai Ilzei Gudro un Vēstures pētniecības un zinātnisko publikāciju nodaļas vadītājai Alīdai Zigmundei ar Gulbenes novada vēstures un mākslas muzeja darbiniecēm Ilzi Ūseli un Inetu Baueri. Veicot izpēti, tapis plašs raksts par J. Rupo, vispusīgi raksturojot viņu un atklājot mazāk zināmo par šo personību, tostarp darbību ne tikai Gulbenē.

Trešais pētījums ir par kuģniecības inženiera Edgara Oto Pinkas dzīves līkločiem, kurus arhīvos un bibliotēkās pētījis vēsturnieks Indulis Zvirgzdiņš. E. O. Pinka 1914. gadā iestājās RPI, taču nestudēja un izvēlējās mācīties Jūras inženieru skolā Kronštatē. Starpkaru laikā viņš bija viens no labākajiem speciālistiem Latvijas jūras spēkos, popularizējis latviešu mūziku Francijā. Viņa meita Māra Pinka ir RPI absolvente un bijusī docētāja.

RPI bijušā profesora Mihaila Berlova mūžs pagājis cariskajā Krievijā un Latvijas Republikā starpkaru laikā. Kā izpētījušas LU pētniece Svetlana Kovaļčuka un RTU profesore Alīda Zigmunde, M. Berlovs un viņa ģimene pēc vilšanās padomju Krievijā pirmajos padomju varas gados lūdza Latvijas varas iestādes atļaut apmesties uz dzīvi Rīgā un iegūt Latvijas pavalstniecību. Nozīmīgs ir profesora pedagoģiskais un zinātniskais mantojums, tostarp viņa sastādītās daudzās mācību grāmatas.

Piektais pētījums ir par Latvijas Zinātņu akadēmijas Goda doktora Voldemāra Dāles zinātnisko darbību un ieguldījumu enerģētikas attīstībā. Raksta autore, LU asociētā profesore Austra Avotiņa, zinātnieka dzīvei izseko visa mūža garumā, pieminot arī viņa sadarbību ar RTU Enerģētikas un elektrotehnikas fakultāti un tās zinātniekiem.

Tālāk seko privātās Skopjes Universitātes Amerikas koledžas Ziemeļmaķedonijā profesora Vladimira Ladinska (*Vladimir Ladinski*) pētījums par pirmajiem inženieriem un arhitektiem, kas dzimuši pašreizējās Ziemeļmaķedonijas teritorijā. Vairāku desmitu inženieru vidū pētnieks apzinājis arī trīs RPI absolventus, kas augstskolu absolvējuši pirms Pirmā pasaules kara un kuriem Belgradas Tehniskā fakultāte ir atzinusi iegūto diplomu 20. gadsimta 30. gados.

Zinātnisko žurnālu noslēdz aviācijas vēsturnieks Ginters Zolingers (*Guenther Sollinger*) ar pētījumu par konstruktoriem un pilotiem – pasaules aviācijas attīstītājiem (1900–1914). Raksts tapis, analizējot 14 142 indivīdu dzīvesdarbību, kā arī lidmašīnu tipus, helikopterus, ornitopterus, planierus un citus lidojošos aparātus, kas tika ekspluatēti 20. gadsimta sākumā – līdz Pirmajam pasaules karam.

Žurnāla noslēgumā publicēti to RPI / RTU docētāju nekrologi, kuri mūžībā devušies 2022./2023. studiju gada laikā. Mūžībā aizsaukti Gunārs Asaris,Vera Gošteine, Vladislavs Grišins, Rihards Indriksons, Lūcija Kupče, Peter Mensah, Jānis Osis, Egils Pāns, Laimonis Šteinbergs, Gunārs Upītis, Jānis Valeinis, Visvaldis Vrubļevskis, Māris Zeltiņš; docētājs un RTU Goda doktors Tālis Millers; RTU Tautas deju ansambļa «Vektors» ilggadējais vadītājs, horeogrāfs Uldis Šteins; ilgggadējās darbinieces – Finanšu prorektora dienesta lietvede Gunta Freiberga, RTU Zinātniskās bibliotēkas bibliotekāre Diāna Ielīte, RTU Arodbiedrības organizācijas Pensionāru padomes priekšsēdētāja Māra Lēruma, Inženiermatemātikas katedras darbiniece Velta Šaicāne, RPI / RTU rektora bijusī palīdze Daina Zviedre.

Zinātnisko rakstu krājumu noslēdz RTU 2022./2023. studiju gada nozīmīgāko notikumu hronoloģija (01.09.2022–31.08.2023).

Galvenā redaktore asociētā profesore *Dr. psych*. Airisa Šteinberga

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1862
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CONTRIBUTION OF LATVIAN TECHNICAL INTELLIGENTSIA TO DEVELOPMENT OF TERMINOLOGY UNTIL THE ESTABLISHMENT OF THE REPUBLIC OF LATVIA

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Summary. The article considers the development of technical terminology in the Latvian language until the proclamation of the independent state of Latvia in 1918. The activists of the National Awakening became the first creators of technical terminology, describing current technical innovations as, for example, *Juris Alunāns* (1832–1864) did in 1860 for the telegraph. The need for technical terms became apparent after the Second Baltic Agricultural Exhibition when difficulties arose in describing the showcased exhibits in Latvian. Significant steps in the development of terminology were made on the initiative of student *Mikus Skruzītis* (also *Skruzīšu Mikus*; 1861–1905), who suggested collecting frequently used names of parts of various simple devices, and the initiative of *Nikolajs Puriņš* (also *Puriņu Klāvs*; 1858–1935) to publish self-education materials in construction («*Būvskola*» or Building School) and mechanical engineering («*Mašīnu būvskola*» or Machine Building School). As the proportion of Latvians employed in the industry and the number of persons who received technical education increased, the need to establish organizations that would take care of both technical education in Latvian and the coinage of the necessary terms became more apparent. The Baltic Technical Society (1906) and the Latvian Educational Society (1908), which established their own terminology committees, deserve special recognition. Encyclopaedic dictionaries were also important for the systematization of terminology, especially the conversational dictionary published by the Knowledge Committee of Riga Latvian Society (1903–1921). The research was carried out within the project «*Mūsdienu latviešu valodas lietojums un attīstība*» (Research on Modern Latvian Language and Development) of the National Research Program of the Latvian Council of Science (No. VPP-LETONIKA-2022/1-0001).

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Keywords: Latvian language, technical terminology, National Revival, Riga Polytechnic Institute, conversational dictionaries.

Introduction

The Terminology Committee of the Ministry of Education of Latvia was successfully established in 1919 due to the fact that since the middle of the 19th century, a large part of Latvian society already held a strong opinion that the formation of a modern nation was not possible without a well-developed system of terms in the national language. Discussions regarding the term creation process and the way it should be organized regularly arose in the Latvian press; book reviews almost always evaluated the used terms and deliberately identified the terms that were still missing in specific areas. Sometimes specialists formed working groups where they discussed the terms used in concrete fields, there were also several attempts to establish terminological committees that would work on a long-term basis [1]. Therefore, before discussing the activity of the Terminology Committee, it is necessary to describe the contribution to the field of technical terminology that had been made previously.

Beginnings of Latvian Terminology

Already in the second half of the 1850s, the most widely recognized activists of the National Awakening Movement published many articles on the problems of natural sciences, which touched upon not only the general principles of the world organization but also described the structure of specific devices and technical solutions used therein. Poet and publicist *J. Alunāns* described the working principles of the telegraph in Volume 1 of the collection «*Sēta, daba, pasaule*» (Homestead, Nature, World) (Fig. 1 p. 12) [2]. When describing the structure of the telegraph apparatus, such terms as conductor (*vadītājs*), positive (*pozitīvīga*) or attracting electricity (*pastādama elektrība*; the one which attracts), negative (*negatīvīga*) or repulsing electricity (*navināma elektrība*; the one which repels), closing wires (*slēdzamās drātes*), coiled wires (*aptīstītas drātes*; winding), current arrester (*straumes apturētājs*; switch), galvanic battery (*galvanīga batarija*), revised corrections (*pārlabotas iegrozīšanas*; accessories?), electric telegraphy (*elektrīga tāļrakstīšana*), anchor (*enkurs*), pointer (*rādītājs*), marker (*zīmnesis*), marker (*zīmdevis*), printing machine (*drukājams aparāts*), bras roller (German: *Walze*) were used [2].

(a) (b) (c)

Figure 1. (a) The cover of the book *«Sēta, daba un pasaule»*; (b) the title page of the book «*Sēta, daba un pasaule» and* (c) description of the telegraph in the book (1860).

Difficulties associated with rendering various technical names into Latvian became apparent in the summer of 1871, when the Second Baltic Agricultural Exhibition was organized in Riga. In spite of the fact that at that time the purchase of houses had already started and a sufficiently wide stratum of Latvian landowners presenting a growing group of potential buyers was gradually formed, their needs were not catered in any way, because «the list or catalogue of exhibited items was not printed in Latvian, not even talking about the headlines in the exhibition and any announcements» [3]. Of course, the organizers of the exhibition could make excuses that they lacked dictionaries to look for Latvian terms, because the existing ones were outdated, but the new ones, both the so-called «*Krievu-latviešu-vācu vārdnīca*» (Russian-Latvian-German dictionary) by *Krišjānis Valdemārs* (1825–1891) [4] and Bishop Karl Christian Ulmann's (1793–1871) «*Lettisches Woerterbuch» (Latvian Dictionary;* see Fig. 2) were published only in 1872; however, it only confirmed the fact that terms were needed, but they were lacking.

In order to confirm the interest of Latvians in the agricultural exhibition and to emphasize the necessity to use the Latvian language at such events, on 10 June 1871, a public worker, businessman, journalist, and one of the founders of Riga Latvian Society (RLS) *Rihards Tomsons* (1834–1893) organized a meeting of farmers in the house of RLS as part of this exhibition. Four more reports on the topical issues in agricultural were delivered together with a general introduction about the items demonstrated at the exhibition («*Izstādīšana un sarunāšanās par tiem uz šīs izstādes redzamiem un priekš mājas saimniecības jo vērā liekamiem zemkopības rīkiem, mašīnām, lopiem u. t. p.»* (Exhibiting and Talking About Agricultural Tools, Machines, Livestock, etc. Demonstrated at this

Exhibition and Important for the Home Economy) [5]. It is important to emphasize that after the meeting, a brochure with the minutes of the meeting and the texts of the reports were sent to each participant.

Lettisches Wörterbuch.

Erster Theil.

Lettisch-deutsches Wörterbuch

von

Bischof Dr. Carl Christian Ulmann,

emeritirtem Vice-Präsidenten des evangelisch-luther. General-Consistoriums zu St. Petersburg u. s. w., u. s. w.

1945-3138.

Riga, 1872.

Verlag von H. Brutzer & Co.

Figure 2. The title page of «*Lettisches Woerterbuch*» (1872).

R. Tomsons can also be considered the author of the most comprehensive review of the basics of chemistry in the Latvian language at the time, which was published in many sequels in the 1875 and 1876 issues of the newspaper «*Darbs*» (Work) under the title «*Bezorganiska ķēmija*» (Inorganic Chemistry). In the introduction, before turning to specific questions, advice was given as per how to learn foreign terminology, «I would invite everyone to read the expressions in each issue one by one; because otherwise many terms and designations that will be used in the articles of the following issues would not be understood; I would ask you to take those new words into account and get used to using them» [6]. Such general terms were mentioned: magnifying glasses (*vairojamās glāzes*) or small glasses (*mazuma skatekļi*; magnifiers); isolators (*savrupinātāji*; insulators); conductors (*turpinātāji*; current conductors) and non-conductors (*neturpinātāji*; non-current conducting substances); weight (*atsvars*; molecular weight) and equivalent weight (*ekvivalentsvari*; equivalence); the method of resolution (*izšķiru ceļš*; *analītīga metode*; analytical method; German: *analytische Methode*) and the method of synthesis (*salaidu ceļš*; *sintetīga*

metode; synthetic method; German *syntetische Methode*); quality (*kādība*; *kvalitēte*; German: *Qualität*) and quantity (*cikkādība*; *kvantitete*; German: *Quantität*); heat gauge (*siltuma mērs*; *termometris*; thermometer); glass tube (*glāžu stobriņš*; *ierīte*; device); spirit of wine (*vīna gars*; German: *Weingeist*); pyrometer (*pirometrs*; *ugunsmērs*; fire gauge; German: *Pyrometer*), etc. [6, 7]. The paper was praised by an engineer-technologist, graduate (1913) of the Department of Chemistry of Riga Polytechnic Institute (RPI) *Augusts Ķešāns* (1881–1954) because it was the most comprehensive article on chemistry for a long time and «in terms of scientific terminology, it will have influenced other authors» [8].

Technical Terminology in Press Publications and Books

The development of technical terminology was hindered by the small number of publications because it was much easier to publish general articles on natural sciences, linguistics, or law in general newspapers and public literary magazines rather than technical papers that delved into the topicalities of a branch of engineering. However, as the number of Latvians who had studied engineering or other technical disciplines, as well as the number of urban residents, increased, the interest in these issues grew as well.

M. Skruzītis, who is better known as a folklorist, ethnographer, and researcher of the history of Selonia, can be mentioned as a vivid example. After studying architecture, chemistry and agriculture at RP, he worked in magazine «*Austrums*» and newspaper «*Tēvija*». Undeservedly forgotten, but important in the history of the Latvian terminology is his 1894 article «*Teknisku nosaukumu lietā*» (On the Case of Technical Names). After pointing out that most farmers no longer use fails (*spriguļi*), flax breaking machines and old ploughs (*veci arkli*), but rather more modern tools, he noted on the difficulty of writing about technical matters due to terminological ambiguities, «Each ... has noticed how many different names the writers use to designate a part of a tool. One calls the German «*Welle*» a shaft (*vārpsta*), another – axes (*asi*), the third – perhaps an axle-tree (*velbomis*; German: *Wellbaum*), and yet each of the two first names denotes something special» [9]. In his opinion, the terminology of these industries could be established in Latvian by collecting the names of parts of old and current tools, «I am sure that if you collect all the names of the parts of the loom (*stāvs*, *stelle*), the spinning-wheel (*vērpjamais ratiņš*) and other tools, you would already have a rich material for the designations of the parts of the current machines; by collecting popularly used designations for mounting the first crown of buildings (the first four logs) so that the corners of the

building come out at an angle of 90 degrees, making sure that one corner does not stand higher than the other three corners of the house (*pakši*), observing what names common people use when they arrange a canvas vertically or attach a handle to the scythe, for the most part, one could do without newly created or yet to be created words if someone wanted to write on physics or the division and measurement of the fields» [9]. Although it is clear that simply collecting the existing words would not be enough, it can be agreed that the availability of such material would allow the creators of terminology to use a larger pool of ideas for coining new words not relying solely on calquing and to more clearly distinguish the designations of related but not identical concepts.

After this publication, this matter was addressed in several issues of magazine «*Austrums*» published in 1894 and 1895 – both short notes by *M. Skruzītis* himself about some commonly used notations, which he created from the materials sent by the readers, and references by other authors, for example, a list of parts of the weaving loom compiled by writer, translator, and journalist *Fricis Mierkalns* (1873–1955) [10]. In the following years, news about the sent materials was periodically published, for example, a collection by a certain *Indriksons* from *Lazdona* about the construction of a spinning-wheel, weaving the canvas on the weaving loom, and the details of an old plough [11], and the names of agricultural tools from *Liezere* collected by *Aleksandrs Vanags* (1873–1919), a student of the Department of Engineering of RP [12]. In both cases, the sent collections were extensively commented on, supplemented with the titles that *M. Skruzītis* himself knew. It is difficult to determine whether these publications died out due to a low response from the interested parties, or because *M. Skruzītis* stopped cooperating with the journal at that time, focusing entirely on ethnographic issues.

Ansis Gulbis (1873–1936), who later became a book publisher, provided an analytical overview of the Latvian book publishing industry at the end of the 19th century. He focused specifically on what was still missing, «We do not have complete editions in any craft, especially those from which trained artisans could expand their knowledge in their craft. Carpenters, locksmiths, machine engineers and mechanics would benefit if they find some illustrated publications in German, which are also suitable for self-study... We are looking forward to the opening of the Latvian craft school, attention is still paid to the publication of textbooks for the new institution. These companies could invest in publishing books on machinery, electrical engineering, simple architecture, and art industry» [13]. It seems that the idea of a broader initiative for the dissemination of technical knowledge in the Latvian society with artisans and qualified workers as a special target group simultaneously occupied the minds of many specialists in technical fields, but the first

concrete steps to the practical solution of the matter were made by writer and publicist *Puriņu Klāvs*. In the history of the Latvian culture, he is better known as a not very successful author of plays and a long-time opponent of *Rainis* (real name *Jānis Pliekšāns*; 1865–1929) in the polemics between newspapers «*Dienas Lapa*» and the more conservative «*Baltijas Vēstnesis*» represented by him, while only a few know about his merits in the promotion of technical education and terminology. Although due to financial difficulties he did not obtain a diploma even after long studies at RP where he studied architecture (1878–1889; with interruptions), there is no doubt that he should be considered an expert in technical fields.

In accordance with the system of organized self-education popular at the time, he organized translation and adaptation of the study papers (German: *Unterrichtsbriefe fuer Selbststudium*) based on the principles of German professor O. Karnack (?–?; in German it was more often called the *Karnack-Hachfeld* system) into Latvian, so that Latvian workers and craftsmen could supplement their theoretical knowledge through self-study. Two series were launched – «*Būvskola*» (Building School; Fig. 3) and «*Mašīnu būvskola*» (Machine Building School), addressing compatriots employed in the construction industry and machine-building factories, respectively. In accordance with the original plan, small (up to 32 pages, average 24 pages) numbered textbooks were periodically published with an outline of the theoretical material, which depending on the topic was also supplemented by problems to be solved or detailed drawings presented on separate pages. The textbooks came out in a mixed order so that the subscriber of each series could learn several courses at the same time, but following a sequential progression from the simplest to the complex and from general to special. From 1901 to 1906, the total of 50 notebooks were published in the «*Būvskola*» series, and 49 – in the «*Mašīnu būvskola*» series. The series shared 34 textbooks, which dealt with general questions (arithmetic; draftsman's office knowledge and geometric drawing; algebra; planimetry and stereometry; projection theory and draftsman's geometry; mechanics). The following courses related to various construction professions were intended only for the readers of «*Būvskola*»: building structures (masonry work), wood working, carpentry, and internal construction and roofing (roofer's and tinsmith's work), for the readers of «*Mašīnu būvskolas*» – machine elements, machine drawing, and machine building materials.

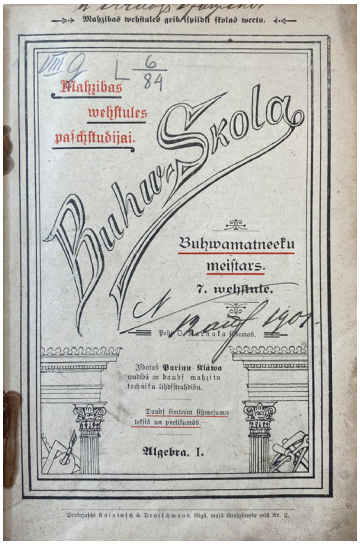


Figure 3. The cover of the 7th textbook «*Būvskola*». Algebra I (1901).

The financing for the initiative was initially provided by the donation of bricklayer master *Frīdrihs Zaļupe* (?–?), later – by architect *Konstantīns Pēkšēns* (1859–1928), a graduate (1885) of RP. Although the edition was not completed, apparently due to the lack of funds, it nevertheless stimulated discussions on terminology. The editor attracted industry specialists, former RP / RPI students, among them *Kārlis Graudiņš* (1863–1915, studied at the Department of Engineering; 1884–1890), *Jānis Pauļevskis* (also *Pavļevskis*; 1872–1922, studied at the Department of Engineering; 1892–1902), *Aleksandrs Vanags* (studied at the Department of Engineering; 1891–1893, 1894–1897, at the Department of Architecture; 1898), as well as a graduate (1895) of the Department of Mechanics *Didrihs Vidbergs* (also *Vidbergs-Piķieris*, 1864–?) and a graduate (1908) of the Department of Engineering of RPI *Jūlijs Kornets* (1878–1968). Architect *Augusts Malvess* (1878–1951), a graduate (1906) of the Department of Architecture of RPI, referred to the publication «*Būvskola*» in his «*Tehniskā vārdnīca celtniecībai*» (Technical Dictionary for Construction; 1931), making numerous references to *P. Kl.* (*Puriņu Klāvs*).

Riga Latvian Society and Latvian Technical Terminology

On 13 and 14 June 1901, *D. Vidbergs* reported on the technical literature written in Latvian in the last ten years at the summer meetings of the RLS Knowledge Committee. He emphasized that there were very few books of that kind (including eight on general and six on

special issues), however, in his opinion, a new era had begun when the letters of *Puriņu Klāvs* started to get published. The need for editions of that kind was dictated by life itself, because Latvians were no longer a plough nation, because «a whole fourth of Latvians live from trade and industry» [14]. Newspapers and books were already actively disseminating knowledge on agriculture, but the same should have been done «also in the industry and handicrafts, where Latvian masters do not dominate, but are simple workers», therefore «concern for the well-being of the people makes the promotion of industrial literature our duty» [15]. So far, very little effort had been invested into the matter because «the publication of technical books is connected with considerable financial expenses, while the number of buyers of such books is not very large, and therefore it is difficult to find investors for the publication of such books» [15].

After this report by *D. Vidbergs*, the idea matured that RLS should also become more actively involved in economic life because many Latvians living in the big city, both entrepreneurs and workers, were employed in the industry. This convincingly overturned the still widespread myth about Latvians as a «plough nation», because, according to historian *Kaspars Kļaviņš*, Latvia was one of the most industrialized regions of Europe at the beginning of the 20th century (the percentage of urban residents in Latvia was close to the highest indicator of that time – the one that characterized the structure of the Belgian society) [16]. However, the difference was that the growing stratum of modern agriculture society had both its own influential associations and stable press traditions started by writer, journalist *Juris Māters* (also *Māteru Juris*; 1845–1885) in «*Baltijas Zemkopis*» (1875–1885) and until World War I continued by magazine «*Zemkopis*» (started in 1893, published intermittently until 1940), whereas there were no such publications and associations for those employed in the industry.

The Industrial Department of RLS established in 1901 on the initiative of *N. Puriņš* tried to bridge that gap. One of the main tasks of this department was to «publish books to spread all kinds of theoretical and practical technical knowledge» [17]. The content of these books would be made up of the reports read at the department meetings, which would allow for the creation of thematic collections of articles in the future, with the hope that «students of our technical university, especially from the senior courses, would take an active part in the work of the Department and drawing up of the reports, as well as in compiling the collection of articles» [18]. It seemed that there was no need to worry about the potential target audience for the publications, because «a whole fourth of Latvians make a living from trade and industry» [14].

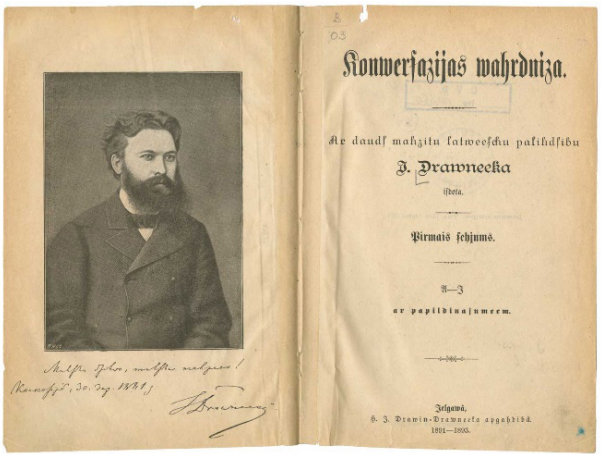
Industrial Department of Riga Latvian Society

At the meeting of the newly established Industrial Department on 9 October 1901, *A. Vanags* delivered a report on the Latvian terminology in technology, emphasizing that difficulties for the compilers of technical articles often arise because «the Latvian language often lacks technical names» [19]. However, the terms were actually there, they had only not been sufficiently recognized, «In practice, however, our craftsmen use technical names among themselves, but they are often not known to technical literary workers. Therefore, he invited the members of the Industrial Department to save and collect Latvian technical names as actively as possible to ensure that these names are further used in writing» [19]. This initiative was consistent with the idea previously popularized by *M. Skurzītis* that not everything needs to be created anew because appropriate designations often already exist in the vernacular; they simply need to be elevated to the status of terms.

However, due to unclear reasons, the activity of the Industrial Department of RLS did not turn out to be as successful as it was hoped (a more extensive study on this issue would certainly be useful), and during its activity in 1905, a single collection of articles was published. It comprised three articles: «*Par kartupeļu izstrādāšanu*» (On Harvesting Potatoes) by a graduate (1901) of the Department of Chemistry of RPI, engineer technologist *Spricis Paegle* (1876–1962), «*Dzelzsbetona konstrukcijas*» (Reinforced Concrete Constructions) by a former student of the Department of Engineering of RPI *J. Pauļevskis*, and «*Par ēku piepi*» (About Polypore on the Buildings) by *Pēteris Bērziņš* (1875–?), presumably a student of the Department of Engineering at the time, later a graduate of RPI (1908) [20]. All three worked in the Latvian Student Corporation «*Selonija*».

In the autumn of 1905, a decision was made to publish a special professional newspaper and to transform the Industrial Department of RLS into an independent Industrial Society. To implement these initiatives, a special action committee was established, which apart from an active architect *A. Vanags* also included a chemist, graduate (1893) of the Department of Chemistry of RP *Kārlis Roberts Vidiņš* (1865– 1909), and electrical engineer *K. Zutis* (?–?). It is clear that the establishment of an independent association would have allowed to conduct a more intense activity, because the status of the RLS branch, according to the Statutes, did not allow either to undertake financial obligations or to accumulate funds. In 1908, the Medical Department of RLS established in 1902 underwent a similar evolution and was transformed into an independent Latvian Medical Association [21]. The fact that it did not really work out for the Industrial Department may be explained by the

crisis of confidence in RLS in the Latvian society after the revolution of 1905 due to the conservative position taken by some leaders of the society, especially lawyer *Fricis Veinbergs* (1844–1924). For this reason, after 1906, a series of other Latvian public organizations began to form, which took over the earlier functions of RLS at least in some areas.


Konwerſazijas wahrdniza.

Ar daudſ mahzitu latweeſchu palihdſibu

J. Dravneeka

iſdota.

Pirmais ſehjums.

A—Z

ar papildinajumeem.

Jelgawâ,
J. J. Dravin-Dravneeka apgahdibâ.
1891—1893.

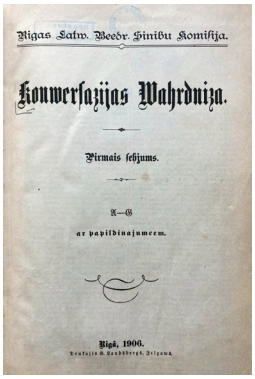
Figure 4. Title page of «*Konversācijas vārdnīcas*» by *J. Dravnieks* (1893).

However, there was one important RLS initiative in the area of terminology development, which successfully continued and allowed uniting Latvians of various political persuasion, namely, «*Konversācijas vārdnīca*» (Conversational Dictionary) of the RLS Knowledge Committee, which began in 1902. The first attempt to present an encyclopaedic dictionary to the Latvian society was connected with the name of lexicographer and book publisher *Jēkabs Dravnieks* (also *Draviņ-Dravnieks*; 1858–1927). His publication with a self-confident title on the title page «*Konversācijas vārdnīca. Ar daudz mācītu latviešu palīdzību H. J. Dravnieka izdot*a» (Conversational Dictionary. Published by *H. J. Dravnieks* with the Help of Many Learned Latvians) (Fig. 4) was launched on 1 February 1891, involving as many specialists as possible, including the already mentioned *M. Skruzītis* (theatre matters), agronomist *Jānis Bergs* (1863–1927), editor and statistician *K. Graudiņš*, who studied engineering at RP, and *Mārtiņš Bīmanis* (1864–1946), a student of the Department of Engineering of RP, later graduate (1891) and Rector of the University of Latvia (UL). Although this work had not been extensively analysed from the point of view of the history of technology, the short pages and numerous explanations of foreign words found in it definitely gave an impetus to the development of the technical language as well. When due to the insolvency of *J. Dravnieks*, the publication of the «*Konversācijas vārdnīca*» stopped in 1898 after the

publication of the 27th issue (a total of 986 pages were published until the beginning of the entry «*Kristjans*», or no more than two-fifths of the intended volume), there were no more doubts that such an edition was necessary, it was rather discussed how to do it better [22].

Discussing the role of such a dictionary, the aforementioned *K. Graudiņš* emphasized that, in addition to the usual encyclopaedia, specific exploratory function and detailed information about local geography, nature, and society, it had to play another important role in the Latvian society, because «various types of knowledge are presented in Latvian but not for the sake of this knowledge itself but for the sake of the language (the so-called technical terms), where this same knowledge has not been completely ignored» [23]. He elaborated on the idea of popularizing the terms in the encyclopaedia, «... Many sciences and arts are only now beginning to be practiced more in the Latvian language and the necessary terms have just been coined. But only specialists themselves know these terms and even they sometimes lack this knowledge, especially new beginners. For this reason, it is necessary to collect them in a handbook not only for the specialists themselves but also for the general readers as well». From the point of view of the development of terminology, it is not important whether the classifications were created independently or were translated from other languages with amendments [23].

The decision to publish a new encyclopaedia was made by the Knowledge Committee of RLS on 1 November 1902, one year was devoted to the preparatory work [24]. The cultural goals of the dictionary and its need were described by pedagogue, poet, literary critic, and literary historian *Teodors Zeiferts* (1865–1929), «In his daily life, a Latvian stumbles upon many objects and phenomena that are not only interesting but clearly necessary to understand. ... He needs scientific advice if he wants to act conscientiously. ... It is important to have a correct understanding of every matter that one comes across» [25].


Rigas Latw. Beedr. Sinibu Komisija.

Konwersazijas Wahrdniza.

Pirmais sehjums.

A—G

ar papildinajumeem.

Rigā, 1906.

