

András SALGÓ¹DOI: <https://doi.org/10.52091/EVIK-2022/4-1-ENG>

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Traditions and renewals

Commemoration in the 100th anniversary the foundation of Department of Food Chemistry at BME

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¹ Budapest University of Technology and Economics

The end of XIXth century and the beginning XXth century was the golden age of Hungarian agriculture and agro-industrial sector and processes.

High number of factories with large capacities were founded in sugar-, starch-, and spirit industries and world-famous innovations were introduced in the Hungarian cereal and milling industry, breweries and in further other branches of food processing.

The developments of industrial microbiology and its conscious applications had also strong effects on the investments and innovations in yeast, beer and alcohol production and in other branches of bio-industries.

This age can be characterized by the innovations and methods development introduced in the world-wide recognised cereal- and milling industry:

- András Mechwart (1837-1907) innovation of striate rolling mill with chill-casting and manufacturing by Ábrahám Ganz,
- Károly Haggenmacher (1835-1921) 15 patents in milling industry included flat sieves and purifiers,
- Tamás Kosutány (1848 - 1915) test methods for detection of dough quality and rupture,
- Imre Pekár (1838 - 1923) „pekáring”, determination the colour of flour,
- Leo Liebermann (1852 - 1926) test method development for gluten strength determination,
- Jenő Hankóczy (1879 - 1939) innovation of Farinograph for determination of water absorption and flour quality,
- Ferenc Grúzl (1897 - 1972) innovation of Laborográf for measuring extensibility of dough,
- Mihály Vuk (1876 - 1952) methods development in cereal and flour chemistry.

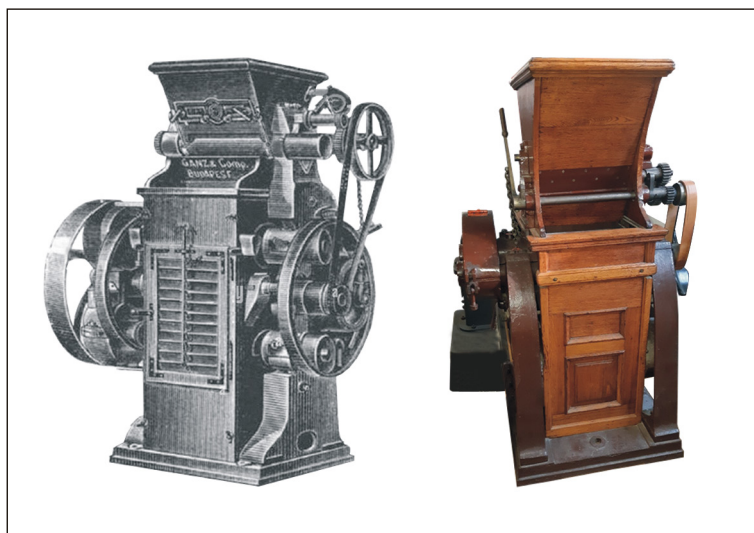


Figure 1. The rolling mill innovated by Mechwart and Ganz

Same age was the period the initiation and definition of biotechnology as a novel field of science. Károly Ereky (1878-1952) mechanical engineer defined the concept of biotechnology as can be followed below:

- “Biotechnology - (1918) all the activities, which produce products (convert raw materials) with the help of microorganisms.”
- “Living machine, biotechnological machine”

In this period of time claims the demand in knowledge of food industry, processing and biotechnology also in higher education:

In the Institutum Geometricum-Hydrotechnicumban (predecessor in title of BME) Lajos Mitterpacher gives lectures in „General nature study and economy” covering hemp, flax, wine, vinegar, alcohol and silk production and technology. Vince Wartha gives lectures of “Fermentation chemistry” in 1871. Later he gives (1873) lectures in “Agricultural chemistry” and with Gyula Klein introduce “Technical microscopy”, “Wine chemistry” and “Wine microscopy” subjects in curriculum.

