



**THE
DEPARTMENT OF
NUCLEAR CHEMISTRY**



THE FIRST TEN YEARS
1983–1993





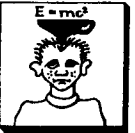
CONTENTS



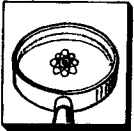
History.....7



Personnel.....9



Teaching.....19



Research.....21



International.....23



Budget.....25



Publications.....27



HISTORY

Nuclear research at the **Royal Hungarian University** - the predecessor of Pázmány University, now **Eötvös Loránd University** or **ELTE** for short - began in 1911, one and a half decades after *Becquerel's* discovery of radioactivity. Six years later *Gyula Weszelszky* (1872-1940), the first head of the new **Radiological Institute**, published a 200-page monograph on radioactivity. The Institute developed its then well-known radium-emanation equipment that was used at several institutes around the world.

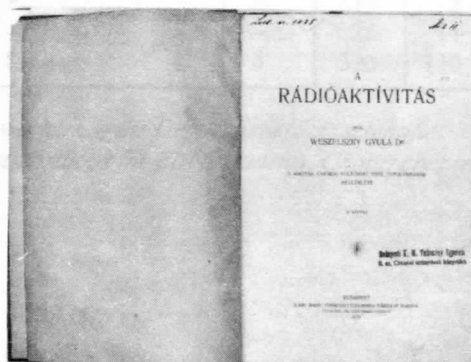


The old "F" Building, the former site of the Department of Nuclear Chemistry, in Puskin utca 11-13

György Hevesy (1890-1970), Nobel Laureate in chemistry, 1943, was appointed professor at the University for a short time in 1919. He carried out most of his radiochemical research at foreign institutes, but he performed the first tracer experiments here together with *Prof. Gyula Groh* (1886-1952).

After *Weszelszky's* death education and research in radiology were continued by his successor *Lajos Imre*. (1900-1974) His most outstanding research achievements included the sorption studies using radioactive tracer technique. Imre left for Kolozsvár University (Transylvania) in 1940. With his resignation nuclear research was interrupted at **Pázmány University**. (The Hungarian Royal University of Budapest was renamed after its founder, *Cardinal Péter Pázmány*, in 1921.)

After a pause of over fifteen years, physico-chemical studies using radionuclides were resumed in 1957 in a level B laboratory attached to the **Department of Physical Chemistry and Radiology** headed by *Sándor Lengyel* (1914-1991). In the meantime the University came to bear the name of *Baron Loránd Eötvös*, a Hungarian physicist and



Gyula Weszelszky: A rádióaktivitás (1917) the first Hungarian monograph on radioactivity

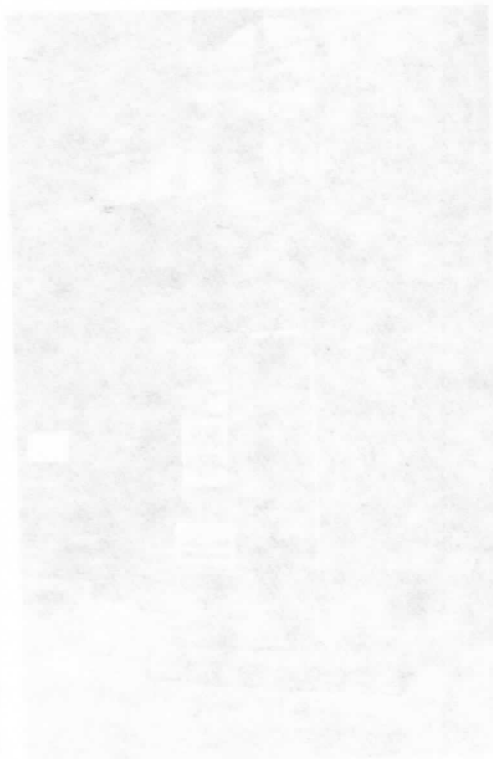


statesman, former professor of the University.

In 1967 a new laboratory, headed by *Attila Vértes*, was formed within the frameworks of the Department of Physical Chemistry and Radiology for carrying out Mössbauer spectroscopic and positron-annihilation investigations. The **Department of Nuclear Chemistry** as a separate unit was established on September 1, 1983 in the building of *Weszelszky's* laboratory. In 1989 the department, together with the rest of the **Institute of Chemistry**, moved to the new Chemistry Building on *Pázmány Péter sétány*, facing the Danube on the Buda side of the city.