Figure 5. Title page of «*Konversācijas vārdnīca*» (Conversational Dictionary). Volume 1 with additions (1906).

RLS planned to start full-scale work on the conversational dictionary in 1904, however, the Action Committee wanted the first book published already at the end of 1903. In mid-September 1903, heads of departments – former RP / RPI students – were named, in agriculture – a graduate (1890) of the Department of Agriculture of RP, agronomist *Jānis Mazvērsīts* (1866–1943), in engineering affairs – a graduate (1898) of the Department of Engineering of RPI, engineer *Mārtiņš Robs* (1874–1947), in commerce – a graduate (1896) of Department of Commerce of RPI, an RPI lecturer *Ernests Birkhāns* (1872–1941), as well as the «polytechnicians» already mentioned in the article: in chemistry – *K. R. Vidiņš*; in mechanical engineering – *D. Vidbergs*; in construction – *J. Pauļevskis* [26]. Not all of the mentioned industry specialists became long-term contributors to the dictionary, so it is important to mention a number of other RP / RPI students, for example: *Jānis Asars* (1877–1908; painting, chemistry, non-Latvian writing); *K. Graudiņš* (construction); engineer *Jūlijs Benšons* (1873–1949; mathematics and technology); a student of the Department of Engineering of RPI *Jānis Beitāns* (1882–1954; technology), as well as RP / RPI graduates: theologian and promoter of commercial education, a graduate (1904) of the Department of Commerce of RPI *Vilis Olavs* (until 1890 – *Plute*; 1867–1917; history); a graduate (1903) of the Department of Commerce of RPI *Jānis Ozols* (1878–1968; trade); a graduate (1908) of the Department of Architecture of RPI architect *Mārtiņš Nukša* (1878–1942; architecture and painting); a graduate (1911) of the Department of Commerce of RPI, economist *Pauls Ašmanis* (1881–1952; trade); a graduate (1913) of the Department of Chemistry of RPI *Augustus Ķešāns* (1881–1954; chemistry); a graduate (1908) of the Department of Engineering of RPI, engineer *Jūlijs Kornets* (1878–1968; technology), and a graduate (1906) of the Department of Architecture of RPI *A. Malvess* (architecture). Having gained experience, several of them later, in 1919, became involved in the work of the Terminology Committee of the Ministry of Education, while Professor *A. Ķešāns* even ensured the spiritual succession between the creators of the conversational dictionary of RLS and the Terminology Committee of the Latvian Academy of Sciences. In 1946, he became the first head of the Sub-Committee for Technical Sciences.

Although the compilation of the conversational dictionary took a long time due to the turnover of collaborators and World War I and the subsequent War of Independence, with the support of the Culture Fund, the work was brought to an end in 1921, requiring 18 years instead of the planned six years (the volume had also increased from 72 to 99 notebooks) [27]. In addition, it is important that this completed conversational dictionary became the most authoritative source of terms

that could be used as a reference by both employees working in the state administration and by the lecturers of the newly founded UL.

Other Organizations and their Contribution to the Latvian Technical Terminology

After the revolution of 1905, numerous other Latvian public organizations were established, uniting the part of the society that was not satisfied with the conservative position of Riga Latvian Society. One of such organizations was the Baltic Technical Society founded in 1906, which set the dissemination of technical knowledge and promotion of industry as one of its goals [28]. The word «Baltic» was included in the name of the Society due to the circumstances of the time, because the Tsar's authorities would not have allowed the use of the word «Latvia» in the same way as it was with the current national anthem, which at that time was allowed to be sung with the words «God bless the Baltics». This Society organized three-year evening courses for craftsmen, where «they learned machine drawing, calculation, and gained knowledge about sewing machines, motors, electricity – thereby adapting to the requirements of the local industry and crafts» [28]. The courses were held in Latvian, so the Society's interest in developing terminology was understandable. The compilation of terms was undertaken by engineer *Kārlis Marovskis* (from 1926 – *Brežgis*; 1885–1958), who also performed the duties of the Society librarian.

On 29 February 1908, the Latvian Education Society was founded, its purpose was to «take care of the education and cultural development of the Latvian people, teaching and educating the youth and disseminating useful knowledge and skills across the nation» [29]. In this Society, the Terminology Committee was established already before World War I, it was led by the lawyer *Alfrēds Čikste* (1871–1958) [30]. Unfortunately, detailed information about the work of this committee before World War I is missing, and its existence was not reflected in the annual activity reports for the period from 1908 to 1914, which could testify to its informal nature. It can be ascertained from circumstantial sources that in addition to *A. Čikste*, RPI graduates, engineers *J. Kornets* and *Alfrēds Razums* (1880–1929; graduated (1909) from the Department of Engineering), architect *A. Vanags* also worked there [31].

It is precisely the lack of terms that often prevented many potential authors from writing in Latvian about various technical innovations in conditions where «each compiler and translator of scientific books creates scientific names at his own discretion, in this respect great

misunderstandings arise» [32]. The efforts of various societies to promote the writing and translation of scientific books and school textbooks by granting various awards were welcomed, but there was a special need for a German-Russian-Latvian scientific and technical dictionary. «Such a dictionary would be of great importance for every intelligent Latvian who would like to know how to write or translate. In this respect, such a dictionary can play a major role in promoting the Latvian culture, but it is hard to believe that we Latvians will soon have such a dictionary» [32].

When the voluminous dictionary of *J. Dravnieks* came out in 1910, 30 years after the German-Latvian dictionary compiled by K. C. Ullmann and *Gustavs Braže* (1802–1883), a new wave of discussions about the lack of terms in the Latvian language started in the press. Responding to criticism, *J. Dravnieks* emphasized that he used both words used in the conversational dictionary and the opportunity to directly ask for advice from many of its collaborators. In the preface of the dictionary, *J. Dravnieks* paid special tribute to *A. Vanags*, whom he mentioned among the consultants who helped him the most. Describing the difficulties he faced, he noted, «... A person who has not been involved in compiling a dictionary has no idea how many terms we still lack! It wouldn't be difficult to come up with words, but the task of the dictionary, as *K. Mīlenbahs* correctly explained to me, is to record words that are used in popular speech or literature, but not to give invented words that have not yet been used anywhere. So, improvement in this respect can only be expected when we have more scientific literature» [33]. The Russian-Latvian dictionary by *J. Dravnieks*, which was published in 1913, played a similar role.

The need for a comprehensively developed, harmonized and nuanced terminology of various branches was seen as an important prerequisite for the comprehensive cultural development of the nation. An entry in Rainis' diary on 2 February 1912 is significant in this respect. Along with reflecting on the idea of a Latvian university abroad, he noted that a scientific journal and «learned societies for the establishment of terminology» were also necessary for the successful development of the nation [34].

Now it is time to focus on a lexicographic edition («*Latviešu-vācu vārdnīca līdz ar svešvārdu paskaidrojumiem sastādīta no R. P. I. studentu pulciņa*» (Latvian-German Dictionary with Explanations of Foreign Words Compiled by the R. P. I. Student Group), Rīga, *L. P. Vītola apgādībā*, 1914, 288 pages, Fig. 6), which, very likely, is incorrectly associated with RPI students. It must be said that very scanty information can be found about this edition both in reviews of the history of Latvian lexicography and in the press in general, and the author of the article has not been able

to find any detailed information about the existence of such a possible group, not to mention its composition. The publisher does not provide such information either, stating in the preface that the need for such a dictionary was great, because the last dictionary with such a language direction was published in 1879, therefore it was considered very outdated [35].

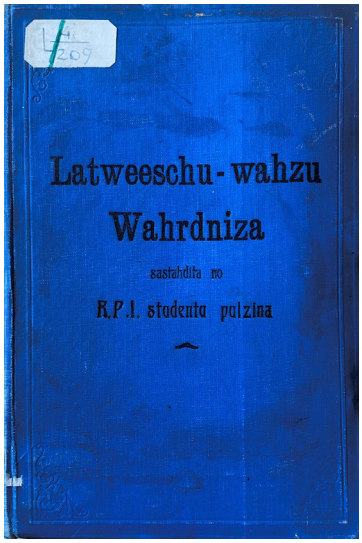


Figure 6. The cover of the book «*Latviešu-vācu vārdnīca līdz ar svešvārdu paskaidrojumiem sastādīta no R. P. I. studentu pulciņa*» (1914).

This edition may be considered a mixed type dictionary, because some of the Latvian words (especially loanwords) are also given an explanation in Latvian without providing a German equivalent, for example «subscription (*abonoments*) – advance payment for newspapers, lunches, theatre performances, etc. das Abonnement; swindler (*afērists*)– adventurer, dubious shopkeeper, fraud, der Affairist; atom (*atoms*) – a basic substance that is so tiny that it cannot be divided any more, der Atom».

A review and at the same time a debunking report about this dictionary was given by a competent evaluator who signed with the initials J. V. At the beginning of the review, without denying the relevance of such a dictionary, he expressed his surprise at the appearance of this edition, because it was known that «none of our linguists is working on composition of any practical dictionary » [36]. In addition, the surprise was said to be twofold: firstly, because it was published by *Vītols*, who was said to have a money-grabbing reputation in the book circles («who, with his Lautenfelds or Rautenfelds novels, excited all the broodies of Riga equally well»), but, secondly, that the creators of the dictionary were students, because «it can't be the work of one day, even one year» and «it was done quietly by the students of Riga Polytechnicum», even

though it does not have a faculty of linguistics [36]. Analysing the choice of words in more detail (it lacks, for example, scene, painting, collision, inclination, relationship, animal husbandry, household, economy, folk school, threshing machine, spring, letter), the reviewer pointed out that the students would have had to «seriously protest against the nefarious use of their name and desecration of their honour» [36]. There seems to be no reason to consider such an assessment too harsh.

Conclusions

Arvīds Lepiks (1889–1965), a graduate (1913) of Department of Mechanics of RPI, specialist in agricultural machinery, in his report at the First Conference of Latvian Engineers and Technicians in 1921 gave an apt assessment of the achievements of technical specialists in the field of terminology, «In the past, political dependence, narrowing the possibilities of using the Latvian language, suppressed every need for special technical Latvian literature, but then both works and translations appeared, for example «*Mašīnbūvskola*» and «*Būvskola*», which remained uncontested in the current years in terms of their scope. At that time, the translator of every technical or generally special work was at the same time the founder of technical terminology, because this field was completely uncultivated, and everyone who wanted to provide people with technical work had to be a pioneer of terminology» [37].

In general, it can be stated that, taking into account the limitations of its use, the Latvian technical terminology was sufficiently formed and stabilized, so that after the establishment of an independent state, it could start to function successfully in a short time in record keeping and in education becoming the language of instruction both at the technical faculties of the UL and in secondary technical education. This was ensured both by the contribution made by technical specialists of the previous generations and by a large number of Latvian engineers from various fields. The majority of these engineers were RP / RPI students or graduates who also worked at RLS [38].

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Figure 1. Latvijas Nacionālā bibliotēka (turpmāk – LNB).

Figure 2. LNB.

Figure 3. LNB.

Figure 4. LNB.

Figure 5. LNB.

Figure 6. LNB.

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Māris Baltiņš

Latviešu tehniskās inteliģences veikums terminoloģijas jomā līdz Latvijas Republikas izveidei

Rakstā apcerēta tehniskās terminoloģijas attīstība latviešu valodā līdz neatkarīgās valsts – Latvijas Republikas – proklamēšanai 1918. gadā. Par pirmajiem tehniskās terminoloģijas veidotājiem kļuva Tautiskās atmodas darbinieki, apcerot tolaik aktuālus tehniskus jaunievedumus (piemēram, Juris Alunāns (1832–1864) par telegrāfu 1860. gadā). Pārliecinoši vajadzības pēc tehniskiem terminiem kļuva redzamas pēc Otrās Baltijas lauksaimniecības izstādes, kad radās grūtības latviešu valodā aprakstīt izstādāmos eksponātus. Būtiski soļi terminoloģijas izveidē bija Rīgas Politehnikuma (RP) studentu Mikus Skruzīša (arī Skruzīšu Mikus; 1861–1905) iniciatīvai vākt tautā lietotos dažādu vienkāršu ierīču detaļu nosaukumus un Nikolaja Puriņa (arī Puriņu Klāvs; 1858–1935) ierosmei izdot pašizglītības līdzekļus celtniecībā («Būvskola») un mašīnbūvē («Mašīnu būvskola»). Pieaugot rūpniecībā nodarbināto latviešu īpatsvaram un tehnisko izglītību ieguvušo personu skaitam, palielinājās nepieciešamība veidot biedrības, kas rūpētos gan par tehnisko izglītību latviešu valodā, gan par nepieciešamajiem terminiem. Īpaši izceļama Baltijas Tehniskā biedrība (1906) un Latviešu izglītības biedrība (1908), kas izveidoja savas terminoloģijas komisijas. Būtiska nozīme terminoloģijas sistematizēšanai bija arī enciklopēdiskajām vārdnīcām, it īpaši Rīgas Latviešu biedrības Zinību komisijas izdotajai konversācijas vārdnīcai (1903–1921). Pētījums veikts Latvijas Zinātnes padomes valsts pētījumu programmas projektā «Mūsdienu latviešu valodas lietojums un attīstība» (Nr. VPP-LETONIKA-2022/1-0001).

Atslēgvārdi: latviešu valoda, tehniskā terminoloģija, Tautiskā atmoda, Rīgas Politehniskais institūts, konversācijas vārdnīcas.

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1862
RIGA TECHNICAL UNIVERSITY

PEDAGOGICAL ACTIVITIES OF GRADUATE (1916) OF RIGA POLYTECHNIC INSTITUTE JĀNIS RUPAIS (1889–1974) IN LATVIA

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Summary. The research on *Jānis Rupais* (1889–1974), engineer, pedagogue, and graduate of the Department of Chemistry (1916) of Riga Polytechnic Institute (RPI), was conducted using the documents of the National Archives of Latvia, the Latvian State Historical Archive and the Latvian State Archives, as well as *Gulbene* Municipality Museum of History and Art. The article about the well-known pedagogue in Latvia in the 20th century – the long-term and only Principal of *Gulbene* State Commercial School and Vocational School (1926–1944) *J. Rupais* also reflects on his activities after World War II at Riga Industrial Polytechnicum. It describes both the educational institutions, the principal and pedagogue *J. Rupais* and his work methods, and the contribution he made to *Gulbene* and Latvia.

Keywords: *Jānis Rupais*, Riga Polytechnic Institute, Gulbene State Commercial School and Vocational School, Riga Polytechnicum.

Family of *Jānis Rupais*

Jānis Rupais was born on 5 May 1889 in *Vecpiebalga* Parish to the family of farmer *Jānis Rupais* (1839–1923) and his wife *Maja Rupais* (b. *Gūta*; 1856–1944). The father came from the house of *Jēkuļi*, but later moved with his family to *Svīkulti*. It is known that his mother – *M. Rupais* – lived

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there until the end of her life in 1944 [1]. *Jānis* was the second child in the family. He had sisters *Marta Rupā* (1888–1958) and *Olga Zālīte* (b. *Rupā*; 1897–1957), and brother *Osvalds Rupais* (1896–1975) [2]. In the autumn of 1918, *Osvalds* entered the Department of Engineering of the Baltic Technical Higher School, which continued the work of RPI (1918–1919). Due to a change in power, this higher school was closed in January 1919, and the Latvian Higher School (LHS) was established in its place in February. *O. Rupais* continued his studies there from February to May 1919 [3]. After that, *Osvalds* intermittently studied (1920–1931) at the University of Latvia (UL; until 1923 – Latvian Higher School) at the Department of Cultural Engineering of the Faculty of Engineering, the Department of Forestry at the Faculty of Agriculture, and the Department of National Economy at the Faculty of National Economics and Law, but he did not obtain a university diploma [4]. Parents wanted their sons to get a good education, it was considered a great value in the family. The *Rupais* family developed the desire to learn thanks to the contribution made by the Moravian Church in *Vidzeme* to the education and upbringing of the people since the 18th century.

The wives of both sons were also educated and received higher education. *Osvalds'* wife *Marta Rupā* (b. *Krieviņa*; 1900–1989) also graduated from the UL (1940) and worked as a Latvian language teacher in Riga schools [5]. The wife of *Jānis Rupais*, *Elizabete Rupā* (b. *Grunte*; 1893–1987), graduated from the Faculty of Chemistry of the UL (1923) [6] and worked there as an assistant (1923–1925) [7]. She later worked as a teacher of physics and chemistry at *Valmiera* Commercial School, after World War II – at Riga Industrial Polytechnicum (since 1991 – Riga State Technical School), as well as a senior research associate at the Institute of Forestry Problems of the Academy of Sciences of the Latvian Soviet Socialist Republic. In 1950, she obtained the degree of a candidate of technical sciences, defending her dissertation «*Egļu kolofonija derivati un to raksturojums*» (Spruce Rosin Derivatives and their Characteristics) [8]. One of the opponents of the thesis was Professor, Academician *Arvīds Kalniņš* (1894–1981) – a graduate (1916) of the Department of Chemistry of RPI and a fellow student of *J. Rupais*.

Studies and Fellow Students at Riga Polytechnic Institute and the First Working Years

In 1909, *J. Rupais* graduated from the supplementary class of Riga City Real School and then studied for a year at the Imperial Moscow Technical School in Russia. In September 1910, *J. Rupais* started studying at the Department of Chemistry of RPI. Studies had to be paid for, and

on 31 August 1912, *J. Rupais* was expelled from the institute for non-payment of study fees. It must be assumed that the parents had no money and the young man worked for a year to continue his studies in September 1913 [9; p. 126]. During World War I, in the summer of 1915, in connection with the approach of the front line, RPI was evacuated to Moscow. A large number of lecturers and students were also evacuated, including *J. Rupais*. In May 1916, he graduated from RPI with honours, obtaining a diploma of an engineering technologist. Several Latvians started their studies at the Department of Chemistry at the same time with him, for example, *Gustavs Vanags* (1891–1965) [9; p. 96], who graduated from LHS (1921) and became a well-known organic chemist, professor at UL and RPI, academician. *G. Vanags* shared a close friendship with his fellow student *Jānis Dāvis* (1891–1965), who completed his studies at the UL (1926) and worked as a sub-assistant (1922–1927) at the Faculty of Chemistry of the UL [10]. Although *J. Dāvis* lived in Canada at the end of his life, whereas *G. Vanags* lived in Latvia, they corresponded and maintained friendly relations. The passing away of *G. Vanags* is said to have affected the health of *J. Dāvis*, his life also ended after a few months [11]. Both passed away in 1965. In 1965, another Latvian fellow student passed away – *Ernests Kreišmanis* (1890–1965), who received a diploma of engineer-technologist in 1915 and entered Alexander Military School in Moscow. He took part in World War I, joined the Latvian army in 1918, took part in the Latvian War of Independence, and was awarded the Order of *Lāčplēsis* (1921) [12]. *Visvaldis Dūms* (1892–1940), who studied chemistry at both RPI and UL, also had a similar life course – he served in both the Russian and Latvian armies and was awarded the Order of *Lāčplēsis* (1920) [13]. Fellow student, a graduate (1915) of RPI *Aleksandrs Plūme* (1890–1986) connected his life with railways. Citizen of *Tukums* City *Roberts Zēbergs* (1889–1938) [14] became a customs official and graduated from RPI a year later than *J. Rupais* – in 1917. In 1915, *Eduards Dundurs* (1891–1935), who worked in factories in Russia for several years, stopped his studies. However, he did not finish his studies when he returned to Latvia. He was Vice-Director (1921–1923) and Director (1923–1935) of the Department of Customs [15]. *Viktors Liniņš* (1891–1968) also started studying chemistry in 1910, after a year he transferred to the Department of Agriculture and graduated from the Faculty of Agriculture of the UL (1925). *V. Liniņš*, like *J. Rupais*, was a well-known pedagogue during the interwar period. He was awarded the Order of the Three Stars of Class IV in 1933, and worked as a teacher in *Smiltene*, *Priekuļi*, and *Mežotne* [16].

Among *J. Rupais'* fellow students, there were also foreigners. Lev Sitin (*Лев Сытин*; 1891–1973) was one of them, he studied at RPI for only one year and gained recognition as a participant in shooting at V Games

of the Olympiad in Stockholm (1912). His life was mainly related to Moscow, where he worked as a photographer [17]. Mikhail Reshetnikov (*Михаил Решетников*; 1878–1937) was born in Perm Governorate of Russia and studied in Riga until World War I. In the 1930s, he was the Technical Director and Chief Engineer of the factory «Altmetalzavod» (*Алтметаллзавод*). He became a victim of the Great Terror in Russia – in 1937, he was executed as an «enemy of the people» [18]. Other fellow students should also be mentioned: a Jew – *Leibs Vulfsons* (1891–?), who completed his studies at the UL (1923), a Polish, a graduate (1917) of RPI *Eduard Jelowicki* (1889–after 1929), Baltic Germans Richard Raasche (1889–?), a graduate (1917) of RPI, and Max Ostwald (1891–?), who as a German citizen was conscripted into military service for a year in 1911. He was the son of Gottfried Ostwald (1855–1918), brother of Willhelm Ostwald (1853–1932), former Professor (1881–1887) of Riga Polytechnicum (RP) and Nobel Prize laureate (1909). His father, G. Ostwald, had entered RP in 1875 to study commercial sciences, but he was drafted into the German military service after a few months and did not resume his studies after a year. The two aforementioned students of the Department of Chemistry – Baltic Germans M. Ostwald and R. Raasche – moved to Germany in 1939.

Although the personal student file of *J. Rupais* has not been preserved in the Latvian State Historical Archive of the National Archives of Latvia, the study book of his fellow student *E. Dundurs* has been preserved [19]. It is signed by a graduate (1889) of RP, Dean of the Department of Chemistry of RPI (1906–1917), Professor (1894), multiple Nobel Prize candidate *Pauls Valdens* (1863–1957), who taught chemistry, as well as Adjunct Professor Hermann Pflaum (1862–1912), who taught physics, graduate (1903) of RPI, Assistant Professor, architect Hermann Seuberlich (1878–1938), lecturer of architectural forms, Professor Bruno Karl Doss (1861–1919), lecturer of geology, mineralogy, etc. Knowledge was assessed on a five-grade scale, allowing for such grades as 3 ½ and 4 ½.

After graduating from RPI, *J. Rupais* lived and worked in Russia. From 1 February 1916 to 30 September 1917, he worked at a factory of asphyxiating and explosive substances in Moscow. Then he moved to Petersburg (at present – St. Petersburg), where from 1 October 1917 to 15 September 1919, he worked at an oil refining factory, from 16 September 1919 to 7 September 1921 – at the company «Njeftegaz» (*Нефтегаз*), the oil, gas, and oxygen factory. After returning to Latvia, from 1 October 1921 to 30 November 1924, *J. Rupais* worked in the industrial enterprises of the trading and industrial joint-stock company «*Nafta*» in Riga and *Daugavpils*. This was followed by work in the salt processing company of the trading and industrial joint-stock company

«*Baltujūra*» in *Liepāja* from 1 December 1924 to 14 March 1925. Later, he worked as a teacher for more than a quarter of a century – first from 15 March 1925 to 31 August 1926 at *Cēsis* State Vocational School, then in *Gulbene* and Riga [20].

Operation of *Gulbene* State Commercial School and Vocational School (1926–1944)

Gulbene developed rapidly in the first half of the 20th century. The narrow-gauge railway line *Pļaviņas–Gulbene–Alūksne–Valka* was built here; in 1916, it was converted to broad-gauge, and a new line was built: *Gulbene–Ieriķi*. The population also increased, and in 1928, *Gulbene*, which until then was a densely populated place with small village rights called *Vecgulbene*, got city rights.

As the population grew, it became necessary to build new public buildings, including various educational institutions. In the summer of 1925, the Director of the Board of Schools *R. Liepiņš*, in consultation with representatives of the local and county municipalities, agreed to open a vocational school in *Vecgulbene*, which would be in the interests of the workers of the *Vecgulbene* railway junction [21]. In 1926, *Vecgulbene* Vocational School was opened, but it did not have suitable premises and it operated on the premises of the old pub. In the beginning, it was a three-year vocational school with the Departments of Commerce and Mechanics. In the following school year, the Department of Commerce was transformed into a Commercial School, which was combined with the Department of Mechanics of the vocational school. Thus, in 1928, *Vecgulbene* (after acquiring city rights – *Gulbene*) State Commercial School and Vocational School with the status of a secondary school began its work. At the end of 1926, the government decided to allocate 160 000 lats for the construction of a special building [22]. In 1926, *J. Rupais* became the Principal of the newly founded *Gulbene* (*Vecgulbene* (1926–1928)) vocational school. On 10 September 1927, the foundation stone was laid for the new school building. The Minister of Education *Jānis Pliekšāns* (*Rainis*; 1865–1929), the Director of the Board of Schools of the Ministry of Education *Reinis Liepiņš* (1885–1949), the Director of Vocational Schools *Indriķis Zubāns* (1884–1961) and the designer of the new construction of the vocational school *Indriķis Blankenburgs* (1887–1944) came to the celebration. [23]. Two of the guests were RPI graduates – *Indriķis Zubāns*, a graduate (1915) of the Department of Engineering, and *Indriķis Blankenburgs*, a graduate (1913) of the Department of Architecture. Designed by *I. Blankenburgs*, the building of *Gulbene* State Commercial

School and Vocational School at 10 *Skolas* Street (at present – *Gulbene* County State Gymnasium) was built in 1928 [24].

Figure 1. *Gulbene* State Commercial School and Vocational School (1920s).

Gulbene State Commercial School and Vocational School had a good reputation because it trained good specialists in their profession. The Commercial School trained accounting and office workers, trade and cooperation workers, and its graduates had the right to study at the UL and other universities. The Department of Mechanics of the Vocational School educated and trained «agricultural machine and general machine building mechanics, locksmiths, turners, blacksmiths and horse farriers who can operate and repair various agricultural machines and work tools, as well as make simple agricultural machines and work tools, set up forges and saddle horses» [25]. Studies at the Commercial School lasted for five years, at a Vocational School – four years in the field of mechanics, locksmith, blacksmith; foundry – three years.

In the school year 1936/1937, for example, 262 pupils studied at *Gulbene* State Commercial School and Vocational School: 153 in a Commercial School and 109 in a Vocational School. By the spring of 1937, 308 young people had graduated from it: 153 from the Commercial School and 155 from the Vocational School. The majority worked in their profession, while some studied at the UL [26]. After graduating from *Gulbene* State Commercial School and Vocational School, young people got a job. Successful and low-income pupils were exempted from tuition fees, which was very relevant and important for many families. The school had a brass band and a choir, plays were staged, sports events and balls were held. In the 1930s, gliding developed in Latvia, and under the guidance of the teacher, engineer *Edgars Riekstiņš* (1904–?), pupils of the Vocational School built gliders, and several of them became fond of

this sport. The pupils of *Gulbene* State Commercial School and Vocational School were members of *Gulbene* Branch of the Latvian Aero Club and were also involved in the construction of a sailplane [27]. Teachers also were members of the Aero Club – Principal *J. Rupais* and *E. Riekstiņš* [28].

Figure 2. A group of pupils of *Gulbene* State Commercial School and Vocational School (standing from the left, the Acting Chairman of the Board of the *Gulbene* Branch of the Latvian Aero Club *Ernests Stambergs* (1884–1943) and Chief Engineer, Teacher *Jānis Turaids* (1902–1980)), at the glider (1930s).

The flag celebration ceremony of *Gulbene* State Commercial School and Vocational School took place on 7 May 1939 [29]. The flag was consecrated and presented to Principal *K. Rupais*. It was made according to the drawing of *Vecgulbene*-born artist *Jūlijs Madernieks* (1870–1955), and the motto «Clear heart, good work» was written on it. The flag was donated by the municipality and school graduates of *Gulbene* City and surrounding parishes [30].

Figure 3. Principal *J. Rupais* presents the school flag to one of the pupils (1939).

Graduations were a festive and joyful event for both pupils and teachers, and there was always a photo shoot. On 15 June 1940, the last graduation of Latvia's first independent state was attended by a graduate (1910) of the Department of Chemistry of RPI, Professor *Pēteris Nomals* (1876–1949) [31], representing the government. The graduates of the school were presented with a gift from the government – the novel «*Kvēlošā lokā*» (In a Glowing Arch) by the Latvian writer *Anna Brigadere*. In a sense, this novel had become a chronicle of the creation of Latvia in the 20th century, and soon after the 1940 graduation from the Commercial School and Vocational School, the Soviet Government included it in the list of prohibited literature for a long time. The period of Soviet occupation had begun, and in the school year 1940/1941, the school, like other commercial schools, was renamed the economic technical school. During World War II, it regained its historical name and, for example, in June 1942, 32 pupils graduated from *Gulbene* Commercial School, 20 – from the Vocational School [32]. During World War II, the school had difficulties with a boarding school, but the city authorities found other premises, and studies continued. In the school year 1943/1944, there were 195 pupils in the Commercial School and 155 – in the Vocational School [33]. It was the last school year – *Gulbene* State Commercial School and Vocational School existed until the summer of 1944. It should be noted that some graduates continued to study at universities.

Pedagogical Activity of *J. Rupais* in *Gulbene* and his Colleagues

J. Rupais was the first and only Principal of *Gulbene* State Commercial School and Vocational School and worked in this position for 18 years. In *Gulbene*, he was known and respected not only by his own pupils but also by the residents of the city and its surroundings. The pupils considered the stately, always calm, sparing words and careful in his speech Principal *J. Rupais* to be the soul of the school. There was order in the school, there was harmony among the teachers and pupils. No one was expelled from the school or severely punished, although sometimes pupils committed misdeeds [34; p. 34]. *J. Rupais* organized question-and-answer evenings and participated in them himself, discussing various topics. He was not able to say a harsher word and did not show anger. However, once «his eyes lit up, and in a raised voice he said, «Do not lie!» There was a deep silence in the classroom, but he had caught one of us in a lie. He did not tolerate lies, and he tried to erase this negative characteristic of human nature from our souls. The Principal was not our

judge, but the most understanding and helpful person in the true sense of the word» [34; pp. 105–106]. It was an exceptional case because *J. Rupais* was balanced, kind, calm, and humane – that is how his former pupils described him.