In 1908 Vince Wartha and Lajos Ilosvay invited professor Elek 'Sigmond (1873-1939) to establish a Department of Agricultural Chemistry at BME. Elek 'Sigmond was that time the professor of soil science and agricultural chemistry in Hungarian Crop Production Institute at Magyaróvár. He organized a lecturer staff covering in those days most relevant industrial syllabus and subjects:

Gyula Szilágyi "Fermentation" and "Spirit-, Beer- and Vinegard Technology", Lajos Vázsony "Fermenting organisms", Ede László "Chemistry of Enology", Tuzson "Technical micology", Mihály Vuk "Control of adulterated food and gusto products", Telegdy Kováts „Protozoology”.

Elek 'Sigmond recognized the latent of Mihály Vuk in the analysis of methods development and made a motion (1919) to establish a Department of Chemical Analysis at BME with the following justification:

„The Hungarian engineering need an extended potential in agricultural chemistry and in food chemistry in higher education”.

Based on this proposal the Department of Food Chemistry was founded in 22nd of September 1921.

The founder of Department Prof. Mihály Vuk (1876-1952) graduated as chemical engineer in Zurich (1898), after receiving his Dr. title he was assistant lecturer at BME and later worked with Tamás Kosutány and Elek 'Sigmond in Magyaróvár. Between 1903-1904 he was director of Budapest Casein Factory and since 1905 worked in Hungarian Institute of Chemistry. His life-work was acknowledged with the Kossuth Grand Prix in 1911 by the Hungarian Society of Engineers and Architects.

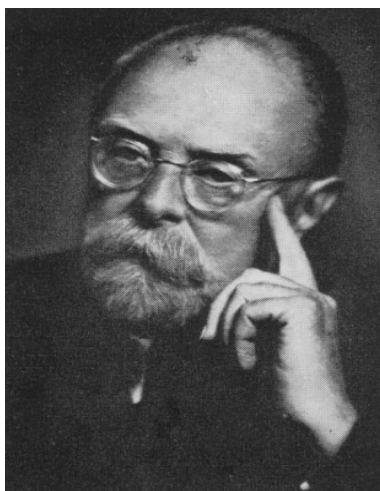


Figure 2. Prof. Mihály Vuk the founder of Department

The characteristic research activities of Vuk era (1921-1948) were the followings:

Chemistry and technology of enology, Flour chemistry and flour improvers, Novel methods is food analysis (chemical preservers, thermal decomposition of lactose, rancidity of lipids, detection of adulteration). Mihály Vuk was the Dean of Faculty between 1928-29 and the TMB (Hungarian Academy of Sciences) awarded him with the DSc (doctor of sciences) title in 1952.

The second head of Department was László Telegdy Kovács (1902-1987) between 1950-1971, who listened the lectures of Mihály Vuk since 1923 and got his doctor tile in 1927 and employed in Hungarian Institute of Chemistry. Since 1942 he was appointed as director of Hungarian Sugar Ltd. Center. After his nomination as professor and head of Department (1950) two times were Dean of Faculty of Chemical Engineering (1952-55) and in 1957.

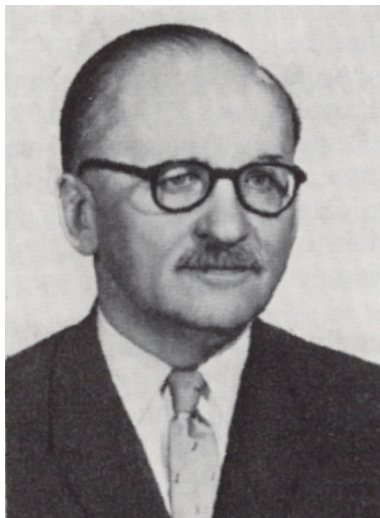


Figure 3. Prof. László Telegdy-Kovács the newbuilder

In hard circumstances after world war the restart of research were cumbersome. The main orientations of projects were the followings: Method developments for quality control of raw materials (Department panel), investigation of Maillard reactions (L. Telegdy Kovács, F. Örsi), analysis of vitamins and antioxidant effects (É. Berndorfé Kraszner), cereal reseaches (R. Lásztity, J. Varga), investigation of packaging material (M. Szilasné Kelemen, F. Örsi), methods development in rheology (J. Major, J. Varga), wine chemistry and tests (D. Törley, J. Nedelkovits), composition and biochemistry of mushrooms (D. Törley), food toxicology (J. Kovács), instrument and methods developments (Dep. panel).

