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Three generations of natural scientists in Hungary, 1848–1918

(1) Introduction

During the whole 19th century, Hungary was part of the Hapsburg Monarchy and the Dual Monarchy, respectively.

The period indicated in the title of the paper is divided in Hungarian history in three distinctly different sections: the epoch of (neo)absolutism (1849–1867); the epoch of the Dual Monarchy (1867–1914); World War I and the collapse of the Monarchy (1914–1918).

(Neo)absolutism meant that, after the defeat of the 1848–1849 Revolution and War of Independence against the Hapsburgs, the constitution was abolished, and centralisation of the Empire carried out in 1851. The legislative and executive power was solely in the hands of the Monarch FRANCIS JOSEPH I. His power was wielded by the so-called Ministry (i.e. government) exclusively responsible to him only. The Crownlands, and also Hungary, were degraded to administrative units. Throughout the whole Empire there was no social class that would support this system.[1]

During this period Hungarian cultural life was governed by COUNT LEO THUN.[2]

(2) Scientific life during (neo)absolutism, and first generation of scientists

During (neo)absolutism and Count Leo von Thun's administration of public education the language of university training was German throughout the Empire.

German-speaking professors were appointed heads of departments at Hungarian universities and colleges. For 150 years they were considered as means of national and linguistic oppression. Little attention was paid to the fact that some of them were outstanding scientists of their specialities and achieved, during their activities in Hungary, results serviceable to our country. From the personages active in Hungary during the epoch, THEODOR WERTHEIM, professor of chemistry at Pest University of Sciences, HEINRICH WILHELM PABST, director of the Agricultural Academy of Magyaróvár and one of the founders of the Factory of Agricultural Machines and Tools in Moson shall be dealt with as examples as well as GUIDO SCHENZL, founder of the [Hungarian] Meteorological Institute.

Theodor Wertheim

THEODOR WERTHEIM (VIENNA, 1820–VIENNA, 1864) was a professional of second generation. His father was an M.D. THEODOR WERTHEIM finished his secondary school studies in Vienna, then went to Berlin, where he dealt, for two years, exclusively with inorganic chemistry. Then he studied organic chemistry in Prague with professor REDTENBACHER.[3] As soon as with his first work dealing with

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[1] I. Diószegi, *A Ferenc József-i kor. Magyarország története 1848–1918* (*Francis Joseph's epoch. History of Hungary 1848–1918*). Vince Kiadó, Budapest, 1999, p. 15–16.

[2] Count Leo von Thun and Hohenstein Teschen, Děčin, 1811–Vienna, 1888) was Governor of Bohemia, then — between 1848 and 1860 Minister of Religious Affairs and Public Education of the Hapsburg Empire. His general reform of public education made school education of 6–12 year-old children compulsory throughout the whole territory of the Austrian Empire. Although elementary school education was based on mother tongues, from secondary school on it served Germanization. He was the one who brought into being modern university education. *Magyar Nagylexikon* (*Big Hungarian Encyclopedia*), Vol. 17, *Magyar Nagylexikon* Kiadó, Budapest, 2003, p. 444–445.

[3] The Austrian scientist J. Redtenbacher, professor of the universities of Vienna and Prague, had several Hungarian connections. Among others, Artúr Görgey, later general and commander-in-chief of the Hungarian army during the War of Liberation, was a student and co-worker of his in Prague, where he carried out important

investigations into garlic oil, he attracted great attention in scientific circles. As it is, he proved that garlic volatile oil is identical with the one present in mustard, moreover, he was able to transform the two into each other. It is to this work he owed LIEBIG's protection.[4] It was from the newspapers that he learnt that he had been elected corresponding member of the Class of Mathematics and Natural Sciences of the Imperial Academy of Sciences (1848).

Owing to his further work that dealt, among others, with some alkaloids, BARON BAUMGARTNER, the then minister of finances of Austria invited him to Hamburg, to the laboratory of the Management of the Tobacco Industry, whe he succeeded in improving the quality of *"snuff"* by replacing potash — used until then in the production process — by soda, and omitting from the further steps of processing the expensive and useless wine additive. By this, he achieves considerable savings. In 1854 he applied for the Chair of Chemistry at Pest University of Sciences, then vacant.

During his years in Pest he first equipped an adequate laboratory, then discovered a new alkaloid named by him *conydrin*, and brought to an end the analysis of the water of Bath Tüffer in Lower Styria. Owing to the end of the epoch of German as language of teaching in Hungary, he left the country and obtained the job of Head of the Department of Chemistry at Graz University. In parallel to teaching, he continued there — with due success — his research into alkaloids. However, in 1864 (at the age of just 44 years) he was attacked by a grave illness and returned to Vienna, where he soon died. The bulk of his scientific works appeared in the Bulletin of the Class of Mathematics and Natural Sciences of the Imperial Academy of Sciences.[5]

He had never learnt Hungarian, held his lectures in German, and published his research results abroad in journals of German language. However, it was due to him that the improvements for a laboratory of adequate level started, which were completed — some decades later — in the building devised by KÁROLY THAN, which exists till today. WERTHEIM was able to attain that — when a university professor's yearly salary was 1300 Florins, the yearly budget of his laboratory amounted to 2000 Florins. The improvement of the laboratory's equipment appeared in the yearly budget of the University as a separate item. Thus — although THEODOR WERTHEIM served, by his work, the spreading of the imperial attitude of Austria — he simultaneously contributed to improving the level of university training in chemistry in Hungary. When, in 1860, owing to the restitution of the Hungarian language in teaching, he returned to his homeland, he spoke highly and with reverence of the capabilities of his successor KÁROLY THAN.

Heinrich Wilhelm Pabst

HEINRICH WILHELM PABST (Maar b. Lauterbach, Hessen, 1798–Wien, Hütteldorf, 1868) entered, as student of agriculture, the service of BARON RIEDESEL in 1812. In 1818 he became inspector of the Baron's estates. In 1821 he obtained a teacher's job at Hohenheim Agricultural School, in 1824 he became economic adviser, then director of the same institution. It was at this time that his main works on agriculture and animal husbandry came into being. In 1831 he was appointed head of the agricultural affairs of the State Hessen. In Darmstadt he established a school for higher agricultural education, then — in 1837 he brought into being the itinerary congresses of (German) farmers and sylviculturists. In 1839 he became director of the Agricultural Academy Eldena in Greifswald. In 1843 we find him as financial Privy Councillor and official in charge of agriculture at the Ministry of

and independent work: he developed a new method for separating the fatty acids of coconut, and detected in coconut oil – besides the fatty acids discovered by Liebig – capric and lauric acids. This work brought Görgey considerable fame as the results were published by the journal of the Vienna Academy of Sciences and Liebig's Annalen. Another famous student and later co-worker of Redtenbacher was – this time in Vienna – Károly Than, who published, as a result of his work done there, his first three papers in the field of organic chemistry. By the way, Than owed much to professor Redtenbacher: besides Bunsen and Wertheim, he was the one who recommended the then but 25-year-old chemist as head of the Department of Chemistry at Pest University of Sciences. F. Szabadváry, Z. Szőkefalvi Nagy: *A kémia története Magyarországon.* (*History of Chemistry in Hungary*), Akadémiai Kiadó, Budapest, 1972, p. 106, 196, 197, 285.