The new "Chemistry Headquarters", the present site of the Department of Nuclear Chemistry





PERSONNEL

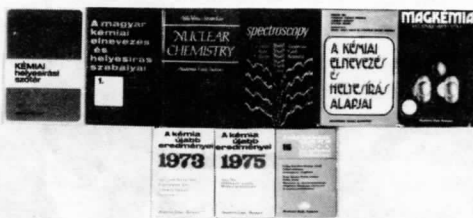
On the next few pages we wish to give some information about the colleagues working for our Department.

Note that the present hierarchy of the Hungarian Academic Degrees is this:

$DSc > CSc > PhD > MSc > BSc$.

The **CSc** (Candidate of Science) is inherited from the former Russian-type system. Recently there are some efforts to simplify the above hierarchy by switching to a system where the **CSc** would be omitted. The **DSc** (Doctor of Science) would still be given by the **HAS** (Hungarian Academy of Sciences) but the right of conferring the next highest degree, the **PhD**, would remain with the

accredited universities together with the right of giving the lower degrees. Right now both the **DSc** and the **CSc** are given by the **HAS**, as are the **MHAS** and the **CMHAS** (Member of HAS and Corresponding Member of HAS) honorary degrees.



Books published by the researchers of the Department of Nuclear Chemistry

Name	Articles			Books				Chapt Sci	Total	Cit
	Sci	Othr	Tr	Sci	Text	Othr	Tr			
Czakó-Nagy, I.	65	-	-	-	3	-	-	-	68	126
Homonnay, Z.	24	-	-	-	-	-	-	-	24	16
Kuzmann, E.	181	-	-	5	-	-	-	-	186	29
Lévay, B.	56	-	-	1	5	-	-	3	65	200
Nagy, S.	49	14	8	3	1	5	12	1	93	68
Süvegh, K.	19	-	-	-	-	-	-	-	19	3
Szeles, Cs.	25	-	-	1	-	-	-	-	26	14
Vértes, A.	300	6	-	7	8	-	1	4	326	740

Summary of the publications written by the co-workers of the Department (Sci: scientific, Othr: other than scientific, Tr: translation, Text: textbook for ELTE students, Chapt: chapter, Cit: citation)



Vértes, Attila

**CMHAS, DSc, Professor of Chemistry,
Head of Department**



Prof. Vértes has written several books on nuclear chemistry and Mössbauer spectroscopy that are used as text books and monographs all over the world. As Prof. Stevens once mentioned at an international conference he is one of the record holders among Mössbauer spectroscopists as far as the number of publications and citations is concerned. Prof. Vértes has a wife as well as two sons. The younger one, a graduate student at ELTE, is about to defend his CSc theses in electrochemistry.

Degrees: MSc, Technical University of Budapest, 1958; CSc, HAS, 1965; DSc, HAS, 1973, CMHAS, 1993

Abroad: PhD Student, Lomonosov University, Moscow, USSR, 1962-1965; Visiting Scientist, University of New Castle, New Castle, England, 1970; Humboldt Fellow, Technical University, Munich, FRG, 1971; Guest Professor, Lehigh University, Bethlehem, US, 1976-1977, 1982, 1986; Guest Professor, Johannes Gutenberg

University, Mainz, Germany, 1991, 1992, 1993

Research interests: Mössbauer spectroscopy and positron annihilation

Teaching experience: Physical chemistry, nuclear chemistry, Mössbauer spectroscopy and positron annihilation

Membership: Committee of Molecular Structure, HAS; Division of Radiochemistry, HAS; Division of Inorganic and Physical Chemistry, HAS; Associate Editor, Journal of Radioanalytical and Nuclear Chemistry

(Elsevier); Editorial Board, Journal of Structural Chemistry (Plenum Press); Editorial Board, Hungarian Journal of Chemistry; Board, International Committee of Applied Mössbauer Effect (ICAME)

Responsibilities: Head of the Department; Member of the Institute Council; Member of the Professors' Council of the Faculty; Lecturer in Nuclear Chemistry for engineer-physicist students; Lecturer in Nuclear Spectroscopy for chemistry students



Lévay, Béla

DSc, Professor of Chemistry, Deputy Dean



Degrees: MSc, ELTE, 1962; PhD, ELTE, 1965; CSc, HAS, 1974; DSc, HAS, 1988

Abroad: *Visiting Scientist*, Helsinki University of Technology, Espoo, Finland, 1971; *Visiting Scientist*, Risø National Laboratory, Roskilde, Denmark, 1974, 1978; *Visiting Scientist*, Joint Institute for Nuclear Research, Dubna, USSR, 1978-1982; *Visiting Scientist*, Kernforschungszentrum Karlsruhe, Karlsruhe, FRG, 1986-1988

Research interests: Positronium chemistry, chemistry of exotic atoms

Teaching experience: Physical chemistry, nuclear chemistry, positron annihilation, and radiation protection