J. Rupais was a teacher in addition to the position of the Principal, he taught organic and inorganic chemistry and supervised the practical work in it, physics, commodity studies, for one year – also algebra, which was not *J. Rupais'* passion in the assessment of the pupil *Jānis Kubulnieks* (1921–2006). However, he is said to have taught the knowledge of commodity studies in an interesting way, making the learning of this subject easy and memorable [34; p. 88]. *J. Kubulnieks* felt the sensitivity and goodness of the teacher in the 3rd grade when he got sick and was only at school for three weeks in the second trimester. The long absence did not contribute to success, and he failed in algebra and accounting. Unsuccessful pupils had to pay for tuition, so for *J. Kubulnieks*, as the son of poor parents, it would have meant quitting his studies. The Principal decided that the pupil should pay only for the time he was at school, that is, for three weeks. The Principal encouraged *J. Kubulnieks*, saying that he would be successful already in the third trimester [34; p. 67]. *J. Rupais* personality and pedagogical activities were a good example for *J. Kubulnieks* – he became a teacher in *Lejasciems*, and was a director and actor in the amateur theatre.

Figure 4. Graduation, fourth from the left in the first row – *J. Rupais* (c. 1932).

In 1933, *J. Rupais* was awarded the Order of the Three Stars of Class IV for the organization, successful and energetic management of *Gulbene* State Commercial School and Vocational School [20]. *J. Rupais'* colleague, graduate (1915) of the Department of Chemistry of RPI *Pēteris Driķis* (1887–?) also received the state award – Cross of Recognition of Class V – [35]. *P. Driķis* participated in the Latvian War of Independence;

he was involved in the life of *Gulbene* City – he was a candidate for the city council elections in 1931 [36], after World War II he was the Head of Studies of *Gulbene* Secondary School No.1.

Figure 5. Graduation, fourth from the left in the first row – *J. Rupais* (1938).

Figure 6. Certificate of *Pēteris Driķis* attesting his participation in the Latvian War of Independence (1923).

Many educators worked at *Gulbene* State Commercial School and Vocational School. For example, *Edmunds Zirnītis* was a colleague of *J. Rupais* in the second half of the 1930s and the beginning of the 1940s (1911–1989). He was a teacher of the Latvian language and literature, Baltic philologist, poet and essayist [37]. Physics, geometry, and

mechanics were taught (1934–1941) by *Voldemārs Andersons* (1905–1941), who was also a lecturer at the University of Latvia [38]. Economist *Jānis Labsvīrs* (1907–2002) and the Principal *J. Rupais* developed a friendly relationship, both teachers were swimming enthusiasts. The Principal usually asked *J. Labsvīrs* to address the school family during national holidays or important events, later he was also invited to address *Gulbene* residents [34; pp. 38–39]. He taught political economy, national economics, cooperation, and law at *Gulbene* State Commercial School and Vocational School (1929–1936), in the 1960s he became a professor of economics at Indiana University, USA, Honorary Doctor of History of the Latvian Academy of Sciences, awarded with the Order of the Three Stars of Class IV (1995) [39]. Economist *Arvīds Baķis* (1894–1983) also worked in Gulbene. He worked as a teacher from 1927 and taught accounting, business arithmetic, and later also the Russian language. Pianist *Kārlis Encis* (1912–1982) taught singing and history. More than one pedagogue worked at Gulbene State Commercial School and Vocational School for a longer or shorter time. Most of them were held nationalistic views and remained in Latvia after World War II, some emigrated (*J. Labsvīrs, Eduards Lejiņš;* 1894–1990 etc.).

Chemistry Teacher of Riga Industrial Polytechnicum *J. Rupais*

After World War II, *J. Rupais* moved from *Gulbene* to Riga and started working at Riga Industrial Polytechnicum. He finally started his own family, starting it after turning 50. He had known his future spouse *Elizabete* since he was young. They had met during World War I in Moscow. There is no documentary evidence of whether they were connected at that time only by teaching work and educational issues, or by mutual attraction.

Many teachers had emigrated, and in the school year 1944/1945 *E. Rupā* also started working at the Polytechnicum; she was the Head of the Department of Chemistry of Riga Industrial Polytechnicum [40; pp. 1–2]. *J. Rupais* was the Head of the Department of Teaching and at the pedagogical meeting of the Polytechnicum on 2 March 1945, he reprimanded his colleagues that the pupils' violations should be reported to the school first [40; pp. 3–4]. Current work issues at the Polytechnicum were discussed at the pedagogical meetings, including the performance and behaviour of the pupils. Unjustified absenteeism and smoking on school premises were considered violations of school discipline. For violations, the grade in discipline was reduced, but if pupils were caught smoking for the third time, according to the decision

of the Pedagogical Council, they were expelled from the educational institution. Two pupils had once brought bombs and detonated them in the school.

J. Rupais was also an educator, and *Pēteris Paukšs* (1926–2001) studied under him, who was an honours pupil at Riga Industrial Polytechnicum [40; p. 27] and later continued his education at UL, was the Dean (1965–1971) and lecturer (1961–2001) of the Faculty of Chemistry of RPI.

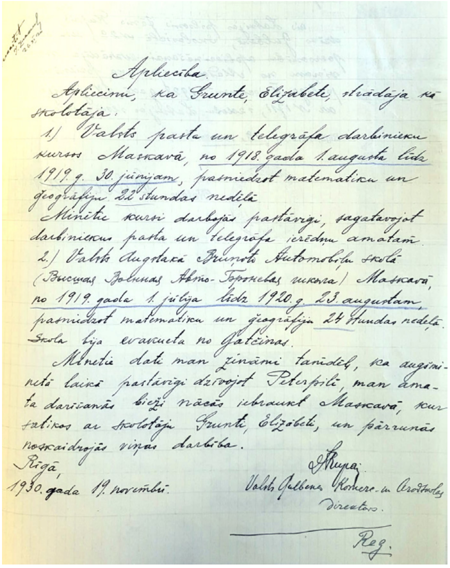
Apliecība.
Apliecinu, ka Grunte, Elizabete, strādāja kā skolotāja:
1.) Valsts pasta un telegrāfa darbinieku kursos Maskavā, no 1918. gada 1. augusta līdz 1919. g. 30. jūnijam, pasniedzot matemātiku un ģeogrāfiju 22 stundas nedēļā.
Minētie kursi darbojās pastāvīgi, sagatavojot darbiniekus pasta un telegrāfa ierēdņu amatam.
2.) Valsts Augstākā Bruņoto Automobiļu skolā (Высшая Военная Авто-Броневая школа) Maskavā, no 1919. gada 1. jūlija līdz 1920. g. 23. augustam, pasniedzot matemātiku un ģeogrāfiju 24 stundas nedēļā. Skola bija evakuēta no Gatčinas.
Minētie dati man zināmi tādēļ, ka augšminētā laikā pastāvīgi dzīvojot Pēterpilī, man amata darīšanās bieži nācās iebraukt Maskavā, kur satikos ar skolotāju Grunti, Elizabeti, un pārrunās noskaidrojās viņas darbība.
Rīgā,
1930. gada 19. novembrī.
J. Rupais
Valsts Gulbenes Komerc- un Arodskolas direktors.
Reg.

Figure 7. Certificate attesting the work of *Elizabete Grunte* (m. *Rupā*) in Russia from 1918 to 1920 (19 November 1930).

In the summer of 1945, all teachers had to help translate books in their subject from Russian into Latvian during the summer vacation. It might be assumed that *Jānis* and *Elizabete* also translated textbooks or their parts in chemistry, although their surnames are not featured in the published books. However, the names of translators were mentioned in only a few books in the first years after World War II, so the translators of some books are unknown. The lack of books in the Latvian language hindered the learning process, but during the Soviet period, it was not allowed to use previously published books. They ideologically were not in line with the education requirements of the Soviet man. Educators believed that learning from lesson notes does not provide pupils with extensive and comprehensive knowledge. In addition, a successful learning process was hindered by widespread absenteeism. Thus, on 3 July 1947, the Head of the Department of Chemistry of Riga Industrial Polytechnicum, *E. Rupā*, reported that statistics show that, on average, each pupil was late for 100 hours. Reasons – illness, family circumstances [40; p. 95, 95. o. p.].

In February 1947, *J. Rupais* read a report on educational work with pupils and their parents at the pedagogical meeting. At the Polytechnicum, some *J. Rupais'* colleagues later worked at his *Alma mater* – RPI. Such was chemist *Fricis Ceplis* (1917–2017), who worked at Riga Industrial Polytechnicum (1945–1948) and later was a lecturer at RPI (1960–1987). Mechanical engineer *Pēteris Saveļjevs* (1925–2006), a graduate (1947) of the Department of Electrical Engineering of Riga Industrial Polytechnicum, also worked at Riga Industrial Polytechnicum. The documents show that for some time *J. Rupais* was also the Head of the Department of Chemistry of the Polytechnicum. In 1947, the Department of Peat was added to the Department of Chemistry [41]. *J. Rupais* worked at Riga Industrial Polytechnicum as late as May 1952 [42], after that his name is no longer found in the minutes of pedagogical meetings. He was also a strict and fair pedagogue at the Polytechnicum [43].

Together with his wife, *J. Rupais* took care of his summer house in *Saulkrasti*, later – in *Vecāķi*, because going to work to Riga from *Saulkrasti* was too far. The sand of the seaside was not suitable for growing vegetables, so the owner brought fertile land for the garden. Trees grew around the house in *Vecāķi,* and there were beautiful flower beds [34; pp. 34, 39].

Conclusion

J. Rupais and his fellow students and contemporaries formed the newly founded Republic of Latvia. He was a teacher and promoted vocational education, his fellow students contributed to the development of the Latvian army, customs, chemical industry, and higher education. After World War II, *J. Rupais* continued his teaching activities in Latvia, while some of his fellow students emigrated to America – USA (*E. Kreišmanis*), Canada – *J. Dāvis*, Argentina – *A. Plūme*, Germany – M. Ostwald, R. Raasche. In 1910, the lives and destinies of those who started studying chemistry at RPI were formed in the conditions of different political powers – they were born in Tsarist Russia, built their careers developed in the Republic of Latvia, the Soviet Union, and other European countries. This generation experienced World War I and World War II and was also a victim of the Holocaust. The authors could not find exact information about the future fate of the Jewish students. *J. Rupais* was lucky because he was not affected by the repressions of the Soviet authorities. He was not active in political parties, was not involved in student corporations, and focused his attention on teaching and educating pupils, laying the foundation for further life.

In 2023, *Gulbene* City celebrated its 95th anniversary, just as the old building of *Gulbene* State Commercial School and Vocational School, whose fate is closely intertwined with the life of engineer and teacher *J. Rupais*. The history of the first and only Principal of *Gulbene* State Commercial School and Vocational School has remained history, but the life of the building continues, giving pupils the opportunity to learn.

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Figure 1. Gulbenes novada vēstures un mākslas muzejs, GVMM 12421.
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Alīda Zigmunde, Ilze Gudro, Ilze Ūsele, Ineta Bauere

Rīgas Politehniskā institūta absolventa (1916) Jāņa Rupā (1889–1974) pedagoģiskā darbība Latvijā

Pētījums par inženieri, pedagogu, Rīgas Politehniskā institūta (RPI) Ķīmijas nodaļas absolventu (1916) Jāni Rupo (1889–1974) veikts, izmantojot Latvijas Nacionālā arhīva, Latvijas Valsts vēstures arhīva un Latvijas Valsts arhīva dokumentus, kā arī Gulbenes novada vēstures un mākslas muzeja krājumu. Raksts par Latvijā 20. gadsimtā pazīstamo pedagogu – Gulbenes Valsts komercskolas un arodskolas ilggadējo un vienīgo direktoru (1926–1944) J. Rupo atklāj arī viņa darbību pēc Otrā pasaules kara Rīgas industriālajā politehnikumā. Tajā raksturotas gan mācību iestādes, gan direktors un skolotājs J. Rupais un viņa darba metodes, paveiktā nozīmīgums Gulbenei un Latvijai.

Atslēgvārdi: Jānis Rupais, Rīgas Politehniskais institūts, Gulbenes Valsts komercskola un arodskola, Rīgas industriālais politehnikums.

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HISTORY OF ENGINEERING SCIENCES AND INSTITUTIONS OF HIGHER EDUCATION

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THE LIFE OF MARINE ENGINEER OFFICER EDGARS OTO PINKA (1895–1941)

INDULIS ZVIRGZDIŅŠ*

Latvian Association for the History of Science

Summary. Based on the documents, the study provides a wide and comprehensive evaluation of the life of an engineer and citizen from *Vidzeme Edgars Otto Pinka* (1895–1941). His life was related to ships, military service in Latvia, Russia, and France, and the Latvian Society of Paris. Researching *E. O. Pinka's* studies and work, the author has studied the engineer's life from birth to the end of his life, reflecting on his progress as one of the best specialists in the Latvian Navy in his capacity of an engineer mechanic, shipping engineer, officer, and pedagogue. The contribution of *E. O. Pinka* to raising awareness about Latvia and Latvian music in France in the early 1930s is also significant. His daughter, a graduate (1964) of Riga Polytechnic Institute (RPI) *Māra Pinka*, inherited his interest in music. The article was developed by studying the collections of Latvian libraries, archives, and museums and communicating with the successors of *E. O. Pinka's* family.

Keywords: shipping engineer, officer, *Edgars Oto Pinka*.

Childhood, Youth, and Education of *E. O. Pinka*

Edgars Oto (often called only by his first name – *Edgars*) *Pinka* was born on 17 April (according to the Julian Calendar – 5 April) 1895 in *Vecgulbene* Manor [1]. His father *Pēteris Pinka* (also *Pinke*; 1855–1928) came from the homestead «*Lejas Ganiņi*» of *Aizkuja* Village, near the present *Madona* Town, his house was located on the bank of the rapid *Rieba* River, there was also a mill. *P. Pinka* is said to have learned the trade of a miller and mill builder in *Pärnu* [2], Estonia, then worked in water mills in *Stāmariena*, *Gulbene*, *Kalncempji*. In the marriage with *Liena Pinka* (b. *Būda*; 1863–1940), daughter *Marta Eiženija Pinka* (m. *Šmite*; 1884–1944(?)), son *Edgars Oto* and two more children who

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died young were born. The manor miller's income was sufficient to educate his son not only in the parish school.

Figure 1. *E. O. Pinka* (first from the right) with his parents and sisters in *Vecgulbene* (July 1903).

From 1904 to 1907, *E. O. Pinka* attended *Gulbene* Lutheran Parish School, until 1914 he continued his education at Pskov Sergey Non-classical School (*Псковское Сергиевское реальное училище*) in Russia. The choice of an educational institution showed his interest in practical matters related to engineering, and graduates of non-classical schools had opportunities to study in this area. There were similar schools in *Vidzeme* and Riga, however, a neighbouring governorate was chosen for training. By road from the mill in *Ate*, where his father worked at the time, it was closer to Pskov if one took the narrow-gauge railway to *Valka* and then took the broad-gauge train to Pskov. It was about the same distance as in the opposite direction through *Stukmaņi* to Riga. There were other educational institutions in Pskov, which the people of the *Vidzeme*, including the boys from Vitebsk Governorate and *Kurzeme,* sometimes attended, e.g., a pedagogical seminary, a school of surveyors, an agricultural school, a cadet corps. Some pupils got involved in the social life of Latvians in Pskov. It was led by the later Professor of the University of Latvia (UL), *Jānis Kauliņš* (1863–1940), who taught *E. O. Pinka* the German language at the non-classical school [3]. Among the employees of the non-classical school was also singing teacher Josif Tulchiev (*Иосиф Тульчиев*; 1860–1938), a graduate of St. Petersburg Conservatory [4]. At that time, he was the one who to a large extent

organized music life in Pskov, he also introduced a young man from *Gulbene* region to this area, sparkling his interest in music for the years to come.

After graduating from the non-classical school, in the summer of 1914, *E. O. Pinka* applied for studies at RPI at the Department of Mechanics [5]. However, he did not start his studies and was dismissed in December, because at the end of August, the young man joined the Imperial Russian Navy as a volunteer. On 1 September 1914, he passed the entrance exam to the Imperial Nicholas I Naval Engineering School in Kronstadt (*Морское инженерное училище императора Николая I в Кронштадте*). It is comparable to a military school; the rules stipulate that the graduate must work at the designated place for five years. The tuition fees were lower as compared to RPI, but it was subject to strict regulations. The school mainly trained ship mechanics for the Russian Navy, as well as shipbuilders. The first year of study was shared by students in both majors – they learned physics, chemistry, analytical and visual geometry, differential calculus and integral calculus, applied mechanics and hydraulics, resistance of materials, maritime law, and foreign languages. Next, three years of specialization were planned. The special subjects for ship mechanics included the basics of shipbuilding, electrical engineering, the theory of thermomechanics, steam engines, machine assemblies drawing, and torpedo construction. Theoretical training from 15 September to 5 May also included lessons in mechanical workshops, chemistry, and electrical laboratories. Success was assessed on a twelve-grade scale. Practice on ships was planned from 15 May to 15 August. Presumably, during World War I, education was reduced from four years to three. The school graduation certificate stated that its recipient, *E. O. Pinka*, had the right of a person who obtained higher special education [6; p. 162].

The First Years of Work as an Engineer (1917–1924)

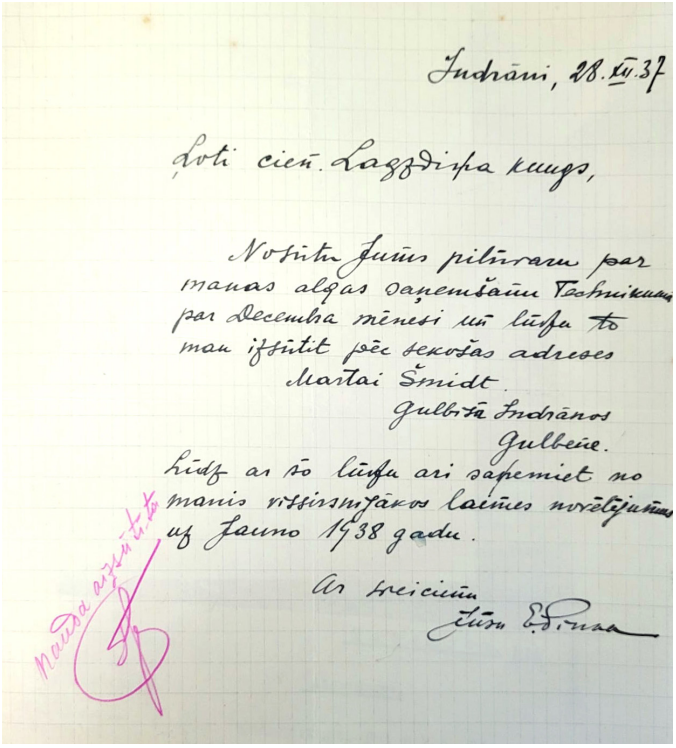
In May 1917, midshipman *E. O. Pinka*, a graduate of the Naval Engineering School, was assigned to the service on the battleship (so-called dreadnought) «*Sevastopole*» built in 1911. Its base port was Helsingfors (now Helsinki, Finland), which until the declaration of independence of Finland in December 1917 was part of the Russian Empire. This ship did not participate in combat operations. Being involved in the Latvian Society of Helsingfors, a mechanic in the Russian Navy raised funds for the support of Latvian war refugees who arrived in the city [7]. In the spring of 1918, the dreadnought «*Sevastopole*» was moved to Kronstadt, in August, the head of the ship's boiler department,

E. O. Pinka, demobilized and returned to his family in *Gulbene*. On 5 December, he became the representative of the Ministry of Supply of the Provisional Government of Latvia in the area of *Valmiera* and *Smiltene*, from 3 January he continued his duties in *Liepāja*. In the middle of January, *E. O. Pinka* was briefly arrested by representatives of the German troops due to a misunderstanding.

On 28 January 1919, a native of *Gulbene* joined the Engineer Sapper Company of *Kalpaks* Battalion in *Liepāja*, and in February, First Lieutenant *E. O. Pinka* was appointed the Weapons Manager and Head of the Workshop. From 5 May, he was the commandant of *Vecauce* and its surroundings, in July, he was transferred to the Latvian Army Car Workshops as a Technical Manager. The Workshop, whose official name was «Car Garage and Workshop No. I», was admittedly managed by *Otto Hotte* (1892–?), a graduate (1916) of the Department of Mechanics of RPI. Thanks to the dedication and special knowledge of engineer *E. O. Pinka*, a strong and well-organized unit of automobile troops was established [8]. In August 1919, under the command of the Army Commander-in-Chief's Staff, the Naval Division started to be formed. From 16 September, *E. O. Pinka* was the engineer of this Division, in October he was approved as the Head of the Technical Department [9; p. 2]. During the Latvian War of Independence, the means of navigation played a special role in the battles against Bermontians, mostly in the transportation of soldiers. Although the army had few ships and boats, there was a sufficient number of maritime specialists. In the 1920s, in the process of officer attestation, *E. Pinka's* attitude towards the performance of his official duties was described as follows, «Energetic, insufficiently conscientious. There is a lack of practice in one's specialty, theoretical knowledge is sufficient» [9; p. 15]. A month after the conclusion of the Peace Treaty with Soviet Russia, First Lieutenant *E. O. Pinka* retired from service, as the army's personnel was downsized at that time.

Figure 2. *E. O. Pinka* (1920).

E. O. Pinka was active in several trade organizations. From 1922 to 1923, he was involved in the company «*Bura*» co-owned by Sea Captain Archibald von Keyserling (1882–1951), then he was the manager of the warehouse of the company «*Robežtirdzniecība*» in Riga and in the village that now is *Indra*, *Krāslava* District. Later, the engineer supervised the shore construction works in the company of Hans Friedrich Schmidt (?–?). In 1921, *E. O. Pinka* was granted a new farm of 15.31 ha in *Vecgulbene* Parish from the land of *Gulbīši* semi-manor of *Gulbene* Manor, it was named «*Indrāni*» [10]. *E. O. Pinka's* father, later his sister, farmed there, the land was rented out. *E. O. Pinka* also visited it now and then [6; p. 148].



Indrāni, 28.XII.37

Ļoti cien. Lazdiņa kungs,

Nosūtu Jums pilnvaru par manas algas saņemšanu Tehnikumā par Decembra mēnesi un lūdzu to man izsūtit pēc iekšējas adreses Martai Šmidt.

Gulbīša Indrānos

Gulbenē.

Līdz ar šo lūdzu arī saņemiet no manis visaugstākos labākos novēlējumus uz Jauno 1938 gadu.

Ar cieņu

Jūsu E. Pinka

Figure 3. *E. O. Pinka's* power of attorney to receive a salary from *Lagzdiņš* (28.12.1937).

Work as a Mechanical Engineer, Marine Engineer, Teacher, and Conductor (1924–1941)

Although immediately after the Latvian War of Independence, the Latvian Army had practically no naval forces, it was necessary to think about the protection of the almost 500 km long sea border. At the beginning of the 1920s, Latvia inquired in various countries about the possibility to purchase ships or submarines from those used in World

War I, but without much success. The possibility of building coastal artillery was also discussed, but guarding the border from Estonia to Lithuania in this way would require relatively larger funds. In 1924, the *Saeima* discussed and on 10 April adopted a law on the purchase of coastal defence equipment, and the President of the State signed it on 19 April [11]. Not everyone in the *Saeima* and Latvian society supported this decision [12; pp. 152–154]. *E. O. Pinka* also got involved in the discussion and doubted whether the submarines would be able to live up to the expectations placed on them in the defence of Latvia's sea borders, as there was also a lack of a base for their deployment [13; pp. 11.–14]. Almost 10 million lats were allocated for the period of four years. Using these funds, Latvia was supposed to acquire two submarines and two minesweepers, including torpedoes. All floating vehicles were built in the cities of Nantes and Le Havre in France.

In connection with the expected development of the navy, on 1 November 1924, *E. O. Pinka* was included in the active war service at the headquarters of the Coastal Defence Squadron and three weeks later was assigned as a controller of the newly built warships in France [9; p. 12]. On 3 December, the naval officer left for Nantes, France. In November 1925, he was awarded the rank of Lieutenant Commander. In France, the engineer supervised the construction of the later submarine «*Ronis*», practiced in service on submarines, and also got acquainted with the manufacturing of torpedoes.

On 1 June 1926, the Underwater Boats Division was established as a separate unit. The first order issued on that day by Lieutenant Commander *Ādolfs Bergs* (from 1940 – *Kalns*; 1892–1957) begins as follows, «As of this day, I assume the duties of commander of the Underwater Boats Division. .. The Underwater Boats Division, as one of the strongest units of the Latvian Fleet, joins the other combat units today to protect the Latvian sea shores, stained with the tears of Latvian ancestors turned into amber» [14]. Engineer-mechanic Lieutenant Commander *E. O. Pinka* (grade 1 of IX salary category, effective from 20 September 1924) [14] was also enrolled in the division. A total of 90 men were initially included in the staff, *E. O. Pinka's* service was the longest among them. The first Commander of the division *Ā. Bergs* at the same time served as the Commander of the submarine «*Ronis*», the submarine «*Spīdola*» was commanded by the long-distance Captain *Oskars Rodiņš* (1892–1955). In August 1926, Latvians – the future crewmen – were sent to France to learn how to work on the ships built there.

Among them, there was also the radio-telegrapher Corporal *Hugo Legzdiņš* (1903–2004), known as the last Commander of Latvia's first submarine «*Ronis*» (1940–1941). He wrote, «Captain *Pinka*, an engineer,

also served on «*Ronis*». In Nantes, our entire team had to go to classes in the shipyard itself, where *Pinka* was assigned a spacious office. Here he laid out submarine drawings on a large table, drew on a blackboard to introduce us to the premises, devices, and apparatuses of the «*Ronis*». Two weeks prior to the arrival of the team in Nantes, the submarine had already been launched, so we could see it in reality immediately after studying the drawings. This type of training seemed very adequate. In general, our engineer and captain acted very energetically. He was fluent in French and very musical. At *Pinka's* passionate suggestion, a brass band was even created from the members of «*Ronis*» team. We solved the issue with the instrument supply quite simply. Considering our large travel allowance, we decided to buy the instruments ourselves. No special motivation was necessary here – everyone contributed the necessary few hundred francs. Then came the training. Captain *Pinka* himself worked both as a bandmaster and as a teacher. We were not really musicians, and we had to learn the matter from the very basics. Every day after work, *Pinka* came to «Saint Anna» (hotel) and played with the orchestra for hours. Horns were making such noise in the hotel that nearby residents complained about troublemakers. We agreed that we would blow more quietly, which we did» [15].

E. O. Pinka participated in the ceremonial launch of both submarines. He left Nantes for Latvia with the submarine «*Ronis*» in May 1927 and arrived in the Latvian territorial waters on 20 May. From then on, he performed the duties of a submarine engineer-mechanic, was the second person behind the commander. The submarine designed by French engineer Jean Ernest Simonet (1866–1958) was 55 meters long and 4.6 meters wide, above water it was powered by a diesel engine, underwater – by an electric motor powered by batteries, submerged to a depth of 50 meters. Above water speed amounted to 14 knots (25.93 km/h), underwater – 10 knots. The submarine was armed with six torpedo tubes, an anti-aircraft gun, and two machine guns [16]. The panned crew was 32 people; usually, 26–28 men were mentioned in the division orders. In a sense, it was the mechanic who was responsible for making the complicated technical complex work safely and well.

At the same time, *E. O. Pinka* was also a mechanical engineer of the Underwater Boats Division (from May 1928 – Submarine Division), who was promoted to the rank of Captain (1927) in the Latvian Army. In the fall of 1930, he was sent to study at the Technical Maritime Academy in France. In the Submarine Division, he was on vacation at that time. The service note said that the officer was on a business trip for scientific purposes. In October 1932, Latvian *E. O. Pinka* was awarded a diploma of civil engineer of marine structures in Paris [17]. He took 16 different courses, six of them lasted for two years. On a 20-grade scale, the

average rating was 16.01. The officer continued his service in the previous place and «On 6 October, 1932, Captain *Pinka Edgars* returned from the regular vacation assigned to him; the engineer-mechanic of the submarine «*Ronis*» also returned after graduating from the technical marine academy in France with a 1st class marine construction engineer's diploma and joined the division, in his capacity of the engineer-mechanic of the submarine «*Ronis*» he resumed performing his official duties on 17 October of this year» [18].

The Latvian Society of Paris operated in the capital of France. The community of compatriots was made up of those working and studying there, the Society used the premises of the Embassy of Latvia. When a men's double quartet was organized in the Society in 1931, Captain *E. O. Pinka* became its leader. In the spring of 1932, the city of Nice proposed to hold a folklore festival along with the traditional flower festival, inviting representatives of different nations to interest vacationers. In January, the Embassy of Latvia in France also received an invitation. It was decided to organize a mixed choir conducted by *E. O. Pinka*, based on a male double quartet. It would then participate in an event on the French Riviera. The number of singers exceeded 30, among them there were several professional musicians, some of them associated with the Russian Opera in Paris. For example, the most famous was the Riga-born singer, mezzo-soprano *Elza Žebranska* (1903–1996), who studied in Paris. She also performed as a soloist at the concerts. The costumes for the choristers were mainly sent from Latvia, *Liepāja* Museum (director *Jānis Sudmalis*; 1887–1984) was especially responsive with the collection collected by the former *Kurzeme* Provincial Museum. *E. O. Pinka's* contacts with the previous place of service may have helped. Men's suits were mostly made locally. On the last day of February, Latvians took part in a joint concert in Paris, after which the participants of the folklore festival left for Nice by train. Representatives of 19 different nations participated in the event, the audience enjoyed the singing of the Latvian choir and its magnificent costumes, the conductor was also appreciated. Captain *E. O. Pinka* also sent correspondence about the holiday to his homeland [19–21]. On 17 April, he was elected an Honorary Member of the Latvian Society of Paris [22].

A similar event was held again in France the following spring. In a special letter to the leadership of the Navy, the Embassy of Latvia asked to allow engineer *Pinka* to come to Paris from *Liepāja* for the training of the choir, the permission of the command was received. On 6 February, the naval officer was granted a leave [23] to proceed to Paris. Also this time the performance could be considered as introducing Western Europe to Latvia, its culture, and traditions [24–25].