[4] É.K.Vámos, "Liebig magyarországi levélkapcsolatai" II. ("Justus von Liebig'sé Hungarian connections by correspondence." Part II.) *Technikatörténeti Szemle XXVI*, Országos Műszaki Múzeum, 2003–2004, p. 109.

[5] J.C. Poggendorf, *Biographisch-literarisches Handwörterbuch zur Geschichte der exacten Wissenschaften* u.s.w. Leipzig, Barth, 1860 Vol. 11, p. 113-116.

Prussia in Berlin. In the same year he became director of Hohenheim Agricultural Institute. From 1850 on he was director of the freshly founded Agricultural Academy in Magyaróvár, Hungary, which post he held for 10 years. In 1857 he became one of the founders of the Moson Factory of Agricultural Machines and Tools, equally in Hungary. Especially by this latter activity of his he did a great service to the country. (By the way, the other founder of the factory — EDMUND KÜHNE — was German, too.) In 1861 he was appointed ministry councillor and head of the Department of Agriculture at the recently established Ministry for Commerce and People's Economy in Vienna.[6] He was remarkable not only for his organizational talent but also for his numerous technical books and textbooks, part of which reached several editions, moreover, were translated into Hungarian and other languages.

Guido Schenzl

The third outstanding foreign scientist, whose life and activities shall be treated here, was GUIDO SCHENZL (Haus, Austria, 1823–Graz, 1890). He was an Austrian Benedictine monk and meteorologist, member of the Hungarian Academy of Sciences (MTA, corresponding 1867, regular 1876). He had obtained his doctoral degree from Graz University. From 1851 on, he was teacher of physics and chemistry at Buda secondary grammar school. In 1855 he became director of the then established Buda modern school. It was there that he started his systematic meteorological observations, and it was in the school that the predecessor of the later Meteorological Institute, Buda observatory came into being. In 1870 SCHENZL was appointed first director of the Meteorological Institute organized upon his suggestion. In 1886 he returned to his homeland — upon the summons of Admont Abbey — whose leader he became some months before his death.

His scientific publications, which appeared both in Hungarian and in German language, comprised mainly investigations into earth magnetism. Between 1864 and 1881 he performed measurements of geomagnetism nearly on the whole territory of Hungary. His main works are: *Yearbooks of the Institute of Meteorology*, which were awarded the Great Prize of the Hungarian Academy of Sciences in 1875; *Directives for localizing earth magnetism* (Budapest, 1884); *Conditions of Precipitates in the Countries of the Hungarian Crown* (Budapest, 1885).[7]

As it can be seen from his biography, SCHENZL did not leave the country at the end of absolutism. He became a highly respected scientist in Hungary, whose lasting merit was the foundation of the Meteorological Institute, which exists till today.

The Royal Hungarian Society for Natural Sciences and the foreign professors working in Hungary

An institution open to the foreign professors working then in Hungary, which survived (neo)absolutism, was the Royal Hungarian Society for Natural Sciences founded in 1841. In the volume published on the occasion of its 100-year-anniversary, the author comments on the foreign scientists working then in Hungary as follow:[8]

> It was the Society's first secretary József Szabó[9] elected in 1855 to draw the German speaking professors then working in Hungary into the Society's work. Thus the following foreign professors joined the Society: ANTAL KERNER, who introduced plant geography in Hungary; JÓZSEF KRIST, teacher of mathematics at Buda modern secondary school; KÁROLY PETERS, professor of mineralogy at Pest University; meteorologist GUIDO SCHENZL; EMANUEL SEIDL, professor of general pathology and pharmacy; KÁROLY LANGER, professor of zoology and comparative anatomy. Even if the majority of these

[6] J. C. Poggendorf (1860), *op. cit.*, Vol. 2, p. 277.

[7] *Magyar Életrajzi Lexikon* (*Hungarian Biographical Encyclopedia*). (Á. Kenyeres, ed.), Vol. II. Akadémiai Kadó, Budapest, 1969, p. 584–585. – L. Markó *et al*., *A Magyar Tudományos Akadémia tagjai 1825–2002.* (F. Glatz, ed.-in-chief). Magyar Tudományos Akadémia Társadalomkutató Központ – Tudománytár. Budapest, 2003. Vol. III, p. 1110–1111. – A. Simon, *Magyarországi meteorológusok életrajzi lexikonja*. Országos Meteorológiai Szolgálat, Budapest, 2004, p. 93.

[8] E.Gombocz, *A Királyi Magyar Természettudományi Társulat története 1841–1941.* (*History of the Royal Hungarian Society for Natural Sciences*). Királyi Magyar Természettudományi Társulat, Budapest, 1941, p. 82.

[9] József Szabó was first secretary of the Society from 1855 to 1861.

professors left Hungary around 1861 under the influence of the reborn national spirit, and not all of them were outstanding personalities of their branches of science, they meant a link to the western movements in natural sciences. Out of them KÁROLY LANGER was even on the board of the Society for some time. For their sake the 3rd volume of the Society's Yearbooks also appeared in German language (Original-Abhandlungen aus dem III. Bande des ungarischen naturwissenschaftlichen Vereins in Pest in deutscher Übersetzung.) This had the advantageous consequence that the papers were cited in foreign literature as well, and thus increased the self-confidence, the zeal to work and the ambition of Hungarian researchers. Several members of the younger generation… acquired their knowledge and their skills in scientific research from these German professors.[10]

(3) Scientific life after the fall of (neo)absolutism

The fall of (neo)absolutism started with the so-called *October Diploma* (20 October 1860) issued by the Emperor. This restituted constitutionalism to a certain extent, and re-introduced Hungarian as language of education. Universities got back to Hungarian as language of education as soon as in the academic year 1860/61, although the total political compromise was achieved in 1867 only. The so-called Compromise was the basis of the Dual Monarchy, by which the Hungarian part of the Monarchy was granted relative independence. The responsible Hungarian Ministry (in today's wording Government) came into being with COUNT GYULA ANDRÁSSY as prime minister. Emperor FRANCIS JOSEPH I was crowned Hungarian king, and Hungary obtained total independence in interior affairs. Three joint affairs were, however, defined: foreign affairs, matters of defence and finances related to the former two.[11] The epoch that followed can be characterized by an enormous boom in scientific and cultural public life. The scientists of the epoch threw themselves with full energy into organizing and re-organizing scientific institutions, and published their research results preferentially in Hungarian language in domestic periodicals.

