THE FACULTY OF CHEMICAL ENGINEERING OF THE TECHNICAL UNIVERSITY BUDAPEST

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Antecedents

The Technical University Budapest celebrates its bicentenary in the academic year 1982/83: King Joseph II's edict decreeing to start engineering training at the Philosophical Faculty of the University in Pest, in an institute established for this purpose and named Institutum Geometricum was issued in August 1782. After three (later two) study year and successfully passed theoretical and practical examinations the students obtained the degree *geometer approbatus*. The Institutum Geometricum was merged in 1850 with the Joseph Industrial School.

The engineers graduated at the Institutum Geometricum corresponded to the civil engineers of our age; they were trained in geodesy, road construction and water management. No chemistry was taught at the Institutum.

Chemistry, however, was the branch of science which had reached a high level, that of research as early as in the 18th century in Hungary. While other sciences were at best taught at universities, both departments of chemistry existing at the time in the country came forward with significant research results attracting international attention.

The oldest department of chemistry in Hungary was established in 1763 at the Academy of Mining in Selmecbánya. Its first professor was Nicolas Jacquin from the Netherlands, active in Selmecbánya till 1769 und subsequently professor at the University of Vienna. His successor was an Italian, Giovanni Scopoli, up to 1779, and the first head of the department of chemistry who already had studied and graduated at Selmecbánya was Antal Ruprecht. He remained there till 1792, when he became director of the Chamber of Mining in Vienna. All three professors were highly active in scientific research.

The Academy of Mining of Selmecbánya has outstanding importance in the history of chemical education, having been the first in the world in the introduction of chemical laboratory exercises.

In the region of Selmecbánya significant noble metal and copper mining was being carried on from the early Middle Ages. Mining took large-scale industrial shape in the 15th century in the hands of the Thurzó-Fugger family, continued in the 16th century in Royal Chamber management. Some training of mining experts—though mainly empirical—was carried out within the frame of this enterprise. King Charles III organized a school for mining officers, including practical education *(practice et manipulando)* in its program. A detailed list of the exercises *(particularia)* has survived, containing a fairly comprehensive program of qualitative and quantitative metal analysis (on the level of the period, of course). The Academy of Mining founded by Queen Maria Theresa in Selmecbánya in 1763–1769 adopted this tradition and successfully fitted laboratory exercises into its program. As a result, the Academy became famous in the 18th century and attracted students from various countries. The laboratory exercises in Selmecbánya served as the model for the École Polytechnique established in Paris in 1794. The proposition submitted to the Convent by the Committee of Public Welfare (as reported in the *Gazette Nationale ou Moniteur universel*, No. 8, octidi, 8. vendémiaire 1794) writes as follows: "La physique et la chimie n'ont encore été montrées qu'en théorie en France. L'école des mines de Schemnitz en Hongrie nous fournit un exemple frappant de l'utilité de faire exercer ou pratiquer par les élèves les opérations qui sont la base de ces sciences utiles. Des laboratoires y sont ouverts et munis des ustensils et des matériaux nécessaires pour que tous les élèves y répètent les expériences et voient par les yeux tous les phénomènes que les corps présentent dans leur union. Le Comité de Salut public a pensé qu'il fallait introduire dans l'école des travaux publics cette méthode..." (Physics and chemistry have formerly been taught only from a theoretical basis in France. The Mining School in Schemnitz (Selmec) in Hungary offers striking proof for the utility of the students exercizing or practicing the operations which are the fundamentals of these useful sciences. Laboratories have been established at that school, supplied with all the materials and equipment needed for the students to repeat the experiments and see through their own eyes the phenomena occurring when substances are combining. The Committee for Public Welfare considers that this method should be introduced into the school of civil engineering...")

Liebig became aware of the utility of practical laboratory teaching at the École Polytechnique. When he became professor in Giessen, he introduced it there, and this was the centre from where laboratory exercises spread to all universities of the world.

After World War I, when—by the Trianon Peace Treaty—Selmecbánya became a part of the new Czechoslovakian state, the Selmecbánya Academy of Mining continued its activity in the West-Hungarian town, Sopron up to 1950.

Then it became a part of the newly organized University of Heavy Industry in Miskolc.

The second department of chemistry was also founded by Queen Maria Theresa, when she added a medical faculty, in 1769, to the Nagyszombat University having been organized in 1635. A chemical and botanical department was established within the medical faculty, and its students were primarily students of medicine. The first professor of the department was an Austrian, Jacob Winterl, who became renowned in international chemical life both by his results and his errors during his four decades of professorship. It was then that the university changed its seat from Nagyszombat to Buda and later to Pest (today it is the Eötvös Loránd University of Budapest). The first Hungarian school of chemists developed around Winterl, and many well-known chemists are found among his pupils. Their main merit was that they created the Hungarian terminology of chemistry and wrote the first books on chemistry in Hungarian. (At that time the language of teaching was Latin at the University and German at the Academy of Mining, and the books and papers were written in the same languages, as well.) Winterl's successor was a Hungarian-born physician János Schuster who graduated at the Pest University. He was the first chemist among the members of the Hungarian Academy of Science founded in 1825. Schuster's pupil and principal assistant, Károly Nendtvich, a physician became in 1847 the first professor of chemistry at the Technical University.