Figure 4. Latvian Choir of Paris in Nice (3 March 1932).

The place of service for the engineer was mainly in *Liepāja*, various training trips were made from there, also going to joint manoeuvres with the fleets of other countries, individual visits to the ports of other countries. He was responsible for collecting the historical materials of the submarine «*Ronis*», organized courses for the seafarers of the Submarine Division, and worked in the Officers' Court of Honour.

Starting from the school year 1928/1929, the engineer worked as a teacher at the courses for ship mechanics in *Liepāja* State Technical School, then also in *Liepāja* Maritime School. In 1931, the brochure «*Kuģu tvaika katli*» (Ship Steam Boilers), compiled by *E. O. Pinka*, was published using the rotaprint technique. In February 1936, considering his education and practical work experience, he was certified as a full-fledged secondary school teacher with the right to teach subjects in marine engineering. Starting from the school year 1935/1936, *E. O. Pinka* taught an airplane course at *Liepāja* State Technical School [26]. Later, he was replaced by *Georgs Novickis* (1908–1985), a graduate (1933) of the Faculty of Mechanics of the University of Latvia, the Head of the Aviation Department of Liepāja War Port Workshops, who, having won a Humboldt scholarship, in the study year 1934/1935, had supplemented his knowledge in the Aircraft Construction Department of the Technical University of Berlin [27]. The senior commander followed world events in the field of maritime affairs, especially in the area of the military fleet, informing the citizens of Latvia about it as well [28–34].

Figure 5. *E. O. Pinka* (c. 1935).

In the annual attestations of *E. O. Pinka* in the mid-1930s, he received positive and relatively similar reviews. The last was written in the fall of 1937, «He was treated in the *Ķemeri* Sanatorium during the year of attestation, but in terms of his health, he was also able to endure the hardships of wartime. Mental abilities are good. Morally and ethically blameless. Moderately energetic, polite, and sociable. Alcohol is used, but it does not affect the service. Outside duty, he teaches classes at the state technical school in *Liepāja*. He knows and performs his duties very well. Fair and apolitical towards subordinates. Behaves within the limits of norms and regulations. Disciplined enough. Capable of organizing and conducting military education courses. Independent within the scope of his rights. Normal self-motivation and courage to take appropriate steps when necessary. Interested in technical innovations. Able to take higher technical positions. Conclusion: Good. Shall be promoted to the position of the head of the divisional maintenance unit» [9; p. 28].

The attestation of the previous three years recommended that the officer be promoted to the position of engineer mechanic of the squadron headquarters. Both positions were mentioned as possible promotions on 5 December 1937 by Squadron Commander, RPI graduate (1914) *Teodors Spāde* (1891–1970) and on 9 December – by Army Commander *Krišjānis Berķis* (1884–1942).

However, in 1937, a Senior Commander supposedly had some disagreement with the leadership. He was charged under Article 52, Part 2 of the War Punishment Law (violation of military honour and subordination), which was discontinued in July 1938 due to lack of evidence [9; p. 33]. However, on 22 December 1937, the Senior Commander resigned from active service «at his own request», and was excluded from the division's officer lists on 11 February 1938, the transfer of the affairs and duties of the submarine and divisional

engineer mechanic to the new executor was completed on 10 March. During the interrogation on 7 February 1941 about the reason for leaving, *E. O. Pinka* said, «I wrongly insulted my superior» [35; p. 179].

Figure 6. *E. O. Pinka* (first from the right) – guest of honour at the graduation of *Gulbene* Elementary School (May 1937).

Captain *E. O. Pinka* was one of the best specialists in his field [7], the only marine engineer who was a specialist in internal combustion engines, specializing in submarine diesel engines, boat engines, and the automotive industry [8]. His work was highly appreciated – he was awarded V (1928) [36] and IV Class (1936) Order of the Three Stars [37]. Among the officers of the Latvian Army, there were not many who received two high state awards of this degree [38].

End of Life (1938–1941)

After retiring from the army, the engineer from *Liepāja* went to Riga, where he established a construction company. He had the construction rights of an engineer and an architect registered in the Construction Department of the Ministry of the Interior [39]. *E. O. Pinka's* office organized electrical installation works, then took over the company «*A. C. Fitzner*», whose owner repatriated to Germany. The company also installed central heating, hot water, and gas mains [40]. From March 1938 to August 1939, the engineer lived in Riga at 67–7 *Valdemāra* Street [41], then shortly after – at 4–24 *Ausekļa* Street (this place is also mentioned as the company's address), in December he moved to 3–3 *Laipu* Street. Nearby, at 39 *Valņu* Street, was the former firm of A. C. Fitzner, where the office of *E. O. Pinka* was situated.

In the fall of 1940, he was hired as an engineer at the People's Commissariat of Labour, from the beginning of the following year, *E. O. Pinka* was the Head of the Technical Department at the Riga Shipbuilding and Repair Factory of the People's Commissariat of the River Fleet of the Union of Soviet Socialist Republics (USSR) [35; p. 166]. It was established in the fall of 1940 by two nationalized companies – the Baltic Machine Factory «*Ed. Cepps*» and shipyard «*Lange*», whose office was situated at 38 *Valguma* Street [42]. This position corresponded to his education as an engineer and also his previous work experience. However, on 24 January 1941, *E. O. Pinka* was arrested, being accused for cooperation with the foreign secret service [35; p. 160]. A total of four people were accused and then tried in one case*: E. O. Pinka*, Riga City Council employee (formerly a railway worker) *Nikolajs Petrovičs*(1906–1941), Headmaster of *Daugavpils* Polish School (formerly also a railway worker) *Pēteris Daugste* (1896–1941) and car mechanic in Riga *Jānis Krolls* (1892–1941). They were not arrested at the same time. The first of the four to be detained was *N. Petrovičs*, who was mentioned by *Arvīds Spriņģis* (1904–?), the attendant of the *Jelgava* railway station, during the interrogation on 7 January. In the spring of 1940, *N. Petrovičs* asked *A. Spriņģis* to note how many and what kind of cargoes were sent to Germany through *Jelgava* with the goods produced in the USSR. This interested the employees of the Embassy of France, and he promised to pay for the news. It started even before the German attack on France in May 1940, when France, apparently, allowed the possibility of such an attack, news about the preparation of the opponent was important. At that time, the cooperation between the USSR and Germany was determined by mutual agreements. *N. Petrovičs* was arrested on 9 January 1941. During the interrogation, he admitted that *J. Krolls*, who had acquaintances at the Embassy of France, had previously approached him asking to collect the news. In addition to *A. Spriņģis*, *N. Petrovičs* also asked *P. Daugste* for similar information about *Daugavpils* railway junction. These men were also arrested. Over time*, J. Krolls* did not deny providing news to the employees of the embassies of France and England. On 18 January 1941, *J. Krolls* mentioned that in April 1940, an employee of the Embassy of France also stayed at the home of his friend engineer *E. O. Pinka* and was interested in military affairs. It should be mentioned here that *J. Krolls* and *E. O. Pinka* met at the end of 1930 in Paris, where the former had been working as a driver for seven years, while the latter had been sent to study. Both were interested in music, both attended small Latvian society events. The driver was the treasurer of the Latvian Society of Paris, he also sang in the choir led by *E. O. Pinka*. From time to time, they also met after 1933, when *J. Krolls* returned to Riga. *J. Krolls* was also connected with the Embassy of France

by the fact that the car workshop sometimes repaired embassy cars. The interrogators also paid attention to the fact that in 1933 *E. O. Pinka* introduced *J. Krolls* to *Pēteris Melbārdis* (1892–1941), whom he had known since the beginning of the 1920s, when they worked together in border trade. *J. Krolls* and *P. Melbārdis* started a joint business in the delivery of illegal goods from Germany, but unsuccessfully. *P. Melbārdis* was arrested already on 30 June 1940 and was prosecuted as an agent of American, English, French, and German secret services, he was executed on 25 March 1941 [43].

During the interrogation on 7 February 1941, engineer *E. O. Pinka* said that in the spring of the previous year, a person visited their apartment and delivered a letter from a Frenchman named Blanchard. *E. O. Pinka* got acquainted with him during joint studies in Paris, after the Latvian returned to his homeland, they exchanged letters. Blanchard was interested in the events in Latvia, also in what had changed recently in the senior commander's former place of service in *Liepāja* (there was a military base of the USSR at that time). The person who came promised to come after some time for an answer, but had not returned. *E. O. Pinka* told *J. Krolls* about the visit, who, based on the visual description of the visitor, assumed that the meeting was really with a person from the embassy. However, *E. O. Pinka* repeatedly emphasized to the interrogator that no information was transferred. After the start of the German-Soviet war on 22 June 1941, the detainees were taken to Astrakhan, Russia, where interrogations took place as late as in September. A court hearing was held on 5 November. In his final statement, *E. O. Pinka* said, «I did not intend to do anything bad and I did not do it. If I also had any connections with the intelligence service, I was not aware of it. Please excuse me» [35; p. 237]. The verdict reads «The defendant *E. Pinka*, recruited by a foreign secret service agent, collected espionage information about the defence». On 5 November 1941, all four were sentenced to death. The life of a naval engineer ended in Russia, near the Caspian Sea.

Figure 7. *E. O. Pinka* in custody (1941).

The Family and its Successors

On 7 April 1929, *E. O. Pinka* married *Marija Monika Tizengolda* (b. *Rusecka*; 1894–?) in the Riga Garrison Congregation in the Riga Cathedral, whom he supposedly met while working at «*Robežtirdzniecība*» company in the vicinity of *Krāslava*. Their marriage was dissolved on 5 November 1935. A sentence in *E. O. Pinka's* 1936 officer attestation is related to this, «He is morally and ethically not to blame, although he wanted to connect his life with a woman, for whom the officers' court of honour expressed their disapproval» [9; p. 26]. He married for the second time doctor *Lidija Ošeniece* (1906–1991) on 8 August 1940.

Four months after the engineer's arrest, in May 1941, a daughter of *Lidija* and *Edgars Pinka* – *Māra* – was born, and she never met her father. In 1959, she entered the Faculty of Electroenergetics of RPI. In 1961, the faculty was reorganized – the Chair of Electrical Communications and Automation was divided into two departments – Electrical Communications and Radio Engineering, and they were included in the newly established Faculty of Automation and Computer Technology, where *M. Pinka* continued her studies. 50 years after her father joined RPI, in 1964, *M. Pinka* graduated from the institute, obtaining a diploma in radio engineering. The young engineer started working at the Chair of Radio Engineering of RPI as a laboratory assistant, from 1965 – as an assistant. Since 1966, the chair was included in the newly established Faculty of Radio Engineering and Communications. The names of the chairs also changed – in 1968 she worked as a senior lecturer at the Chair of Radio Receivers, from 1972 – at the Chair of Radio Equipment [44; p. 513]. *M. Pinka* was associated with her *Alma mater* for 30 years. Not only the chairs', but also the name of the university changed – in 1990 RPI was renamed Riga Technical University (RTU). *M. Pinka* also worked at the Chair of Latvian Language and Culture of RTU (1990–1991) as the students of the Russian flow had to be taught the Latvian language. There were short training courses, which *M. Pinka* also completed. In parallel with her work at the chair, *M. Pinka* started working in Riga Secondary School No. 6 from 1993 as a mathematics teacher, later also a physics teacher. There was a shortage of teachers of the mentioned subjects, and the pedagogical work of an engineer was very necessary. Moreover, *M. Pinka* liked it and was good at it, so in 1995 the engineer decided not to run for the next term at the chair and switched to full-time work at school. In order to continue working at school, according to the new regulations, higher pedagogical education was required, therefore, from September 2004 to June 2005, *M. Pinka* obtained the qualification of a secondary school physics teacher in

part-time studies at the Faculty of Physics and Mathematics of the University of Latvia [45].

Engineer *M. Pinka*, like her father, liked music. She had learned to play the violin and sang in the RPI / RTU women's choir «*Delta*», she was also its president [44; p. 197]. *Vadims Ņikitins* (1939–2021), husband of *M. Pinka* and son-in-law of *E. O. Pinka*, also worked at RPI / RTU. Two granddaughters continue the family.

In Latvia, the Latvian Maritime Academy was established in 1989, which became a structural unit of RTU in the faculty status in 1990 [46]. From 1993 to 2022, it operated as an independent higher education institution, and since 1 November 2022, it has been part of RTU again as an independent structural unit. Here, maritime specialists of the highest level are now being trained, and young people have the opportunity to get an education in Latvia. In the first half of the 20th century, *E. O. Pinka* did not have such an opportunity. That is why young people from Latvia went abroad to study maritime sciences.

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Indulis Zvirgzdiņš

Kuģniecības inženiera, virsnieka Edgara Oto Pinkas (1895–1941) dzīves līkloči

Pētījumā rodams plašs un vispusīgs dokumentos balstīts vidzemnieka inženiera Edgara Oto Pinkas (1895–1941) mūža izvērtējums. Tas saistīts ar kuģiem, dienestu Latvijā, Krievijā un Francijā, Parīzes Latviešu biedrību. Veicot pētījumu par E. O. Pinkas mācību un darba gaitām, autors inženiera dzīvi apzinājis no dzimšanas līdz mūža beigām, atspoguļojot viņa kā viena no labākajiem speciālistiem Latvijas jūras spēkos inženiera mehāniķa, kuģniecības inženiera, virsnieka un pedagoga gaitas. Nozīmīgs ir arī E. O. Pinkas ieguldījums Latvijas un latviešu mūzikas popularizēšanā Francijā 20. gadsimta 30. gadu sākumā. Interesi par mūziku mantojusi viņa meita, Rīgas Politehniskā institūta (RPI) absolvente (1964) Māra Pinka. Raksts tapis, izpētot Latvijas bibliotēku, arhīvu, muzeju krājumus un sazinoties ar E. O. Pinkas dzimtas turpinātājiem.

Atslēgvārdi: kuģniecības inženieris, virsnieks, Edgars Oto Pinka.

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HISTORY OF ENGINEERING SCIENCES AND INSTITUTIONS OF HIGHER EDUCATION

2023/7

PEDAGOGICAL AND SCIENTIFIC HERITAGE OF PROFESSOR OF RIGA POLYTECHNIC INSTITUTE MIKHAIL BERLOV (1867–1935)

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Summary. The pedagogical and scientific activity of a mechanical engineer, a faculty member (1897–1918) of Riga Polytechnic Institute (RPI), Professor (1904) Mikhail Berlov (*Михаил Берлов*; 1867–1935) at the end of the 19th century and in the first half of the 20th century was related to Riga, as well as the Russian city of Ivanovo-Voznesensk (at present – Ivanovo). M. Berlov was the first Rector of the Ivanovo-Voznesensk Polytechnic Institute (IVPI; 1918–1921), who returned to Riga in 1921, obtained Latvian citizenship, and worked at the Russian Technical School of Nikolai Okolo-Kulak. The research also revealed the contribution of the pedagogue and scientist to the compilation of textbooks that were used in the Russian Empire, including in the territory of present-day Latvia in the first half of the 20th century and in the first years of the Republic of Latvia.

Keywords: Mikhail Berlov, Riga Polytechnic Institute, Ivanovo-Voznesensk Polytechnic Institute, textbooks for engineers.

Childhood and Study Years of Mikhail Berlov

Mikhail Berlov was born on 3 June 1867 (on 22 May according to the Julian calendar) in the Kherson Governorate of the Russian Empire (at present – the Republic of Ukraine) [1]. After graduating from a vocational school in Vladikavkaz (at present – the Russian Federation) in 1885, M. Berlov entered the Technological Institute of St. Petersburg, Russia, and

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on 23 May 1891, he graduated with honours, receiving a diploma of a first-class engineer-technologist [2; 50. o. p.].

After graduating from the institute, from 3 May 1892, M. Berlov worked at St. Petersburg Arms Factory as a mechanic's assistant, and from 21 May – as the Head of the Drawing Workshop [2; p. 36, 51]. On 16 August 1892, M. Berlov left his job because he wanted to improve his knowledge and went to study abroad.

M. Berlov arrived in the Belgian city of Liège, which at that time was one of the centres of the Belgian steel industry. In 1883, thanks to the financing provided by Georges Montefiore-Levi (1832–1906), a Belgian politician and philanthropist of Jewish origin, the Montefiore Institute (Institut Montefiore) – the Department of Electrical Engineering of the University of Liège – was opened in this city. M. Berlov graduated from this institute in 1897. One of the institute's organizers and long-term Director was the then well-known Belgian Professor Éric Gérard (1856–1916), a scientist, pioneer of electrification, and the author of several monographs, including the repeatedly published book «Elements d'Electrotechnique» (Elements of Electrotechnics), which from French was also translated into English and German, and author of «Leçons sur l'électricité» (1890, 1891; Electricity Course), which was also translated into Russian. At the end of the 19th century, E. Gérard's books in French, Russian, and German were also available in the library of Riga Polytechnic Institute (until 1896 – Riga Polytechnicum) [3].

In 1897, after returning to Russia from Liège, M. Berlov wanted to continue working and get to know the position of a railway worker in practice. He worked for a short time as a locomotive driver on the St. Petersburg–Moscow or Nikolaevskaya Railway and as a ten-man (leader of a group of workers) in construction works [4].

Pedagogical and Engineering Activities (1897–1918)

In the summer of 1897, M. Berlov settled in Riga. He had received a good education, was well practically prepared for the work of an engineer, thus he started working in the Riga–Orla Railway service. It should be explained here that in the 1890s, an industrial boom began in the Russian Empire and there were changes in the national railway policy. The state began to invest in the construction of railways, and the railway network gradually came into state ownership. The statutes of all railway companies provided for their transfer to state ownership within 20 years of their commissioning. Due to large capital investments, the condition of railways improved, new railway lines were built, and the volume of cargo transportation increased [5]. Engineer M. Berlov

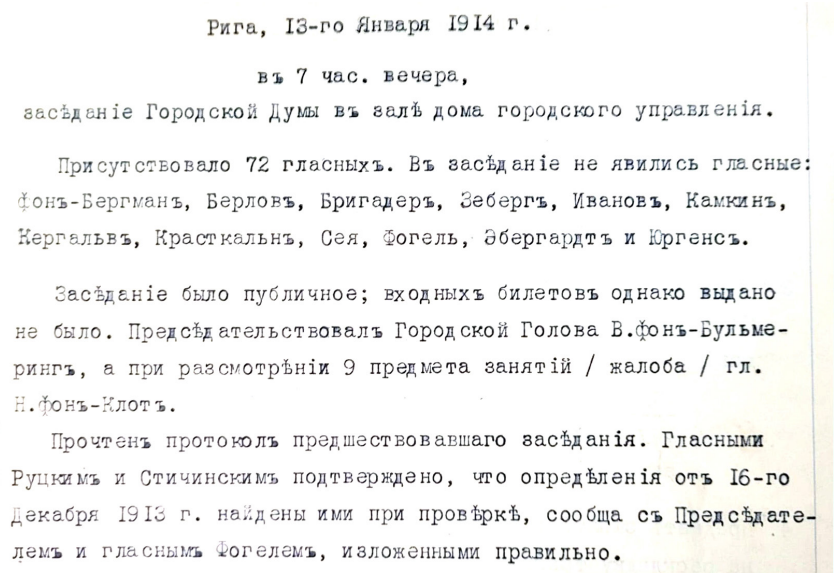
worked in the state railway service, and his scope of responsibilities was very wide – according to the projects developed by engineer M. Berlov and under his leadership, very large railway workshops and depots were built in Daugavpils [6]. The Russian-Baltic Wagon Factory (Russo-Balt) was situated in the centre of Riga, at the corner of *Valmieras* and *Bruņinieku* Streets, next to the Riga–Orel Railway line, and M. Berlov moved from working in the railway service to the Factory, where he worked as the Head of the Technical Department at the beginning of the 20th century [7]. It is noteworthy that the Chief Designer of the Factory's Automobile Department (1907–1912) was a graduate of the Montefiore Institute, Julien Potterat (1882–1962) [8]. It might be assumed that the graduates of the same institute M. Berlov and J. Potterat had not been familiar with each other before they started working at the Russian-Baltic Wagon Factory, but the knowledge gained by the two engineers in Liège was very relevant for the work they did at the Factory.

In addition to his work as an engineer, M. Berlov was offered a job at a university (institute). In 1896, Riga Polytechnicum (RP) was reorganized into RPI, in this regard, many new vacancies were opened. From a higher educational institution with German as a language of instruction, RP became a university with the Russian language of instruction, and most German lecturers had to leave their jobs due to their lack of knowledge of Russian. From 1897, a new and important phase of M. Berlov's life began. On the recommendation of the RPI Council, he was appointed an Assistant in Applied Mechanics from 1 September 1897, and became a lecturer from 1 September 1898. A year later, in 1899, he became an Adjunct Professor. Since 1 July 1904, M. Berlov was a professor at RPI [2; p. 3–5]. In May 1906, he was elected the Chairman of the Disciplinary Committee of RPI [9]. His pedagogical and scientific career developed quite successfully.

At the beginning of June 1911, the XIX Russian Railway Traffic and XVIII Russian Railway Traction Service Congress was held in Riga Latvian Society House. It was headed by an engineer Alexey Staritsky (*Алексей Старицкий*; 1872–1940), Chief Engineer of Petersburg Branch of the Moscow–*Ventspils*–Rybinsk Railway. Congress participants delivered reports, got acquainted with the layout and buildings of Riga railway stations, visited Riga factory «*Fēnikss*», Russian-Baltic Wagon Factory, elevators, etc. A one-day trip to *Ventspils* was organized to see the railway station and port. After the opening of the *Ventspils*– Rybinsk Railway line (1904), *Ventspils* had become one of the most modern export ports, a transit point for agricultural products. A large grain elevator and a freezer for storing exported butter were built here. Professor M. Berlov delivered a report on the latest metal testing methods to the congress participants [10].

From 17 to 27 April 1913, Professor M. Berlov was sent to the Congress of Mining, Metallurgy and Machine Engineering in St. Petersburg [2; p. 52]. During World War I, in August 1915, while the front line was approaching, M. Berlov, together with the RPI professors and students, evacuated to Moscow and continued working at the evacuated RPI until its closure in the summer of 1918. At that time, Riga was occupied by the German troops, so M. Berlov did not even consider returning to an independent life in Riga. M. Berlov's wife owned real estate in Riga, and on 10 June 1918, the Professor asked RPI Rector *Pauls Valdens* (Paul Walden; 1863–1957) to grant him a leave to go «to the Baltic provinces» [2; p. 44], most likely to Riga, to take care of family and property matters. It might be assumed that M. Berlov did not stay long in Riga, because he had to think about what to do in the future and look for a job.

Professor M. Berlov was always a socially active person, he was an active member of the Russian Private Loan Fund founded in 1871 [11, 12]. Before World War I, he ran for elections to Riga City Council and was elected a city councillor. Participating in the meetings of the Riga City Council, he actively discussed various issues, for example, at the meeting on 2 June 1914, when talking about the fight against drunkenness, M. Berlov proposed to change the rules on vodka shops and their working hours and also called not to mix vodka shops with beer shops [13]. The minutes of the meetings of Riga City Council show that M. Berlov worked in the City Council in 1913, 1914, and 1915. Several RP / RPI former students and graduates (*Konstantīns Pēkšēns*; 1859–1928), Hugo Wittrock (1873–1958), and others were elected councillors) [14].



Рига, 13-го Января 1914 г.

въ 7 час. вечера,
засѣданіе Городской Думы въ залѣ дома городского управленія.

Присутствовало 72 гласныхъ. Въ засѣданіе не явились гласные: фонъ-Бергманъ, Берловъ, Бригадеръ, Зебергъ, Ивановъ, Камкинъ, Кергальвъ, Краскальнъ, Сея, Фогель, Эбергардтъ и Юргенсъ.

Засѣданіе было публичное; входныхъ билетовъ однако выдано не было. Предсѣдательствовалъ Городской Голова В.фонъ-Бульмерингъ, а при разсмотрѣніи 9 предмета занятій / жалоба / гл. Н.фонъ-Клотъ.

Прочтенъ протоколъ предшествовавшаго засѣданія. Гласными Руцкимъ и Стичинскимъ подтверждено, что опредѣленія отъ 16-го Декабря 1913 г. найдены ими при провѣркѣ, сообща съ Предсѣдателемъ и гласнымъ Фогелемъ, изложенными правильно.

Figure 1. Fragment of the Minutes of the meeting of Riga City Council (13.01.1914).

As a Deputy of Riga City Council, M. Berlov was elected to the Board of the Artisan School of the City of Riga in 1913 [15]. M. Berlov also worked in Riga Branch of the Russian Technical Society. It is known that the magazine «*Железнодорожное дело*» (Railway Industry) published by the Russian Technical Society was available in RPI library and M. Berlov, apparently, as an engineer connected with the railway, also read it.

During World War I (1915–1918), RPI conducted active operations in evacuation in Moscow, and Professor M. Berlov lived in Moscow with his family and continued working at the university until April 1918, when its activity in Russia was stopped.

The Professor's work was evaluated with high awards – Order of St. Anna of Class I and II, Order of Prince St. Vladimir of Class IV. M. Berlov was issued a certificate allowing him to wear a light bronze medal minted in honour of the 300th anniversary of the rule of the Romanov Dynasty [2; p. 51–52].

Work in Ivanovo-Voznesensk (1918–1921)

The future fate of RPI after the signing of the Peace Treaty of Brest-Litovsk (Brest) on 3 March 1918 was uncertain. World War I ended on the Eastern Front, and Russia withdrew from the war as the loser, while German troops were still in Riga. On 20 April, the RPI Study Committee decided to stop working in Moscow and return to Riga. However, part of RPI faculty believed that the higher education institution could remain in Moscow and be included in other higher education institutions. Still others supported the idea of moving RPI to another Russian city. The management of RPI wanted to return to Riga, despite the offer to move to Ivanovo-Voznesensk, one of the cities of the central European part of Russia. Russian statesmen had a plan to establish a Polytechnic Institute there, and on 6 August 1918, the IVPI was established on the basis of RPI [16].

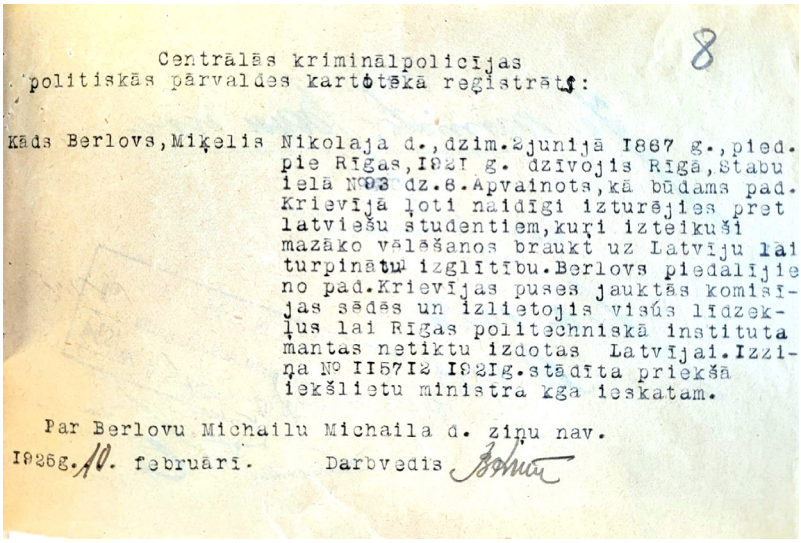
Among the lecturers of the newly founded IVPI, alongside M. Berlov, there were former RPI professors: Carl Blacher (1867–1939), Vsevolod Keldysh (*Всеволод Келдыш*; 1878–1965), Nikolai Ozmidoff (*Николай Озмидов*; 1850–1938) and Stephan Shimansky (*Стефан Шиманский*; 1868–1931). The mentioned colleagues of M. Berlov, with the exception of N. Ozmidoff, were RP / RPI graduates. Another RPI graduate – Dmitry Lastochkin (*Дмитрий Ласточкин*; 1890–1948) worked as a lecturer at the newly founded IVPI. M. Berlov became the Rector of IVPI, and he worked in this position for three years – from 1918 to 1921. M. Berlov was the Chairman of the IVPI Academic Council and the Chairman of the Presidium of this Council, as well as the chairman and member of

several committees of the institute and Dean of the Faculty of Machine Engineering (1918–1920). Today, IVPI continues its operations as Ivanovo State University of Chemistry and Technology (*Ивановский государственный химико-технологический университет*). To this day, the work of Professor M. Berlov, as well as other Riga professors, is remembered with great appreciation in the then Ivanovo Voznesensk [17; p. 3–7].

Three years later after M. Berlov left his post, Vyacheslav Sushkov (*Вячеслав Сушков*; 1880–1951), a student of M. Berlov, a graduate (1903) of the Department of Mechanics of RPI and RPI assistant (1903–1907), took the post of IVPI Rector (1924–1927) [18]. V. Sushkov, like M. Berlov, had also worked as an engineer at the Russian-Baltic Wagon Factory (1909–1910) [17; p. 18].

End of Life in Latvia (1921–1935)

The living conditions in Soviet Russia, where hunger reigned after the Civil War and the first illusions and enthusiasm for the Soviet rule soon faded for many, encouraged M. Berlov to make the decision to return to Latvia. He stopped working at IVPI in 1921, left Russia and went to Riga [1]. In 1919, the Latvian Higher School was founded on the basis of technical faculties of RPI (from 1923 – the University of Latvia (UL)). There was no place for Professor M. Berlov because the lecturer positions were already taken and he did not know the Latvian language either.



Centrālās kriminālpolicijas
politiskās pārvaldes kartotēkā reģistrēts:

8

Kāds Berlovs, Miķelis Nikolaja d., dzim. 8junijā 1867 g., pied. pie Rīgas, 1921 g. dzīvojis Rīgā, Stabu ielā №93 dz. 8. Apvainots, kā būdams pad. Krievijā ļoti naidīgi izturējies pret latviešu studentiem, kuŗi iztēikuši mazāko vēlēšanos braukt uz Latviju lai turpinātu izglītību. Berlovs piedalījies no pad. Krievijas puses jauktās komisijas sēdēs un izlietojis visus līdzekļus lai Rīgas politechniskā institūta mantas netiktu izdotas Latvijai. Izziņa № II57I8 1921g. stādīta priekšā iekšlietu ministra kga ieskatam.