(3.1) Situation and development of the universities in Hungary in the period of dualism

During this flourishing period two earlier institutions of higher education were raised to the rank of university. One of them was the former *Joseph Polytechnikum* (Joseph Polytechnical School) that was organized into a technical university in 1871. This was the first institution of higher technical education in the world that bore in his name the word *"university"*. It gave degrees of engineers, mechanical engineers, architects or chemists, however, doctoral degrees could not be obtained there in the 19th century.[12] The second new university was Kolozsvár (today Cluj) University of Sciences. This was brought into being in 1872 from two earlier local institutions of higher education, by merging an academy of law and a medical-surgical school, but without a faculty of theology.[13]

During the ministry of religious affairs and public education of ÁGOSTON TREFORT (1817–1888) the establishment of a third university was planned but not realized.[14] At the same time the existing universities were enlarged by several new buildings: the Technical University obtained its building in Museum Street, new buildings were erected for the Library and the Faculty of Medicine of the Pest University of Sciences as well as for the Clinics in Üllői street. A number of new departments were placed in the new buildings. Out of the disciplines of natural sciences independent departments were

[10] *Ibid*. 58.

[11] I. Diószegi (1999), *op. cit.*, p. 37–39.

[12] F. Szabadváry, *Budapesti Műszaki Egyetem 200 éve. 1872–1882*. (*200 Years of Budapest Technical University.*) Periodica Polytechnica, Budapest, 1982, p. 24–32.

[13] Gy. Bisztray, T.A. Szabó, L. Tamás (eds.), *Erdély magyar egyeteme.* (*The Hungarian University of Transylvania.*) Erdélyi Tudományos Intézet, Kolozsvár, 1941.

[14] M. Mann, *Trefort Ágoston élete és működése.* (*Ágoston Trefort's life and activities.*) Akadémiai Kiadó, Budapest, 1982, p. 88–89.

established for chemistry, geology, mineralogy, mathematics, physics, anthropology, zoology, botany, and astronomy.[15]

Those, who deal with the university world of the epoch, cannot disregard LORÁND EÖTVÖS's thoughts about the tasks of university:

> It is the task of university to educate young people, duly prepared at secondary school, in a way that — on the basis of their scientific knowledge — they become fit for serving the Church, the State and the Society. In close connection with this task is the university's duty to deal with the improvement of science, and educate scientists from whose rows it will be able to complete and thus maintain itself. That is why but independent thinking tried in the sphere of scientific research may qualify for the job of university professor.[16]

In his open letter addressed to ÁGOSTON TREFORT, LORÁND EÖTVÖS says:

> …a good professor can be but one that deals with science himself, the ideas of others can be properly propagated only by [someone] who has ideas himself.[17]

Manifestations on ministerial of rector's level laid down research as task of the universities. However, the kind of research going on at the individual departments was, to a great extent, dependent on the personal ambitions of the leading professors.[18]

(3.2) Scientific societies

Another important site of scientific public life was that of scientific societies. The scientific societies founded in Hungary until 1914, which played an important role in the epoch of the Compromise — and partly exist till today — are enlisted below:

Scientific societies in Hungary founded before 1914[19]

Year of foundation	Name
1841	Itinerating Conferences of Physicians and Naturalists
1841	Royal Hungarian Society of Natural Sciences
1842	Hungarian Geological Society
1866	Society of Forestry
1872	Hungarian Geographical Society
1878	Society of Hungarian Dentists
1891	Loránd Eötvös Society of Physics
1891	János Bolyai Society of Mathematics
1892	Hungarian Society of Mining and Mineralogy
1896	Society of Hungarian Gynecologists
1900	Electrotechnical Society
1907	Hungarian Chemical Society
1910	Hungarian Speleological Society

[15] J. Antall, *A modern felsőoktatási rendszer kialakulása Magyarországon (1848–1890).* [*Establishment of the modern system of higher education in Hungary (1848–1890)]*. Orvostörténeti Közlemények, 1969, p. 73.

[16] L. Eötvös, *Az egyetem feladatáról.* (*On the task of university*). Magvető, Budapest, 1985, p. 11.

[17] L. Eötvös, "Néhány szó az egyetemi tanítás kérdéséhez". (Nyílt levél Trefort Ágoston vallás és közoktatásügyi miniszterhez). ["Some words on university education". (Open letter to Ágoston Trefort, minister of religious affairs and public education)]. Budapesti Szemle. In: FN 16, p. 24.

[18] É. Vámos, "Német-magyar kapcsolatok a kémiában, az élelmiszeriparban és a vegyiparban. Német-magyar természettudományi és technikai kapcsolatok történeti vizsgálata. II. füzet." ("German-Hungarian relations in the fields of science, with special regard to chemistry, chemical industry and food industry. Historical investigations into German-Hungarian Connections in Natural Sciences and Technology"). Abigél Bt. Budapest, 1995, p. 9–10.

[19] É. Vámos, cf. FN 18, p. 67.

The societies considered popularization of science as work done for the public's benefit, and worthy of scientists. Out of all the contemporary scientific societies it was the Royal Hungarian Society of Natural Sciences that did most of the popularizing work.[20] In 1868 KÁROLY THAN invited the Board of the Society for dinner to his own house, where it was decided to make popularization of science one of the essential tasks of the Society. In 1869 the new statutes define the goal of the Society as follows: "… go in for natural sciences, in general, and study our homeland from this aspect, in particular, and propagate natural sciences." [21] In the same year the Journal of Natural Sciences was started, and in 1872 the Publishing Company for Natural Sciences.

The outcome of all these changes was summarized by KÁLMÁN SZILY in his address given in 1881, on the occasion of the Society's 40-year-anniversary, as follows:

> We have learnt, and I wish we would not forget that the reason for the existence of our Society, here in Budapest, in the vicinity of the National Museum and the Academy of Sciences, is solely due to its trend of spreading science and making science popular. This procured it [i.e. the Society] the faith of the public, and while this exists, it will always have the opportunity of practicing science as well…" [22]

(3.3) The second generation of scientists

Thus, in the period dealt with, scientific public life laid an immense charge on the individual researchers. They were expected to carry on independent and serviceable research, teach at universities, inform themselves and others about the scientific achievements of foreign countries, and spread scientific knowledge.

At the beginning of the epoch outstanding scientific personalities tried, with full enthusiasm, to fulfil the tasks falling to their share in scientific public life. They threw themselves at full strength into organizing and re-organizing scientific institutions and tried, by their publications, to raise the standard of the domestic scientific journals. Their papers over-abounded in locutions like "for the public's benefit", "for making the homeland flourish", or "in the great competition of countries, we Hungarians, have to see to it that…" [23]

Out of the scientists of the epoch, engaged in work *"for the public's benefit"*, we shall mention as examples the chemists KÁROLY THAN (1834–1908), RUDOLF FABINYI (1849–1920), and LAJOS ILOSVAY (1851–1936), the physicist KÁLMÁN SZILY (1838–1924), the geologist-mineralogist JÓZSEF SZABÓ (1822–1894) and engineer JÓZSEF STOCZEK (SZTOCZEK) (1819–1890).