As it was mentioned, the two predecessors of the Technical University of Budapest were the Institutum Geometricum and the Joseph Industrial School (founded in 1846) which were united in 1850.

In Hungary industry began to prosper in the first decades of the 19th century. Enterprises were established mainly in the food and textile industries and in the field of machine construction. They needed a new type of experts different from those trained by the Institutum Geometricum above all for civil service, experts trained in mechanical engineering and chemistry. Such training was provided by the so-called polytechnics which had been founding from the beginning of the century in the well-developed countries, among them in Austria, as well.

In 1836 the Hungarian Diet moved a resolution to establish a polytechnic in Hungary. It was, however, materialized only in the shape of a secondary industrial school founded by King Ferdinand V in Pest in 1846. The school bore the name of the Royal Archduke Joseph, palatine of Hungary. The language of teaching was Hungarian, the study time was three years including a first preparatory year. It was arranged in three courses, agronomy, technology and trade. There were departments for the following subjects: mathematics, physics, architecture and descriptive geometry, chemistry and technology, drawing, commercial accounting (in German, using the termi-

nology of industrial trade), and finally natural history and study of commercial goods.

The candidates for professorships were required to pass an examination at the philosophical faculty of the University, which ranked them. For the chemical department among the five competitors, dr. Károly Nendtvich was recommended in the first place, and he was appointed on October 24, 1847.

Chemistry was taught in the courses of agronomy and technology of the school, in the second year, in 5 hours per week. This, however, was not equivalent of a proper chemical education. The students in the technological course of the school received some sort of general training enabling them to do any kind of engineering work. The agronomic and trade courses were dissolved in 1850 so that the technological character of the institution took a more distinct shape. However, the language of teaching changed into German. In 1854 the Industrial School was moved to Buda, into a building, having three floors, into the Castle District (Országház St.), where 18 lecture halls, 3 drawing halls, 17 rooms and 1 laboratory were at its disposal. On September 30, 1856 the Industrial School was reorganized into a polytechnic and thus became equal in rank to the similar institutions of the Austrian part of the Empire. After the obligatory one-year preparatory class the students passed into the technical class where they could choose their subjects as previous study, certain given subjects was required. Vince Wartha, student and later professor of the Polytechnic, recollected this period: "At that time there existed no faculties at our polytechnic. Any student immatriculated could become civil engineer, architect, mechanical engineer or chemical engineer as he liked, but those who intended to follow the chemist career also diligently made drawings of Dorian, Ionian and Corynthian columns. . ." There were no final examinations, and no engineering diplomas, but only study certificates were issued. Vince Wartha's memoirs provide a picture of the first chemical laboratory of the Technical University, a not too cheerful picture. After his Ph.D. graduation in Zurich "I returned home and became assistant of Károly Nendtvich in Buda. It was only then that I realized what a well-equipped laboratory is worth. In Zurich everything was most efficient, most brilliant, while in Buda, in the laboratory in the Castle District not even gas was installed, for the simple reason that petroleum was being used for street lighting, and gas needed for any experiment had to be carried from the gas works in Pest in rubber bags. The chief attraction of the laboratory was a large fume chamber equipped with a coal-fired grate. Each time we lit the fire in this ancient fireplace, almost all of the glass panes of the chamber burst. Could we have completed this laboratory with a stuffed owl, a skull and an old codex, Faust and Mephisto would have felt quite at home."

The language of teaching turned to Hungarian again in 1860, and from this date the name of the polytechnic was changed to Royal Joseph Technical

University. Specialization of education was the main goal urged by the University. From the year 1863/64, technical education was temporarily divided into three sections: civil engineering, mechanical engineering and chemical engineering. Curricula were established for these sections. That for chemists took three years, later (from 1867/68 on) two years. However, curricula were not compulsory, only recommended.

In 1870 a department of chemical technology was established; Vince Wartha was appointed professor and head of department.

Establishment of the training in chemical engineering. Teaching up to 1945

Following the Austro-Hungarian Compromise in 1867, the new independent Hungarian Government decided to raise the polytechnic to the rank of a university. Baron József Eötvös, minister of education laid a bill before Parliament in April 1870 concerning the reorganization, with the main points that the Technical University be equal in rank with other universities; to consist of five faculties: civil engineering, architecture, mechanical engineering, chemistry and a universal faculty. The faculties be headed by deans, and the former director be replaced by the rector.