Membership: Division of Radiochemistry, HAS; Committee of Molecular Structure, HAS; Committee of Isotope Application, HAS; Hungarian Chemical Society

Responsibilities: *Deputy Dean* for the Scientific and International Affairs at the Faculty of Science (till

Teasingly called Senator by his fellow Deputy Deans, Prof. Lévay did actually run for Congress during the first democratic Elections in 1989. Fortunately for ELTE he came second in his District, so he can use his full capacity as an organizer for the benefit of the Faculty. He has three adult sons as well as a wife who is an accomplished dentist. Beside taking care of the International and Scientific Affairs of the Faculty he also manages to spend some time with his grand children. Owing to them - two of whom are girls - the family is reaching a more satisfactory balance of sexes.

August 31, 1993); *Director* of the Institute of Chemistry (after September 1, 1993); *Member* of the Professors' Council of the Faculty; *Lecturer* in Nuclear Chemistry for chemistry students



Czakó-Nagy, Ilona

CSc, Associate Professor of Chemistry



A Mössbauer spectroscopist with many distinguished achievements to her name, it is more surprising to find that Dr Czakó-Nagy is also the proud grandmother of a baby girl, through her son. She also has a daughter working for a bank. Dr. Czakó-Nagy has good international relations among others with Italy, Britain and Croatia. She has also paid three longer visits to the United States working there as a Visiting Scientist for Lehigh University, Bethlehem.

Degrees: MSc, ELTE, 1962; PhD, ELTE, 1965; CSc, HAS, 1981

Abroad: *Visiting Scientist*, Lehigh University, Bethlehem, US, 1978, 1983, 1986

Research interests: Mössbauer spectroscopy of electrodeposits and minerals

Teaching experience: Physical chemistry and nuclear chemistry

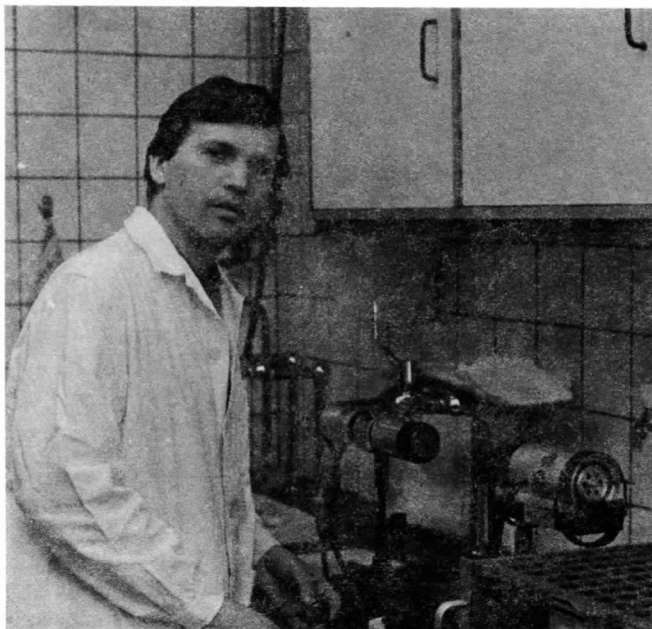
Responsibilities: *Coordinator* of the Nuclear Spectroscopy Lab for chemistry students; *Educational Secretary* of the Department;

Lecturer in Mössbauer Spectroscopy for geology students; *Lecturer* in Nuclear Environmental Protection for high-school teachers (postgraduate course)



Homonnay, Zoltán

CSc, Assistant Professor of Chemistry



Dr. Homonnay is an expert in Mössbauer spectroscopy. He is also a dedicated teacher taking part in "preparatory camps" preparing would-be chemists for the entry exams. He also writes for Élet és Tudomány (Life and Science), a Hungarian periodical on popular science. He spends most of his free time with his family - his wife and his daughter - but he also tries to continue his hobby which is hiking. As a matter of fact he has almost done the National Blue Tour, the Hungarian equivalent of the American Appalachian Trail, zigzagging over 1000 km across the country.