Károly Than

After professor WERTHEIM had left the country, an outstanding personality of lasting impact on Hungarian chemistry was invited to head the Chemical Institute of Pest University. About his capabilities the worldwide well-known professor BUNSEN of Heidelberg University, professor REDTENBACHER of Vienna University and even his predecessor, professor WERTHEIM spoke with the highest appreciation. It was a good choice. The following 50 years of Hungarian chemistry were hall-marked by KÁROLY THAN's name. He was a great organizer, a teacher of generations of chemists and a great scientist in one person.

KÁROLY THAN (Óbecse, Serbia, 1834–Budapest, 1908) first enrolled at Vienna University as a student of medicine, then went to Heidelberg, where he studied chemistry with BUNSEN, physics with KIRCHHOFF, and mathematics with CANTOR. As his interest was focused on chemistry, he mainly worked in BUNSEN's laboratory. After his studies he returned to Vienna, where he was appointed assistant for the Department of Chemistry in 1859. One year later he obtained the permission to lecture in pharmaceutical and in analytical chemistry as *private docent*. Owing to the favourable turn of circumstances and the recommendations of the three professors mentioned, he was invited — at the

[20] K. Szily, "Negyven év társulatunk történetéből." ("Fourty years from the history of our Society"). *Természettudományi Közlöny*, Vol. XII, 1881, p. 41–49.

[21] F Szabadváry, *Than Károly.* (*Károly Than*). Akadémiai Kiadó, Budapest, 1972, p. 128–134.

[22] É. Vámos, cf. FN 18, p. 68.

[23] É.Vámos, *ibid.*. p. 68.

age of 25 — as substitute professor of chemistry to Pest University of Sciences. In 1862 he was appointed regular university professor. From this time on, during his university professorship of nearly half a century, he was unceasingly working for the improvement of Hungarian scientific and cultural life, without jeopardizing his activities as chemist, teacher or researcher. From 1862 to 1872 he was vice-president, from 1872 to1880 president of the Royal Hungarian Society for Natural Sciences. He was one of the initiators of the Hungarian Journal of Chemistry *(Magyar Chemiai Folyóirat)*, and contributed to the coming into being of the journal out of his own pocket. As soon as in 1860 he was elected corresponding member of MTA, from 1870 on he was a regular member, then member of the managing council, president of the Class of Mathematics and Natural Sciences for 25 years, finally vice-president of the Academy. There was hardly any scientific of social association in the country, of which he was not a member. He obtained many distinctions during his career, and became even member of the Upper House of the Parliament, although he never participated actively in politics. He died soon after his retirement in 1908.[24] His most lasting work was the bringing into being of Pest University's new building of chemistry in Trefort Garden, existing and in use till today.[25]

Rudolf Fabinyi

RUDOLF FABINYI (Jolsva, today Slovakia, 1849–Budapest, 1920) studied at the Faculty of Philosophy of Budapest University. In 1871 he became assistant at the Department of General Chemistry of József Technical University headed by KÁROLY NENDTVICH, then acquired a secondary school teacher's degree in chemistry and physics from the University of Sciences, where he was conferred the degree of doctor in 1875. Thereafter he was working as grant holder with the chemists WISLICENUS, BAEYER and BUNSEN and the physics professor JOLLY in Germany for two years. Returning to Budapest, he became assistant professor at the Technical University and *private docent* of organic chemistry at the University of Sciences. In spring 1878 he travelled to Paris, where he was working with the professor of organic chemistry WURTZ. In the same year he learnt that the Department of Chemistry of Kolozsvár University was vacant due to the decease of its head. He applied for the job, which he obtained from among 17 applicants.[26] Thereafter he devoted all his energy to establish the new chemistry building of the university that counted as most up-to-date in its days. Of the construction and equipment of the building RUDOLF FABINYI himself gave a detailed description in the journal *Vegytani Lapok* (Chemical Gazette) edited and published by himself.[27]

FABINYI was a very active member of both his university and the Hungarian scientific public life, in general. He was rector of his university in 1899–1900, twice its pro-rector, and elected dean of the Faculty of Mathematics and Natural Sciences for nine years. He was elected by MTA corresponding member in 1891 and regular member in 1915.[28] The Hungarian Chemical Society founded in 1907 elected him its first president.[29] Apart of all this he directed the Kolozsvár Masonic Lodge *Unió* for 15 years.[30]

Amidst all these engagements in public life, he still found time for scientific work. The monography devoted to his life and activities elicits 94 publications of his between 1874 and 1918, which — from time to time with co-authors — embrace nearly all the fields of the science of chemistry

[24] F. Szabadváry, Z. Szőkefalvi-Nagy (1972), *op. cit.*, p.196–197.

[25] É. Vámos, "Iskolateremtő kémiai laboratóriumok dualizmuskori egyetemeinken." ("School-creating chemical laboratories at our universities at the epoch of Dualism.") *Természet Világa*, Vol 138, 2007, 1st Separate Issue, p. 98–104.

[26] L.Móra, "Fabinyi Rudolf és kora." ("Rudolf Fabinyi and his age.") *Technika Alapítvány*, Budapest, 1999a, p. 285–289.

[27] R. Fabinyi: "A kolozsvári m. k. F. J. tudományegyetem új vegytani tanszéke." ("The new Department of Chemistry of the Royal Hungarian Francis Joseph University of Sciences in Kolozsvár.") *Vegytani Lapok*, Vol. II., 1884, issue 8–9, p. 177–196. See more details in the paper cited in FN 25.

[28] L. Móra: "Emlékezés Fabinyi Rudolfra születése 150. évfordulóján." ("Commemorating Rudolf Fabinyi ont he occasion of the 150th anniversary of his birth.") *Magyar Kémikusok Lapja*, Vol. 54. issue 6, 1999b, 285.

[29] É. Vámos: "Scientific Community of an Emancipating Nation: Chemical Societies in Hungary before 1914", in: S. Štrabaňova, A. Kildebaek-Nielsen (eds.), *Chemical Societies in Europe before 1914*, Royal Society of Chemistry, London, 2007, *in press*.

[30] L. Móra (1999a), *op. cit.*, p. 126.

(analytical chemistry, electrochemistry, inorganic and organic chemistry). Nearly one fourth of them appeared in foreign journals. His early work on diphenol-ethane published in German language attracted general attention. In the field of organic chemistry his works with azarone and its derivatives were of importance, too. His research on fuelling cells were of pioneering character. He was one of the first in Hungary to recognize the role of electricity in chemical research. A number of Hungarian and foreign patents of his prove that practice was not far removed from him.

