

English edition

Eduard Hála



THE ACADEMY
OF SCIENCES
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REPUBLIC



Science 7
Around
Us
Personalities

Who is who

Prof. Ing. Eduard Hála, DrSc. (9. 12. 1919 – 28. 8. 1989)

Born in Roudnice nad Labem. After graduating from secondary school that he had attended in Kolín and Chrudim, and after an involuntary break caused by WWII he finished his studies of chemistry in 1947 at the Czech Technical University (CTU). He then became junior lecturer and later on senior lecturer in physical chemistry at first at CTU and later at the independently founded Institute of Chemical Technology (ICT) in Prague. With Arnošt Reiser they wrote a seminal university textbook of physical chemistry, the first volume of which was published in 1960. When he was forced to leave ICT for the Czechoslovak Academy of Sciences in 1958, he first worked at the Institute of Physical Chemistry, but was later offered to create his own thermodynamic group at the Institute of Chemical Process Fundamentals. His laboratory very soon became world-renowned not only among physical chemists, but also with chemical engineers. In tribute to prof. Hála, the laboratory was renamed shortly after his death to Eduard Hála Laboratory of Thermodynamics, on suggestion of the international thermodynamic community. When the thermodynamic laboratory became part of the Department of Separation Processes in 2014, Hála's legacy was passed over, in the name of Eduard Hála Laboratory of Separation Processes.

Prof. Arnošt Reiser

Born in Prague in 1920. World-renown chemist, director of the Institute of Imaging Sciences of the Polytechnic University in New York, he is now professor at the Polytechnic School of Engineering of the New York University. He studied physical chemistry at CTU (later ICT) in Prague where he later became junior lecturer and senior lecturer. With Eduard Hála they formed one of the most eminent duos of this discipline. He published an autobiographic story of his times at ICT Prague, but more importantly of his fate of the Holocaust survivor and communist regime refugee.

Prof. Ing. Jiří Drahoš, DrSc., dr. h. c.

After finishing his undergraduate studies in physical chemistry at ICT Prague, prof. Drahoš started working at the Institute of Chemical Process Fundamentals of CAS where he obtained his PhD in 1977. Since then he has been successively scientist, senior scientist, Deputy Director (1992–1995), and Director (1996–2003). He is President of the Academy of Sciences of the Czech Republic (ASCR) since 2009.

Ing. Karel Aim, CSc.

After finishing his undergraduate studies in physical chemistry at ICT Prague, Dr. Aim started working at the Institute of Chemical Process Fundamentals of CAS where he obtained his PhD in 1977. Since then he has been successively scientist, senior scientist, Chairman of the Scientific Board of ICPF (1992–2006), Head of E. Hála Laboratory of Thermodynamics (2009–2012), and Chairman of the Board of the Institute (2007–2012). He is currently a member of the Presidium of the Academy Council of AS CR and Vice-Chair of the governmental Research, Development and Innovation Council.

Ing. Zdeněk Wagner, CSc.

After finishing his undergraduate studies in physical chemistry at ICT Prague, Dr. Wagner started working at the Institute of Chemical Process Fundamentals of CAS where he obtained his PhD in 1986. Since then he has been a scientist at ICPF specializing in chemical thermodynamics. In his free time he writes short stories and poetry in Czech and Hindi.

Ing. Ivan Wichterle, DrSc.

After finishing his undergraduate studies in physical chemistry at ICT Prague, Dr. Wichterle started working at the Institute Physical Chemistry of CAS where he obtained his PhD in 1964. Afterwards he started his work as a scientist at ICPF. In 1989 he obtained a DrSc. degree and subsequently was Head of E. Hála Laboratory of Thermodynamics until 2008.

Prof. Ing. Jan Hlaváč, DrSc.

Professor Emeritus at the ICT Prague and outstanding expert in silicate chemistry. Over his long pedagogic and scientific career he brought up several generations of successful engineers and became a world-renown authority in silicate technology, especially in solid state reaction kinetics and mechanisms, theoretical fundamentals of glass melting and glass surface interactions with aqueous solutions.

Standing on the shoulders of a giant of thermodynamics

Thermodynamics is a funny subject. The first time you go through it, you don't understand it at all. The second time you go through it, you think you understand it, except for one or two small points. The third time you go through it, you know you don't understand it, but by that time you are so used to it, it doesn't bother you anymore.

This quote by the German quantum physicist Arnold Sommerfeld expresses very much the state of mind of almost every thermodynamicist. It is indeed quite difficult to gain a deep understanding of a scientific field of study addressing no less than the fundamental laws of nature. However, exceptions to the rule exist, represented by remarkably perspicacious scientists and true geniuses who laid foundations and paved the way for further advancement of thermodynamics; starting with Sadi Carnot, over Josiah Willard Gibbs, to Ilya Prigogine.