General subjects were taught in the Universal Faculty. Originally its first year had to be completed before entering the first year of studies in the technical faculties, and passing examinations in certain subjects was the precondition to continue studies. No compulsory curriculum restrained full academic freedom, subjects and their succession could be chosen at will, only examinations were regulated.

The new organization was sanctioned by Francis Joseph on July 10, 1871 and came into force in the academic year 1871/72. Simultaneously it was decided to build a new technical university. In the meanwhile the university was transferred to Pest, to the Nagel building at the corner of Két Nyúl St. and Csillag St. (The building still stands at the corner of Szamuely St. and Gönczy Pál St., across the Calvin Place Department Store.) Let us note that the Technical University was not fully equal to other universities, insofar as it did not have the right to confer a doctor's degree until as late as 1901.

It turned out within a short time that full academic freedom is infeasible at the Technical University, the succession of the subjects cannot be optional, since the subjects are based on each other. For this reason recommended curricula were introduced in 1874/75, which became compulsory from 1882 on.

The projects did not come to life fully as imagined. Presumably due to lack of applicants no independent chemical faculty was organized, instead a

united universal and chemical faculty was established with one dean. The first dean was Kálmán Szily, professor of physics. In his opening adress of the academic year 1877/78, the rector, József Sztoczek pointed out these difficulties: "The faculties of architecture and chemistry have passed the difficulties of establishment. The faculty of architecture is developing more rapidly, so that one may hope that it will usefully contribute to the progress of our cultural interests. The slower development of the faculty of chemistry may be explained by the fact that our chemical industry is in a very primitive stage as yet." In addition to the two chemical departments, numerous departments of fundamental sciences belonged to the united universal and chemical faculty, such as botany, zoology, mineralogy and geology, as well as physics and mathematics.

As a matter of fact, up to 1898 the university only issued 33 chemist's diplomas, demonstrating the slight degree of interest. The first three were granted to Albert Grittner, Jakab Sonnenfeld and Gyula Szilágyi, in 1884. Let us note that the degree was termed "chemist" up to 1907, only then was it changed into "chemical engineer".

The construction of the new Technical University, on the site between Museum Boulevard and Eszterházy St. (today Pushkin St.) was started in 1881, and the chemical departments could move into their new, modern building fitted with up-to-date laboratories as early as 1882. (The building serves the purpose of chemical teaching still in our days. When the Technical University moved to its present site, its former buildings were taken over by the University of Budapest, and the former chemical building of the Technical University houses at present the departments of physical chemistry and colloid chemistry of the Eötvös Loránd University.)

As mentioned, a compulsary curriculum was introduced from 1882 on. It was modified in 1898. The curriculum of the chemical faculty was as in Table 1.

This program was truly modern in its time, particularly because lectures of chemical physics and organic chemistry were being held. To be sure, chemical physics was far from its later content. Its subject, according to the program, was: Weight measurements, determination of specific weight and of vapour density. Specific heat. Telescopes and microscopes. Polarization. Saccharimetry. Already in 1891 caloric measurements and in 1898 electrical measurements also appeared in the program.

As to the other chemical subjects, their 1882 program: General Chemistry: Introductory notions. Inorganic chemistry. The simplest carbon compounds.

Organic Chemistry: Introductory notions. Bodies connected with fats. Carbohydrates. Aromatic compounds. Glucosides. Alkaloids. Proteins.

Table 1

	1882		1898	
	Lectures	Exercises	Lectures	Exercises
	First year			
Analysis and geometry	8	6	4.5	5.5
Physics	3	—	4	—
General chemistry	2.5	8	3	—
Drawing	—	6	—	6
Descriptive mechanics	2	2	—	—
Machine drawing	—	—	—	2
Industrial zoology	1.5	—	1.5	—
Industrial botany	1.5	—	1.5	—
Organic chemistry	2.5	—	2.5	—
Mineralogy	—	—	3	—
	Second year			
Organic chemistry	1	—	1	—
Chemical technology	2.5	—	1	—
Manufacture of chemical products	2	4	2	—
Chemical physics	2	4	2.5	4
Technical microscopy	—	2	—	3
Theoretical chemistry	1	—	—	—
Mineralogy	2	—	—	—
Analytical exercises	—	18	—	20
Machine elements	—	—	2	—
	Third year			
Manufacture of chemical products	—	—	2	—
Mechanical technology	2	—	2	—
Encyclopedia of architecture	2	1	1	2
Mineralogical exercises	—	4	—	—
Chemical technology exercises	—	20	—	20
Geology	—	—	1.5	—
Equipment for the chemical industry	—	—	2	—
	Fourth year			
Mechanical technology	—	—	2	—
Chemical technology exercises	—	26	—	26
Bookkeeping	3	—	—	—
National economics	4	—	4	—
Economic calculations	—	—	2	—
Industrial economic calculations	—	—	1	—

Chemical Technology: Manufacture of iron and steel. Processing of wood. Materials of construction, Explosives. Technology of water. Metals. Fuels.