Degrees: MSc, ELTE, 1984;
CSc, HAS, 1989

Abroad: Postdoctoral Fellow, Drexel University, Philadelphia, USA, 1989-1990; Humboldt Fellow, Johannes Gutenberg University, Mainz, Germany, 1993

Research interests:
Mössbauer spectroscopy of aluminium and high- T_c superconductors

Teaching experience:
Nuclear chemistry (ELTE),

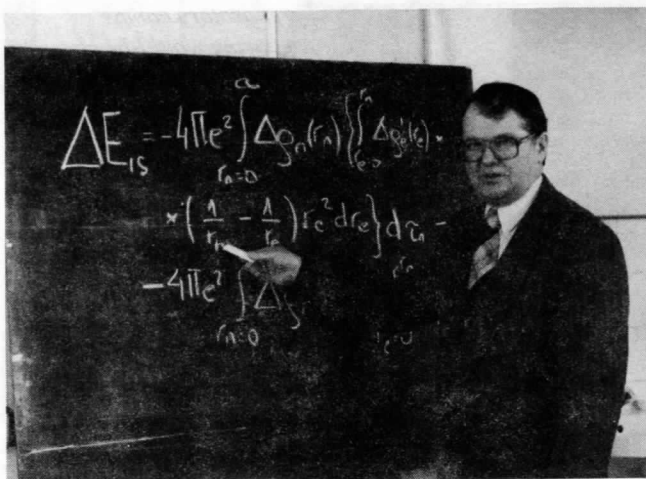
general chemistry and physical chemistry (Drexel)

Responsibilities: Lecturer in Nuclear Chemistry for chemistry students



Kuzmann, Ernő

PhD, Lecturer in Physics



Calling Dr. Kuzmann an enthusiastic experimenter might sound like understatement to those having the privilege of knowing him. The Institute of Chemistry could spare the employment of one night watchman having him around. This whirlwind of a person has three children as well as a splendid spouse who has accompanied him to all the Mössbauer meetings of the last couple of years, no matter how far away. His second favorite pastime is mountaineering.

Degrees: MSc, ELTE, 1968; PhD, ELTE, 1971

Abroad: *Visiting Scientist*, Osaka University, Osaka, Japan, 1979-1980; *Visiting Scientist*, Joint Institute for Nuclear Research, Dubna, USSR, 1981-1984

Research interests:

Mössbauer spectroscopy and X-ray diffractometry of crystalline and amorphous alloys, high-Tc superconductors, and radiation damage

Teaching experience: Metal physics and computers (ELTE), Mössbauer spectroscopy (ELTE and Osaka), nuclear methods (ELTE)

Membership: Physical Society of Hungary;

Chemical Society of Hungary; Biophysical Society of Hungary; Physiological Society of Hungary; Metallurgical Society of Hungary; Physical Society of Japan; Metallurgical Society of Japan

Responsibilities:

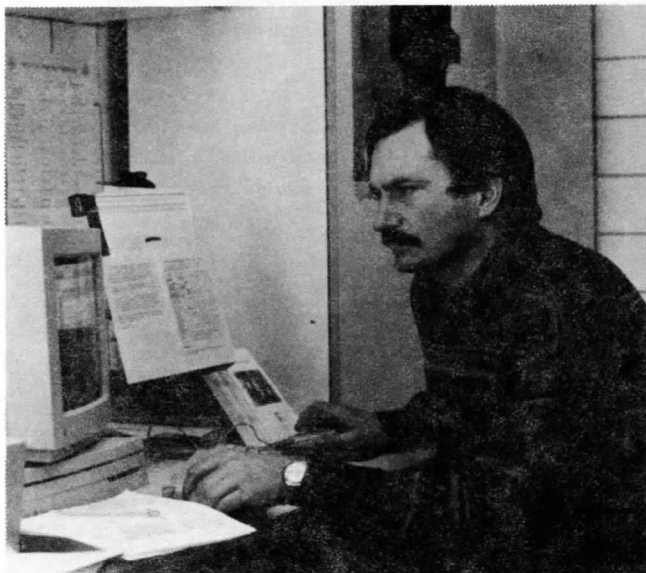
Representative of the Mössbauer Laboratory of the Department at the OTKA Instrument Network of the HAS; *Leader* of the X-Ray Lab of the Department; *Coordinator* of the study affairs of engineer-physicist students, *Coordinator* of the extra-curricular research activities of students at the Department; *In Charge* of

the equipment-affairs at the Department; *Lecturer* in Computer Techniques for engineer-physicist students; *Lecturer* in Nuclear Material-Testing Methods for engineer-physicist students; *Lecturer* in Mössbauer Spectroscopy for chemistry and physics students.



Nagy, Sándor

PhD, Assistant Professor of Chemistry



Dr. Nagy has not quite yet accepted (although has well realized) that the future belongs to specialization. Besides teaching and research he is also engaged in other activities. With the patient understanding of his colleagues he has written 3 books on bicycling, translated a number of novels and short stories (by Douglas Adams, Isaac Asimov, Roald Dahl, Frederik Pohl, etc) as well as several non-fiction books. His attraction to applied mathematics is well indicated by the fact that he has $(n-1)!$ daughters from each of his n th wives (where $n = 1, 2, 3$). He will probably never be able to afford another divorce...

