Main sponsors: Richter Gedeon; Ministry of Education and Culture; OKM
Sponsors: Servier; MOL; Egis
Partners: Heidolph; Sigma-Aldrich; FKI; cerbona; Microsoft

The problems of the first Olympiad

Problem 1

A mixture of hydrogen and chlorine is irradiated with scattered light in a closed vessel. After some time, the amount of chlorine decreased by 20% compared with the initial quantity at the same temperature. The resulting mixture has the following composition: 60% chlorine, 10% hydrogen and 30% hydrogen chloride by volume.

1. What was the original composition of the gas mixture?
2. How are chlorine, hydrogen and hydrogen produced?

Problem 2

Give balanced reaction equations for the following processes:

a. Oxidation of chromium (III) chloride with bromine in alkaline (KOH) solution.
b. Oxidation of potassium nitrite with potassium permanganate in acid (H_2SO_4) solution.
c. The action of chlorine on lime water ($Ca(OH)_2$) in a cold reaction mixture.

Problem 3

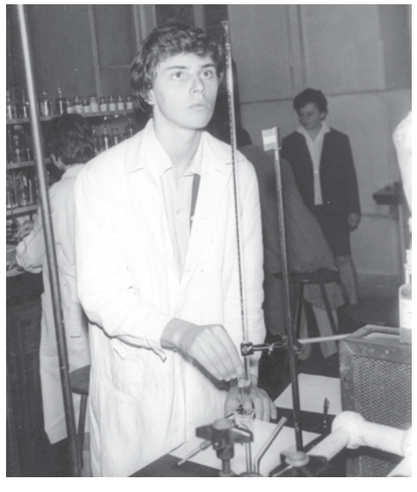
The gas that comes from a blast furnace has the following composition:

CO_2 12.0% vol, H_2 3.0%, 0.2% C_2H_4, CO 28.0%, CH_4 0.6 %, N_2 56.2%

a. Calculate the volume of air (m^3) required for a complete combustion of 200 m^3 of the exhaust gas (at the same temperature and pressure measured, the oxygen content in air is 20% by volume).
b. Determine the composition of the products if the gas is burned in a 20% excess of air.

Problem 4

The vapor of an organic acid has a density 30 times of hydrogen. For the neutralization of 0.19 g of this acid 31.7 ml 0.1 M sodium hydroxide is consumed. Give the name and structural formula of the acid.



Colophon

Catalyzer
Journal of the 40th International Chemistry Olympiad
Anniversary Issue July 12, 2008
Editorial team: Darvas Mária, Jagasics Éva, Magyarfalvi Gábor, Stirling András, Túri László, Vass Márton
Copy editor: Jon Baker
Layout: Csordás Zoltán, Pál Attila
Photographer: Gilicze Bálint
Press: Prime Rate Ltd. Budapest