The next head of Department Prof. Radomír Lásztity (1929-2018) took over this leading position from L. Telegdy Kovács in his age 42 in 1971. The talented new leader had quick scientific career (1951 assisted lecturer, 1961 candidate, 1968 DSc, 1969 full professor) and parallel took faculty and university positions (1966-70 Vice Dean of Faculty, 1970-76 Vice Rector of BME education affairs).



Figure 4. Prof. Radomír Lásztity the reformer

Prof. Lásztity had plenty of innovations in education, e.g. actuation of education in organizer chemical engineering, initiation of english language education, but the most important and relevant was the foundation and actuation of biochemical engineering education.

This education form and curriculum was figured out with Professor László Nyeste under dean's leadership Prof. János Holló, recognized the increased importance of biological and biochemical skills beside the chemical and engineering skills and the importance of integrated knowledges.

According to this recognitions the name of Department was also changed to Dept. of Biochemistry and Food Technology.

The research profile of Department kept the strong orientation in cereal chemistry; mechanism of flour improvers (*L. Telegdy Kováts L. – R. Lásztity*), non-covalent interactions in gluten complex (*R. Lásztity*), isolation and determination of amino acid sequence of avenationin (*F. Békés – R. Lásztity*), heterogeneity and control functions of wheat proteases (*A. Salgó*),

and novel research trends and projects arose:

- **Protein–carbohydrate, protein–lipid, protein-protein interactions:** Mechanism and role of formation brown colour products and methyl-glyoxal (*F. Örsi*), structure and role of lipoproteins in cereals (*F. Békés, I. Smied*), characterization of interactions (*R. Lásztity– J. Nagy*).
- **Novel protein sources, enhance the biological value of proteins:** Isolation, purification amino acid composition, deficiencies digestibility (bioavailability) biological value (in vitro) techno-functional characteristics optimization of recipes (*Dept. panel*)
- **Development of analytical methods:** Analysis of amino acid composition and biogenic amines. (*A. Zsigmond, L. Sarkadi, E. Ungár*), Methods development for detection of mycotoxins (*Á. Bata*), measurement the functional properties of proteins (*S. Tömösközi – J. Nagy*), development of air segmented and flow injection analytical methods (*J. Varga, S. Tömösközi*), innovation of electrophoretic method (*E. Györey, M. Kárpáti*).

The leadership of Department was received from Prof. Lásztity by András Salgó (1951) in 1993. The new head went through all the academic stair-steps and got his professor's nomination in 1995 and parallel served the Faculty as Vice Dean (economic affairs) between 1993 and 1999.

The main tasks of this period are to deal with the negative processes affecting higher education after the regime change "Bokros package", to develop the departmental infrastructure, to rebuild and renovate. Preparations for the Bologna process and the complete overhaul of the education system will begin. Projects aimed at strengthening the links between industry and academia are launched, and the Department is gradually involved in international, mainly European Union, research framework programmes and projects. (Lajos Bokros was a left-wing Hungarian minister of finance, during whose tenure the actors of Hungarian public life and science were forced to endure numerous financial restrictions. The Ed.)