Degrees: MSc, ELTE, 1972; PhD, ELTE, 1975; BSc (applied math.), ELTE, 1979

Abroad: *Visiting Scientist*, Lehigh University, Bethlehem, US, 1979-1980; *Postdoctoral Fellow*, *Adjunct Associate Professor*, Drexel University, Philadelphia, US, 1988-1989

Research interests: Mössbauer spectroscopy of alloys and high- T_c superconductors

Teaching experience: Physical and nuclear chemistry, Mössbauer spec-

troscopy, calculus (ELTE), general chemistry (Drexel)

Membership: Phi Lambda Upsilon, Beta Epsilon Chapter at Drexel University, Philadelphia, US

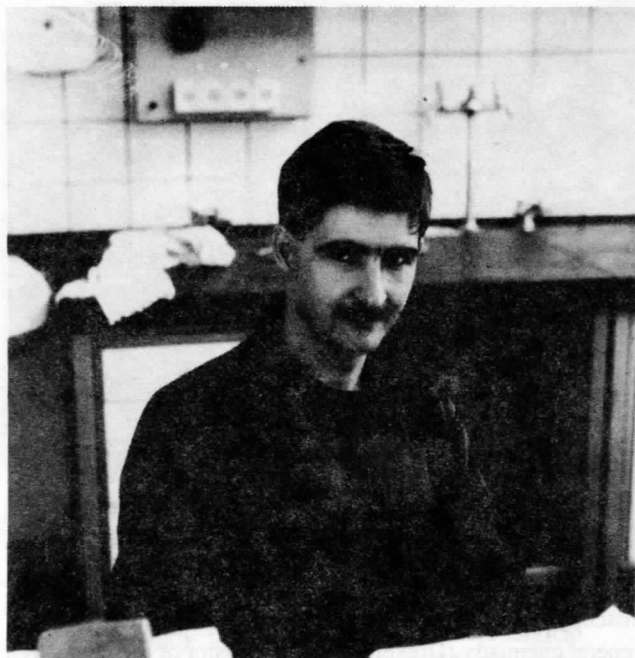
Responsibilities: *Contact Person* of TEMPUS for the Faculty; *Editor* of the annual information booklet of the Faculty; *Member* of the Faculty Council; *Coordinator* of the extra-curricular research activities of students for the Institute of Chemistry; *Coordinator* of the study affairs of international students for the

Institute of Chemistry; *Coordinator* of the Nuclear Chemistry Lab for chemistry students; *Coordinator* of the National Postgraduate Course on Radiation Protection; *Lecturer* in Nuclear Chemistry for chemistry students



Szeles, Csaba

CSc, Assistant Professor of Physics



Although Hungarian by nationality, Dr. Szeles was born and raised in the Hungarian inhabited parts of the former Yugoslavia. However he got his university degree in Hungary. If you want to meet him, the chances are that you can more easily find him in the United States or in Japan than in Hungary. At the present moment he is working as a Visiting Scientist for the Brookhaven National Laboratory in the US. He has two children as well as a wife, who is a psychologist by profession.

Degrees: MSc, ELTE, 1981;
CSc, HAS, 1990

Abroad: *Visiting Scientist*,
Tokyo University, Tokyo,
Japan, 1987-1989; *Visiting
Scientist*, Brookhaven
National Laboratory,
Brookhaven, US, 1992-1993

Research interests: Positron
annihilation studies of met-
als, alloys and molecular
materials