Par Berlovu Michailu Michaila d. ziņu nav.

1926g. 10. februāri. Darbvedis

Figure 2. Statement of the political administration of the Central Criminal Police about *Miķelis* (*Mihails*) *Berlovs* (10.02.1926).

In addition, the attitude towards him was not favourable – M. Berlov was not forgiven that, in fact, on his proposal, a valuable academic library, technical equipment, unique mineral and zoological collections of RPI were left in Ivanovo-Voznesensk. The documents show that M. Berlov fought hard for the material base of IVPI, as well as for the students. These facts were already known to the Minister of Internal Affairs and the political administration of the Central Criminal Police in Latvia in 1921 19]. It is interesting to note that the Criminal Police claimed that they had no information about Mikhail Berlov (*Mihails Berlovs*), but wrote about *Miķelis Berlovs*, who was actually the same person.

M. Berlov wanted to obtain Latvian citizenship, justifying his request with the fact that from 1897 he lived in Riga and was the owner of a house on *Stabu* Street. He became a citizen of Latvia in October 1922 [20]. His name was Latvianized – both in his passport and in many other documents he was called *Miķelis*.

Figure 3. M. Berlov (1930s).

M. Berlov worked at the Russian Technical School of Nikolai Okolo-Kulak. It was founded on 1 February 1921 by a graduate of Moscow Technical University, engineering technician, inventor Nikolai Okolo-Kulak (*Николай Около-Кулак*; 1867–1927). At the beginning of the 20th century, N. Okolo-Kulak was the Head of the main workshops of the Riga–Orel Railway, and he briefly studied at the Department of Engineering of RPI. The Technical School had the status of a state secondary school and operated under the supervision of the Russian Education of the Department of Minorities of the Ministry of Education, which allowed students to enrol in Latvian universities after graduation. Professor M. Berlov worked at the Technical School until 1 September 1928, maintaining friendly relations with former RPI colleague S. Shimansky, who also worked at this Technical School. In 1933, the Technical School became the private technical school of the Russian Engineers Society in Latvia, which operated in this status for three years – until 1 October 1936, when it closed due to lack of students [21].

Former RPI colleague C. Blacher, writing a manual on furnace technologies and elements of heat energy equipment, expressed his gratitude to M. Berlov for his help in selecting the latest literature [22].

During the interwar period, M. Berlov was the director of JSC «*Pirmais privātais lombards*» (The First Private Pawn Shop) and the Chairman of the Council of the Third Mutual Credit Society of Riga [23], one of the founders and an Honorary Member of the Russian Engineers Society in Latvia [24].

Engineer M. Berlov passed away on 6 February 1935 [6], he was buried in Pokrov Cemetery in Riga.

Compilation and Publication of Textbooks

The first known and publicly available work of M. Berlov is «*Устройство и работа локомобиля*» (Construction and Operation of a Locomotive; 1892). These are notes of he lectures delivered to fortress artillery officers who were studying electrical engineering [25]. So far, no information about these lectures was found in M. Berlov's documents. Before starting work at RPI, M. Berlov prepared for publication the brochure «*Исследование водотрубного котла системы Шухова*» (Investigation of Tubular Steam Boilers of the Shukhov System), which was published in St. Petersburg in 1897 [26]. A contemporary of M. Berlov, a Russian engineer Vladimir Shukhov (*Владимир Шуухов*; 1853–1939) invented a horizontal and vertical tubular steam boiler in 1896. The invention was awarded a gold medal at the World Exhibition in Paris in 1900. These steam boilers were produced and used in Russia, also in the territory of present-day Latvia. As an engineer, M. Berlov was also interested in them and thus wrote the mentioned brochure.

Engineer M. Berlov became known as a compiler of textbooks in Russian. «*Детали машин*» (Machine Parts) is one of his most published and used works. It was first printed in Riga in 1902. The book was supplemented and published several times (1909, 1922, 1926, 1928, 1931, 1935, 1938), and its copies can be found in the State Library of Russia, the National Library of Belarus, the National Library of the Czech Republic, the National Library of Latvia (NLL), the Scientific Library of RTU, RTU History Museum and other places. Most of the reprints of this book were printed in Russia – in St. Petersburg (after 1924 – in Leningrad) and Moscow, in 1922 – in Minsk, Belarus. In Riga, it was printed again in 1924 by «*Valters un Rapa*» Publishing House.

The textbook «*Детали машин*» was also translated into German and French, it was used in the higher technical school of France [6]. The textbook was intended for university students, students of technical

schools, technicians, mechanics, and engineers [27]. The quick guide – the Concise Manual on the Calculation and Design of Machine Parts – was published in 1935 [28].

The books compiled by M. Berlov, especially «*Детали машин*», were popular in Russia in the first half of the 20th century. Respecting the copyright and respecting the Professor, in 1938 in Leningrad (at present – St. Petersburg) the textbook of Nikolai Zamickij (*Николай Замицкий*; 1890–1953), Professor of mechanics at Leningrad Correspondence Industrial Institute, was published – the abbreviated course of M. Berlov's textbook «*Детали машин*» was supplemented [29]. A Russian engineer Nikolai Deyev (*Николай Деев*; ?–?), supplementing this work by M. Berlov, published a textbook for students of the All-Union Correspondence Industrial Institute in Moscow in 1938 [30].

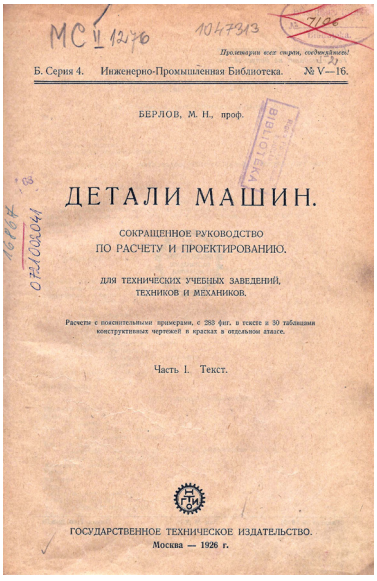


Figure 4. Title page of the 1st part of the book «*Детали машин*» compiled by M. Berlov in Russian (1926).

M. Berlov also composed other books. In 1911, his book on the mechanical theory of heat [31] was published, in 1934 – a technical graphics textbook in three parts [32]. In 1928, a large English-Russian technical dictionary was published in Moscow.

M. Berlov was the editor of many books printed in Russian. In 1915, he edited a collection of exercises in calculus and a textbook on the elements of probability theory by the mathematician, a pedagogue of Riga Commercial School Robert Bernstein (1877–?). The technical calendar for engineers, architects, builders, and mechanics for 1918 was also published under his editorship.

M. Berlov was the editor of several books published by Berlin and Riga Russian publishing house «*Наука и жизнь*» (Science and Life) at the beginning of the 20th century and in the 1920s. The books were published in Russian, and only a part of them can currently be found in Latvian libraries, a part is stored in the German National Library in Leipzig, because at least some of them were printed in Leipzig. Here we can mention the works translated from German on building drainage and cleaning, installation of toilets, general principles of bridge construction, railway rolling stock, buildings for industrial and technical companies (elevators, warehouses, factories), chemical engineering calculations, etc.

In 1923, under the editorship of M. Berlov, the publishing house «*Valters un Rapa*» published a book on electricity and magnetism by an RPI Professor Vladimir Lebedinsky (*Владимир Лебединский*; 1868–1937) and a collection of practical exercises for technical chemistry labs by an RPI graduate (1911) Pyotr Budnikov (*Пётр Будников*; 1885–1968).

It is known that M. Berlov collaborated with a graduate (1907) of the Department of Mechanics of RPI, Professor's student *Aleksandrs Kleinenbergs* (1882–?) in drawing up technical publications [33].

The Family of M. Berlov

Engineer M. Berlov was married to Vasa Berlov, b. Fyodorova (*Васа;* b. *Федорова*), born on 1 September 1868 in Tver Governorate, Russia [2; p. 2]. There were two daughters in the Berlov family – Yevgenia Berlov (*Евгения Берлова*), born on 14 December 1891, and Darya Berlov (*Дарья Берлова*), born on 21 March 1902, as well as a son Mikhail (also *Miķelis*) Berlov (*Михаил Берлов*) born on 25 September 1899. Darya and Mikhail were born in Riga and in 1921 returned to their hometown with their mother and father.

Figure 5. Yevgenia Berlov (c. 1928).

Figure 6. Darya Petrova (b. Berlov) (c. 1927).

Yevgenia Berlov decided to stay in Russia after World War I – in the city of Ardatov, Nizhny Novgorod Governorate. In January 1928, she went to the Latvian embassy in Moscow to get permission to enter Latvia and meet her parents. Due to health problems, Yevgenia stayed with her parents after the visit [34]. The Berlov family owned a house with rental apartments at 93 *Stabu* Street, Riga. The documents show that the property was registered in the name of Vasa Berlov [35; p. 1–2] and Mikhail Berlov owned a tenement at 91 *Stabu* Street [36]. Mikhail lived at 93 *Stabu* Street with his wife Vasa and daughter Yevgenia.

The son of Berlov family Mikhail was a Russian citizen and studied at Braunschweig Polytechnic Institute. He visited Latvia in 1924 and 1927, in 1925 he was refused entry because there was no «established reason for entry» [37]. The immigration case was handled by a Latvian citizen *Helene Podoļskija* (1904–?), who lived in the house owned by the Berlovs at 93 *Stabu* Street, as well as Mikhails' father Mikhail Berlov. After coming to Latvia, M. Berlov lived and rested in *Ķemeri*, *Jūrmala* of Riga.

Vasa's sister Praskovya Bolshakova (*Прасковья Большакова*; 1879–?) also lived with Mikhail and Vasa. She spoke only Russian and was provided for by Professor M. Berlov. P. Bolshakova's request to grant her Latvian citizenship was rejected because she did not have a certain occupation and income that would ensure her sustenance [38].

Professor M. Berlov travelled to France, Austria, and Germany in 1928. The authors have not been able to find out whether these were private trips to visit relatives or acquaintances. Presumably, some relatives lived in Western Europe, because the Professor's daughter D. Petrova also went to France at the end of 1928.

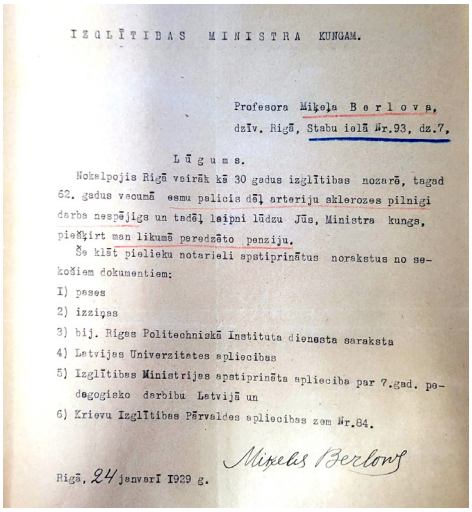
On 5 April 1941, M. Berlov's wife Vasa and her sister moved from 93 *Stabu* Street to 40 *Brīvības* Street [35; p. 129]. When the Soviet power was established in Latvia, the large real estate properties were nationalized. It was not possible to find any information about Berlov family's further fate.

Conclusion

Professor M. Berlov was a professional in applied mechanics, the author of widely used and highly rated textbooks, a respected engineer in the late 19th and early 20th centuries. The textbooks compiled by M. Berlov are stored in the libraries of several countries (Belarus, Bulgaria, Czech Republic, Russia, Latvia, and Germany) as witnesses of the achievements and inventions of the era.

In the history of education in Latvia, the name of M. Berlov is associated with the pedagogical and scientific activities of RPI, as well

as the Russian Technical School of Nikolai Okolo-Kulak – he worked as a teacher in the educational institutions founded on the territory of Latvia for almost 28 years, until he retired on 1 September 1928 [39].



IZGLĪTIBAS MINISTRA KUNGAM.

Profesora Mihela B e r l o v a,
dzīv. Rigā, Stabu ielā Nr.93, dz.7,

L ū g u m s.

Nokalpojis Rigā vairāk kā 30 gadus izglītības nozarē, tagad 62. gadus vecumā esmu palicis dēļ arteriju sklerozes pilnīgi darba nespējīgs un tādēļ laipni lūdzu Jūs, Ministra kungs, piešķirt man likumā paredzēto penziju.

Šo klāt pielieku notarieli apstiprinātus norakstus no sekošiem dokumentiem:

1) pases
2) izziņas
3) bij. Rigas Politechniskā Instituta dienesta saraksta
4) Latvijas Univerzitates apliecības
5) Izglītības Ministrijas apstiprināta apliecība par 7.gad. pedagogisko darbību Latvijā un
6) Krievu Izglītības Pārvaldes apliecības zem Nr.84.

Mihels Berlovs

Rigā, 24 janvarī 1929 g.

Figure 7. M. Berlov's request to the Minister of Education to grant him a pension (24 January 1929).

In Russia, he laid the foundations of Ivanovo-Voznesensk Polytechnic Institute and became its first Rector in the first years of the Soviet rule.

His merits were not forgotten even in the 1950s. In 1953, representatives of Kyiv Technological Institute of Silicates (*Киевский технологический институт силикатов*; Ukraine, currently – the National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute» (*Национальный технический университет Украины «Киевский политехнический институт имени Игоря Сикорского»*)) wanted to obtain M. Berlov's photograph and autobiography from the State University of Latvia in order to present it to their students, as the Professor was known in Kyiv as a theoretician and designer of elevators [2; p. 60–62]. M. Berlov was a citizen of Latvia, but he did not speak the Latvian language. He returned to Riga when the faculty of the Latvian Higher School, later the University of Latvia, was already complete. The Professor chose Latvia as his place of residence at the end of his life, because his wife had real estate in Riga and his daughters did not stay in Russia either. The authors, after studying the activities of the Professor, have concluded that M. Berlov and his family, finding refuge in Latvia, found political and financial security, they had the opportunity to visit Western European countries and had the opportunity to realize at least some of their plans.

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Svetlana Kovaļčuka, Alīda Zigmunde

Rīgas Politehniskā institūta profesora Mihaila Berlova (1867–1935) pedagoģiskais un zinātniskais mantojums

Mašīnbūves speciālista, Rīgas Politehniskā institūta (RPI) mācībspēka (1897–1918), profesora (1904) Mihaila Berlova (*Михаил Берлов*; 1867–1935) pedagoģiskā un zinātniskā darbība saistīta ar Rīgu 19. gadsimta beigās un 20. gadsimta pirmajā pusē, kā arī ar Krievijas pilsētu Ivanovovozņesensku (patlaban – Ivanova). M. Berlovs bija pirmais Ivanovovozņesenskas Politehniskā institūta (IPI) rektors (1918–1921), kurš 1921. gadā atgriezās Rīgā, ieguva Latvijas pavalstniecību un strādāja Nikolaja Okolo-Kulaka Krievu tehnikumā. Pētījumā atklāts arī pedagoga un zinātnieka ieguldījums mācību grāmatu sastādīšanā, kas tika izmantotas studijās Krievijas impērijā, tostarp tagadējās Latvijas teritorijā 20. gadsimta pirmajā pusē un Latvijas Republikas pastāvēšanas pirmajos gados.

Atslēgvārdi: Mihails Berlovs, Rīgas Politehniskais institūts, Ivanovozņesenskas Politehniskais institūts, mācību grāmatas inženieriem.

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HISTORY OF ENGINEERING SCIENCES AND INSTITUTIONS OF HIGHER EDUCATION

2023/7

SCIENTIFIC ACTIVITY AND CONTRIBUTION OF VOLDEMĀRS DĀLE (1922–2008), HONORARY DOCTOR OF THE LATVIAN ACADEMY OF SCIENCES, TO THE DEVELOPMENT OF POWER ENGINEERING

AUSTRA AVOTIŅA*
University of Latvia

Summary. Honorary Doctor *(Dr. h. c.*) of the Latvian Academy of Sciences (LAS), long-time leading researcher of the Institute of Physical Energetics, Professor *Voldemārs Dāle* (1922–2008) devoted his entire working life to science. The most important field of *V. Dāle's* research was the use of mathematical methods and computer technology in the dynamic optimization of power engineering development. The main areas of his scientific work include planning and forecasting methods of power system development; research on development problems of the Latvian and Baltic energy systems; methods of mathematical modelling of power systems considering the environmental factors. A monograph on research results in the optimization of electrical network development published in 1964 written by a group of three scientists, including *V. Dāle*, received the State Prize of the Latvian Soviet Socialist Republic (LSSR), which was awarded in 1965.

Keywords: *Voldemārs Dāle*, power engineering, power systems, dynamic programming, Institute of Physical Energetics.

Childhood and Youth of *V. Dāle* (1922–1950)

V. Dāle was born in Riga on 20 October 1922 [1]. When he renewed his documents in 1949, an error occurred, and from then on (from 28 March 1945, when the passport was issued), it was indicated in the official documents and passport that he was born on 10 October [2]. He was

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raised by his mother *Irma Dāle* (1900–1974), who was a newspaper dispatch worker.

In 1930, he graduated from Riga 12th Elementary School. As a child, he lived at 15/17 *Valguma* Street. From 22 March 1939, he lived at 5 *Dandāles* Street with a break from 26 June to 17 September 1942, when he stayed in the homestead «*Tūtes*» in *Zvārde* Parish. Before he started his family in 1950, his living conditions could be considered quite comfortable, but then the place became very cramped. Five people lived in a small two-room apartment with furnace heating, given that one of the rooms was walk-through. In the autumn of 1967, *V. Dāle's* family received the right to live in a new comfortable three-room apartment in Riga, at 145/1 *Gorky* (*K. Valdemāra*) Street.

V. Dāle was one of the 25 graduates of Riga State Technical School of 1942. He graduated from the Department of Electrical Engineering obtaining the qualification of a technician electrician. He was one of the most notable graduates of the technical school. A special chapter on his further achievements was included in the edition dedicated to the 100th anniversary of Riga State Technical School [3]. During World War II, he was not drafted into the German Army due to health issues, but most students of the technical school were forced to go off at the front. Three of them fell and 11 continued their lives in exile after the war. Many of them achieved significant success working in power engineering companies or used to be responsible for power engineering issues while working in various jobs [4].

V. Dāle gained his first practical work experience while renovating «*Latvenergo*» companies and working at «*VEF*» Factory. From 1942 to 1944, he worked at «*Siemens-Schuckertwerke*» Company, where he headed the engineering design group of the Company's Riga Branch. It is stated in his personnel record file that he also worked as a draftsman in the company. *V. Dāle* also worked at the Institute of Power and Mechanical Engineering and the Latvian Power System. From 1944, he worked as a technician at the company «*Latpromenergomontaž*» of the Ministry of Power Stations of the Union of Soviet Socialist Republics (USSR), in Riga.

In 1946, the Institute of Physical Energetics of the Academy of Sciences (AS) of the LSSR was founded (currently, the State Agency «Institute of Physical Energetics»). According to its statutes, one of the functions of the institute was to conduct fundamental and applied research in order to acquire new knowledge in power engineering and related natural sciences and engineering industries and to ensure the sustainable development and advancement of these industries [5]. *V. Dāle* wanted to join the family of young scientists of this institute. In his application, he mentioned that while working in the energy

distribution meter repair workshop and laboratory of the company «*Latvenergo*», he realized that he wanted to improve his qualifications. He also expressed his certainty that he would be able to achieve this goals conducting his scientific work. In 1949, *V. Dāle* graduated as an extern from the 8th Riga City Workers' Youth *Rainis* Secondary School. At that time, he already was a student of the Faculty of Mechanics of the State University of Latvian (SUL). An application dated 2 November 1944 has been preserved. He started his studies in December of the same year. There was a total of 18 students, three of them from Riga State Technical School (RSTS; *V. Dāle*, *Kārlis Tomariņš* (1923–2016), later a lecturer at Riga Polytechnic Institute (RPI), from 1990 – Riga Technical University (RTU), and *Helmuts Fridrihsons* (1924–1972)) and three other colleagues from «*Siemens-Schuckertwerke*». Several teachers who taught *V. Dāle* at RSTS at that time worked at SUL; thus, they continued to teach him and his groupmates at the university – *Kārlis Dommers* (1899–1983; at RSTS, he was also his form teacher, RPI lecturer (1958–1962)), and *Alfrēds Auziņš* (1879–?). He had to work in the daytime and study in the evenings.

In 1950, *V. Dāle* graduated from the Faculty of Mechanics of SUL, obtaining the qualification of an electrician of electrical networks, stations, and systems. The title of the new engineer's diploma paper was «*Asinhronmotors Latvijas PSR lauksaimniecībai*» (Asynchronous Motor for the Agriculture Sector of the Latvian SSR). His scientific supervisor *Jānis Demants* (1905–1981; RPI lecturer (1958–1975)) wrote in his review, «The diploma paper developed by *Dāle* has demonstrated that he is able to use all available literature, make independent conclusions, apply his methods in the calculations and that he is generally able to conduct scientific research» (20 July 1951). The diploma paper comprising 206 pages was written by hand, it consisted of nine chapters and 30 subsections, the bibliography comprised 28 bibliographic entries. In the course of the development of the diploma paper, *V. Dāle* designed 13 kW asynchronous motor for driving threshing machines, which was more economical as compared to the ones used at the time. The invention was very important for agriculture [6].

After graduating from the SUL, *V. Dāle* was assigned to *Ķegums* Power Plant, but he asked to revoke this assignment due to family circumstances. In the summer of 1950, *V. Dāle* started his family getting married to *Aina Eglīte* (1925–2006), who also graduated from the SUL that year and whose working life was also dedicated to the planning and development of the electrification of Latvia, specifically during her work at the Council of Ministers of the LSSR as a senior reporter. Their first child, *Edgars Dāle*, was born soon afterward, and six years later, their

daughter *Austra Dāle* was born. *V. Dāle* and *Aina Dāle's* marriage lasted for 56 years.

In April 1950, *V. Dāle* started working in the meter repair and testing laboratory of «*Energosbit*» division of «*Latvenergo*». On 15 December, he applied for the position of a junior research associate at the Institute of Power and Mechanical Engineering of the AS of the LSSR. At the end of his life, he admitted in an interview that «working there has become a part of my life and an addiction – 42 years!» [7].

Years as a Junior Research Associate

Figure 1. *Voldemārs Dāle* (1957).

In 1951, *V. Dāle* enrolled in a full-time postgraduate program in general power engineering at the Institute of Power and Electrical Engineering of the AS of the LSSR (Decree No. 35/195 of the AS of the LSSR of 4 October 1951). The period of post-graduate studies finished in 1954, but the thesis had not yet been completed. A diary of post-graduate studies that *V. Dāle* started on 19 June 1951 is still available. In the diary, he quite frankly expressed his thoughts about his ideas, attempts to realize them, and tasks. There are clear, critical descriptions of the external reasons why it was not possible to fulfil them within the expected deadlines. On 3 March 1953, *V. Dāle* wrote to *Kārlis Plaude* (1897–1975), the President of the AS of the LSSR, that his «situation was very serious». Classes in philosophy were planned for spring or late summer, but they were not organized and ended only

in November. The program in power engineering was not transferred from the capital of the Soviet Union, Moscow, and *V. Dāle* could not find a supervisor for his thesis of the candidate of technical sciences. *V. Dāle* tried to work on various topics, but he was not optimistic about a positive result [8].

In 1954, *V. Dāle* started working in the General Power Engineering Sector of the Institute of Physical Energetics (IPE) as a junior research associate, where he was engaged in determining the optimal parameters of electrical networks in rural areas and developing dynamic design methods. A record of the 5 May seminar of the sector has preserved. It was mentioned that *V. Dāle* agreed to work as an associate and reported on the program for further work: «*Методика учета сельскохозайственных электрических нагрузок при выборе параметров местных электрических сетей и станций*» (*Lauksaimniecības elektrisko slodžu uzskaites metodes, izvēloties vietējo elektrisko tīklu un staciju parametrus*; Methods for metering the agricultural electrical loads, choosing the parameters of local electrical networks and stations). The main task of this work was to demonstrate the shortcomings and inconsistency of the current approach and to develop the methodology for a new approach. During this difficult period, peculiar life habits of a hermit researcher were formed. A purposeful and serious sense of responsibility for one's tasks, understanding that in order to achieve something, that is, to invent, create, and prove, it is necessary to work persistently – all these feelings created the previously mentioned sense of work addiction. In order to be able to work productively, *V. Dāle* learned shorthand on his own using a textbook «*Stenogrāfija*» (Stenography), which was published by the Stenography Commission of the AS of the LSSR [9]). Many of his undeciphered summaries have been preserved in the shorthand record. The work of the researcher and inventor became his life. In the 1950s, he worked a six-day workweek at the Institute, spent evenings at the desk, and lived in silence at home. Excellent knowledge of the German language, the ability to use both Russian and English professionally, excellent logic, and a Christian philosophy-based view of life – all these factors can be considered important in the creation of his personality – the personality who does not cooperate with local authorities to the degree possible, does not aspire to high positions, and does not accept offers to take lucrative positions, because only members of the Communist Party can take them. It should be noted that *V. Dāle* never became a member of the Party.

In the late 1950s and 1960s, the field of power engineering, especially electrical power engineering, was developing rapidly. This was the time when continuous electrification was planned and partially

implemented, and unified electric power systems were created. As early as 1956, a publication on the issues of agricultural electrification was drafted [10], and an article on the five-year electrification plan of the *Daugava* basin was published in the journal «*Zvaigzne*» [11]. The scientific associate of the Institute of Physical Energetics of the AS of the LSSR *V. Dāle* published an informative article in the journal «*Zinātne un Tehnika*» on the planned electrification plan of the *Daugava* cascade and its great significance. The author mentioned various limitations and disadvantages at the same time offering possible solutions. The article outlined the importance of securing the fish roads, possibilities of ensuring migration of sea fish, and other significant factors of the construction of the Riga-Kherson waterway (including ship locks). The article demonstrated that the proposed plan was the result of many years of work when the information on the 1020 km long *Daugava* River bed, catchment basin, rainfall, geological composition of the soil at different stages, the importance of basin of Lake *Lubāns,* natural waterfall indicators (221 m), the structure of the banks, and the influence of weather conditions on the sector of electric power engineering was gathered and summarized. The scheme of the *Daugava* River cascade was added, starting from the Vitebsk Dam to the *Dole* Island. It was concluded that, for example, while constructing the *Pļaviņas* HPP, «it is possible to obtain unusually favourable economic indicators for the hydroelectric power plants of the European part of the USSR, which can be explained mainly by favourable topographical conditions – without significant flooding, a power station with 40 m pressure can be built here» [12]. The construction of the *Pļaviņas* HPP had already started in the previous decade. The project caused wide discussions and public protests, since it implied the flooding of the *Staburags* Waterfall. Despite the protests, the first symbolic cubic meter of concrete was poured in October 1961, and everything was put into full operation in July 1968 [13]. This article was also important because it was a good illustration of the challenge a new associate had to face, when he had been assigned the task of revealing the great economic importance of this project in the most logical, professional, and emotionless way. Therefore, it was not possible for the researcher to take the opposite side. Further activity of *V. Dāle* was always aimed at proving the far-reaching influence of logical connections and the role of pursuing priorities. Independent energy supply is the precondition of independence of every country. The conviction that Latvia needs and is able to have an independent, cheap, self-sufficient production and supply system of energy resources was one of the main missions of *V. Dāle*.

The 1960s were the time when a new branch of science – cybernetics – was also recognized and mastered. Computing

technology was developing rapidly, almost from scratch. Taking modern mathematical methods and computing techniques as the basis, research in general power engineering could develop to a qualitatively new level. In mid-1960s, IPE bought a small electronic computing machine «*НАИРИ*» and established a computing laboratory. In 1969, the electronic computing machine «*M-220 A*» was installed in the Dispatcher's Office of the North-western United Power System of the USSR located in Riga, and this marked the beginning of the widespread use of electronic computing machines (ECM) in the Latvian power engineering practice. The Laboratory of Complex Power Engineering Problems (Head *J. Mazurs*) was established at the IPE. In 1969, following the initiative of the President of the Presidium of the AS of the LSSR, Academician *K. Plaude*, who was also the Director of the IPE, the Laboratory of Mathematical Modelling of Power Systems (LMMPS) separated from the Laboratory of Complex Power Engineering Problems as an independent unit. *Zigurds Krišāns* (1930–2016), *Omārs Paegle* (1929–1988 (1987?)), and *V. Dāle* became the key researchers of the new laboratory. A close creative cooperation was established between the two laboratories, and it was maintained for the entire period of scientific activity of the researchers. The group was jokingly called *коефициент полезного действия* (*КПД*) – the coefficient of efficiency. The abbreviation used to denote this coefficient in Russian looks as though it was composed of the initial letters of the surnames of the key researchers of the laboratory – *К.* (K – for *Krišāns*) *П.* (P – for *Paegle*) and *Д.* (D – for *Dāle*). Their cooperation started already in the 1950s and they regularly published joint publications since 1955. Until 1971, they developed a total of 53 % joint publications including manuscripts with an approximate volume of 214 author sheets (bibliography compiled by *V. Dāle*). In the period from 1956 to 1996, 43 entries appear in the general catalogue of NLL and the world's largest library catalogue Worldcat.org* [14–16].

During this period, *Z. Krišāns*, *O. Paegle* and *V. Dāle* made a significant contribution to promoting the inclusion of 20 kV voltage in the USSR State Standard and the development of a 20 kV network in Latvia. In the mid-1960s, they developed the principles of dynamic design, which helped solve the issues of Latvian power system network development in the period from 1970 to 1975. In 1967, a team of scientists developed the mathematical model ORS-5 (*ESM – БЕСМ3М*), for the first time adopting dynamic programming to optimize network development. In the first 15 years since the establishment of the laboratory, computing technology and programming languages changed completely, and cooperation in the field of practical use of developed models expanded rapidly. Many original modelling and optimization methods were created, studied, and tested.

Figure 2. From left: *Zigurds Krišāns*, *Voldemārs Dāle*, *Omārs Paegle* (1966).