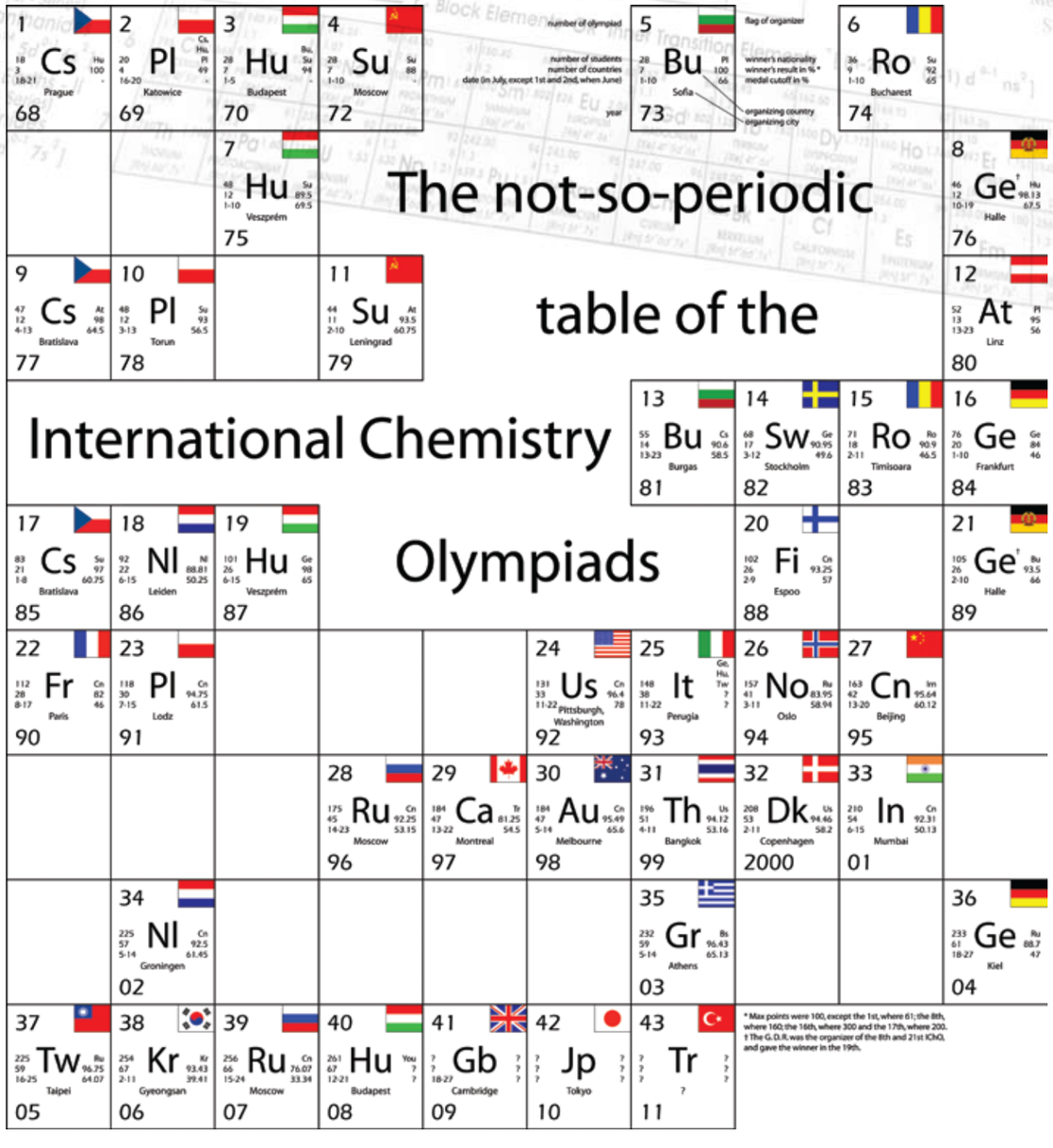
Secretariat of the IChO
http://www.icho.hu
Pázmány Péter sétány 1/A, Budapest H-1117, Hungary
Telephone: +36 1 372 2910, Fax: +36 1 372 29 31
E-mail: info@icho.hu

Budapest	www.budapest.hu
Ministry of Education and Culture	www.okm.gov.hu
Eötvös Loránd University	www.elte.hu
Faculty of Science	http://ttk.elte.hu
Institute of Chemistry	www.chem.elte.hu

40 Hu 08
40th International Chemistry Olympiad
2008 Budapest, Hungary

Catalyzer

Anniversary Issue – Saturday 12 July 2007



An insight on history – Dr. Fuggerth Endre, the member of the first team

Fuggerth Endre, one of the six members of the Hungarian team at the first Chemistry Olympiad (1968) in Prague was born in Budapest in 1951. His attraction toward sciences began early, but was given direction, as well as momentum, when he "borrowed" and read the chemical textbooks his brother – older by six years – was studying for his exams. Enthused by their content, the youngster put every penny he had into building a home laboratory – causing serious concern to his parents – and performed numerous experiments that gave him a sure hand later in practice. Despite his passion for chemistry, he opted to study Mathematics in Fazekas Mihály secondary school (which had a very high reputation at its level). "Mathematics is the key to logic, and without impeccable logic no science (or scientist) is worth the name", he professes. Time unconsumed by Mathematics was poured into reading about any kind of chemistry whatsoever, limited only by the language barrier of Hungarian. With such a background, the road to Prague for him now seemed inevitable, yet there was a stumbling block. Training problems sent by the Czechoslovakian organizers did not differentiate between the competitors as they needed only simple calculations done quickly. Back in 1968, the slide-rule was the fastest tool available, yet – although dexterity at it can be laudable – it has nothing to do with either mathematics or chemistry. So it happened that he ranked 7th, just out of the team, when a chance came. Each potential team member was given the opportunity to lecture on whatever topic he liked, and Fuggerth accepted the challenge – and won. He went on, oblivious to his audience, reciting and explaining great parts of organic chemistry to the astonishment of the teacher present until he was stopped, and given a place in the team. It was thus no surprise that at university he specialized in organic chemistry and made his MS thesis in 1975 in this field. The topic he chose involved both spectroscopic and chromatographic methods. The latter subject

being in extreme flux at that time, he decided to part for a while from organic chemistry to devote some time to a relatively new science in its infancy. HPLC acted on him like magnet, and taught him special skills. Although its grip later slackened, the embrace of chromatography still remained. He has now left science and is living in a rural village, spending his time improving the house he lives in and creating an orchard containing the widest range of fruits possible at this latitude.