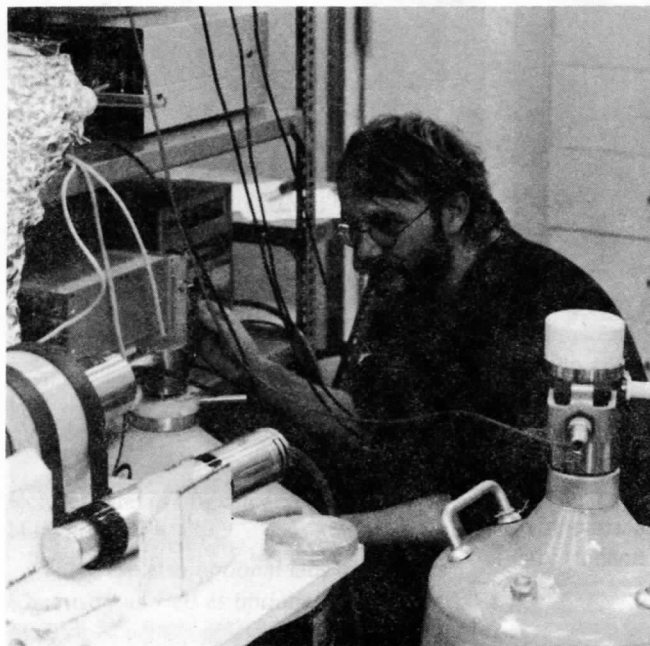
Teaching experience:
Nuclear chemistry

Responsibilities:
Coordinator of the
Electronics Lab for chem-
istry students



Süvegh, Károly

MSc, Assistant Lecturer in Chemistry



Though still lacking the right of using the prefix Dr, Mr. Süvegh is considered a serious scientist by his colleagues. His competence as a teacher is best demonstrated by the fact that he has managed to marry one of his students - one of the best of her class indeed and certainly the most beautiful. They have two kids - a two year old girl and a baby boy. He tries to keep his balance by equally dividing his time and energies between teaching, research, family as well as playing computer games.

Degrees: MSc, ELTE, 1986
Abroad: *Visiting Scientist*,
 Lehigh University,
 Bethlehem, USA, 1989

Research interests: Positron
 annihilation studies of mole-
 cular crystals and polymers

Teaching experience:
 Nuclear chemistry, positron
 annihilation spectroscopy

Membership: Division of
 Radiochemistry of the HAS

Responsibilities:
*Coordinator of the Nuclear
 Chemistry Lab for physics-*

*engineer students; Lecturer
 in Nuclear Chemistry for
 chemistry students*



Technical Assistance



Mrs Börcsök, technician



Mrs Bor, technician



Mrs Suba, secretary and technician, co-author of several publications written by Prof. Vértes



Mrs Paál, typist



TEACHING

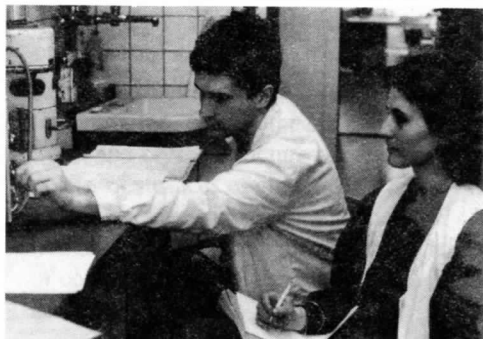
The teaching of Nuclear Chemistry to chemistry students began in 1958 under the initiative of *Prof. István Kiss*. First it was taught in the 7th semester (out of 10) on a facultative basis (lecture: 1 hour, tutorial: 2 hours per week).

Since the academic year 1960-61 every chemistry student has attended some Nuclear Chemistry seminars within the framework of Physical Chemistry education.

Since the academic year 1967-68 chemistry students have had **Nuclear Chemistry lectures and laboratory practice** on a *regular* basis. The lecture is in the 5th semester (2 hours a week) and the lab is in the 6th (4 hours every other week). Since 1990 the students can choose from alternative series of lectures, one in English and another in Hungarian.

There are also *optional labs* in Nuclear Chemistry as well as *optional lectures* on **Nuclear Spectroscopies** in the 7th and 8th semester.

Together with the *Central Physical Institute of the HAS* the Department organizes *postgradual courses* in **Radiation**

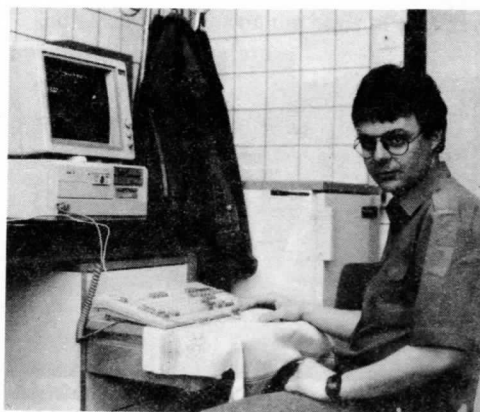


In the 3rd year students' lab

Protection. The highest-level course consists of 28 hours of "leveling" lectures in nuclear sciences (the students' backgrounds range from medicine to nuclear physics) as well as 56 hours of lectures and 56 hours of lab in radiation protection.

The Department also takes part in the teaching of engineering physics students. We teach them **Computer Science** in the 1st semester and nuclear methods in the 7th and 8th semesters. Engineering physics students, by the way, take their 1st, 2nd, 7th and 8th semesters at *ELTE*, Budapest, and the 3rd through 6th at *Miskolc University*, Miskolc. It is their choice where they want to finish the 9th and 10th semesters.

One of our colleagues is the coordinator of the Greek chemistry students studying at *ELTE*. He also teaches **Calculus** to them. He is also responsible for the coordination of the *extra-curricular research activities* of chemistry students at the Institute of Chemistry.