It is not necessary, though, to travel neither into distant past, nor far and foreign lands to find one of those exceptions. In 2014 we are commemorating the 95th anniversary of the birth and 25 years of the passing of Professor Eduard Hála, whose erudition in physical chemistry rightly makes him one of the most significant Czechoslovak and international experts in thermodynamics. Being endowed with vision similar to that of the greatest ones, the university pedagogue and scientist did not think sufficient to limit himself to the basic research in chemical thermodynamics, but rather broadened his outlook to chemical engineering and studies of industrially relevant compounds and properties as well. His book *Vapour-Liquid Equilibrium* was translated into English and has quickly become a seminal work used by students, researchers, and engineers till present days.

Although Eduard Hála was a great scientist in his own right, his name should rarely be mentioned alone. Czech culture has always been shaped by famous duos such as Werich and Voskovec, Suchý and Šlitř, Šimek and Grossman, and many others; to physical chemistry it was Hála and Reiser who formed a similar tandem of classics. Eduard Hála became with Professor Arnošt Reiser the founder of the so-called Prague school of physical chemistry. In his commemorating lecture, Professor Reiser remembers the times when they were creating together a brand new system of teaching physical chemistry that was inspired by the Anglo-Saxon way of textbook writing. Their textbook, *Physical Chemistry I and II*, published in 1960 is a timeless work according to many that did not take a wrinkle ever since.

Eduard Hála was not only a fine expert who shaped the scientific focus of the Institute of Chemical Fundamentals of the Czechoslovak Academy of Sciences (today the Academy of Sciences of the Czech Republic), but also a distinguished, inspiring, and warm personality. The following memories of his former students and colleagues bring in sufficient evidence for this.

Remembering a friend

The following lecture was delivered by Professor Arnošt Reiser at the Eduard Hála Symposium on Thermodynamics in Prague on the occasion of the 80th birth anniversary of the late Eduard Hála, on October 8, 1999. Professor Reiser not only

granted us a permission to reprint his lecture, but also added a very personal memory, that provides the only suitable ending to this brochure.

Ladies and Gentlemen, dear Friends,

I feel honored and privileged to be here with you remembering Eduard Hála at the start of this Symposium. I feel that way not only because I appreciate and admire Eduard Hála's work, but also because for many years Eduard Hála and I had been colleagues and friends, sharing many interests, scientific and otherwise. Our lives were running in parallel for a good stretch of the road, and when in 1960 my family tried to leave the country, Eduard was the only person we could confide in. He stood by us, and without a moment's hesitation gave us the crucial support we needed. I cannot begin to tell you how much we owe him.

Our friendship started in 1947 when we both joined the Institute of Physical Chemistry at the School of Chemical Technology here in Prague. After the German occupation ended, the School re-opened and the Institute of Physical Chemistry re-established itself sometime in 1946. The early days of the Institute remind me now of the American Goldrush. The personnel had been assembled hurriedly and without much regard to professional qualifications, and a number of adventurers had come in looking for easy pickings. Nobody seemed to be in charge, and for a time we lived in a state of primordial chaos. After a while people of like mind were drawn to each other, and at that point a small group of science enthusiasts crystalized around Eduard Hála.

Eduard had come from the laboratory of Professor Šandera at the Sugar Institute, and he was the only legitimate physical chemist among us. In common with the rest of us he held a profound belief in the moral value of science, and he had unlimited enthusiasm for physical chemistry. In addition he brought to the group a calm maturity of judgement and the rare ability to lead without seeming to do so. That was a great asset. Leadership was essential at that juncture when there was so much to do! What did we do? We started by carrying furniture into the offices and laboratories, we tried to set up experiments for the students to do, we were thinking of research subjects for ourselves etc. etc. All of this was then much more difficult than it is now. Even the simplest things were not available, and we had to follow the most unlikely leads to find glassware, chemicals and at least primitive instrumentation. To give you an example: one of our colleagues. Jiří Sládeček, was a genius in building scientific instruments, but he needed the basic parts to do it. He realized that some basic parts had literally fallen from the sky at the end of the war, and he scouted out two or three war planes that had crashed onto Bohemian soil. Eduard Hála then organized the rescue operation. The instruments on board the planes were transferred to our Institute, and a few months later a number of quite sophisticated optical experiments and others were set up on the benches of our student laboratory. In all these moves Eduard Hála had played an important part.

Eduard played an even more important part in another function of the Institute. There were no textbooks in Prague after the war. The Germans had done a thorough job of extirpating all the intellectual endeavor of the Nation. Our Professor, Ladislav Daneš, tried to create a textbook as he went along in his lectures.

He handed his notes for the next lecture to Eduard several days ahead of time. Eduard had to decipher the notes and complement them with information taken from English or German books and finally translate the whole into an actual text. We then typed this onto old-fashioned wax membranes and produced 500 copies on a hand-operated duplicator in the rector's office. That was almost a full time job for Eduard and for me, but it forced us to learn a good deal of Physical Chemistry and get acquainted with the literature. Much of the final work on these so-called "skripta" was done in the evenings at our homes, and pouring over the pages of the manuscript Eduard and I became close friends.