Q: Dr. Fuggerth, why chemistry?
A: Circumstances, as always, played a role. I remember my father, a man without higher education but endowed with talent and skill, having subscribed to a monthly periodical titled "Univerzum" that contained original papers translated into Hungarian from every branch of science, including contemporary results. I perused that periodical heavily as a child. The breakthrough in favour of chemistry came when I found the textbooks my older brother was using in his high school and faced their breath-taking, unfathomable content. The die was cast.

Q: Do you have favourite problems or fields in chemistry?
A: Let me just think. I always found it very interesting to look into the remarkable chemical composition of the Earth which renders it unique among the other planets (in our solar system). If you compare Earth to the other planets, its diversity and kaleidoscopic nature strikes you at once. One may then ask if all this can be connected in some way to the origin of life.

Q: What has been the most important chemical discovery of the last few decades in your opinion?
A.: Novelties are twelve a dozen, yet giant achievements are rare and are usually recognized and given the place they deserve only when looking back from quite a distance; sorry, but such is human nature. H. C. Brown, who discovered and developed organo-boranes, a chemistry in itself, immensely useful tools in synthetic organic chemistry, surpassing even the highly regarded Grignard's reagents, received his Nobel prize some ten years later; a fate very similar to our own Oláh György. Ancillary techniques seem to deserve even lesser attention: a remark and a few equations uttered by an old physicist almost informally at a Ljubljana conference could be traced back as the origin of 2D NMR spectroscopy, now an unprecedentedly useful tool.

Q: And what has been your most important discovery?
A: I regard myself as lucky to have been faced with an intellectual challenge in 1982, which, doggedly tracked for five years, resulted in what was subsequently called Zone Gas Chromatography, an approach that later opened the door to Multidimensional Gas Chromatography.

Q: What was the Olympiad like? Was it difficult to win?
A: Actually it was more difficult to get into the team. (This has been touched on earlier, in the introductory part.) In Prague the problems had fortunately more colour and diversity, with the experimental part clearly being an overshot. A pardonable fault of the organizing committee, this being the very first Olympiad. By then I had at long last obtained a proper grip on the plethora of accumulated knowledge in my mind, and solutions came smoothly, and with mirth.

Q: Did you follow the life of the other members of the team?
A: In fact, no. Only one of the remaining five chose chemistry as a profession. His name is Deli János, we attended the same class at university, and we made a lasting friendship.

Q: Do you think it is possible to pose theoretical chemical tasks based on real life problems for such competitions which can differentiate between students?
A: I am rather sceptical. Chemistry does not work with imagination alone, even if it is the brightest. Those who know more facts are in a much better position at the start. At the same time, accumulating facts never has an end, not to mention that secondary schools have their other functions at an age when such a task is rather unusual even to begin with. So, diligence and devotion are easier to measure than to single out talent. This is especially true if reasoning is curbed, a list of standardized answers is offered, and if the problem posed allows only a single approach in solving it. The students will do their best in any event. Life, and real – at times testing – problems come later.

Q: One can contrast science Olympiads with sport Olympic Games in several aspects. One such aspect is the recognition of the participants: youngsters competing in sport are far more recognized, and celebrated, than those participating in science Olympiads. How do you see this difference?
A: The contrast is too wide, indeed. The responsibility for change lies with the media. There would be a favourable shift, both culturally and socially, if instead of false heroes gifted youngsters living among us were given more publicity. It would be more human, more elevating for the aimless and would cost very little. Furthermore, talented people would have less chance of losing their way in society.

Q: Why do you think the majority of the people dislike chemistry nowadays?
A: First of all I am not sure it is true. Nevertheless I see two problems here. One is that people in general do not acknowledge that principles of chemistry in fact govern a lot of aspects of our everyday life, and what's more, they do not respect them. See for example the careless usage of fireworks and crackers at feasts, the widespread abuse of drugs, the blind-eyed acceptance of chemical modifications in the food industry, to mention but a few. Teachers should be given the opportunity to explain relevant concepts at their students' level to clear the mist, thus eradicating the serious consequences that are now so prevailing. The other problem is an overall negative attitude towards chemistry, mainly because it is widely believed that "chemicals" cause pollution. Cardinal is the point that this picture is false. It is industry that pollutes, transportation and energy consumption contribute even more, and all because of mankind's supposed increasing needs. Are they really justified?

Q: With hindsight, would you follow the same career or would you choose something different?
A: I can't help feeling that something in my genes "encoded" me for chemistry. So, a second start, although it may differ at the outset and lead to a less tortuous career, would certainly land me somewhere in chemistry. However, should it happen nowadays, I would need a scrutinizing eye, too, open to perceive and address changes: environmental issues, abuse of science by industry, justification of research priorities, etc. This should also be a task for those who are still active and in a position to influence events.