In 1964, a monograph «*Оптимизация электрических сетей при росте нагрузок*» (Optimization of Electrical Networks along with Increasing Loads) on the research results in the optimization of the development of electrical networks was published [17]. The decision of the Academy of Sciences on the publication was made already on 13 September 1963. It demonstrated that contextually innovations were in line with the latest trends in Europe. The book contained six chapters, the first of which was written by *V. Dāle*, the others were a collective work. The bibliography contained 110 sources in Russian, English, German, and French, predominantly references to the latest research, which were made in the decade up to 1962. The book contained bibliographic references to such periodicals as «Zeitschrift für Elektrizitätswirtschaft», «Elektrizitätswirtschaft», «Deutsche Elektrotechnik», «Electrical Review», «Electrical World», etc. In 1965, *V. Dāle*, together with his colleagues *Z. Krišāns* and *O. Paegle*, received the LSSR State Prize in Science for this monograph. Considering the scientific novelty of this method, which was developed with the reference to Richard Ernest Bellman's (1920–1984) research on dynamic programming first published in 1957, it may be concluded that research in Latvia was conducted in direct response to the latest discoveries (R. E. Bellman's book was translated into Russian and published in 1960). Newspaper «*Cīņa*» also wrote about this award, commenting that the candidate of technical sciences *O. Paegle*, group leader, senior engineer *V. Dāle* and candidate of technical sciences *Z. Krišāns* had

developed a mathematical model for optimizing energy distribution systems [18].

V. Dāle defended his dissertation of the candidate of technical sciences – «Specifics of the Selection of Electrical Network Parameters Considering the Dynamics of Electrical Loads» (Supreme Attestation Committee of the USSR, 28 March 1966, Minutes No. 5) only in 1966, at Kyiv Polytechnic Institute, Ukraine, The manuscript of the work was dated 1964 (the abstract was dated 1965). It was written in typescript in Russian, its volume amounted to 269 pages, it contained three chapters. The last page listed seven publications written on this theme during the writing of the dissertation. The first article was published in 1956, the other six publications were written from 1963 together with *O. Paegle* and *Z. Krišāns*, including the already mentioned monograph of 1964. The dissertation presented an example of a dynamic design program for digital computing machines in complex cases of electrical load balancing, considering the economic and technical indicators of the network [19].

Years as a Senior Research Associate

On 14 December 1972 (decision of the AS of the LSSR Presidium, Minutes No. 30/879), *V. Dāle* was appointed as a senior research associate at LAS IPE in the field of electrical systems and their management (certificate approved in Moscow on 17 April 1973). In his report on scientific and organizational research work from 1969 to 1974, *V. Dāle* noted that the work to be carried out was planned for three problems of pan-Soviet Union significance: 1) development of the scientific basis and optimization theory to reach the balance between fuel consumption and power supply; 2) development of the principles of system design and inter-system links for the unified power system of the USSR; 3) development of forecasting methods and theory of the perspective structure of the fuel and power economy and optimization of management of large energy systems. During the reporting period, *V. Dāle* worked on solving the optimization problems of the development of various power engineering facilities, mainly electrical networks. The fundamental findings made and justified in his earlier works were fully employed and advanced to a new level, allowing to conclude that it was mandatory to solve development tasks in compliance with dynamics, and that development processes, not states, should have been optimized. If earlier *V. Dāle* conducted research and implemented its results in practice considering mainly electrical networks of agricultural districts, in this period, he expanded the scope of his work to address development of the principles of system design and inter-system links for the unified

power system of the USSR as well. Mathematical models for optimizing the development of electrical power systems were developed based on the synthesis of dynamic programming methods and optimization of the system state, as well as functional equations and a system of constraints for the optimization of the development of the combined power systems taking into account the factors of the system's operating mode. As a result, a calculation methodology for optimizing the development of electrical networks of a complex electric power system was developed. A series of mathematical models with relevant program complexes for electronic computing machines was created on the basis of scientific-methodical works of *V. Dāle* [20].

In these circumstances, in 1969, the Presidium of the AS of the LSSR decided to establish a Laboratory of Mathematical Modelling of Power Systems at the Institute of Physical Energetics. In 1969, the scientific core of the new laboratory was formed by *V. Dāle*, *Z. Krišāns*, and *O. Paegle*. The perfectly coordinated joint work of these three scientists, to which *Dr. h. c. Dāle* contributed greatly, gave valuable scientific and practical results. In the early 1960s, they made a significant contribution to the creation of the 20 kV network in Latvia. In 1969, *V. Dāle* developed *ORS-12* (*ESM-M220*) computer program, with the help of which, the dynamics of the 330 kV network of any configuration was optimized for the first time. An original optimization (output states) method was developed for this model, it laid foundations for overcoming the problem of the number of states [21]. In 1969, the laboratory researchers already maintained good scientific connections with many research organizations.

The 1970s were the period of rapid development of this branch of science. The work of *V. Dāle*, the achievements of the LMMPS team and the contribution of each of its members were also valued at the national level. Researchers received several prizes. With the decision of the Presidium of the AS of LSSR dated 21 December 1973 No. 24/905, *V. Dāle* was awarded the second prize of the Presidium of the AS of LSSR for the work «*Matemātiskais modelis OM-2/1, kas paredzēts 110-35-20-10-6 kW sprieguma elektrisko tīklu attīstības variantu tehniski ekonomiskajai novērtēšanai*» (Mathematical model OM-2/1, intended for the technical and economic evaluation of the development options of 110-35-20-10-6 kW voltage electric networks). With the decision of the Presidium of the AS of LSSR dated 13 March 1975 No. 41, *V. Dāle* was awarded the second prize of the Presidium of the AS of LSSR for the work «*Elektroenerģētisko sistēmu galveno tīklu attīstības optimizācijai paredzētu matemātisko modeļu apakšsistēma*» (Subsystem of mathematical models intended for the optimization of the development of the main networks of electric power systems). With the decision of

the Presidium of the AS of LSSR dated 21 February 1980 No. 28, *V. Dāle* was awarded the first prize of the Presidium of the AS of the LSSR for the collective monograph «*Energosistēmu tīklu attīstības analīzes dinamiskās metodes*» (Dynamic Methods of Power System Network Development Analysis) [22].

Years as a *Ph.D*

The basic principles of dynamic design were already developed in the 1980s. However, during this period, electric power objects became much more complex, thus the development tasks also changed. Thus, *V. Dāle* was developing methods that could be used to solve these new tasks. Tasks of dynamic optimization were developed and formulated, criteria selection options, the structure of electric network preparation, and principles for optimal development of dynamic models were proposed. All theoretical conclusions were substantiated by both systemic and specific network modelling examples providing relevant evidence [23].

Figure 3. Staff of the Laboratory of Mathematical Modelling of Power Systems (c. 1989). In the first row from left: *Dagmāra Briede*, *Halina Abramova*, *Lidija Oļeiņikova*, *Ingūna Būmane*, *Svetlana Lunte*, *Ināra Greivule.* In the second row from left: *Tālivaldis Ķipurs*, *Voldemārs Dāle*, *Māra Ragovska*, *Zigurds Krišāns*, *Irēna Mistere*, *Omārs Paegle*, *Vairis Putniņš*. *Anna Kalpiņa* (b. *Onckule*), who worked in the laboratory since 1988, is not present.

In the 1990s, a complete transition of computer technology from large third-generation computers to personal computers took place in Latvia. The use of computers in the economic activity was expanding, and the technical parameters of computers and their mathematical support were changing very quickly. In the second half of the 1990s, cooperation between «*Latvenergo»* and the power systems of Western countries was established. Funds for the restoration and modernization of Latvia's power system were founded, the weak points of which became apparently visible – the system consisted of low-voltage networks and medium- and high-voltage distribution networks in major cities. Therefore, the basic scientific research area of the laboratory in this period was the technological problems of the construction of the automated system for the optimization of the development of electrical networks. The aim of the research was to develop databases and interfaces for automated systems that would ensure a convenient interface between an engineer and a computer software system, solving both strategic and operational tasks. Low-voltage networks were the focus of the research, this issue had not been addressed by the laboratory before. Research was carried out in cooperation with RTU, the Royal Swedish Institute of Technology, the Latvian Power System, the Estonian Academy of Sciences, and the Lithuanian Academy of Sciences. Scientific cooperation and connections with research organizations, power systems, and design organizations in Western Europe were expanded and strengthened. The laboratory became an authority in research and practice.

In 1992, with the decision of the LAS IPE FEI Habilitation and Promotion Council of 14 July 1992, No. 2-92 *V. Dāle* obtained a degree in engineering (for the dissertation «*Elektrisko tīklu parametru izvēles īpatnības, ievērojot elektrisko slodžu dinamiku»* – «Specifics of the selection of electrical network parameters, considering the dynamics of electrical loads).

In 1994, *V. Dāle* was elected a professor (LAS IPE Science Council Decision No. 4 of 26 April1994) and, in recognition of his merits in science, he was awarded the title of an Honorary Doctor of Latvia's AS (*Dr. h. c*. – 15 March 1994) [24].

From 1995 to 1999, permanent cooperation with the Faculty of Power and Electrical Engineering of RTU was established. LMMPS developed the Master's study program «*Elektroenerģētisko uzņēmumu vadība*» (Management of Electric Power Companies) and a cycle of several courses. LMMPS also became part of RTU Institute of Electric Power Systems as one of the organizational units, it educated and trained Master's students to continue their field of work [25]. The year of 1999, when the staff of the laboratory included 29 employees,

was unexpectedly difficult. The theme of the planned research for the year was the scientific basis of dynamic analysis of power efficiency. The method of determining load schedules, the technology, and the method of low-voltage network energy loss calculations under conditions of information deficiency were being developed, and several program systems had been developed. However, all attempts to conclude contracts with «*Latvenergo*» management were unsuccessful. Despite the previous orders and the great interest shown by certain organizational units, LMMPS fell into debt. While distribution network companies needed LMMPS services to deploy loss calculations in low-voltage networks, the lab's operations were changing a lot, and it could implement only small direct contracts. In 1999, the first contract with the Network Service was also concluded, and the «*Zudumi'99*» program system was developed, which enabled mass calculations of low-voltage network energy losses [26].

Dr. h. c. V. Dāle retired from active scientific work in 1999 after 30 years of working at the laboratory. The core team of the laboratory at this time consisted of *Z. Krišāns*, *V. Dāle*, *A. Kalpiņa*, *I. Oļeiņikova*, *I. Greivule* (also retired in 1999), *V. Putniņš* (also retired in 1999), *I. Būmane*, *K. Krišāns* and *M. Ragovska*. The work started by *V. Dāle* has been continued by young, but already world-famous scientists who grew up and matured thanks to the scientific base created by the original scientific core of the laboratory – *V. Dāle*, *Z. Krišāns,* and *O. Paegle* [27, 28]. Dynamic programming methods for solving tasks of optimal network development are still relevant in the education process of young scientists. References to the solutions proposed by *V. Dāle* and his colleagues can also be found in textbooks on the optimization and planning of power supply systems. They are also relevant for 21st-century students [29, 30]. The mandatory reading list of the RTU study course «*Algoritmizācija un optimizācijas metodes industriālajā elektronikā*» (Algorithmization and Optimization Methods in Industrial Electronics) includes the book «*Elektrisko tīklu attīstības dinamiskā optimizācija*» (Dynamic Optimization of Electrical Network Development), which can be considered a targeted summary of all scientific activity, since it covers many principles and steps of formulating dynamic optimization tasks, starting from modelling to recommendations for the development of electrical network projects [23].

Conclusion

The second half of the 20th century was the most productive period of Professor *V. Dāle's* activity. Starting from the late 1950s and 1960s, the power industry, especially electric power systems, and computer technology developed very rapidly, and a new branch of science – cybernetics – was established. Scientists, including *V. Dāle*, should have used modern mathematical methods and computing techniques in power engineering.

V. Dāle was not a member in any political parties or organizations, worked a lot, lived quite a reserved life, and served science. At the end of his life, *V. Dāle* admitted that «in the end, everything turned out quite well, I am a Latvian in Latvia, my life has been lived, but I can still experience something by observing, if not making an impact» [7]. In an interview in 2001, which was conducted by *V. Dāle's* granddaughter *Antra Ozola* (since 2022 – professor at the Faculty of Education, Psychology and Arts of the University of Latvia), when he asked about his character, he said, «A person gets into many situations in the course of his life, many things can get manifested in his personality and many things would never get manifested throughout his life. There are perhaps some values that you need to persistently hold to. It is good for a person to be independent, it is good for a person to be indifferent to other people's impressions. It is good if one can distinguish, if not distinguish good from evil, then at least useful from useless. .. I have always tried both consciously and unconsciously to be myself, to be what I was created to be. In my understanding, the main task is not so much to create my personality but rather to purify myself from the impact of those creators, to protect myself from them, and to try to be what I am, to try to understand it to some extent, and then to remain that way. .. Those who want to shape us attack us from all sides – using television, radio, newspapers, we find them at schools and churches, society, and among familiar people, etc. They all consider themselves creators, but you should try to get rid of them remaining as healthy as possible. .. You should try to live happily. You need to try to live decently. A righteous life is happiness, and a wrong life is unhappiness. .. Everyone has to decide for oneself, and every person deals with it in their own way» [31].

V. Dāle knew how to live his life so that not only his descendants could be proud of his achievements. The scientist was an erudite researcher with comprehensive and deep knowledge. He «knew how to get to the essence of the problem and to always find weak points of the proposed scientific hypotheses» [32].

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SOURCES OF ILLUSTRATIONS

Figure 1. A. Avotiņas personīgais arhīvs.

Figure 2. A. Avotiņas personīgais arhīvs.

Figure 3. A. Avotiņas personīgais arhīvs.

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Austra Avotiņa

Latvijas Zinātņu akadēmijas goda doktora Voldmemāra Dāles (1922–2008) zinātniskā darbība un ieguldījums enerģētikas attīstībā

Latvijas Zinātņu akadēmijas (LZA) Goda doktors (*Dr. h. c.*), ilggadējs Fizikālās enerģētikas institūta vadošais pētnieks profesors Voldemārs Dāle (1922–2008) visu darba mūžu veltījis zinātnei. Nozīmīgākā V. Dāles pētījumu joma bija matemātisko metožu un datortehnikas izmantošana elektroenerģētikas attīstības dinamiskā optimizācijā. Galvenie zinātniskā darba virzieni: energosistēmu attīstības plānošanas un prognozēšanas metodes; Latvijas un Baltijas energosistēmu attīstības problēmu izpēte; energosistēmu matemātiskās modelēšanas metodes, ievērojot apkārtējas vides faktorus. 1964. gadā iznāca monogrāfija par pētniecības rezultātiem elektrisko tīklu attīstības optimizācijā. Par šo darbu trīs zinātnieku grupai, tostarp V. Dālem, 1965. gadā piešķirta Latvijas Padomju Sociālistiskās Republikas (LPSR) Valsts prēmija.

Atslēgvārdi: Voldemārs Dāle, elektroenerģētika, energosistēmas, dinamiskā programmēšana, Fizikālās enerģētikas institūts.

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EARLY ENGINEERS AND ARCHITECTS BORN ON THE TERRITORY OF PRESENT NORTH MACEDONIA

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Summary. This article presents the initial results of the ongoing research into the early engineers and architects born in the past on the territory of present North Macedonia, who graduated before the establishment of the country on 2 August 1944, prior to the founding of the first Technical Faculty in Skopje in 1949. The majority of the identified engineers and architects were men who graduated within the interwar period from the Technical Faculty at the University of Belgrade (Serbia), founded in 1846. Women started entering engineering and architecture in the 1930s. Some of the early graduates pursued their professional careers elsewhere. Three graduates of Riga Polytechnic Institute (Latvia) were identified, who had their degrees recognized by the Technical Faculty in Belgrade, as well as one Serbian woman, an engineer, and an architect who briefly lived in Riga within the researched period. This study contributes to the history of engineering and architecture in North Macedonia.

Keywords: North Macedonia, early engineers and architects, RPI, prior to 1944.

Introduction

The territory of current North Macedonia was part of the Ottoman Empire between c. 1371 and 1912. During the turbulent period of the 1st and the 2nd Balkan Wars (1912–1913), as well as World War I (WWI) and World War II (WWII) the territory was part, initially, of the Kingdom of Serbia and in the interwar period – of the Kingdom of Serbs, Croats and Slovenes that in 1929 became the Kingdom of Yugoslavia. Federal Unit Macedonia within the Federal and Democratic Yugoslavia was proclaimed on 2 August 1944. Later, it remained part of the former Socialist Federal Republic of Yugoslavia as the Socialist Republic of

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Macedonia until the proclamation of independence on 8 September 1991. The country changed its name from the Republic of Macedonia to the Republic of North Macedonia on 12 February 2019 in response to objections by the Hellenic Republic to the original name that prevented the country from joining NATO and the EU.

The formal tertiary education in engineering including architecture in North Macedonia became possible only in 1949 when the Technical Faculty comprising the Departments of Civil Engineering and Architecture was founded and became part of the University of Skopje (now the Saints Cyril and Methodius University in Skopje). The first generation of students completed their five-year full-time studies in engineering leading to the title *'diplomiran inžener (dipl. inž) – дипломиран инженер (дипл. инж.)'* (Graduate Engineer) by the mid-1950s. Therefore, all engineers and architects originating from this territory in the past were educated elsewhere.

This pilot study focuses only on those engineers and architects who were born in the past on the territory of present North Macedonia but were educated outside its present borders before the end of WWII. It is expected that the identification of these early engineers and architects will contribute to the understanding of the development of engineering in North Macedonia and encourage further research into their individual achievements and contributions.

Methodology

The research to date has focused on identifying the early formally educated engineers and architects born on the territory of present North Macedonia, who graduated before 2 August 1944 when Federal Unit Macedonia was proclaimed. Desktop research was carried out to establish their main personal details, the year, and the place of graduation. For this, available directories of graduate students from the Technical Faculty of the University of Belgrade (Serbia), the Faculty of Architecture of the University of Zagreb (Croatia), and the Faculty of Architecture of the University of Ljubljana (Slovenia) were consulted. These were complemented with available publications covering the history of engineering and architecture by the Museum of Science and Technology in Belgrade, the Macedonian Academy of Science and Arts, and books by the late Professor Georgi Konstantinovski (1930–2020), and other available publications and internet resources.

The presented list of early engineers and architects born on the territory of present North Macedonia was established using the 1939 Directory of Graduate Engineers and Architects by the

Technical Faculty at the University of Belgrade [1], complemented by the information from the book «Architects of Macedonia (XVIII–XX Century)» by Professor G. Konstantinovski [2], and other available sources. The main challenges were associated with the scattering of the potential sources of information in Türkiye, Serbia, North Macedonia, Croatia, Slovenia, and other countries and different languages of the materials used, including Arabic for the period of the Ottoman Empire. Furthermore, up to the end of WWII, it was a common practice for the people living on the territory of present North Macedonia to be issued a new birth certificate when the control of the territory was transferred from one to another country. During this process, their names and surnames were often changed to align with the language of the ruling country. In practice, this means that often the name and surname of the same person may have been recorded differently throughout their lives. The additional difficulty is associated with the 1919 change from the Julian to the Gregorian Calendar on the territory of North Macedonia, which makes establishing the correct dates challenging since it is not clear which calendar is used in date references.

The early engineers and architects presented in this paper include only those for whom there was at least a single source available about their place of birth. Throughout the research, other engineers and architects were identified whose name and surname allowed assuming that they may have been born on the territory of present North Macedonia. However, they were not included in the study since it was not possible to confirm their place of birth.

Brief History of Early Engineering Education in the Region

As formal education in engineering and architecture on the territory of North Macedonia became available only in 1949, those who graduated before 2 August 1944 could do it only outside its territory, like, for instance, within the Ottoman Empire or the former Kingdom of Yugoslavia that were mostly in control of the territory until 1944, or other countries.

Within the Ottoman Empire, Istanbul Technical University (ITU) in Istanbul (Türkiye) is considered to be the oldest engineering school founded in 1773 as the Imperial School of Naval Engineering that led to the establishment of the Imperial School of Military Engineering in 1795. The scope and the name of the school changed in 1883 and 1909 when it became a public engineering school [3]. The training of architects within ITU commenced in 1884 [4]. In 1882, the Mimar Sinan Fine Arts

University was established in Istanbul (Türkiye) as the first Academy of Fine Arts in the country offering education in arts and architecture [5].

Within the «western» part of the territory of former Yugoslavia (encompassing present Slovenia, Croatia, and Bosnia and Herzegovina), which was under the Austro-Hungarian Empire rule until the end of WWI, the oldest engineering school was the Austro-Hungarian Naval Academy established in Rijeka (then Fiume, Croatia) that in 1889 became Imperial and Royal Naval Academy. It operated until 1914 when it was moved to Vienna (Austria) [6]. In 1919, the High Technical School was established in Zagreb (Croatia); in 1926, it became the Technical Faculty within the University of Zagreb [7]. In the same year (1919), the Technical Faculty of the University of Ljubljana, Slovenia, was established [8].

In the eastern part of the territory of former Yugoslavia (comprising present Serbia, Montenegro, North Macedonia, and Kosovo), the oldest school is the Engineering School at the Lyceum in Belgrade (Serbia), founded in 1846, that in 1863 became the Technical Faculty of the High School in Belgrade and later, in 1905 – of the University of Belgrade. Initially, due to the limited resources and teaching staff, the studies lasted for three years, they aimed to provide only the foundations of technical education whilst allowing the most promising students to carry on their studies abroad. The studies were extended to four years from 1863 [9]. All other engineering schools on the territory of the entire former Yugoslavia were established after WWII.

Ottoman Empire Period (1371–1912)

The research to date has been able to establish only a few formally educated engineers and/or architects born on the territory of present North Macedonia during this period. Probably, the earliest mentioned engineer practicing but not born on this territory is Sterie Guşa Ciumetti (1870, Veria, Ottoman Empire (now Greece) – 1933, Bucharest, Romania) (see Figure 1 (a), p. 102) who was educated in the Polytechnic University in Bucharest (Romania) (founded in 1818) as a bridge and road engineer before returning to Bitola (then – Monastir). There, he taught mathematics at the local Lyceum where he was a former student and practised as an engineer. A stone bridge on the River Dragor in Dovledžik near Bitola built at the turn of the 20th century is an example of his work (see Figure 2, p. 103). During the turbulent years of the Balkan War and WWI, he moved to the north of the Balkan Peninsula along the present Bulgarian-Romanian border. He was appointed the first Head of

the County Technical Service in Silistra (Bulgaria) and later appointed Inspector General of Bridges and Roads in Constanta (Romania) [10].

Three engineers and/or architects born on the territory of present North Macedonia that graduated during this period were identified (see Table 1).

Table 1

List of engineers and architects born in the past on the territory of present-day North Macedonia who graduated during the period of the Ottoman Empire [2, 11, 12]

No	Year Grad	Name and surname	DOB, POB, DOD, POB	Subject	University
1	1896	Petar J. Popović	25 May 1873, Prilep, Ottoman Empire (now North Macedonia)–4 February 1945, Belgrade, Yugoslavia (now Serbia)	Architecture	Belgrade
2	1904	Naum Torbov	18 November 1880, Gopeš, Ottoman Empire (now North Macedonia)–2 June 1952, Sofia, Bulgaria	Architecture	National University of Arts Bucharest
3	1910	Josif M. Mihajlović	28 April 1887, Teresonče, Ottoman Empire (now North Macedonia)–11 March 1941, Skopje, Kingdom of Yugoslavia (now North Macedonia)	Architecture	Belgrade

Figure 1. From left to right: (a) engineer Sterie Ciummeti, (b) architect Petar J. Popović, (c) architect Naum Torbov (cropped), and (d) architect Joisf M. Mihajlović (cropped).

P. J. Popović (Figure 1 (b)) and J. M. Mihajlović (sometimes also listed as Josif Mihajlović-Jurukovski) (Figure 1 (d)) both graduated from the Technical Faculty in Belgrade in 1896 and 1910, respectively. P. J. Popović

started working for the Ministry of Construction in Belgrade in 1897 and passed the State Exam in 1901. Later he became the Head of the Ministry of Construction and Public Works (1919–1927) and an Honorary Professor of Medieval Serbian and Byzantine Architecture at the Technical Faculty in Belgrade (from 1919). Probably one of his most prominent works is the Ruski Car (Russian Tsar, named after Alexander II of Russia) – a mixed commercial-residential building in Belgrade (1922–1925) on Knez Mihjalova Street, designed together with Dragiša Brašovan (1887–1965). His main professional contribution to the territory of present North Macedonia is related to the conservation works on historic monuments, like the cravanserai / caravan saray / roadside inn/han, Kuršumli An in Skopje (Figure 3, p. 104), and the Memorial Church (Chappel) with Ossuary in Štip (1926) that was lost during WWII. In recognition of his prominent work and contribution to architecture, he became a member of the Serbian Royal Academy (now Serbian Academy of Arts and Sciences) in 1925, and in 1926 – a corresponding member of Jan Masaryk Academy of Labour in Prague [11].

Figure 2. Stone bridge on the River Dragor near Dovledžik in Bitola by engineer Sterie Ciumetti (1916).

Unlike P. J. Popović, J. M. Mihajlović took more opportunities and continued his education in Italy, the USA, France, and the UK before returning to the Kingdom of Serbs, Croats, and Slovenes. After a period in Belgrade, Serbia, he moved to Skopje where he served as a Mayor twice in the period between 1920 and 1941. As a Mayor, he played a pivotal role in transforming Skopje from an oriental kasbah/town into a Europe-inspired regional capital. During his mandate, Skopje got a new master plan and city centre (see Figure 4, p. 104), water supply and drainage were improved, the first power station, the first man-made

lake and hydroelectric power station, a new railway station, airport, and a number of other key buildings were built. As an architect, he will be remembered for his Red Cross and the Labour Exchange buildings [2].

Figure 3. Kuršumli An (Inn/Han) from the Ottoman Period in Skopje (pre-1963).

Figure 4. Aerial Photo of the City Square in Skopje (pre-WWII).

Similar to P. J. Popović, N. Torbov left the territory of present North Macedonia as a child, with P. J. Popović growing up in the Principality of Serbia and N. Torbov – in the Principality of Bulgaria. After completing his studies at the National University of Arts (founded in 1854) in Bucharest (Romania), he returned to Bulgaria and took a post at the Ministry of Public Building in Sofia before being appointed as the Head

of the Department of Architecture at the Sofia Municipality in 1906 and commencing private practice in 1908. He became one of the most prominent architects of that time in Bulgaria, who designed a number of public and residential buildings throughout the country, including probably the most prominent one, Sofia Central Market Hall (1911) (see Figure 5). Unlike P. J. Popović and J. M. Mihajlović, it is not known whether he contributed any architectural work to the territory of present-day North Macedonia [12].

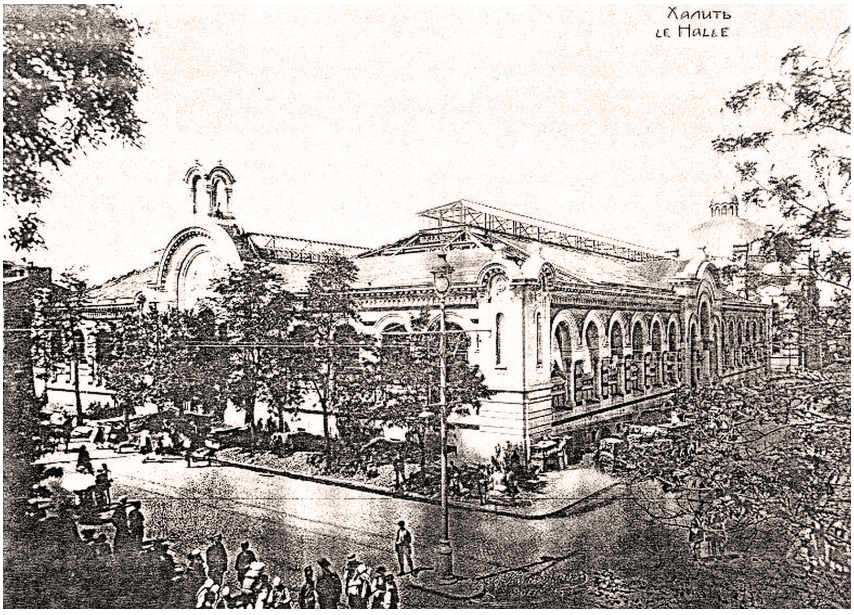

Figure 5. The Market Hall in Sofia (Bulgaria) by architect Naum Torbov (1912).

Period Between the Balkan Wars (1912–1913) and the WWI (1914–1918)

So far, the research has identified only one engineer who graduated during these turbulent times. Gligorije Tomić (1886, Kruševo, Ottoman Empire (now North Macedonia)–1971, Belgrade, Yugoslavia (now Serbia)) graduated in architecture from the University in Belgrade in 1914. Upon passing his professional exam, he returned to Skopje to set up his own practice that was active until 1941. After WWII, he worked initially as an architect for the Railway Transport Company (*Železničko trnasportno pretprijatie* – *ŽTP*) before becoming Deputy Head at the Ministry of Construction. During his professional career, he designed several

residential, public, and commercial buildings, as well as military barracks in Skopje and across North Macedonia. One of his most prominent buildings is the Ibni Pajko Dom (Centre) building in Skopje (1937) (Figure 6) [2].

Figure 6. The Medieval Stone Bridge in Skopje with the Ibni Pajko Building in the background (left hand side) by architect Gligorije Tomić (1950s) [9].

Kingdom of Serbs, Croats, and Slovenes (1918–1928)

In the aftermath of WWI, the Kingdom of Serbs, Croats, and Slovenes was formed providing a period of relative stability. During this period, Technical Schools / Faculties within the University of Zagreb and Ljubljana were formed offering more opportunities to study engineering and architecture within the country.