The monography already mentioned enumerates 36 doctoral theses prepared under his supervision between 1892 and 1914.[31] Among the authors of the theses we can find such later outstanding personalities of Hungarian chemistry as ELEK 'SIGMOND and TIBOR SZÉKI. The latter was FABINYI's co-author in a number of his works on organic chemistry.

However, the tempest of the world war did not allow FABINYI's disciples to continue and complete, respectively, the excellent master's work in his institute. After the Trianon peace treaty (1920) all those professors and other members of the faculty that denied the Roman rule the oath of allegiance, fled — together with FABINYI — to the remaining Hungary, where the excellent master soon died.

Lajos Ilosvay

As another example of a scientist, who put his life-work at the service of scientific-cultural public life, we will show the activities of LAJOS ILOSVAY (1851–1936).[32] In his profession, chemistry, his name became known mainly owing to the reagent *Grieß-Ilosvay*, which allows to detect nitrous acid in a dilution of 352 million times. Among his themes we also can find investigations into carbonyl-sulphide and similar compounds, analyses of lighting gas, the analysis of the famous *"stinking cave"* of Torja, etc. He carried out all these works while teaching as professor at the Technical University from 1883 on, and being its rector from 1901 to 1903. He actively participated in the work of the Royal Hungarian Society for Natural Sciences, was its secretary as well as its president. He was a member of MTA, later its co-president. He launched, in 1895, and later edited the journal Magyar Chemiai Folyóirat (Hungarian Journal of Chemistry). Later he also was editor of the Bulletin of Natural Sciences. After the turn of the century he was a Member of Parliament and also state secretary to the Ministry of Religious Affairs and Public Education. He not only held all these office but conscientiously performed the pertinent duties. In spite of all that he experienced with some bitterness that the scientist is hampered in his research if he tries to meet the requirements of scientific-cultural public life. He writes as follows:

> In our country it is not easy to be a prolific scientist and an untiring professor. Here a professor is an expert and an adviser of various fields, authorities and scientific societies."[33] Elsewhere he complains as follows: "We teach and teach again, manage and organize societies spreading science and knowledge or practising charity, we sit day after day in smaller or bigger committees, moreover, if we can pinch off one or two minutes from somewhere, we might even make an excursion to our field of research.[34]

Kálmán Szily

KÁLMÁN SZILY (Izsák, 1838–Budapest, 1924) finished his secondary school studies at the Pest grammar school of the Piarists (1856), then enrolled — in 1857 — at József Ipartanoda (Joseph Industrial School). Between 1857 and 1860 he was a student at Vienna Polytechnical School, where he finished his studies. Returning to Hungary, he became assistant to JÓZSEF STOCZEK at the Industrial School in the meantime raised to the rank of József Polytechnikum (Joseph Polytechnical School), in 1862 he was assistant director and temporary professor at the same institution. From 1863 he was studying, for two years, at the universities of Zurich, Berlin and Heidelberg with the professors CLAUSIUS, ZENNERI, MAGNUS and KIRCHHOFF. From December 1869 on he was regular professor of experimental physcs at the Polytechnical School. In 1870 he had to perform the duties of professor for

[31] L. Móra (1999a), p. 124–126.

[32] F. Szabadváry, Z. Szőkefalvi Nagy (1972), *op. cit.*, p. 196–197.

[33] Szőkefalvi Nagy Z., *Ilosvay Lajos.* (*Lajos Ilosvay*). Akadémiai Kiadó, Budapest, 1978.

[34] *Ibid.*, p. 15.

the Departments of Mathematics, Physics and Analytical Mechanics of the institution. In 1872 he became dean until 1874, then — from 1879 on — rector for five years of the institution organized into Technical University (in 1872). The new building of the Technical University in Museum boulevard was achieved during his being the rector.

In 1867 he participated in the foundation of the Hungarian Association of Engineers (later Association of Engineers and Architects), was its first secretary and edited the Bulletin of the Association. In 1865 he became correspondent, in 1873 regular member of MTA, and in 1889 Secretary General of the institution. He held this post until 1905. Between 1890 and 1905 he edited the Bulletin of the Academy launched by him. He was a member of the Royal Hungarian Society for Natural Sciences since 1860, its first secretary between 1868 and 1870, then again from 1872 to 1879. In 1871 he became vice president, and from 1880 to 1898 president of the Society. He obtained a number of distinctions from King Francis Joseph; became member of the Upper House of Parliament in 1915, and honorary Doctor of Technology in 1917.

The most valuable of his scientific papers are those dealing with thermodynamics. Several of them have appeared abroad.

KÁLMÁN SZILY had invaluable merits in shaping the popularizing profile of the Royal Hungarian Society for Natural Sciences and in high-standard editing of its Bulletin. He made a special point of the right usage of the Hungarian language. He was as old as 66 when he founded, in 1804 the Hungarian Society for Linguistics, together with its journal *The Hungarian Language.* His indefatigable readiness to make sacrifices in the service of the public was exemplary even within this generation of scientists.[35]

József Szabó

JÓZSEF SZABÓ (Kalocsa, 1822–Budapest, 1894) graduated — after studies of philosophy and the law — from the Selmec Mining Academy, where he had studied between 1842 and 1846. In 1848 he was invited by Minister Lajos Kossuth to the Department of Mining of the Ministry of Finances. Between 1850 and 1855 he was substitute professor at the Department of Mineralogy of Pest University of Sciences. In 1851 he acquired the title of Doctor, then participated in a study journey abroad in 1853. Between 1855 and 1858 he was regular teacher at the State Modern School of Buda, in 1858 he became professor of chemistry and physics, in 1860 director at Pest Academy of Commerce. In the academic year 1860/61 he again was substitute at the Department of Mineralogy, where he was appointed regular professor in 1862. In the academic year 1867/68 he was dean of the Faculty of Philosophy, from 1883 on he was rector of the University.

He was a founding member of the Hungarian Geological Society (1842), from 1850 on its second, from 1862 on its first secretary, between 1870 and 1883 its vice president, between 1883 and 1894 it president. He was a member of the Royal Hungarian Society for Natural Sciences, its first secretary between 1855 and 1861, and from 1872 on its vice-president. He was elected correspondent member of MTA in 1858, and regular member in 1867. From 1870 on he was secretary to the 3rd Class (Mathematics and Natural Sciences) of the Academy, and until 1888 a member of the Directors' Council.

He was the founder of independent Hungarian geology, who was able to implement the perfect unity of theory and practice. His publishing activity in the fields of geology, mineralogy, petrology and chemistry is exceptional, the number of his papers amounts to nearly 350. His book *Mineralogy* reached several editions and was the first special book on the topic in Hungarian language. His achievements in petrology are of international significance. Generations were educated by his book on geology. He performed pioneering work in soil science, even on an international scale. Apart from all this, he was an outstanding teacher and a school-founding professor.[36]

József Stoczek

József Stoczek (Szabadka, today Subotica, Serbia, 1819 – Budapest, 1890) graduated as engineer from Institutum Geometricum in 1844. In 1847 he became teacher of physics at József Industrial School, ten years later professor of general and technical physics at József Polytechnical School, and in

[35] E. Gombocz (1941), *op. cit.*, p. 123–128.