(Stirling András)

Father of the Olympiad – interview with Székely György

Székely György was the mentor of the Hungarian team at the first Chemistry Olympiads and he was also one of the founders of this global meeting. He started his carrier as a highschool chemistry teacher. Later he was promoted and obtained a position in the Educational Ministry where he was responsible for the chemistry curriculum and education. After 21 years he retired, but he remained active for 17 years. During this period, at age 70 he dedicated himself to his other favourite field, namely literature: he has translated various German and French poems to Hungarian, including such famous authors as Heine, Goethe, Baudelaire and Verlaine. His translations appeared both in literature journals and schoolbooks. He is now a happy great-grand father of his great-grand children. We talked with him about the beginnings in the Chemistry Olympiad at his home.

Q: Mr. Székely, can you tell us about how this whole wonderful series of Chemistry Olympiad started?
A: It has been long ago, in 1968. It was inspired by the success of the Mathematical Olympiad started in 1959 and that of the physics started just a year earlier. In the spring of '68 we had received an invitation letter from the Czechoslovakian Ministry of Education in which they had proposed to organize a similar Olympiad for chemistry and in May we had a pleasant meeting in Ostrava, where 3 Czechoslovakian and 3 Polish colleagues participated, and I represented Hungary. We agreed on some of the most important issues: 6 participants from each country, no official ranking at the first three events, there would be theory and experimental parts, the problems are given by the host country, and that the host country prepares and sends out preliminary problems similar to the competition tasks.

Q: Do you remember your fellow colleagues from the other countries?
A: Yes, I can easily recall some of them. Tymoteusz Szarszaniewicz, an enthusiastic chemistry teacher from Poland made a long lasting impression on me. Also, the Czechoslovakian organizer, Mr. Novotny from the Charles University was a nice colleague and friend. I also recall the amazing beauty of the directress of the pioneer house in Prague where the experimental part of the competition took place – said Mr. Székely smiling.

Q: And some Hungarian colleagues from the initial years?
A: Certainly. Two colleagues from the Eotvos University: Dr. Hartmann Hildegard, Dr Szepes László, the late Davida Leóné and Dr Várnai György were all key persons in the competitions.

Q: How did you select which countries were invited?
A: The selection of countries fell entirely within the host country's competence. As far as I remember Hungary who organized the third competition, decided to invite European non-socialist countries, and later the USA and Cuba as well. However they did not come at that time yet.

Q: Were there any language problems?
A: At the beginning the host country translated the problems to all the languages of the invited countries. Since the number of the participating countries was not much, it was feasible. Nevertheless the final translated version was always written by the mentors of the given country. We also managed this problem in the first years when we, i.e. Hungary hosted the Olympiad. However, later this policy has changed.

Q: Nowadays media coverage is inevitable. 40 years ago, in a socialist country, this was different. How did you do it at that time?
A: During the Olympiads, I had very frequent contact with a correspondent of the national news agency (MTI) and they usually issued a short report.

Q: While the media coverage of sport events is taken granted naturally and of course strongly demanded, the same is not true for science competitions. What is your opinion?
A: I do not think that the two types of competition would be comparable. There are very fundamental reasons why the sport events are covered much more profoundly. First of all sport events by nature are much more popular and people are much more interested in them. People understand sport and often do it themselves. They like sport but do not like and understand science.

Q: Why do people not like chemistry?
A: People here in Hungary do not like chemistry for a couple of reasons. Chemistry as a separate subject in education has been introduced relatively later into the curricula. Its material is very very theoretical today, and the people hardly see the link between this theory and the real life.

Q: What would be your choice to show in a chemistry class?
A: I always preferred to illustrate large-scale industrial processes in small-scale model experiments. H_2SO_4 production, Haber-Bosch synthesis and the electrolysis of NaCl were always on my demonstration list when I taught. I also put big efforts to demonstrate how general the redox processes can be and invoked various phenomena, like corrosion.

Q: Coming back to the Chemistry Olympiad, how do you see the enormous increase in the material covered by the problems in the Olympiads?
A: I am very happy and satisfied with that. It has a very significant feedback to the chemistry education, to the local and national competitions, and to talent development as well. I am also very happy about the large number of the participating countries.

Q: What is the most important aspect of the Olympic movement for you?
A: The enthusiasm and devotion of the teachers of the various countries and that they were always ready to volunteer the organization and preparations of the Olympiads, which subsequently initiated new local and national competitions both in Hungary and elsewhere. I can enumerate a lot of Hungarian and foreign colleagues with whom we worked during the first decades of the Chemistry Olympiad. We had wonderful moments together. A lot of them are no longer among us, but surely a lot of them are still with us and I would be very happy to meet them again.

(Stirling András)