List of engineers and architects born on the territory of present-day
North Macedonia who graduated during the Kingdom of Serbs, Croats, and Slovenes (1918–1928) [1, 2]

Abbreviation: N/A – data not available

No	Year Gard	Name and surname	DOB, POB, DOD, POB	Subject	University
1	1920	Dragoljub A. Gazikalović	11 June 1889, Skopje, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
2	1921	Ahilo I. Džadžević	25 March 1891, Gevgelija, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
3	1921	Vladimir S. Petrović	24 December 1890, Labunište, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
4	1922	Velimir Dj. Stavrić	31 October 1894, Skopje, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
5	1922	Čedomir A. Gazilkalović	20 April 1894, Skopje, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
6	1924	Stojmir S. Simić	21 April 1896, Kratovo, Ottoman Empire (now North Macedonia)–N/A	Architecture	Belgrade
7	1924	Sotir T. Tomić / Sotir T. Tomoski	16 February 1899, Bitola, Ottoman Empire (now North Macedonia)–30 November 1985, N/A	Architecture	Belgrade
8	1924	Vladimir R. Ristić	12 October 1898, Resen, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
9	1925	Veljko V. Veljković	12 August 1896, Kučkovo, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade

No	Year Gard	Name and surname	DOB, POB, DOD, POB	Subject	University
10	1925	Gligorije T. Tašković	20 June 1901 or 3 July 1901, Bitola, Ottoman Empire (now North Macedonia)–21 August 1963, New York, USA	Civil Engineering	Belgrade
11	1925	Dimitrije Karadžić	21 June 1897, Štip, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
12	1926	Mihailo K. Nebreklijević	30 October 1894, Prilep, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
13	1926	Kosta D. Hadžiev	10 May 1902 Ohrid, Ottoman Empire (now North Macedonia)–2 November 1973, N/A	Hydro Engineering	Vienna University of Technology
14	1927	Stevan A. Gazikalović	8 February 1900, Skopje, Ottoman Empire (now North Macedonia)–1975, Belgrade, Yugoslavia (now Serbia)	Architecture	Belgrade
15	1927	Dimitrije A. Simončević	25 February 1895, Ohrid, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
16	1927	Todor S. Spasić	11 January 1902, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
17	1927	Borivoje J. Popović	28 April 1899, Tetovo, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
18	1927	Haralampije N. Fukarević	13 August 1901, Prilep, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
19	1927	Djordje J. Ivanović	19 January 1897, Prilep, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade

The majority of engineers and architects with a confirmed place of birth on the territory of present North Macedonia graduated from the University of Belgrade with the exception of K. D. Hadžiev who was trained as a hydro engineer at the Vienna University of Technology (Austria) founded in 1815 (Table 2, pp. 107–108). The later part of this period saw the emergence of the early graduated mechanical and electrical engineers. Apart from K. D. Hadžiev, who contributed with his engineering and building projects to his native Ohrid, civil engineer G. T. Tašković and architects S. T. (Tomić) Tomoski and S. A. Gazikalović are considered to be among the most prominent representatives from this period. They contributed significantly to the post-WWI rebuilding efforts on the territory of present-day North Macedonia.

Kingdom of Yugoslavia (1929–1940)

The largest number of engineers and architects graduated in this period (Table 3, pp. 110–113). Again, the majority of the identified graduates come from the University of Belgrade. There are some uncertainties about Isajlo J. Jovanov-Nikolovski's qualification. Based on the available information it is assumed that he completed a higher technical education in construction, which appears to be a vocational qualification at a level between that of a secondary technical school and a university degree. This qualification allowed him to proceed to the State Exam and upon completion, he was able to undertake design and construction of the buildings.

Although the majority of graduates are men, for the first time three women were identified as the earliest engineering women graduates born on the territory of present North Macedonia. The first one, Ms. S. Rifat Güreyman, obtained a degree in civil engineering at Istanbul Technical University in Istanbul (Türkiye) in 1933 whilst the other two, Ms. J. Dj. Naumović and Ms. R. Č. Vohoska, graduated in architecture from the University of Belgrade in 1934 and 1938, respectively.

Table 3

List of engineers and architects born in the past on the territory of present-day North Macedonia who graduated during the Kingdom of Yugoslavia (1929-1940) [1, 2, 13]

Abbreviation: N/A – data not available

No	Year Grad	Name and surname	DOB, POB, DOD, POB	Subject	University
1	1927	Kiril D. Žernovski	21 September 1897, Debar, Ottoman Empire (now North Macedonia)–28 November 1972, Skopje, Yugoslavia (now North Macedonia)	Civil Engineering?	Zagreb
2	1929	Lambra P. Kovačević	12 October 1900, Labunište, Ottoman Empire (now North Macedonia)–N/A	Architecture	Belgrade
3	1929	Kosta T. Šorković	25 July 1902, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
4	1929	Ćira L. Lazarević	3 March 1894, Kavadarci, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
5	1929	Bojan S. Sanjević	2 February 1899, Štip, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
6	1929	Zlatko A. Aritonović	17 December 1906, Kriva Palanka, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
7	1929	Momičilo P. Kozomarić	7 January 1901, Tetovo, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
8	1930	Petar H. Vlahčević	29 June 1898, Štip, Ottoman Empire – now North Macedonia–N/A	Civil Engineering	Belgrad
9	1930	Mihailo A. Ačević	26 August 1903, Veles, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
10	1932	Djordje Z. Kardaljević	1 May 1905, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade

No	Year Grad	Name and surname	DOB, POB, DOD, POB	Subject	University
11	1932	Lazar M. Mihailović	1 April 1907, Tetovo, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
12	1932	Milan M. Djunković	24 December 1902, Bašino Selo, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
13	1932	Jordan Dj. Pandilović	18 November 1906, Tetovo, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
14	1932	Isajlo J. Jovanov-Nikolovski	21 January 1910, Tresonče, Ottoman Empire (now North Macedonia)–26 July 1963, Skopje, Yugoslavia (now North Macedonia)	Construction *(qualification between technician and graduate engineer/ architect)*	Higher Technical School in Belgrade
15	1933	Metodije J. Nočević	25 December 1902, Prilep, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
16	1933	Apostol D. Sotirović	17 March 1904, Mavrovo, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
17	1933 or 1934	Djordje V. Vasiljević / Georgi Vasilev	13 March 1908 or 13 March 1909, Strumica, Ottoman Empire (now North Macedonia)–1965, Belgrade, Yugoslavia (now Serbia)	Mechanical & Electrical Engineering	Belgrade
18	1933	Ms Sabiha Rifat (*married* Gürayman)	1910, Bitola, Ottoman Empire (now North Macedonia)–4 January 2003, Izmir, Türkiye	Civil Engineering	Istanbul Technical University
19	1934	Ms Jovanka Dj. Naumović	6 January 1911, Bukojčani, Ottoman Empire (now North Macedonia)–N/A	Architecture	Belgrade
20	1934	Metodije M. Petković	13 February 1910, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
21	1934	Penčo L. Zafirović	7 April 1910, Veles, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
22	1934	Tiberije Dj. Kirijas	5 May 1908, Trnovo, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade

No	Year Grad	Name and surname	DOB, POB, DOD, POB	Subject	University
23	1934	Ignjat J. Krstić	21 December 1906, Požarane, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
24	1935	Rista N. Talević	14 September 1909, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
25	1935	Veselin S. Dićić	2 May 1908, Skopje, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
26	1935	Lazar M. Hristov	15 March 1914, Veles, Kingdom of Serbia (now North Macedonia)–N/A	N/A	Belgrade?
27	1936	Dragoljub S. Sotirović	10 April 1905, Mavrovo, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
28	1936	Branko F. Djukić	19 June 1912, Prilep, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
29	1936	Petar S. Nikolić	29 June 1911, Bitola, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
30	1936	Rista L. Mukajetović	10 July 1907, Kavadarci, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
31	1936	Ćirilo I. Jovanović	20 December 1911, Kavadarci, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
32	1937	Milorad D. Macura	9 March 1914, Skopje, Kingdom of Serbia (now North Macedonia)–1989, Belgrade, Yugoslavia (now Serbia)	Architecture	Belgrade
33	1937	Dimitrije A. Ilić	22 October 1907, Kavadarci, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
34	1937	Elio I. Koen	15 August 1912, Skopje, Ottoman Empire (now North Macedonia)–N/A	Technology Engineering	Belgrade
35	1937	Draguting M. Jovanović	20 September 1914, Skopje, Kingdom of Serbia? (WWI) (now North Macedonia)–N/A	Civil Engineering	Belgrade

No	Year Grad	Name and surname	DOB, POB, DOD, POB	Subject	University
36	1937	Jaćim P. Perić	23 August 1914, Skopje, Kingdom of Serbia? (WWI) (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
37	1937	Rahamin N. Beraha	1 January 1912, Skopje, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
38	1937	Alfred L Melamed	28 August 1913 Kumanovo, Kingdom of Serbia (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
39	1937	Bogoljub B. Urošević	26 April 1911, Skopje, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
40	1937	Konstantin L. Zordumis	24 January 1914, Kumanovo, Kingdom of Serbia (now North Macedonia)–N/A	Architecture	Belgrade
41	1937	Mladen T. Stefković	23 December 1909, Skopje, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
42	1938	Ćirilo D. Djordjvić / Kiro Georgievski-Dejan	15 August 1910 or 15 July 1910, Prilep, Ottoman Empire (now North Macedonia)–30 April 1986, Skopje, Yugoslavia (now North Macedonia)	Architecture	Belgrade
43	1938	Vladimir T. Kamenjarević	2 May 1914, Veles, Kingdom of Serbia (now North Macedonia)–N/A	Civil Engineering	Belgrade
44	1938	Hristifor-Rista V. Desanović	3 November 1907, Bitola, Ottoman Empire (now North Macedonia)–N/A	Civil Engineering	Belgrade
45	1938	Samo J. Rafajlović	15 March 1913, Skopje, Ottoman Empire? (1st Balkan War) (now North Macedonia)–N/A	Technology Engineering	Belgrade
46	1938	Ms Ratislava Č. Vohoska	18 August 1914, Skopje, Kingdom of Serbia? (WWI)–N/A	Architecture	Belgrade
47	1938	Nikola N. Manojlović	25 January 1911, Dojran, Ottoman Empire (now North Macedonia)–N/A	Mechanical & Electrical Engineering	Belgrade
48	1938	Rista A. Vasiljević	17 October 1913, Veles, Kingdom of Serbia (now North Macedonia)–N/A	Technology Engineering	Belgrade

Apart from architects, civil, mechanical and electrical engineers, during this period the early generations of technology (chemical) engineers started emerging. Some of the graduate engineers and architects became prominent figures in their field in North Macedonia, like Professors K. D. Žernovski and T. Dj. Kirijas, I. J. Jovanov-Nikolovski (Secretary of the Review Commission at the Ministry for Construction), G. Vasilev (Minister for Construction and Minister for Industry), K. Georgievski-Dejan (Minister for Industry and Minister for Communal Services) in North Macedonia [2]. Others became prominent architects in Serbia, like M. D. Macura [14], or prominent civil engineers, like S. Rifat Güreyman in Türkiye where she was also the first female civil engineer. In Türkiye, she was appointed Chief Construction Engineer at the Ministry of Public Works and was engaged, among other matters, in the 10-year project to build the Anitkabir Hürriyet Tower, the Mausoleum for the Türkiye's founding father, Mustafa Kemal Attatürk (1881, Thessaloniki, Ottoman Empire (now Greece)–1938, Istanbul, Türkiye) [13].

World War II in the Territory of North Macedonia (1940–1944)

During WWII, the studies were disrupted by the war which in turn resulted in the fact that very few engineers and architects were able to complete their studies. Boris A. Čipan (27 March 1918, Ohrid, Kingdom of Serbia? (WWI)–31 March 2012, Skopje?, North Macedonia) is the only identified graduate in this period. He graduated in architecture from the University of Belgrade in 1941 and became one of the most prominent architects, conservators, and professors of architecture in North Macedonia with the building of the Macedonian Academy of Sciences and Arts in Skopje being his most prominent project [2].

Connection of Engineers Born in the Territory of North Macedonia with Riga Technical University

So far, no early engineers or architects from the territory of present-day North Macedonia who studied or graduated from Riga Polytechnic Institute (RTI), now – Riga Technical University (RTU), Riga (Latvia), were identified. However, the research identified three graduates of Riga Polytechnic Institute who had their degrees recognized by the Technical Faculty of the University of Belgrade in the Kingdom of Yugoslavia (Table 4) [1].

Table 4

List of engineers and architect who graduated from Riga Polytechnic Institute that had their degrees recognised by the University of Belgrade, Serbia) [1, 15, 16, 17]

Abbreviation: N/A – data not available

No	Year Rec.	Name and surname	DOB, POB, DOD, POB	Subject	University
1	1932	Antolije I. Hmara	1878, Don Republic, Russian Empire–N/A	Architecture	Riga Polytechnic Institute, 1906
2	1935	Sergije I. Trofimov	1888, Riga, Russian Empire (now Republic of Latvia)–N/A	Mechanical Engineering	Riga Polytechnic Institute, 1913
3	1938	Konstantin Mironov	1890, Riga, Russian Empire (now Republic of Latvia)–N/A	Technology Engineering	Riga Polytechnic Institute, 1912

It should be assumed that the youngest of the mentioned three RPI graduates, *K. Mironov*, was the son of *Nikolajs Mironovs,* the owner of the commercial school in Riga, and graduated from the mentioned commercial school in 1907 together with the later first Foreign Minister and second Prime Minister of the Republic of Latvia, *Zigfrīds Anna Meierovics* (1887–1925), who studied commerce at RPI. K. Mironov's fellow student was chemist *Eižens Rozenšteins* (1886–1933), later a professor at the University of Latvia, who also graduated from *N. Mironovs*' commercial school with a silver medal in 1907 [18]. *K. Mironov* graduated from RPI with distinction, but the author has not been able to find more information about him. It is possible that his career took place outside of Latvia.

Furthermore, the research identified that *Aleksej N. Žukov*, born on 31 October 1910 in Riga, Latvia, graduated as a mechanical and electrical engineer from the Technical Faculty at the University of Belgrade on 13 October 1938 [1].

The research also identified that one of the most famous early women engineers and architects from Serbia lived in Riga for a certain period of time. Jovanaka Bončić-Katerinić (22 June 1887, Niš, Kingdom of Serbia (now Serbia)–27 December 1966, Belgrade, Yugoslavia (now Serbia)) as a student of architecture at the University of Belgrade was granted a scholarship to attend Technische Hochschule Darmstadt (TH). There she successfully completed two degrees: one in architecture and one in engineering. She is considered to be the first woman graduate of TH-Darmstadt and the first women university-trained engineer in Germany in 1913. In 1914, she moved to the Russian Empire where she married a fellow Darmstadt student of architecture from Russia, Andrei Katerinić (?–?). Between 1914 and 1922, they lived in the Russian Empire including St. Petersburg, Riga, Moscow, Kiev, and Odessa. As during this

time she had three sons, it is not known if she practiced whilst there. Upon her return to the Kingdom of Serbs, Croats, and Slovenes, she re-joined the Ministry of Construction in Belgrade, Serbia, where she became the Head of the Department for University Construction. Apart from some secondments during WWII, she remained with the Ministry of Construction from where she retired in 1945 with a legacy of a number of public buildings including the Cultural Centre Banski Dvor and the National Monument of Bosnia and Herzegovina, both in Banja Luka, as well as the Teacher Training School and the School of Veterinary Medicine, both in Belgrade [19, 20].

Conclusions

The paper has presented the initial findings of ongoing research aimed at identifying the early engineers and architects who originated in the past from the territory of present-day North Macedonia. So far, 72 engineers and architects have been identified with the majority of them graduating from the University of Belgrade (Serbia), the oldest Technical Faculty from the territories of the former Yugoslavia, and a smaller number from other universities in the former Yugoslavia and Europe. The majority of the early engineers and architects were men graduating in the later part of the 19th century, with women entering these professions starting from the 1930s. These early engineers and architects along with those coming from other parts of former Yugoslavia and abroad were the founding members of the engineering professions on this territory, which ultimately led to the creation of the Skopje Section of the Yugoslavian Association of Engineers and Architects in March 1920. Their numbers and expertise were strengthened by the policies of the former Kingdom of Serbs, Croats, and Slovenes, later the Kingdom of Yugoslavia, that promoted the education of engineers and architects in Western Europe after WWI and allowed for either a temporary stay or a settlement of the refugees from the 1917 October Revolution and the subsequent Civil Wars in Russia (1917–1923).

The real number of engineers and architects who graduated within the observed period is likely to be higher than reported here, due to the absence of sufficient information from other universities in the region to confirm the origin of their graduates. All of the identified architects in the paper are graduates of engineering schools, apart from Naum Torbov who is a graduate of a fine arts school.

The research to date has not identified any engineers or architects born on the territory of present North Macedonia who studied at Riga Polytechnic Institute or graduated in Riga prior to 1944. However, three graduates

from Riga Technical University who had their degrees recognised in the Kingdom of Yugoslavia by the Technical Faculty at the University of Belgrade were identified, as well as one person born in Riga who graduated from the Technical Faculty of the University in Belgrade. In addition, an early Serbian woman engineer and architect who lived briefly in Riga was also identified. The paper provides a brief indication of the personal contributions and achievements of these early engineers and architects that can be expanded further through ongoing and subsequent research.

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Pirmie inženieri un arhitekti, kas dzimuši pašreizējās Ziemeļmaķedonijas teritorijā

Rakstā sniegts ieskats par pirmajiem inženieriem un arhitektiem tagadējās Ziemeļmaķedonijas teritorijā, kuri absolvējuši augstskolu pirms valsts izveidošanas 1944. gada 2. augustā, kā arī pirms pirmās Tehniskās fakultātes dibināšanas Skopjē 1949. gadā. Lielākā daļa apzināto inženieru un arhitektu ir vīrieši, kuri starpkaru periodā absolvējuši 1846. gadā dibināto Belgradas Universitātes (Serbija) Tehnisko fakultāti. Sievietes inženierzinātnēs un arhitektūrā ienāca pagājušā gadsimta 30. gados. Daži no pirmajiem absolventiem savu profesionālo karjeru turpināja citviet. Noskaidroti trīs Rīgas Politehniskā institūta (Latvija) absolventi, kuriem Belgradas Universitātes Tehniskā fakultāte ir atzinusi iegūto grādu, kā arī viena serbiete, inženiere un arhitekte, kura apskatāmajā periodā neilgu laiku dzīvoja Rīgā. Pētījums atklāj līdz šim maz zināmus Ziemeļmaķedonijas inženierzinātņu un arhitektūras vēstures aspektus.

Atslēgvārdi: Ziemeļmaķedonija, pirmie inženieri un arhitekti, RPI.

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AVIATION DEVELOPERS WORLDWIDE: CONSTRUCTORS AND AVIATORS (1900–1914)

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Latvian Association of the History of Science

Summary. Despite speculations long back in history, heavier-than air flight made its breakthrough during the first decade of the 20th century, based on the designs and practical experiments of at first a handful of constructors in Europe and the United States. Already by early 1911, the activities of several thousand aviators, including the constructors of airplanes, attracted not only wide public attention but also the interest of military establishments. The article analyzes significant data – nationality, profession, military rank, date and location of certification, location of airplane operations, domestic and foreign airplane types, and fatalities – for 13 369 constructors and aviators from 51 countries worldwide who were active between 1900 and 1914. Added to this group are the constructors of helicopters, ornithopters, gliders, and other flying apparatuses, resulting in a total of 14 142 individuals.

Keywords: airplane construction, early aviation, pilot certification, aviation at the beginning of the 20th century.

From Aerostats to Airplanes

Ballooning, speculations dated far back in history, became a practical reality only in 1783 with the first ascents of «Montgolfiers» and «Charliers» in Paris, France. During the coming century, despite partly successful experiments by Henry Giffard (1825–1882) in 1852, Gaston Tissandier (1843–1899) and Albert Tissandier (1839–1906) in 1883, and Charles Renard (1847–1905) and Arthur Krebs (1850–1935) in 1884, the breakthrough of motorized aerostatics had to wait until the turn of the century and the constructions of Graf Ferdinand von Zeppelin (1838–1917) in Germany and «*Lebaudy Frères*» in France [1, 2]. For some years dirigibles attracted the attention not only of the general public but also of the military establishments in Europe. By 1914, over 90 dirigibles

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of various types and sizes were kept in the arsenals of 12 countries together with close to 20 ships used for civil purposes. Dirigibles, many in the military believed, were to play an important role in the war that was expected to be around the corner: the coming war, however, would prove them in many ways wrong [3]. Despite heavy pre-war investments in different dirigible programs, airplanes – comparatively inexpensive craft of far greater operative reliability compared to the aerostats – made strong headways in both civil and military aviation of most major countries.

Aviation Constructors and Aviators: Biographical Data

Dictionaries about aircraft constructors, aviators, and others involved in the development of aviation vary considerably with regard to scope, personalities to include, and biographical content, as well as what biographical data to observe. Emile-Jean Lassalle, to take one example, in his «*Les 100 Premiers Aviateurs Brevetés au Monde*» (The World's First 100 Certified Airmen) of 1960, presented short biographies for the first 100 certified aviators [4, 5]. William Longyard's «Who's Who in Aviation History» of 1991, again, presents biographical data for 524 personalities that since Greek Antiquity had been involved in aeronautics, including the Greek Archytas (428–347 BC), a Swedish polar explorer Salomon August Andrée (1854–1897), an American astronaut Neil Armstrong (1930–2012), and a French aviator Henri Farman (1874–1958). While E. J. Lassalle focused on one specific group, W. Longyard's ambition, stretching over the centuries, entails a highly impressionistic selection of personalities. In Bernard Marck's «*Dictionnaire Universel de l'Aviation*» (Universal Aviation Dictionary) of 2005, to take one more example, the search – the same as W. Longyard's – dates far back in history, observing the legendary King Bladud (883–852 BC), the Greek Archytas, Roger Bacon (1214–1294) in England, Leonardo da Vinci (1452–1519) in Italy and Emanuel Swedenborg (1688–1772) in Sweden; this motley group gets mixed-up with such well-known balloonists as Jean-Pierre Blanchard (1753–1809), Gaspard-Félix Tournachon (1820–1910), and Gaston Tissandier (1843–1899). B. Marck, like W. Longyard, takes notice of the astronaut N. Armstrong, the rocket scientist Wernher von Braun (1912–1977), and the airplane constructor Louis Bréguet (1880–1955) [6]. Radically different from W. Longyard, though, B. Marck's «*Dictionnaire*» (Dictionary) encompasses no less than 2808 entries on 1140 pages, making it one of the most comprehensive biographical dictionaries of aeronautics – rather than aviation as is indicated by its title – published so far.

One major issue that underlies both W. Longyard and B. Marck is their inclusion of flight lighter – as well as heavier-than-air. The same concerns the border-line to space flight, an area that decidedly deserves its own «dictionnaire» unrelated to both aerostats and airplanes. A third issue is the time horizon selected in both cases, which starts out with legends and myths and ends with man's forays into outer space.

One of the earliest registers of airplane operators (pilots), compiled in 1911 by Claude Grahame-White (1879–1959) and Harry Harper (1880–1960), lists 691 aviators who had «learned to fly» airplanes up to early March 1911 [7]. This number, covering a period of some seven years, can be compared to W. Longyard's 524 or even B. Mark's 2808. What it illustrates is the subjectivity inherent in the perceptions of later-day authors relative the importance of personalities in compiling registers underlying biographies. Pointing to the dynamic development of early aviation, C. Grahame-White and H. Harper added that the actual number of aviators most likely exceeded the 691 mentioned: some contemporaries talked about a total of over 3000. This latter number, though, the authors believed to be «too ambitious». In any case, close to 700 aviators were said to have operated 729 airplanes of basically two different types (bi- and monoplanes) from 20 constructors, while 66 aviators had built their own machines.

This begs the question: Who in pre-1914 aviation can be considered important enough for inclusion in a biography? Taking W. Longyard and B. Marck as examples, it is demonstrated that different studies have time and again taken notice of the same more or less inclusive group of personalities. What this in part over-reliance on the works of previous biographers entails, though, is the risk that many *per se* relevant personalities remain unnoticed.

The present study, in contrast to the authors mentioned, focuses on one specific and relatively short time period in the development of heavier-than-air flight – the formative years from 1900 to 1914. The overriding ambition thereby was to compile a register of all airplane constructors/aviators active worldwide, observing their country-wise distribution and other personal characteristics.[1] Included on this register are the following:

- civil and military aviators (pilots) of motorized, fixed-wing airplanes:
- holding FAI-based certificates issued by national aero-organizations;
- operating without certificates;
- individual constructors (designers) of airplanes;

[1] This register will be published separately.

- constructors – pilots of gliders, manned kites, ornithopters, and helicopters;
- manufacturers (firms, companies) of airplanes and engines;
- historical persons of interest in the development of aviation [8, 9, 10].

Excluded are the following:

- constructors – operators of so-called «cyclo-planes», «aero-cycles», «aviettes» [11];
- holders of aero-patents not having taken any practical steps for their realization [12, 13];
- designers of airplanes not having taken any practical steps to realize their projects (a special column «*l'Aéro*», published during 1908–1911 under the headline «*La page des inventeurs*» (The Inventors Page), gave airplane designers the opportunity to present their projects; these proposals were many times combined with requests for financial support in order to enable construction);
- constructors and pilots of aerostats (free-captive balloons, dirigibles);
- suppliers of auxiliary aero-equipment.

Table 1 shows the number of individuals placed on the register, a total of 14 142 from 51 countries. In the following analysis, persons active before 1900, as well as the constructors of ornithopters, helicopters, gliders, etc. have been excluded, leaving a total of 13 369. The categorization according to nationality follows the constellation of powers involved in World War I (Entente & Central Powers); the United States, due to its large civil sector, deserves a category of its own. Other countries in Europe and the rest of the world played subordinate roles and can be sorted under summary categories. The remaining category «other» comprises individuals with the missing data.

Table 1

Constructors/aviators of airplanes and other aircraft active before August 1914

Country	FR	DE	GB	RU	AT	IT	US	EU	World	Other	Total
(A) Constructors/ Aviators to 1900	71	33	60	11	10	16	26	27	22	–	276
(B) Constructors/ Aviators post 1900	3944	1862	1993	769	350	742	2473	917	683	133	13 866
(A+B) Total	**4015**	**1895**	**2053**	**780**	**360**	**758**	**2499**	**944**	**705**	**133**	**14 142**
Ornithopter	12	30	19	2	5	2	5	4	1	?	80
Helicopter	20	11	12	4	1	?	13	2	?	?	63
Kite	2	2	2	?	?	?	1	?	1	?	8
Gliders	47	40	77	26	10	4	97	20	17	?	338
Other	4	1	1	?	1	?	1	?	?	?	8
(C) Total	85	84	111	32	17	6	117	26	19	?	497
(B-C) Total 1900–1914	**3859**	**1778**	**1882**	**737**	**333**	**736**	**2356**	**891**	**664**	**133**	**13 369**

It is quite likely that the resulting number 13 369 does not include all constructors/aviators active during the pre-war years. What it does include is the vast majority holding FAI-based aviator certificates, the bulk of military flyers, as well as others having constructed and flown airplanes while being noticed by the editors of aviation journals or the later-day authors of historical accounts. The total number in the underlying worldwide population, however, is difficult to estimate. Nevertheless, today's unbroken interest in the early stages of flight will in time surely uncover more individuals relevant to this period. Data for these 13 369 individuals will be analysed according to the following variables:

- constructors of airplanes and aero-engines;
- airplanes used in civil and military operations;
- location of flight activities;
- professions of civil constructors/aviators;
- ranks of military constructors/aviators;
- certification of civil and military aviators;
- fatalities.

Individual data for the different variables in the dataset in some cases are incomplete. Strictly speaking, therefore, the analysis applies in such cases only for subsets of individuals. However, it is not unreasonable to assume that these subsets, most are of considerable size, are representative of the underlying populations for the different variables in question.

Sources Used in the Research for Aviation Constructors and Aviators

The following sources were used for compiling the register:

- historical treatises such as Charles Dollfus & Henri Bouché (1932), Gerhard Wissmann (1979), or Charles Gibbs-Smith (1985) [10, 14, 15];
- country-specific studies such as R. Dallas Brett's (1933) for Great Britain or Peter Supf's (1935, 1958) for Germany [16, 17, 18];
- studies of manufacturers such as Christopher Barnes' works for Bristol (1964) or Short (1967) in England [19, 20];
- handbooks, «Taschenbücher», year books, dictionaries, etc.;
- aeronautical bibliographies such as Paul Brockett's two volumes from 1909 and 1921 [21, 22];
- local studies such as Allen Herr's two volumes (2019, 2020) about aviation in California [23, 24];

- data published in aviation journals post-1914;
- online portals such as «Early Birds of Aviation», «*Les débuts de l'aviation militaire française*» (The Beginnings of French Military Aviation), or «Harold E. Morehouse Flying Pioneers Biographies Collection»;
- the most important source constituted by aviation journals published pre-1914, such as the French «*L'Aéro*», the German «*Flugsport*», or the British «*Aircraft*».

Constructors of Airplanes and Engines

A distinction should be made between the constructors of airplanes and aero-engines. The challenges faced by the latter group were of a different, technologically more advanced kind, demanding a thorough understanding of both mechanics and the materials used in construction. While some airplanes were constructed by lawyers or students, constructors of engines usually had a background in engineering or came from the automobile industry.

Table 2

Constructors of airplanes and aero-engines

Country	**FR**	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**World**	**Total**
Constructors and aviators	357	234	173	71	54	53	615	159	79	**1795**
Airplane constructors	201	152	184	17	31	34	400	44	20	**1083**
Engine constructors	47	55	14	1	8	20	46	5	?	**196**
Scientists	5	9	7	4	5	1	3	1	?	**35**
Total	**610**	**450**	**378**	**93**	**98**	**108**	**1064**	**209**	**99**	**3109**

The table includes commercial manufacturers of airplanes and engines only in those cases where the firm's owner/director/engineer was also an aviator. Thus, Louis Blériot (1872–1936), H. Farman, and Gabriel Voisin (1880–1973), all three being well-known aviators and successful airplane manufacturers, are included as constructors/aviators and not as owners or directors of companies.

Close to one-fourth (3109) of 13 236 individuals in the dataset, scientists excluded, had either:

- built and operated their own airplanes (1795);
- designed or built airplanes without subjecting them to any flight trials (1083);
- designed or built aero-engines (196).