[36] E. Dudich: "Szabó József." ("József Szabó"), in: F. Nagy (ed.-in-chief): *Magyar Tudóslexikon A-tól Zs-ig.* BETTER-MTESZ-OMIKK, Budapest, 1969, p. 660.

1871/72 the first rector of the Technical University. In 1872 he was vice president of the Council of Public Education, from 1874 on director of the Teachers' Training College and president of the Teachers' Examination Committee. In the academic years 1875/76 and 1878/79 he was again rector of the Technical University. MTA elected him corresponding member in 1858 and regular member in 1860. In 1872 he was director, between 1886 and 1889 vice president of the Academy. He was president of the Royal Hungarian Society for natural Sciences between 1865 and 1872. In 1885 he became member of the Upper House of Parliament. His papers appeared in the *Yearbooks* and *Bulletins of the Royal Hungarian Society for Natural Sciences*, in the *Bulletin of MTA* and in Poggendorf's *Annalen*. He gained considerable distinction in developing domestic technical training. His main work, *Technical Physics,* was published in Budapest.[37]

(3.4) The third generation of scientists

By the end of the 19th century the scientific institutions were established, and their majority became consolidated in their form accepted till today. In the new buildings relatively well equipped laboratories made research at European level possible. The enthusiastic statements about the role of science in making the homeland flourish became somewhat worn down as empty slogans. That is why part of the scientists that obtained a university chair around the turn of the 19th and 20th centuries did not strive anymore after raising the standard of domestic journals by their research results, or translate the special literature of their trade written in foreign languages thus mediating it to the domestic public. They rather aspired to address the substance of problems of worldwide interest of their speciality, to make their own results known abroad, and to publish in journals of international reputation. There were among them, of course, such great personalities whose energy was sufficient for activities in public life, however, their primary aim was going in for science and achieving important scientific results. Such was the, perhaps, physicist Loránd Eötvös, the greatest Hungarian scientist of the epoch with the greatest impact, and we can count here chemist Vince Wartha, founder of training in chemical technology in Hungary as well. As examples of scientists that practically did not participate in domestic scientific-cultural public life, we will deal with the careers of physicist Ányos Jedlik and chemist-pharmacist Lajos Winkler.

Loránd Eötvös

Baron LORÁND EÖTVÖS (Buda, 1848–Budapest, 1919) came from a great family. His father, baron JÓZSEF EÖTVÖS was a politician of reforms, minister of religious affairs and public education, and the first great master of Hungarian realistic fiction. His son Loránd — like the sons of Hungarian aristocracy, in general — first studied the law at Pest University of Sciences (1865–1867), but he was more interested in natural sciences. He himself wrote about that as follows:

> While a student of the law, I entered, in 1867, among KÁROLY THAN's students. This was a decisive step in my career. It was from his lectures that the magic light of research into natural sciences shone at me for the first time, his — then still very small and defective — laboratory was the first that opened up to me, and when I had performed the first chemical reaction, and had first sat in front of a balance, and when later my professor honoured me with allowing me an insight in his own investigations, then… I really learnt what — following my scientific inclination — I can be good for in this homeland…[38]

Therefore, KÁROLY THAN's advice he enrolled in Heidelberg University, he graduated from in 1870. He notified his father about the latter event as follows:

[37] "Stoczek József." ("József Stoczek"), in: *Magyar Életrajzi Lexikon.* (*Hungarian Biographical Encyclopedia*). (Á. Kenyeres (ed.-in-chief): Vol. II. L-Z, Akadémiai Kiadó, Budapest, 1969, p. 660.

[38] *Acta Reg. Scient. Universitatis Ung. Budapest* (1892), Fasc. II. 14, in: J. Hatvany: *Eötvös Loránd* (*Loránd Eötvös*). Művelt Nép Könyvkiadó, Budapest, 1951, p. 11.

> Today I successfully passed the doctoral exam… My examination was accepted with the degree 'summa cum laude", which is an honour envied by many people.[39]

LORÁND EÖTVÖS was, from 1871 on, substitute professor of higher physics at Pest University of Sciences, from 1872 on regular professor at the Department of Theoretical Physics. He developed a new process for measuring surface tension. He created the Eötvös law that shows the relationship between the surface tensions of liquids at different temperatures and the molecular weight. From the 1880s on his attention shifted to gravity. In 1888 he started his pertinent measurements. In order to measure the changes of the field of gravity, he created his field pendulum that gained world fame. At the 1890 Paris World Exhibition he was honoured — together with the mechanic Nándor Süss — with a gold medal. In the same year he proved, with great accuracy, that the pull of gravity was independent of the quality of the bodies' materials. One year later the first and very successful field measurements with the Eötvös pendulum started.

From 1902 on, EÖTVÖS performed regular measurements of gravity in the Carpathian Basin. He presented his instrument at the Congress of Internationale Erdmessung in Budapest, in 1906. The Congress Committee suggested to the Hungarian Government that it should financially support the measurements. This support was the basis for the foundation of the Hungarian State Institute of Geophysics Loránd Eötvös. EÖTVÖS's measurements performed on the ice of Lake Balaton in 1901–1904 gained considerable fame. The first successful measurements for detecting petroleum sites were carried out in 1905. The torsion pendulum became, for decades, the most important instrument in geophysics applied for the detection of raw-material sites. It was used to disclose petroleum fields in Texas, Venezuela, and the Middle-East.

In 1909 EÖTVÖS won — by his measurements performed together with DEZSŐ PEKÁR and JENŐ FEKETE — the Benecke-prize of Göttingen University for proving, with an accuracy of $2x10^{-8}$, the proportionality of the inert and the weighty mass. By this, he created the solid experimental basis for the fundamental condition of EINSTEIN's general theory of relativity.

At the end of his life he built the EÖTVÖS torsion balance for proving the effect related to the change in weight of moving bodies resulting from the rotation of the earth which was later called, after him, Eötvös effect.

In recognition of his scientific work he was elected correspondent member of MTA in 1873, and regular member in 1883. From 1889 on he was, for 10 years, president of the institution. He was rector of the Royal Hungarian Budapest University of Sciences in 1891/92 and minister of religious affairs and public education for 7 months in 1894/95. Thereafter, however, he returned to his research work. He obtained the grand prize of MTA in 1897 for his measurements related to gravity and magnetism. He became external member of the Royal Prussian Academy of Sciences, doctor h. c. of the Jagellonian University in Cracow and of the Norwegian Royal Frederic University in Christiania (today Oslo).