Mr. Imre Varga, graduate student, has spent several months in the US as part of his PhD program. He is also a former winner of a National Students' Award for his extracurricular research

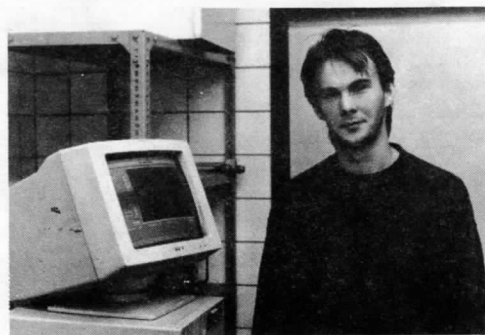


Our colleagues are also involved in teaching at other Budapest universities. We took part, e.g., in the teaching of **Physical Chemistry** for English speaking students at the *Semmelweis Medical University*, Budapest.

On various occasions our colleagues also had the opportunity to teach **General Chemistry** and **Physical Chemistry** at *Drexel University*, Philadelphia, as well as **Nuclear Techniques in Structural Chemistry** at the *Johannes Gutenberg University*, Mainz.

In preparation for the coming Law of Public Education due this year, the Faculty has proposed 19 postgraduate programs for accreditation. The Department has offered its willingness to take part in three of these:

- (1) Environmental effects of radiation and chemicals
- (2) Structure investigation and modeling of molecules
- (3) Materials science and solid state physics



Mr. György Vankó is about to finish his MSc program and to start working on his PhD. He has just won a second award at a National conference organized biannually for students involved in extracurricular research activities

The methods offered are summarized in the next chapter dealing with the research activities of the Department.



Ms. Anikó Cserei, one of the graduate students working on her PhD theses in Mössbauer spectroscopy. As a part of her PhD program she has spent three months in Germany under Professor Gonser's supervision. She is the co-author of five publications



RESEARCH

The research that began in 1958 covered the following topics:

- (I) Diffusion and self-diffusion by means of tracer methods
- (II) Measurement of soft β -emitters by liquid scintillators
- (III) The study of water migration in soils with special respect to radioactive environmental contamination
- (IV) In connection with the Chernobyl accident, examination of ^{14}C content of wines of different ages and origins
- (V) Chemical structure research with the aid of nuclear techniques started at the end of the 1960's.

Specifically, Mössbauer spectroscopy began in 1967, positron annihilation spectroscopy in 1969 and meson chemistry in 1979. These nuclear methods were first introduced into chemical research in Hungary at ELTE.

These techniques as well as X-ray diffraction have been applied at the Department in the following fields:

Mössbauer spectroscopy

- (1) Study of the chemical structure of solutions on the basis of the Mössbauer spectra of frozen solutions.
- (2) Mössbauer studies in surface chemistry including the study of the chemical, magnetic, and crystal structure of electrodeposits, of surfaces of electrodes, of interphases between substrates and coatings (metal-metal, metal-organic coatings, etc.), of corroded surfaces and of ion implanted surfaces.

(3) Investigation of the electronic and geometric structure of coordination compounds.

(4) Mössbauer spectroscopy of crystalline and amorphous iron alloys.

(5) Identification of the chemical and crystal position of the Mössbauer active nuclides in aluminium alloys containing iron and tin impurities. (The HAS acknowledged the results of these studies with a prize in 1986.)

(6) The Mössbauer effect was also applied to solve several industrial problems resulting in a number of industrial projects and some income for the University.

(7) Study of high Tc superconductors.

(8) Study of compounds containing buckminsterfullerenes and Mössbauer-active atoms.

Positron annihilation

(1) Study of the defect structure of metals and electrodeposits on the basis of the lifetime spectra of positrons.

(2) Positron annihilation study of the phase transformation and structure of organic polymers and polymer layers.

(3) Study of the surface of catalysts by the lifetime of the positronium formed in the free volume and on the surface of catalysts.

(4) Positronium chemistry in liquids.

(5) Positronium chemistry in solids.

Meson chemistry

(1) Study of hydrogen bonding with the aid of π -mesons.



X-ray diffractometry

- (1) Structure investigation and phase analysis of metals, alloys and compounds.
- (2) Structure determination and identification of probes used for positron annihilation and Mössbauer studies.

The scientific works published since 1983, the establishment of the Department, are listed in the last chapter.

During this period 10 PhD, 6 CSc and 1 DSc degrees have been obtained as a result of the efforts reflected by these publications.

Some of the scientific books published by the co-workers of the Department are shown by the illustrations.



INTERNATIONAL

The Department has had **joint agreements** with several foreign universities for a number of years, viz. *Drexel* (US), *Glasgow* (UK), *Helsinki* (Finland), *Kyushu* (Japan), *Lehigh* (US), *Mainz* (Germany), *Moscow* (Russia), *Padova* (Italy), *Paisley* (UK), *Sofia* (Bulgaria), *Tokyo* (Japan), and *Warsaw University* (Poland). These cooperations resulted in common publications. The distribution of our foreign co-authors according to nationality is given in a separate table.