Manufacture of Chemical Products: Sulphur industry. Soda and chlorine industry. Potassium and ammonium industry. Mineral paints. Glass

and ceramics industry. Fats and oils. Perfumes. Resins and rubber. Starch and dextrine manufacture. Sugar manufacture. Manufacture of alcohol, wine, beer and vinegar. Inorganic and organic dyes, aniline dyes, bleaching and scouring of fabrics. Textile printing. Leather processing.

The subjects Industrial Zoology and Botany are described as follows: "A detailed discussion of those animals and plants which have industrial or other importance by themselves or by their products."

It is interesting that already the first curriculum contains mechanical engineering and economic subjects. The program for the subject Equipment for the Chemical Industry listed: Machines of the chemical industry. Crushers and mills. Mixers, screens and classifiers. Machines for manufacturing briquette, coal-cleaning equipment, pug-mills and clay-cleaning machines. All types of presses and filter-presses. Centrifuges. Kneaders. All types of pumps, blowers and exhauts.

Two examinations had to be passed successfully for graduation. The subjects of the first examination were initially physics and mineralogy, those of the second chemistry (general, inorganic and organic), chemical technology and manufacture of chemical products. In 1898 chemistry was transferred into the first examination.

Numerous non-obligatory subjects like Theoretical Chemistry, Alkaloids, Lighting and Heating, Fundamentals of Wine Chemistry, Microscopy of Wine Processing, Fermentation, Operations of Gas Analysis, Electrochemistry, Technology of Fuels were read by honorary lecturers. In 1898, Professor Nendtvich's successor, Professor Lajos Ilosvay already spoke up for establishing independent departments of agricultural chemical technology and electrochemistry, and a laboratory for organic chemistry. However, due to lack of space a discussion in merit was postponed, since in the meanwhile the necessity of building a new Technical University emerged, the Museum Boulevard buildings having been outgrown rapidly. After many disputes and search for a suitable site the Parliament finally decided in 1902 to construct the new Technical University on the bank of the Danube at the south end of Buda. The complex of buildings (the core of the present Technical University) evidences the splendid work of its designers regarding efficiency, architectural value and city planning. It may well have satisfied all wishes, considering the number of students at the time. Notwithstanding, Lajos Ilosvay as rector deemed, in 1903/1904, the size of the chemical building being unsatisfactory: "I am rightly concerned by the slow preparations; considering the present growth rate of the number of students, the building designed on the basis of their former number may be outgrown by the time it will be completed." The number of chemical students then totalled 68, that of the teaching staff of the two departments to be housed in the building 6. Apparently the notion of tightness was entirely different from what it is today to their successors in that

same building. However, Ilosvay was right insofar that interest did increase remarkably in chemical engineering in that period.

In contrast to the buildings themselves, the equipment of the Technical University was much criticized. This is what Professor Ignác Pfeifer wrote in a newspaper: "A new Technical University is being built, a palace to be admired by the whole world. When, however, the question turns to equipment and staff, it appears that no credit, no funds are at disposal. The lecturers who should have free time for independent scientific research can only comply with their lecturing duties if they work like horses from early morning till night."

Pfeifer wrote this on the occasion of a discussion continued on the columns of the *Vegyészeti Lapok*, a discussion regarding the level of the education of chemical engineers in Hungary started by a certain Aurél Bartal. In his opinion, training of chemical engineers at the Technical University was characterized "by high general technical knowledge, lesser knowledge of chemistry, and even less specialized knowledge; thorough knowledge in analytical chemistry, but less in preparative and even less in organic chemistry; and above all, far too much training in physical chemistry at the expense of the former disciplines". Bartal advocated that education of chemical engineers be of a more specialized type. In his reply Pfeifer stated: a comparison of the curriculum with that of similar German institutions demonstrated no essential differences, and technological training was even somewhat higher in Hungary. He agreed that the absence of organic laboratory exercises was a shortcoming and would have approved to introduce them as soon as possible. He found the number of the teaching staff too low: in his opinion, successful laboratory teaching can only be achieved if no more than 8 to 10 students are assigned to one assistant. He was against specialization, since Hungarian chemists should be trained for the Hungarian chemical industry which cannot be compared in scale to the German industry. Another participant in the discussion noted that analytical work dominates in the Hungarian chemical industry, and research departments exist only at one or two companies. In his reply Bartal made some noteworthy remarks, for instance: "the lack of organic chemical industry is no justification for not teaching organic chemistry, because in this manner there will never be one." And further "it is much less the industry that educates the chemist than rather it is a well-trained set of chemists that will develop industry."