As to the role of domestic science, he formulated his ideas in 1902 as follows:

> Real science is one that is of worldwide importance; and therefore, if we want to be real scientists and — as it is necessary — good Hungarians, we have to hoist the banner of science so high that it can be seen from beyond the borders of our country, and be given due respect.

Beside his intensive intellectual work, EÖTVÖS found time for doing sports as well: he rode a horse, in summer a bike, and was a passionate climber of mountains. As president of the Hungarian Tourists' Association, he did much to promote and popularize tourism in Hungary.[40]

The Hungarian scientists' society cherishes the memory of the great physicist best by the fact that — from 1950 on — Budapest University of Sciences has been named Loránd Eötvös University of Sciences.[41]

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[39] D. Pekár: *Báró Eötvös Loránd. A torziós inga ötvenéves jubileumára.* (*Baron Lorán Eötvös. For the 50th anniversary of the torsion balance*. Kis Akadémia, Budapest, 1941, p. 27–28.

[40] I. Baráth, Z. Szabó, "Eötvös Loránd emlékkiállítás." ("Memorial exhibition Loránd Eötvös"). *Tájak, korok, múzeumok kiskönyvtára*, No. 584. Budapest, 1998, p. 5–6.

[41] É. Vámos, G. Szunyogh, "Magyarok Németországban — németek Magyarországon" vándorkiállítás forgatókönyve. (Script of the travelling exhibition „Hungarians in Germany — Germans in Hungary"), 2006.

Vince Wartha

VINCE WARTHA (Fiume, today Rijeka, Croatia, 1844-Budapest, 1914) enrolled — after having finished secondary school — first enrolled at József Polytechnikum (József Polytechnical School), then continued his studies in Zurich, where he graduated from Eidgenössische Technische Hochschule as "technical chemist" in 1864. Thereafter he obtained his title as doctor from Heidelberg University (1865), where he had been a student of BUNSEN and KIRCHHOFF. Then again we can find him as assistant and private docent, respectively, in Zurich. He returned home after the Compromise and first became substitute and extraordinary professor at the Department of Mineralogy and Geology of Budapest Technical University, then became the first Head of the Department of Chemical Technology established at the same university in 1870. (The name of Chemical Technology dates from 1882 only). He was the one to shape the subject of chemical technology, which he kept teaching for 42 years, until his retirement.[42] Today his name is mostly mentioned in connection with the eosin glaze of the ceramics manufactured by the factory Zsolnay (Pécs). However, the field of his activities was a much wider one. LÁSZLÓ MÓRA's monography enlists 662 papers of his.[43] These were dealt with by his pupil and one of his successors at the Department MÓR KORACH subdivided in two groups: (1) general scientific works, and (2) works dealing with special technologies, operational science, and other papers on special topics. To the first group belong over 50 studies on mineralogy and geology, 19 papers from the field of general chemistry, 32 papers dealing with analytical chemistry, over 30 dealing with physical chemistry and 20 papers from the field of general chemical technology. In the second group we can find 20 studies from the field of technology of ceramics, 30 dealing with metallurgy, over 30 from the field of water technology, 9 dealing with viticulture, about 40 on colorants (ink and Indian ink), over 10 on photography and about 15 on household chemistry. In a short summarizing evaluation of the oeuvre KORACH observes that a considerable part of WARTHA's works was of popularizing character, and appeared in the Bulletin of Natural Sciences. Many of his papers were published in foreign journals. He also wrote papers on themes far from chemical technology. These allow the conclusion that their author was interested in a wide range of topics he was familiar with, and was so-to-say a real polyhistor.[44]

Apart from his widespread scientific work he assumed a role in scientific public life, too. At the Technical University he was dean several times (1875–1877), even rector (1896–1898 and 1907–1910, respectively). The completion of the Technical University's buildings in the district Lágymányos falls in the time of his second rectorate. Between 1870 and 1897 he was director of the Technical University's library, and enlarged the holdings. MTA elected him corresponding member in 1875 and regular member in 1891. Between 1908 and 1910 WARTHA was vice-president of MTA. He was secretary general, later president of the Royal Hungarian Society for Natural Sciences (1899–1910), vice-president of the Hungarian Society for Applied Arts, and even president of Hungarian Tourists' Association.[45]

Ányos Jedlik

ÁNYOS ISTVÁN JEDLIK (Szimő, 1800 – Győr, 1895) was a Benedictine monk from 1817 on, and attended, from this time on, the schools of the order. He graduated as doctor in 1822. The order first sent him to Győr secondary school, then to its Academy in Pozsony (today Bratislava, Slovakia) as teacher. From 1839 on until his retirement (1879) he was professor of the Department of Physics and Mechanics of Pest, later Budapest University of Sciences. Until 1850 he lectured at the Institutum Geometricum, too. In 1848 he was dean of the University's Faculty of Philosophy, in 1863 the University's rector. In 1867 he obtained the title of Royal Councillor. MTA elected him corresponding member in 1858, and honorary member in 1873. After retirement he lived in the Győr monastery of the Benedictines, and went on with his scientific work until his death.

[42] L. Móra, "Wartha Vince." ("Vince Wartha"), in: F. Nagy (ed.-in-chief) (1969), *op. cit.*, p. 860–861.

[43] L. Móra, *Wartha Vince, a hazai kémiai technológia megalapítója (1844–1914)*. [*Vince Wartha, founder of domestic chemical technology (1844-1914)*]. Tankönyvkiadó, Budapest, 1967, p. 119–145.

[44] M. Korach, L. Móra, "Wartha Vince." ("Vince Wartha"). Akadémiai Kiadó, Budapest, 1974, p. 36–107.

[45] É. Vámos (2007), *op.cit*, p. 103.

JEDLIK dealt with a number of fields in physics but he was mainly interested in electric engineering. He was the first in the world to construct an electromotor from two magnet coils (1828) and the first commutator with a mercury tank. He invented the principle of electric self-induction and constructed the first direct-current generator (dynamo, 1861). He created Hungarian names for these inventions, however, he had not patented them. With the help of the principle of voltage multiplication invented and a network of leiden jars, he prepared a high-voltage current source and brought into being large arc discharges (1863, awarded a prize at the Vienna World Exhibition 1873). Soda water also ranges among his inventions. He dealt with promoting the Hungarian technical language and was the first to write a university textbook in physics in Hungarian language.[46]

Lajos Winkler

LAJOS WINKLER (Arad, today Romania, 1863 – Budapest, 1939) was professor of chemistry at Budapest University of Sciences, and member of MTA from 1896 on.[47] His special fields of science were analytical chemistry and pharmacy. His main themes of research were precision gravimetry, gas analysis, analyses of water and pharmaceuticals. His method used for determining oxygen dissolved in water became known under the name of *"Iodometric determination after Winkler"*. WINKLER did not regularly participate in the work of scientific societies. It is true, his name appeared from time to time among the editors of journals but not lastingly. He very consciously protected his time to be spent on research from duties related to scientific public life. Every day he went to the University at noon, gave his courses fro 2 to 3 p. m., brought to an end the work to do in relation to the Institute from 3 to 6 p. m., and kept working in the laboratory from 6 p. m. to 6 a. m. In his opinion *"during the day a man of an institute is unable to work, being troubled all the time."* That is why, for his way of life, he was considered as queer. To one of his assistants he one said about that as follows: *"I am not as crazy as I look, moreover, I am not crazy at all, I only play the crazy man, otherwise they would not let me live."* As the result of all that he published 242 papers, out of them 150 in German language, in the highest-standard journals of the trade.[48]