Beside the traditional research orientations, novel innovation themes and projects were below:

- **Investigation of functional properties of proteins:** Methods development of emulsifying and foam forming activity and stability using conductometry. (*S. Tömösközi et.al.*), Micro-scale test methods and instrument developments in detection of cereal quality (*J. Varga, S. Tömösközi, A. Salgó, F. Békés*).
- **Plant physiological (seed development, germination, stresses) research:** Non-destructive spectroscopic methods development to follow the seed development and germination processes in wheat (*A. Salgó – Sz. Gergely*), Evaluation of post-harvest processes in fruits (*P. Merész, T. Lovász, A. Salgó*), Biochemical and chromosomal investigation of the effects of drought, cold and salt stresses in cereals, methods development for detection of biogenic amines (*L. Sarkadi*).
- **Development of variety identification methods based on proteins:** Gel electrophoretic method for variety identification in wheat, development of national wheat catalogue (*Á. Kemény, M. Kárpáti, F. Örsi, F. Békés*), Variety identification using HPLC method (*O. Baticz, F. Örsi F*), Variety identification with capillary electrophoresis (*É. Scholz*).
- **Near-infrared based spectroscopic and imaging (NIR/MIR/FT-IR) methods developments:** Qualitative and quantitative method for detection of proteins, composition, physiological status, methods networking. Industrial process control, detection of adulterations. (*A. Salgó – Sz. Gergely*).
- **Molecular biological methods development and application in quality control of proteins:** Genetic background the formation of gluten proteins, detection of gluten „contamination”, analysis of GM raw materials, developments using aptamers. (*J. Gaugecz – T. Révay – A. Szarka- T. Mészáros*).
- **Technological innovation in development** of health promoting cereal products. (*S. Tömösközi et.al.*)
- **Vitamin C:** metabolism research (*A. Szarka et.al.*)

Due to internal integration of Faculty (2007) basic changes were resulted in the life and operation of Department. The main aims of integration were to develop bigger, more integrated and efficient units, so instead of former 10 departments five were structured.

Department of Applied Biotechnology and Food Science was formed by the integration of Dept. Biochemistry and Food Technology (earlier Food Chemistry) and by Dept. Agricultural Chemistry. The integrated unit with 25 academic people, 20 technical staff and approx. 20-25 PhD student took extreme big education tasks and produced notable incomes from national and international projects and industrial resources.

The research profile of integrated Department was changed continuously according to alteration of scientific and industrial conditions and demands. At the end of integration process nine main thematic area were defined which were listened below:

1. Biochemical and molecular background of draught, salt és oxidative stresses in plant materials (cereals, tuberoses);
2. Research in cereal chemistry and technology, product developments, innovation of functional products.
3. Methods and instruments development of rapid-tests and dedicated analysis methods.
4. Non-destructive methods developments and applications in monitoring of biosystems and bioprocesses.
5. Non-food exploitation of agricultural and other wastes.
6. Theoretical projects in biology and industrial microbiology,
7. Development of up-stream and down-stream processes and operations in fermentation.
8. Development and application of targeted biodegradation processes and operations.
9. Development of engineering toolkit in environmental management

On account of integration procedure both former units maintained their research traditions, the inside synergic affects were firmmed in the novel innovations and the participation of students in R+D+I projects were increased

The leadership of integrated department was taking over by Vértessy Beáta in 2015. She was the Vice Head of Institute of Enzymology Hungarian Academy of Sciences (later ELKH-TTK) and Head of Research Group of Genom Metabolism. Her scientific carrier was acknowledged by the Division Biology in Hungarian Academy of Science as candidate (1991) and DSc (2001).

The histories of Dept. Food Chemistry and Dept. Agricultural Chemistry were interlocked very organic way, so both organizations made significant services for the Hungarian food science during the last total 113 years.

Finally, the names of the heads of the departments providing training in food chemistry and technology should be listed here (the numbers indicate the dates of the department's name changes):

- **Agricultural Chemical Technology (1908)**
 - o Elek 'Sigmund
 - o Géza Binder Kotrba
 - o Sándor Zoltán
 - o János Holló
 - o Lajos Fodor
 - o Béla Sevela
- **Food Chemistry (1921) later Biochemistry and Food Technology**
 - o László Telegdy Kováts
 - o Radomír Lászity
 - o András Salgó
- **Department of Applied Biotechnology and Food Science (2007-)**
 - o András Salgó
 - o Beáta Vértessy