Actually the first building of the Technical University that was completed was the chemical building on Gellért Place, designed by Győző Czigler. It cost 1,361.264 crowns and 44 fillérs. The departments of chemistry and of chemical technology, as well as temporarily the department of botany moved into the building, and chemical lectures and exercises were held in it from the academic year 1904/05 on.

The education of chemical engineers made much progress in the first decade of the 20th century. It should particularly be noted that the faculty very soon realized the necessity to establish specialized departments in the place of the parallel departments marked with numbers only, which was usual at the time at the university, each of which — at least in theory — was destined to cultivate the total domain of chemistry. In the spirit of this recognition the Department of Electrochemistry was established in 1905, headed by Imre Szarvasy, subsequently, in 1908, the Department of Agricultural Chemical Technology headed by Elek 'Sigmond, and in 1913 the Department of Organic Chemistry headed by Géza Zemplén.

The subjects corresponding to the new departments were made compulsory in the curriculum, if this was not the case already earlier. Organic chemistry was taught from the very beginnings on. Laboratory exercises in organic chemistry (30 hours per week) were first held in 1912/13 by Professor Lajos Ilosvay who also lectured on analytical chemistry. Already before the Department of Agricultural Chemical Technology had been established, the subject became compulsory (in 1905); the lectures were held by the famous specialist in flour chemistry Tamás Kosutány, director of the National Chemical Institute. Up to and including the academic year 1918/19 the Technical University granted 372 diplomas to chemists and chemical engineers.

The periods of the Hungarian Republic and the Hungarian Soviet Republic that followed the fall of the Austro-Hungarian Monarchy were too short to allow effectuation of permanent reforms in university education, considering that the country was economically exhausted after a lost war and partly occupied by foreign intervention troups. However, the plans and concepts that were born during this short period were so dynamic, so up-to-date and opening up such wide prospects that many of the concepts were materialized in the subsequent stage of the Faculty's life.

During the period of the Hungarian Soviet Republic, a general reform of the education at the Technical University was launched "because the results of teaching mathematics and sciences at the Technical University are — in many respects — in no proportion to the time and pains spent by teachers and students. One of the reasons is the unsuited selection of the matter of instruction, namely the lack of relationship to technology, and another is that teaching of mathematics and fundamental sciences ceases in the higher grades, exactly when the students begin to realize what mathematical and scientific knowledge they actually require...". "It appears necessary to include non-compulsory lectures on higher mathematics, mechanics and other fundamental sciences for the students of the third and fourth years." Instructions were given to the faculties to prepare curricular reforms. In connection with the Chemical Faculty, it was underlined that "particularly the teaching of physical

chemistry should play a much more important part than in the past". It was planned to replace the Department of General Chemistry by a Department of Inorganic and Analytical Chemistry and a Department of Physical Chemistry.

Due to the following dramatic change in the political situation, the general reform suggestions conceived during the Soviet Republic could not be carried out, e.g. the admission of women students. Some of the reforms concerning the curriculum of the Faculty of Chemical Engineering were necessarily effectuated, such as the establishment of new departments. The Department of Inorganic Chemistry was established in 1921 by separating it from the Department of Chemistry. Its first head was László Putnoky. The Department of Zoology was reorganized into a Department of Food Chemistry, with Mihály Vuk appointed its professor in 1921. Finally, in 1924, the Department of Chemical Physics, the first in Hungary, was established, headed by Ármin Strauss.

The character of the Universal and Chemical Faculty turned more and more towards chemistry. The initial aim of the Universal Faculty, namely to prepare the students for engineering studies became unnecessary with the development of secondary education. Students with a secondary school grade could immediately pass into one or another engineering faculty. The Universal Faculty was kept up for persons continuing free studies. However, with time its students and subsequently its departments wasted away. From that time on, one meets the term Faculty of Chemical Engineering increasingly, though officially the programs still contain the expression Universal and Chemical Faculty, up to the reorganization of the Technical University in 1934.

Owing to the establisment of new departments and the rapid increase of the number of students, space again proved insufficient. The Chemical Building, originally planned for two departments, now housed five ones, and the others were located in further buildings. Therefore it was decided in 1928 to construct a second chemical building. However, this did not come true, similarly to the whole complex of buildings not getting enlarged at all up to World War II. This fact in itself symbolizes the stagnation characterizing the period between the two wars. Funds were so low that elementary problems arose and equipment criticized in earlier stages sank to the worst possible level. There was no possibility at all to buy more modern instruments. It is admirable that the high scientific level and conscientiousness of the professorial staff was able to sustain the education of chemical engineers at a level acknowledged in Europe under such adverse conditions.