The Mössbauer spectroscopic and positron annihilation spectroscopic activities of the Department played an instrumental role in the introduction of these techniques into solution chemistry, corrosion studies and electrochemical research. The applicability of Mössbauer spectroscopy to corrosion chemistry was first pointed out by us in a 1969 article (*I. Dézsi, A. Vértes, L. Kiss: Mössbauer Study of the Corrosion Products*

of Iron: *J. Radioanal. Chem.* 2, 183, 1969.) Some years later the Mössbauer technique, and also in the 1970's the positron annihilation technique gained ground in studies of electrochemical problems at the Department. At present there are several Mössbauer laboratories which were established to serve corrosion and electrochemical research.

The Department of Nuclear Chemistry participates in the work of *IUPAC* (International Union of Pure and Applied Chemistry).

Two monographs (*Attila Vértes, László Korecz, Kálmán Burger: Mössbauer Spectroscopy, Elsevier-Akadémiai Kiadó, 1979* and *Attila Vértes, István Kiss: Nuclear Chemistry, Elsevier-Akadémiai Kiadó, 1987*) of those published by the co-workers of the Department of Nuclear Chemistry have found widespread application in several countries both in research and in higher education.

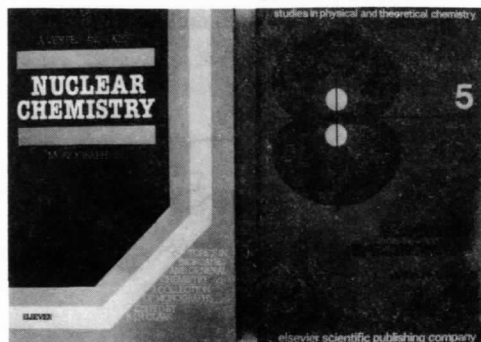


International relations of the Department of Nuclear Chemistry



The number of foreign co-authors and common publications

Country	Co-authors	Publications
Bulgaria	6	15
China	1	1
CIS	35	57
Czechoslovakia	1	1
Egypt	4	8
Finland	1	1
Germany	14	23
Great-Britain	6	15
India	1	1
Italy	5	16
Japan	9	23
Panama	1	11
USA	11	44
Vietnam	1	1
Yugoslavia	11	27



Monographs published by Prof. Vértes



BUDGET

Financial support obtained by the Department of Nuclear Chemistry over the last decade

Source	Number	Year	Amount (Ft)
HAS	1	1985-89	800,000
HME ¹	1	1987-89	900,000
Supporting Scientific Workshops (HME)	1	1988-91	1,000,000
OTKA ²	10	1986-94	18,000,000
FEFA ³	1	1991	2,000,000
US-Hungarian Joint Fund	1	1991-94	2,000,000
State support for teaching		1983-93	1,000,000
State support for research (TKFA ⁴)		1983-93	1,000,000
KK ⁵ (Hungarian enterprise)	8	1983-93	5,000,000
KK (US enterprise)	1	1991-93	3,000,000

¹Hungarian Ministry of Education

²Országos Tudományos Kutatási Alap (National Fund for Scientific Research)

³Felzárkózás az Európai Felsőoktatáshoz Alap (Fund for Closing up to European Higher Education)

⁴Tudományos Kutatási és Fejlesztési Alap (Fund for Scientific Research and Development)

⁵Költségvetésen Kívüli (industrial research supported by enterprises)



Books (1983-1993)

Addison, A.W., Scattolini, J.L., Solomon, S., Nagy, S. I.: *Concepts in General Chemistry: Laboratory Manual. Kendall/Hunt Publishing Company, Dubuque, Iowa, 1989 (2nd edition), 1991 (3rd edition)*

Beke, D., Deák, P., Giber, J., Janszky, J., Kazsoki, J., Kuzmann, E., Martinás, K., Marton, D., Pipek, J., Tichy, G.: *Problems and calculations in solid state physics (Hungarian). Műszaki Könyvkiadó, Budapest, 1983*

Fodor-Csányi P.: *Definitions and symbols in physical chemistry. Vol. I. and II (Hungarian). Tankönyvkiadó, Budapest, 1985*

Fodor-Csányi, P.: *Nomenclature of inorganic chemistry. IUPAC, 1990*

Fodor-Csányi, P., Fábíán, P., Csengeri, Pintér P.: *Műszaki helyesírási szótár. Műszaki Könyvkiadó, Budapest, 1990*

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