The first group comprises the majority of pioneers active before 1910, men like L. Blériot, H. Farman, or G. Voisin [25]. This coterie often experimented with different designs and models with the intent to turn them into commercially attractive products that could be sold on the international market. In this group of 1795 individuals, one also finds a large number of constructors who built their craft based on home-made designs or using the blueprints of well-known aero firms (in the United States, specialized firms offered blueprints and technical drawings for the construction of airplanes, including types from major firms, such as L. Blériot, Édouard de Niéport (1875–1911) or Robert Morane (1886–1968); see, for example, N. Armstrong, Blue prints and specifications. Aero, Vol 3, No 7, 1911, p. 148; in addition, many aeronautical journals regularly included detailed technical specifications and drawings of new airplanes put on the market, data that private constructors could use in their own efforts). No less than one-third (615) of the individuals in this group were active in the United States, followed by one-fifth (357) in France and one-sixth (234) in Germany.

The second largest group consisting of 1083 individuals includes constructors who built their own airplanes without, apparently, having subjected them to any flight trials. However, members of this group might very well have actually flown their craft without any information about these trials having become publicly known.

The third and important group involved in the early development of flight was made up of the designers and builders of aero-engines: in the dataset, this group is represented by 196 individuals who either worked on their own designs or were connected to firms manufacturing engines; some individuals in this group were also engaged in flight operations. 35 scientists have been added for illustrative purposes only.

Airplanes

After the Wright brothers' first controlled flights in late 1903 at Kitty Hawk, neither the technical development nor the practical implementation of motorized flight took any immediate further steps [25]. The breakthrough occurred only during the second half of the decade when

people like G. Voisin, H. Farman, L. Blériot, or Robert Esnault-Pelterie (1881–1957) stepped forward with machines that involved partly new technology: two memorable events hereby were H. Farman flying the first circle on 13 January 1908 (winning 50 000 Fr in prize money), and L. Blériot crossing La Manche on 25 July 1909 on his Type XI (winning 1000 £).

An aviation meeting held during August 1909 near Reims, «*La Grande Semaine d'Aviation*» – the event attracted 23 airplane constructors and more than half a million spectators, including the French president – and an aviation exhibition organized in Paris during October that same year, «*La Première Exposition Internationale de Locomotion Aérienne*», demonstrated that airplane construction had taken hold of industry and that France was the unquestioned leader in this development [26, 27, 28]. Amongst 271 mostly French exhibitors in Paris' Grand Palais the visitors met not only 34 different constructors of airplanes and 28 of aero-engines but also suppliers of aeronautical equipment such as speedometers, barometers, rubber tires, tissues, hangars, photographic apparatus, or welding equipment. On display there were also the products of suppliers of aerostatic craft, a mode of flight that in France had started to lose its appeal [29].

Table 3

Airplanes: domestic and foreign constructors operating in different countries

Country	**Aviators**	Airplane	**Constructors**			**Foreign**
		Data available	**Domestic**	**Foreign**	**Total**	**Total (%)**
FR	3859	2184	120	10	130	**8 %**
DE	1778	961	88	12	100	**12 %**
GB	1882	1337	94	19	113	**17 %**
RU	737	121	23	25	48	**52 %**
AT	333	73	27	12	39	**31 %**
IT	736	325	27	27	54	**50 %**
US	2356	1156	310	12	322	**4 %**
EU other	891	360	50	50	100	**50 %**
World other	664	337	37	32	69	**46 %**
Other	133	?	?	?	?	?
TOTAL	**13 369**	**6854**	**?**	**?**	**918***	**?**

* This number is not the sum of constructors for individual countries, as quite many constructors were represented by their crafts in more than one country.

It is interesting to find out what kinds of airplanes, produced domestically or in countries abroad, were used by the early aviators for their aerial exploits. The data about airplanes used in operations was found for somewhat more than one-half (6854) of all aviators on the register. With some hesitation, this number can be taken to represent the entire population of more than 13 300 aviators, or rather their airplanes. According to Table 3, the relationship of airplanes from foreign constructors relative to the total number of planes in operation differs widely by country, ranging from 4 % in the United States to 52 % in Russia. The lowest exposure to foreign machines, as one could expect, in addition to the United States is found in the aeronautically advanced countries in Europe, that is, France, Germany, and Great Britain, all with percentages below 20.

Table 4

Number of airplanes from the five largest constructors operated in countries worldwide

Country	Position 1	Position 2	Position 3	Position 4	Position 5	Percentage of all airplanes/ country
FR	Farman/ 477	Blériot/ 398	Deperdussin/ 135	Voisin/ 108	Nieuport/ 83	55 %
DE	Grade/ 122	Rumpler/ 76	Albatros/ 68	Aviatik/ 46	Wright/ 45	37 %
GB	Bristol/ 387	Farman/ 214	Blériot/ 100	Short/ 89	Vickers/ 87	66 %
RU	Farman/ 23	Blériot/ 20	Antoinette/ 8	Wright/ 4	Voisin/ 4	49 %
AT	Bleriot/ 11	Etrich/ 10	Voisin/ 6	Wright/ 3	Farman/ 3	45 %
IT	Blériot/ 117	Farman/ 71	Nieuport/ 26	Caproni/ 23	Voisin/ 12	77 %
US	Curtiss/ 341	Wright/ 132	Blériot/ 51	Benoist/ 40	Thomas/ 30	51 %
EU other	Farman/ 71	Blériot/ 67	Bristol/ 21	Deperdussin/ 18	Voisin/ 14	53 %
World other	Blériot/ 67	Curtiss/ 45	Farman/ 34	Bristol/ 34	REP/ 11	57 %

Another way to illustrate the dominance of European constructors is to look at the five most commonly used airplanes (brands) in the countries involved. France, as shown by Table 4, is thereby represented

with French-made planes only, Germany – by German ones together with some American-made Wrights (manufactured in Berlin), and Great Britain – by three British firms together with French-made Farmans and *Blériots.* In the United States, the only foreign brand of any prominence was a batch of French Blériots. Turning to Russia and Austria, the French dominance in both cases may be observed. In the rest of Europe and the countries overseas, French planes held their ground, supplemented by some Curtiss from the United States and Bristols from Great Britain. It is also interesting to reflect on the dominance of just a few constructors relative to the total number of planes operated in the different countries, whereby the five most common brands reached over 50 % of the market share of all airplanes in most countries except Germany (37 %), Russia (49 %) and Austria (45 %).

The final step in trying to illustrate the situation regarding the exposure of airplane constructors in different countries is to look at the distribution of their products worldwide.

Table 5

Top 10 airplane constructors/airplanes represented in different countries worldwide

Constructors	Constructors nationality	Number of airplanes	% of airplanes worldwide	Number of countries
Farman	FR	937	**14 %**	29
Blériot	FR	843	**12 %**	34
Bristol	GB	479	**6 %**	14
Curtiss	US	406	**6 %**	17
Deperdussin	FR	236	**3 %**	20
Wright	US	236	**3 %**	15
Voisin	FR	156	**2 %**	18
Caudron	FR	151	**2 %**	13
Nieuport	FR	137	**2 %**	15
Grade	DE	131	**2 %**	7
Top-10		**3712**	**54 %**	
APL data known		**6845**	**100 %**	

Considering the Top 10 constructors, which together supplied 54 % of all 6854 airplanes worldwide, it may be observed that six came from France, one from Great Britain, one from Germany, and two from the United States. L. Blériot operations took place in 34 countries (of 51 in total) followed by H. Farman in 29, and Armand Deperdussin (1864–1924) in 20. Grade from Germany is at the bottom of the list, implying that Grade manufactured mainly for the home market.

In summary, until the outbreak of World War I in August 1914, the worldwide airplane market was dominated by French products, that is,

machines produced by Farman, Blériot, Deperdussin and others who had used an early start in aviation to their full advantage. Glenn Curtiss (1878–1930) in the United States stands out as an exception by having developed products that found customers also outside his large home market. The Bristol firm in Great Britain, again, could rely not only on military orders but also on the demand from other countries in the British Empire. Other constructors, outside this exclusive circle of the Top 10, either focused on their in many cases restricted home markets dominated by the military or were part of the many-faceted crowd of individuals who built their own – at times less successful – machines.

Locations of Construction and Flight Activities

The design, construction, and operations of airplanes during the early years, based on the current dataset, took place at 1241 different locations in 51 countries. The pairing of constructors/aviators with locations is thereby based on individuals – at specific locations – having attended a flight school, having constructed or tested an airplane, having passed the FAI or other pilot exam, having carried out their first solo flight, or in some other way having had their first practical encounter with flight. For constructors without any flight experience of their own, the location stands for the place of airplane design/construction. Many constructors/aviators, considering the nature of flight, were in the course of their careers active at different locations.

Table 6

Constructors/aviators active in countries and locations

Country	Aviators	%	Locations
FR	3859	29 %	**137**
DE	1778	13 %	**132**
GB	1882	14 %	**174**
RU	737	6 %	**41**
AT	333	2 %	**38**
IT	736	6 %	**60**
US	2355	18 %	**457**
EU other	892	7 %	**106**
World other	664	5 %	**96**
Other	133	1 %	
TOTAL	**13 369**	**100 %**	**1241**

Heavier-than-air flight during the short period from 1900 to 1914 took place in a relatively small number of countries: according to Table 7, 1039 of 1241 locations in total, or 84 %, were situated in seven out of 51 countries.

Table 7

Constructors/aviators active in limited number of regions worldwide

Regions	Number of countries	Locations
EU majors	**6**	**582**
EU other	14	106
US	**1**	**457**
World	30	96
TOTAL	**51**	**1241**

Table 8

Constructors/aviators active at major aerodromes 1900–1914

Aerodrome/site	Country	City	Constructors/aviators
Brooklands	GB	London	425
Johannisthal	DE	Berlin	379
Hendon	GB	London	278
Mourmelon-le-Grand	FR	(military)	271
Buc	FR	Paris	257
Salisbury	GB	(military)	193
Étampes	FR	Paris	179
Pau	FR	Pau	177
Issy-les-Moulineaux	FR	Paris	174
Reims	FR	Reims	167
Chicago	US	Chicago	148
Sevastopol	RU	(military)	147
W-Neustadt	AT	Vienna	141
Juvisy	FR	Paris	105
TOTAL			**3041**

Another way of illustrating this geographical concentration is to look at specific sites (cities, aerodromes, airfields) in the countries involved considering the number of aviators active at those sites. Locations frequented by more than 100 different individual constructors/aviators are shown in Table 8. Among 13 369 constructors/aviators

underlying the analysis, 3041 – close to one-fourth – were active at 14 out of 1241 locations in total. Thereby, 11 sites were situated near major cities including, in addition to Chicago and Reims, four European capitals Paris (4 sites), London (2), Berlin (1), and Vienna (1). Three of the sites were operated by military establishments while Pau in southern France was one of the first aerodromes opened for fixed-wing airplanes, housing a number of flight schools including L. Blériot and Wright and attracting students not only from Europe but also overseas.

Civil and Military Constructors/Aviators

After the breakthrough of motorized flight during 1908–1909, military establishments and their requirements vis-à-vis the awakening aviation industry started to play an increasingly important role. Demand for airplanes used for civil purposes was by its very nature limited in scope, while actual or expected military orders directly affected investments in new technology and production facilities. As early as 1910, the French military organized a public competition – with sizable prize money attached – in the construction of airplanes suitable for military use, a practice soon adopted also by other countries and kept until the outbreak of the war in 1914 [30, 31, 32, 33]. The design and construction of airplanes by private individuals went in parallel with this development, a trend most clearly seen in the United States where the military aspect, at least until 1914, played a more subdued role.

In the dataset with a total of 13 236 individuals, two-thirds of the constructors/aviators fall into the civil and one-third in the military sector of aviation. Considering individual countries, roughly the same relationships hold for France, Germany, and countries in the category «Europe other» (EU), while the military percentages are clearly higher for Great Britain, Russia, Austria, and Italy, as well as for countries under «World other». The United States is the country that stands out in Table 9 below, where, as mentioned, the civil sector dominated.

Table 9

Constructors/aviators active in civil and military aviation in different countries

	FR	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**World**	**Total**
Civil	2567	1059	998	356	150	372	2231	546	362	8641
	67 %	**60 %**	**53 %**	**48 %**	**45 %**	**51 %**	**95 %**	**61 %**	**55 %**	**65 %**
Military	1292	719	884	381	183	364	125	345	302	4595
	33 %	**40 %**	**47 %**	**52 %**	**55 %**	**49 %**	**5 %**	**39 %**	**45 %**	**35 %**
Total	3859	1778	1882	737	333	736	2356	891	664	13 236

Civil Constructors/Aviators: Professions

Data regarding the individual professions of 8641 civil flyers were available for 1359. Thereby, hardly surprising given the technical nature of flight, two categories stand out – «engineer» and «mechanic» that together constitute close to 50 % of all individuals active in the civil sector. Other professions fall far below these figures, while a wide spectrum, one-fifth of the total, fall into the remaining category «Other».

Table 10

Professions of constructors/aviators active in civil aviation

Professions	FR	DE	GB	RU	AT	IT	US	EU	World	Total
Engineer	87	149	58	20	17	25	49	37	21	463
Mechanic*	54	74	10	5	10	6	34	15	2	210
Athlete**	45	**?**	11	5	3	8	23	19	**?**	114
Industrialist***	21	4	5	1	5	**?**	6	2	**?**	44
Entrepreneur******	3	6	3	**?**	1	1	16	6	5	41
Academic*******	9	29	17	3	4	3	21	5	4	95
Physician	9	4	**?**	**?**	**?**	**?**	16	2	2	33
Student	11	50	1	10	2	**?**	6	4	2	86
Other professions	33	86	35	6	5	10	63	20	15	273
Professions known	272	402	140	50	47	53	234	110	51	1359
Civil total	**2567**	**1059**	**998**	**356**	**150**	**372**	**2231**	**546**	**362**	**8641**

* Includes the titles 'technician' and 'machinist'.

** Includes titles 'cyclist', 'car racer', 'motorcyclist', and 'jockey'.

*** Includes the titles 'boat maker,' 'piano manufacturer', 'brewer', 'mill owner', 'distiller', and 'toy manufacturer'.

**** Includes the titles 'merchant', 'show owner', 'hotelier', 'banker', 'car dealer', 'garage owner', and 'shop owner'.

***** Includes the titles 'lawyer', 'notary', 'judge', 'architect', 'chemist', 'physicist', 'pharmacist', and 'dentist'.

Military Constructors/Aviators: Ranks

Military aviation, which in Europe started developing around 1909–1910 (military aeronautics dates back to the 1880s) was in the case of the terrestrial armies operationally based on the holders of foremost three military ranks: captains, lieutenants, and non-commissioned officers. In the dataset, which shows the ranks for over eight-tenths of all military personnel, these three categories include nine-tenths of all 3512 military flyers. Corporals and privates played a somewhat

more pronounced role only in France. This lopsided distribution, which excluded more or less everybody above captain – Great Britain being an exception with 25 officers holding the rank of major – can be partly explained by considering the nature of flight where the physical characteristics of individuals (eyesight, reflexes, courage, etc.) played a major role. The following personalities can be mentioned amongst those holding higher ranks – together with a small number of colonels, the French general Bonnier (French brevet 187), the German Prinz Heinrich von Preussen (German brevet 28), and two British generals Henderson (British brevet 118) and Baden-Powell; the latter had not obtained any brevet. This in turn was accentuated by the promise of faster promotion, with sergeants, lieutenants, and captains trying to step out of their traditional career ladders by voluntarily joining the newly formed air services. Some military aviators, not to forget, like the well-known British captain John Dunne, also designed and constructed airplanes.

Table 11

Ranks of military aviators (army)

Army	**FR**	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**World**	**Total**
Major and higher	5	6	33	6	1	3	2	3	4	63
Captain	130	25	132	67	10	47	9	55	22	497
Lieutenant	576	349	344	191	116	184	58	188	146	2152
Non-comm. officer	288	70	80	10	3	70	9	15	32	577
Corporal	19	7	3	1	8	2	1	2	3	46
Private	109	4	51	2	5	2	3	1		177
Rank known	1,127	461	643	277	143	308	82	264	207	3512
Rank not known	118	200	47	80	19	35	13	43	53	608
Army total	**1245**	**661**	**690**	**357**	**162**	**343**	**95**	**307**	**260**	**4120**

Table 12

Ranks of naval aviators

Navy	FR	DE	GB	RU	AT	IT	US	EU	World	Total
Higher ranks		5	7				1		1	14
Captain		2	6			1	1	4	1	15
Lieutenant	23	50	127	12	20	18	18	29	35	332
Ensign/ cadet	13		1		1	1	9	5	5	35
Non-comm. officer	11	1	30	12		1				55
Seaman			23				1			24
Rank known	47	58	194	24	21	21	30	38	42	475
Navy total	**47**	**58**	**194**	**24**	**21**	**21**	**30**	**38**	**42**	**475**

In the case of naval aviation, a service that with some delay started to go operative first after aviation was introduced in different armies, basically the same distribution of aviators according to rank can be observed. Thus, more than nine-tenths of all individuals was either lieutenants, naval ensigns or non-commissioned officers. Higher ranks, the same as in the case of army aviation, played no significant roles. Like in the case of army aviation, some few officers with equivalent ranks to colonels can be found amongst the higher ranks. The First Lord of the Admiralty W. Churchill, a strong supporter of British naval aviation, can be added to this motley group; W. Churchill had not obtained any brevet. In the paper «Churchill Conducts aero Experiments» on 23 February 1914, W. Churchill was reported to have made two flights from Spithead (together with an airman as a passenger), trying to locate submarines [34, 35]. One country that in terms of absolute numbers stands out from the fest is Great Britain and its Royal Navy, a service that contributed close to four-tenths of all lieutenants and more than five-tenths of all non-commissioned officers in the dataset. This hardly surprises considering the standing of this service vis-à-vis the rest of the country's military: in July 1914, British naval authorities even succeeded to found an air arm separate from the Royal Flying Corps, the Royal Naval Air Service. Like in the case of army aviation, some naval flyers, like the French lieutenant Jean-Louis Conneau (pseud. André Beaumont; 1880–1937) also designed and constructed airplanes.

The distributions of aviators according to their professions can be compared to an analysis carried out in 1912 in Germany for 211 flyers [36].

Table 13

Professions and military background of aviators 1912

Professions	**Total**	**%**
Professions unknown	74	35 %
Professions known	137	65 %
Civil	**77**	
Engineers	27	
Pilots*	9	
Students	8	
Academics**	8	
Mechanics***	7	
Merchants	6	
Others	12	
Military (officers)	**600**	
Army	43	
Navy	9	
Reserve	8	

* This appears to refer to professional pilots.

** The group includes architects and lawyers.

*** The group includes «technicians».

Certification of Civil and Military Aviators

FAI-based brevets

Flight with motorized aircraft, dirigibles and airplanes alike, was an activity that entailed dangers no one could neglect. This involved not only pilots and ground personnel but also third parties, be it spectators at airfields or people simply walking on the street. Frequent accidents, often with fatal outcome, became headline news (not much has changed in this respect, airplane accidents in whatever part of the world still create breaking news in all channels). It is hardly surprising, therefore, that attempts were made from early on to try to regulate flight, the initial focus being set on the proficiency of pilots. Airplane technical standards and the regulation of the airways had to wait until the launch of the first international air treaty in 1919 [37].

The first organization to introduce aviator licenses was the «*l'Aéro-Club de France*» (founded 1898), a club that in January 1909, presented its brevet No 1 to L. Blériot. L. Blériot was followed by another 16 aviators that year, among them three Americans – Glenn Curtiss (1878–1930) and the two Wright brothers [38, 39, 40]. In 1911,

aero organizations in other countries followed the suit, applying regulations (in force from Feb 1911) that had been adopted by «*Fédération International de l'Aéronautique*» (International Federation of Aeronautics; founded 1905) in October 1910 [41, 42]. These regulations, amended over the years, remained in force until the outbreak of World War I [43]. Regulatory initiatives from governments, despite attempts by lawmakers in France, Germany and other countries, had to wait until the promulgation of the 1919 air treaty [44, 45, 46, 47].

In compiling the register, 4795 holders of the FAI-based brevet could be identified, a total made up of 2483 civil and 2312 military flyers: thus, close to three-tenths of all civil and five-tenths of all military pilots in the dataset had passed the stipulated theoretical and practical exams set by the FAI before receiving their brevets. Overall, the lowest proportion of flyers holding the FAI-based brevet is found in the United States, where a mere 241 civilians out of a total of close to 2000 thought it necessary to acquire a license that many apparently believed was of little practical value. In general, the highest proportions of brevet-holders, except for Germany and Russia, are found in the military sector, amongst the lieutenants, non-commissioned officers and others recruited to the air services of different countries.

Table 14

Civil and military aviators holding the FAI-based brevet

	FR	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**World**	**Total**
Civil aviators										
Brevet	735	555	311	160	53	100	241	192	136	2483
	29 %	**52 %**	**31 %**	**45 %**	**35 %**	**27 %**	**11 %**	**35 %**	**38 %**	**29 %**
Military aviators										
Brevet	664	228	557	136	126	242	51	193	115	2312
	51 %	**32 %**	**63 %**	**36 %**	**69 %**	**66 %**	**41 %**	**56 %**	**38 %**	**50 %**
TOTAL										
Brevet	1399	783	868	296	179	342	292	385	251	4795
	36 %	**44 %**	**46 %**	**40 %**	**54 %**	**46 %**	**12 %**	**43 %**	**38 %**	**36 %**

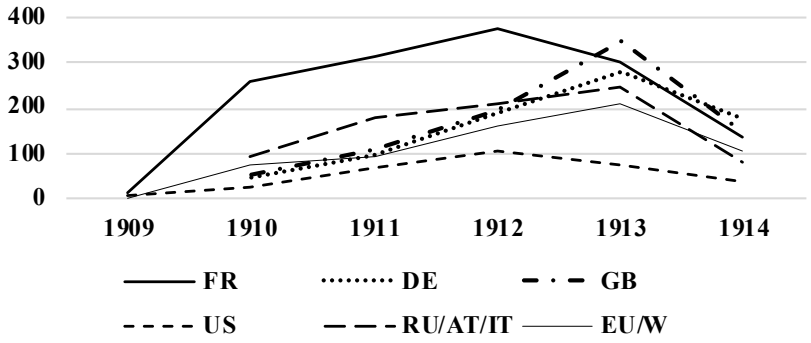
Other certificates

In addition to the FAI brevet, a number of other aviator certificates were in circulation pre-1914, issued by civil aero-organizations and military establishments and often based on more stringent requirements compared to the ones stipulated by the FAI:

- the FAI brevet was often a prerequisite for obtaining military certification: FR [48, 49, 50], DE, RU, AT, IT, US [51], BE, NL, ES, RO, AR, CL;
- hydroplane certificates: FR, DE, AT, IT, US [52, 53];
- special brevets: GB [54, 55], US [56], IT;
- some aviators were also certified for aerostats:
    - dirigibles: FR, DE, GB, AT, US, RU;
    - balloons: FR, DE, GB, AT, US, RU, ES, AR.

Certification/Non-Certification

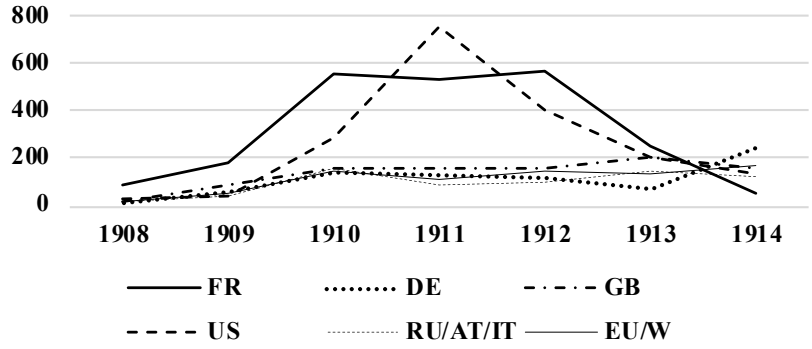
Graphs 1 and 2 show the distribution of aviators having obtained the FAI-based brevet during different years pre-1914, as well as aviators having started to fly airplanes during different years without being certified.



Graph 1. The number of aviators having received the FAI-based brevet/year.

France, as shown by Graph 1, took an early lead in certification, starting with 13 brevets in 1909 issued by the Aero Club de France and reaching a top of 376 in 1912 (the maximum for all countries). Included in these numbers are more than 400 foreign nationals who had trained in France and received their brevets from the Aero Club de France.

Certification in other countries got started in 1910 with the entering into force of the FAI regulations. Many of the aviators holding brevets had begun to fly airplanes long before certification; in the analysis, the certification year underlies the year-based categorization. Certification in France was surpassed only in 1913 by Great Britain, the year when all countries (groups of countries) except for the United States reached their highest marks (Russia, Italy, and Austria have for the sake of clarity been placed into one group; the same goes for the rest of the European countries, which have been placed in one group together with countries overseas (except the United States)). For the years 1910 to 1913, a steady increase of certifications in all countries except, as mentioned, the United States could be observed. The sharp decrease in 1914 was caused by the outbreak of war in early August that year and the cessation of civil certification in Europe.



Graph 2. Number of aviators without brevet carrying out first flight/year.

With the exception of the year 1911, when it was surpassed by the United States and its multitude of non-certified aviators, France took the lead also regarding aviators having started to operate airplanes without holding any brevet (underlying categorization was the data about the year of first flight or year of airplane/engine construction; these data are in some cases inexact and subject to confirmation). From 1910 onwards, the annual numbers of non-certified aviators starting to fly in other countries stayed constant at around 100–200. The graph, it must be noted, also includes a number of constructors of airplanes and engines not having operated any airplane in flight.

Fatalities

During the pre-war years, aviation was largely characterized by a trial-and-error approach. Untested technology and operational practices, the breakdown of equipment, be it airframes or engines, lack of proper instrumentation, the hazardous influence of winds and other weather phenomena, insufficiently prepared ground facilities: in short, flight operations, up to the year 1910 and beyond, were marked by so-called «learning by doing».

Therefore, it should not come as a surprise that during that short period, more than 630 aviators worldwide were involved in fatal flight accidents, a rate of 6 % relative to 13 369 flyers in total. The rates for different countries, both for civil and military aviators, vary between 3 % to 7 %; the only higher rates are found for Russia's military (73 %) and for military aviation in the United States (16 %); in the case of Russia, lack of data influenced this exceptionally high figure.

After August 1914, many aviators of the pre-war years continued flying in their respective country's military, thereby causing sharp increases in fatality rates throughout the world. In total, considering the entire period 1900–1918, fatalities rose from 634 (until the end of 1913) to 1574, or 12 % of the total number of 13 236 aviators; rates for individual countries vary between a high of 26 % for Russia (tentative) and a low 6 % for the United States. These numbers, it must be noted, are at best indicative and include only aviators that had started to fly before January 1914. The actual number of military pilots killed in battle or in other ways having lost their lives during the war years 1914–1918 was far greater. According to Morrow, aviation casualties for the three main combatants on the Western Front alone during 1914–1918 were as follows:

- France: 7255 (2872 killed);
- Germany: 16 054 (5953 killed);
- Great Britain: 16 223 (6166 killed) [57].

Table 15

Civil and military flight fatalities in different countries during 1900–1913, and 1900–1918

1900–1913	**FR**	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**World**	**TOTAL**
Fatalities civil	98	68	30	11	7	24	86	39	18	381
	4 %	**6 %**	**3 %**	**3 %**	**5 %**	**6 %**	**4 %**	**7 %**	**5 %**	**4 %**
Fatalities military	93	47	17	30	6	12	20	17	11	253
	7 %	**7 %**	**2 %**	**73 %**	**3 %**	**3 %**	**16 %**	**5 %**	**4 %**	**6 %**
Fatalities total	**191**	**115**	**47**	**41**	**13**	**36**	**106**	**56**	**29**	**634**
Aviators total	3859	1778	1882	737	333	736	2356	891	664	13 236
	5 %	**6 %**	**2 %**	**10 %**	**4 %**	**5 %**	**4 %**	**6 %**	**4 %**	**5 %**
1900–1918	**FR**	**DE**	**GB**	**RU**	**AT**	**IT**	**US**	**EU**	**WORLD**	**TOT**
Fatalities up to 1913	191	115	47	41	13	36	106	56	29	634
Fatalities 1914–1918	268	258	168	61	27	34	47	45	32	940
Fatalities total	**459**	**373**	**215**	**102**	**40**	**70**	**153**	**101**	**61**	**1574**
Aviators total	3859	1778	1882	737	333	736	2356	891	664	13 236
	12 %	**21 %**	**11 %**	**26 %**	**12 %**	**10 %**	**6 %**	**11 %**	**9 %**	**12 %**

CONCLUSIONS

In his research focused on civil and military aviation at the beginning of the 20th century (1900–1914) worldwide, which includes numerical data on airplane constructors and pilots, the author identified individuals from 51 countries including the great European powers and the United States. Thereby, he specified the number of pilots operating with and without certificates in the different countries, their nationality, age, civil professions and military ranks. In the case of certified pilots, their certification number, location and date of examination, and airplane type used in the examination is added. Specially noted are airplane fatalities. Information regarding individual aircraft constructors and airplane companies complete the study.

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Konstruktori un piloti – pasaules aviācijas attīstības veicinātāji (1900–1914)

Pacelties spārnos, pārvarot Zemes pievilkšanās spēku, un lidot ir bijis sens cilvēku sapnis, kas īstenojās 20. gadsimta pirmajā desmitgadē, pateicoties dažu Eiropas un ASV konstruktoru projektiem un praktiskiem eksperimentiem. 1911. gada sākumā vairāku tūkstošu pilotu, tostarp lidmašīnu konstruktoru, darbība piesaistīja ne tikai plašu sabiedrības uzmanību, bet arī militāro iestāžu interesi. Rakstā analizēti nozīmīgi dati par 13 369 konstruktoriem un pilotiem no 51 pasaules valsts no 1900. līdz 1914. gadam – valsts piederība, militārais rangs, sertifikācijas datums un vieta, lidmašīnu ekspluatācijas vieta, iekšzemes un ārvalstu lidmašīnu tipi, bojā gājušo skaits utt. Šai grupai pievienoti helikopteru, ornitopteru, planieru un citu lidojošo aparātu konstruktori, apzinot 14 142 personu datus.

Atslēgvārdi: lidmašīnu būvniecība, aviācijas pirmsākumi, aviācijas konstruktori, piloti, pilotu sertifikācija, aviācija 20. gadsimta sākumā.