In 1934, great reorganization took place, above all with budget reduction aims, and the Palatine Joseph Technical and Economical University was organized, formed by the union of the Joseph Technical University with the Mining and Forestry Academy of Sopron, the Veterinary College and the Faculty of Economics of the Pázmány Péter University. The university turned

out to be too large for one organization. Its centre was the former Joseph Technical University, but none the less this university provided only two of the five faculties of the new university. The Faculty of Chemical Engineering which had just then achieved independence became part of the Faculty of Mechanical and Chemical Engineering, with the dean's charge alternating year by year between the two sections.

After a pause of 15 years, a new department was again established in 1939, with industrial financial help, since it satisfied industrial needs: the Department of Textile Chemistry. Its first professor was Zoltán Csűrös.

The curriculum of chemical engineers was essentially established in the early twenties, and apart from smaller changes it did not change much until after World War II. The number of theoretical and laboratory hours was fairly high. In the academic year 1928/29 there was an initiative to reduce this number to maximum 40 per week, but it never took shape. Although laboratory exercises were held by practically all departments, they were — with a few exceptions only — mainly analytical exercises under the name of the department, even for technological departments. The complete lack of semi-scale plants and workshops indispensable for engineering education aiming to keep pace with industrial development was increasingly understood, but all initiatives taken by the university were in vain.

Women students by now appeared at the Palatine Joseph Technical and Economical University, above all and in higher numbers at the Faculty of Economics. On principle, chemical engineering studies were also opened to women, but in practice there were only one or two girl students in each year. The first female chemical engineer in Hungary was Judit Pogány who graduated in 1939.

In the period between the two World Wars, the Hungarian chemical industry — earlier suppressed by the competition of the higher-developed Austrian chemical industry — made more rapid progress than other branches of industry. A pharmaceutical industry noted on the international market was founded, the basis of the Hungarian nitrogen industry was established, the development of alumina and aluminium industries and exploration of the petroleum of West-Hungary was started. Just before World War II reached Hungary, the first factory of synthetic fibres started operation. Due to these changes the education of chemical engineers attained increasing importance in society. The relations between the industry and the faculty strengthened significantly. This was very advantageous, both from the financial view, considering the destitute budgets of those years, and from the view of scientific research within the faculty, as demonstrated by the establishment of a new department and by scientific results achieved.

During the long siege of Budapest towards the end of World War II the Technical University was enormously damaged. Military actions affected

training of chemical engineering particularly, since its main building stood on the bank of the Danube. The damage in the chemical engineering departments was up to 50%. After the siege only ruins were left, and the students were scattered to the winds. Such were the conditions in which the most recent period of the Faculty of Chemical Engineering began.

The Faculty of Chemical Engineering since 1945

Unselfish, generous work was started immediately among the ruins. Teaching began in the ruinous classrooms and laboratories: not a single semester was lost by war and siege. Reconstruction soon began. For the time being the structure of the faculty remained untouched, but many changes in the personnel happened. Long interregnums in heading the departments were rather charasteristic for those year.

In the following years many new universities were organized, among others some faculties of the Palatine Joseph Technical and Economical University were turned into independent universities, so that finally only the original engineering faculties remained. In 1949 the name and organization of the university was changed. It continued its activity under the name Technical University Budapest. An independent Faculty of Chemical Engineering was finally organized (although the former Universal and Chemical Engineering Faculty, in its final period, was purely chemical, nominally no independent chemical engineering faculty had existed till then).

To meet the demands of socialist industrialization, the education of chemical engineers, homogeneous till then, had to be specialized to a certain extent. It was, however, obvious that moderate specialization will comply with the industrial structure of the country. Three sections were formed in 1948: inorganic chemical technology, organic chemical technology and agricultural-food industry. The first was then organized into a Faculty of Heavy Chemical Industry which, from 1951 on, continued its activites as an independent university in Veszprém. Simultaneously the chemical engineer education profile in Budapest became that of organic and agricultural-food chemistry.

Changes and modernization of the curriculum demanded for further departments. An independent Department of Mathematics was established in 1948 at the Faculty of Chemical Engineering, headed by György Alexits. The Department of Plastics and Rubber, headed by Rudolf Balló, was established in 1953. The Department of Mechanical Engineering for the Chemical Industry began its activities in 1965. The section of the Department of General Chemistry serving to teach chemistry to the students of non-chemical faculties of the Technical University was separated in 1966 to form an independent Department of Applied Chemistry, and the Department of General Chemistry changed its name into Department of General and Analytical Chemistry. In

1956, the Department of Mineralogy and Geology was transferred to the Faculty of Civil Engineering. It continued, however, to participate in the teaching of students of chemical engineering. The teaching duties of the Department of Electrochemistry became substantially less by the transfer of the line of inorganic chemical engineering to Veszprém, and therefore it was annexed to the Department of Chemical Technology in 1957.