(4) Concluding thoughts

The generation of scientists referred to by us as the *first* one can be clearly distinguished from the other two by the fact that their mother tongue was *German*, and it was in this language they lectured. The other two generations of scientists cannot be distinguished from one another in the usual sense of the word. All of the scientists dealt with were borne before the Compromise, however WINKLER belonging to the third generation, was borne 4 years earlier only (1863). The earliest borne (1800) was JEDLIK, also classified among those of the third generation. He was the longest living of all of them (95 years), thus his life spanned practically the whole 19th century. According to their years of birth STOCZEK (1819), JÓZSEF SZABÓ (1822), THAN (1834) and perhaps even SZILY (1838) may be considered children of the Reform Period. However, FABINYI and ILOSVAY (1849 and 1851, respectively) were given birth to during the War of Independence and even after its defeat, respectively, somewhat later than WARTHA (1844) and EÖTVÖS (1849) of the third generation. None of these 10 scientists died earlier than the last decade of the 19th century, some of them as late as in the first decades of the 20th century. What is it then that entitles us to classify these scientists as belonging to two different "generations"? Only their own opinion on which part of their activities they thought to be more important: laying the foundations of scientific research in Hungary by bringing into being adequate institutions, by assuming roles in Hungarian scientific societies, by lounching Hungarian scientific journals and keeping them on an appropriate level by having their own papers published in them or — practising science at a very high level. Some role in scientific life these scientists had to assume anyway as all of them were members of the Hungarian Academy of Sciences, and this Body of Scientists counted as highest instance governing scientific public life. The status of *member of the*

[46] Á. Király, "Jedlik Ányos István." ("Ányos István Jedlik"), in: F. Nagy (ed.-in-chief) (1977), *op. cit.*, p. 418–420. *Magyar Nagylexikon* (cf. FN 2), Vol. 10, p. 241–242.

[47] F. Szabadváry, *Winkler Lajos* (*Lajos Winkler*). Akadémiai Kiadó, 1975.

[48] F. Szabadváry (1975), *op. cit.*, bibliography of Winkler's works, p. 156–178; his well-known saying: p. 70.

Academy was, however, awarded for the merits gained in *science.* Thus, the two kinds of activities cannot be strictly separated.

When analysing, one by one, the activities of the professors dealt with in the paper, the literally taken institute-building activities of THAN and Fabinyi — both of the 2nd generation— served future high-standard research anyway, and perhaps these were their longest lasting activities, for all that they achieved valuable scientific research. In STOCZEK's activities unambiguously the tasks of leading the Technical University in the phase of organization occupied the first place. (This was what the celebration organized on the occasion of his 40-year-anniversary as professor particularly stressed.) [49] KÁLMÁN SZILY's life was focussed on the re-organization of the Royal Hungarian Society for Natural Sciences, on editing its journal, and on popularizing science, in general. However, one must not forget that the final works on the building of the Technical University in Museum Street must have given him ample occupation. ILOSVAY himself complained — as quoted — how much of his time was taken away from research by active participation in scientific public life and by lecturing. JÓZSEF SZABÓ reached — after manifold studies and charges in state administration — the rank of regular university teacher relatively late, at the age of 40. However, this position gave him ample opportunity for scientific research. This was thoroughly used by him: from the scientists dealt with above perhaps his activities were the most wide-ranging.

Out of the scientists of the 3rd generation the greatest, EÖTVÖS, shall be mentioned first. He was the one, who held it a main and indispensable requirement that university professors should carry on high-standard independent research as was shown by quotation from a number of his works. Let us cite some further ideas of his as expressed in his inaugural address as rector of Budapest University of Sciences (September 15, 1891):

> Scientific is the school, and scientific is education there, and only there, where scientists teach. … I call scientist not a person that knows much but a researcher of science.… Independence of thinking can be mediated by a teacher only, who himself thinks in an independent way. … the standard of scientific education at a university is exclusively determined by the personalities of its professors… the questions related to its organization and rules are of secondary importance only.… It is not always for the established departments that we should be looking for a scientist, it is rather for the sake of the worthy, the scientist, that we should establish a department.[50]

These theses of his are verified by his enormous and worldwide recognised scientific oeuvre. Although in EÖTVÖS's life there was room enough for a number of functions in public life, his openly professed *credo* on the primacy of science and scientific research makes him belong, at any rate, to the 3rd generation of scientists.

VINCE WARTHA introduced a new branch of science in Hungary, i.e. chemical technology. In his research he implemented a principle considered up-to-date even in our days: i.e. linking theory and practice. The best-known of his research achievements, the eosin glaze resulted in the boom of a factory. The great number of his publications — nearly unprecedented at the epoch — shows that we are facing someone committed to scientific research. The bulk of his activities in public life were also performed in the service of science. It is beyond doubt that he, too, belonged to the 3rd generation of scientists.

Finally, JEDLIK and WINKLER both wanted to assume a possibly small part in scientific public life, in order to be able to devote possibly all their time and talents to their trades. JEDLIK — besides being a committed teacher — is the archetype of the real, forever restless inventor, not in the least interested in the possible financial profit of his inventions, perhaps not even interested in fame and glory as he did not even want to assume the burdens of having his inventions patented. As to Winkler — as it was cited — he rather accepted to be considered a fool or a queer customer to avoid that part of his time intended for research should be "pinched off".

[49] "A királyi József Műegyetem MDCCCLXXXVII. Október 30-án tartott Stoczek-ünnepélye." ("Celebration in Stoczek's honour on October 30, 1887 at the Royal József Technical University"). Budapest, A Pesti Lloyd Társaság könyvnyomdája, 1887. 56 p.

[50] Cf. FN 16, p. 38–39.

Summarizing, one can conclude that the traditional approach to Hungarian history of science showing the differences in research style between the two generation after the Compromise, is well founded and accurate. Looking back from the 21st century to the scientific public life during (neo)absolutism, we — nevertheless — owe a more detailed analysis of the scientific work of the foreign scientists in Hungary. The despair and anger justly felt by the Hungarians over the Hapsburg Empire's autocracy and unforgiving attitude that had, as a consequence — among others — the dismissal of excellent Hungarian scientists from universities, cannot prevent us from a just evaluation of the achievements of the foreign scientists. We can add them as a first generation of scientific style to the history of science of the second half of the 19th century.