Talented workers who, in the previous régime, had no chance to study engineering were given this chance after the Liberation at the State Technical College, an institution accepting students, without the interruption of their work, in evening courses. The State Technical College ceased to exist in 1951, and its duties were transferred to the evening course branch of the Technical University. In the beginning the education of chemical engineers in the evening courses proceeded in a single department, the former department of chemistry of the State Technical College ranging among the departments of the Faculty under the name Department of Practical Chemistry and headed by István Rusznák. The students graduated after 7 semesters and obtained a "production engineer" diploma. Term-time was subsequently increased to 8, 10, and finally to 12 semesters, and the students now graduate similarly to regular students as chemical engineers, their diploma becoming equivalent to that obtained by regular students. The teaching, first based on the single Department of Practical Chemistry, was successively passed to the corresponding departments of the Faculty, since then, taught both regular and evening students. Consequently the Department of Practical Chemistry ceased to exist in 1959.

The change of social structure in Hungary led to dramatic evolution in all areas of cultural life, and particularly in superior education. The number of students, including above all the sons and daughters of the working classes who — up to then — were cut off from universities, rose sharply. The number of the teaching staff rose to an even higher extent. The staff of the Faculty consisted in the last pre-war year of 10 professors, 9 first assistants, 12 assistants and 5 research students, totalling 36. In 1981/82 the corresponding numbers were 20 professors, 37 assistant professors, 143 first assistants, 38 assistants, totalling 238. Before the war the floor space of the departments was 6700 m^2, in 1981/82 13,000 m^2. Substantial progress was achieved in equipment in the course of the past close to 40 years. The Faculty now disposes of most of the modern instruments required for teaching and research.

Curriculum changes were frequent during this period, reflecting the persistent endeavours that education keep pace with the revolutionary progress in science and technology affecting social and economic life of our age so largely. Term-time was raised from 8 to 9 semesters in 1955/56 and to 10 semesters in 1960/61. Education has turned more and more definitely towards modern chemical engineering. Chemistry being, above all, an experimental

science, it was clear to the Faculty that a major factor in education should consist in developing the ability and concept of experimenting in the students. Hence in addition to thorough theoretical and laboratory training, in order to promote the formation of the industrial outlook, the training of chemical engineers must necessarily include access to semi-scale operations, in addition to the traditional laboratory exercises. The main feature in the curriculum reforms was that — based on fundamental subjects yielding theoretical foundations — operations and processes successively replaced teaching of traditional technology, although the term technology still occurs in the name of most departments. Analytical chemistry has been concentrated into one department and process and operation exercises were introduced instead at the technological departments. This was facilitated by the successive establishment of the long-missed semi-scale industrial equipment. The first step taken in this direction was by the Department of Agricultural Chemical Technology in 1952. At the present stage the Department of Chemical Unit Operations, the Department of Plastics and Rubber (the latter within the Hungarian Cable Works) and the Department of Chemical Technology have semi-scale equipment at disposal, while the Department of Agricultural Chemical Technology has a pilot plant in the country.

The fact that the socialist society created new educational institutions and forms widely opening the gates to superior education — which earlier was mainly reserved for the privileged — resulted in the first period in a rapid numerical increase of the students. Scientific and technological progress, however, soon turned attention to the aspect of higher qualification. The differentiated requirements of society to chemical engineers cannot now be satisfied by re-raising the standard level of training which earlier was necessarily lowered. To comply with these requirements, differentiated training had to be introduced. Instead of establishing a separate institution for lower-level training, the Faculty of Chemical Engineering chose two-stage education from the academic year 1969/70 on, introducing the degrees "chemical production engineer" and "chemical engineer". Chemical production engineers graduate after three years of study. Their training prepares them to comply with the tasks of superintending a chemical plant. They are equipped with the necessary fundamentals in chemistry and material knowledge; they are familiar with batchwise and continuous operations and processes, with chemical equipment, with the basic equations of process control and automation and with the problems of plant and labour organization.

Chemical engineers graduate after five years. They are trained to comply with technological development tasks using up-to-date means and methods to establish material and energy balances; to select the suitable type of equipment; to determine the major dimensions of the equipment, depending

on physical, chemical and operation parameters; to promote the work of specialists in instrumentation and automation; to determine, and if possible, to compute by laboratory, semi-scale and pilot-plant-scale experiments, the parameters required to introduce new processes; to comply with research and design tasks in chemical and related industries.

The training is common in the first two years. When the student enters the university, he is not asked to decide in which type of training he wishes to participate. It depends largely on the results attained in the first two years. Teaching bifurcates in the third year. It appears that natural differentiation based on abilities is largely ensured in this manner.

In 1967 a government resolution abolished the appointment of professors for life, and instead professorial assignments for a term of five years (which can, however, be prolonged) have been introduced.

The departments existing in 1982 the 200th anniversary of the Technical University at the Faculty of Chemical Engineering and their actual heads are as follows:

Agricultural Chemical Technology, Prof. Lajos Fodor
Applied Chemistry, Prof. Lajos György Nagy
Biochemistry and Food Chemistry, Prof. Radomir Lásztity
Chemical Technology, Prof. Imre Szebényi
Chemical Unit Operations, Assoc. prof. József Manczinger
General and Analytical Chemistry, Prof. Ernő Pungor
Inorganic Chemistry, Assoc. prof. József Nagy
Mathematics, Prof. Dezső Králik
Mechanical Engineering for the Chemical Industry, Assoc. prof. Attila Verba
Organic Chemical Technology, Prof. István Rusznák
Organic Chemistry, Prof. Csaba Szántay
Physical Chemistry, Prof. György Varsányi
Plastics and Rubber Industries, Assoc. prof. József Varga

Deans of the Faculty

1871–1872 Kálmán Szily	1882–1883 István Fölser
1872–1873 Kálmán Szily	1883–1884 István Fölser
1873–1874 János Kriesch	1884–1885 József Krenner
1874–1875 János Kriesch	1885–1886 József Krenner
1875–1876 János Kriesch	1886–1887 Lajos Ilosvay
1876–1877 János Kriesch	1887–1888 Lajos Ilosvay
1877–1878 János Kriesch	1888–1889 Lajos Ilosvay
1878–1879 János Kriesch	1889–1890 Lajos Ilosvay
1879–1880 János Kriesch	1890–1891 Lajos Ilosvay
1880–1881 János Kriesch	1891–1892 Lajos Ilosvay
1881–1882 János Kriesch	1892–1893 Géza Entz

1893–1894 Géza Entz
1894–1895 Gyula Klein
1895–1896 Gyula Klein
1896–1897 Gyula Klein
1897–1898 Gyula Klein
1898–1899 Mór Réthy
1899–1900 Mór Réthy
1900–1901 Sándor Schmidt
1901–1902 Sándor Schmidt
1902–1903 Sándor Schmidt
1903–1904 Sándor Schmidt
1904–1905 Gyula Klein
1905–1906 József Kürschák
1906–1907 József Kürschák
1907–1908 József Kürschák
1908–1909 József Kürschák
1909–1910 Jenő Daday
1910–1911 Jenő Daday
1911–1912 Jenő Daday
1912–1913 Ferenc Schafarzik
1913–1914 Ferenc Schafarzik
1914–1915 Imre Szarvasy
1915–1916 Imre Szarvasy
1916–1917 Imre Szarvasy
1917–1918 Elek 'Sigmond
1918–1919 Elek 'Sigmond
1919–1920 Károly Tangl
1920–1921 Károly Tangl
1921–1922 Gyula Istvánffy
1922–1923 Gyula Istvánffy
1923–1924 Géza Zemplén
1924–1925 Géza Zemplén
1925–1926 Géza Zemplén
1926–1927 László Putnoky
1927–1928 László Putnoky
1928–1929 Mihály Vuk
1929–1930 Elek 'Sigmond
1930–1931 József Varga
1931–1932 József Varga
1932–1933 József Varga
1933–1934 Aladár Vendl
1934–1935 Béla Pogány
1935–1936 Aladár Vendl
1936–1937 László Verebély
1937–1938 Elek 'Sigmond
1938–1939 Géza Pattantyús
1939–1940 Géza Zemplén
1940–1941 Ödön Vajda
1941–1942 István Náray-Szabó
1942–1943 Elöd Abódy
1943–1944 Zoltán Csűrös
1944–1945 József Liska
1945–1946 Jenő Plank
1946–1947 Ödön Vajda
1947–1948 Jenő Plank
1948–1949 Ödön Vajda
1949–1950 Imre Vörös
1950–1951 László Erdey
1951–1952 László Erdey
1952–1953 László Telegdy Kováts
1953–1954 László Telegdy Kováts
1954–1955 György Alexits
1955–1956 György Alexits
1956–1957 János Holló
1957–1958 László Telegdy Kováts
1958–1959 György Varsányi
1959–1960 György Varsányi
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1972 Imre Szebényi
1972–1973 Ernő Pungor
1973–1974 Ernő Pungor
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1976–1977 Ernő Pungor
1977–1978 Ernő Pungor
1978–1979 Ernő Pungor
1979–1980 Ernő Pungor
1980–1981 Ernő Pungor
1981–1982 Lajos Fodor
1982– Lajos György Nagy

Prof. Ferenc SZABADVÁRY Department of General and Analytical Chemistry, H—1521 Budapest
Prof. Lajos György NAGY Department of Applied Chemistry, H—1521 Budapest