The presence of a Professor notwithstanding the Institute of Physical Chemistry functioned at the time like a small republic. There were of course tribal relationships and some political ones, but decisions were almost always made by consensus. In this again Eduard was a calming influence. His quiet authority pervaded the whole group and created a team spirit which proved to be more resilient than we realized. This became important during the Communist take-over. The tectonic changes which occurred at that time destroyed communities all over the country, but at the Institute of Physical Chemistry there was no rift and we continued to function in the same amicable spirit as before.

Then, something unexpected happened. About a year after the Communist take-over there was a big party at the Institute and the Professor participated in it. After the party two young women complained about Daneš's behavior, and because the girls were party members the incident made its way somewhere high up. Daneš was removed from the University and transferred into the Academy of Sciences. The next day the rector called in Eduard and asked him whether he could take over the Professorial lectures.

"The show must go on," the rector said, "you have to help us out here." Eduard agreed, on the condition that I share the task with him and that we alternate in giving the lectures. And that is what finally happened. Eduard went first and gave a wonderful, calm, and clear lecture. I was frantically preparing myself for the following Wednesday and survived that too. From the start we decided that we would not follow the Professor's plan, but would create our own lectures. We were surprised, and very pleased, when Physical Chemistry which had been a hated subject, became now quite popular.

What was different about our lectures? In Europe, chemistry had been very much a German science, systematic, serious, and sometimes complicated. Reading the English and the American textbooks we discovered a different world. In the Anglo-Saxon approach science was clearly meant to be useful and as easily absorbed as possible. The idea of retaining the simplicity of ideal gas thermodynamics by introducing the concept of activity was a revelation. It was so much more transparent, so much better adapted to the needs of the practical engineer. Together, we read the book by Lewis and Randall in what resembled prayer meetings, people sitting in all kinds of positions on the tables of Eduard's office and arguing the precise meaning of some of the more obscure sentences. We struggled to penetrate the material as deeply as we could and we immediately transmitted it to our students.

The second novelty was the use of corresponding states: the deviations of real systems from the ideal gas became similar for a large number of systems if their

Laboratory of chemical thermodynamics, ICPF CAS. Upper left T. Boublík, K. Hlavatý, E. Hála, J. Linek, lower left J. Miškovský, J. Vejrosta, I. Wichterle



state was expressed in terms of “reduced” variables, i.e. variables referred to the critical data of the materials. Generalized charts could then be constructed which made it possible to predict the behavior of real systems over a wide range of variables from a minimum of experimental information. We realized the practical importance of all this, but it was not entirely clear to us why it worked so well. There was still a residue of uneasiness which dispersed only when Jaroslav Koutecký started to teach a course in Quantum Chemistry at our school. We were well prepared when one day George Standart burst upon the scene. George was an American chemical engineer from Stanford who was a Communist and who had come to Prague to help advance the cause of Chemical Engineering. His lectures followed the “Chemical Process Principles” of Hougen and Watson where not only Thermodynamics was based on activities and corresponding states, but everything else too. George Standart’s lectures were a turning point in our education.

When Eduard and I started to feel more secure with the new approach, we thought we would like to write a book of our own. This plan came to fruition some years later. Eduard and I were supposed to each write one half of the text. In the end Eduard wrote more than two thirds. We wanted to build the subject of Physical Chemistry clearly on its fundamentals. None of the many textbooks at our disposal did this properly, and we thought we could do better. The first volume of *Fyzikální Chemie* came out in 1960, the second volume appeared a few years later. It was a great joy to see our book printed, bound and being used by the students. I had still seen the first volume appear in Prague, but soon after that our family moved to England, and I left the manuscript of my part of the second volume in our Prague apartment. The apartment was impounded by the authorities and it seemed that my work would be lost, but at this point the friendship among all of us at the Institute came again into play. Some of our Communist colleagues managed to get access to the apartment and rescued the manuscript. The second volume appeared later with all of my contribution printed. What is more: Eduard insisted that my name be retained on the title page, and our Communist colleagues must have supported him in that. Today, this sounds like a very nice gesture, at the time it was an act of heroism on Eduard’s part.

The center of our lives at the Institute was the laboratory. We lived in the laboratory from morning till night, including the students who had to be turned out forcibly at 10 pm when the administration did not tolerate further activities on the premises. In spite of this it must be said that we were not entirely consumed by science. Among other things, music became an important ingredient of our lives. Eduard was a good violinist and on some evenings he was joined by an even better violinist, Jan Klička from Analytical Chemistry, by an excellent cellist, and by me playing the viola. We would plow through a good part of the classical quartet repertory, and we later co-opted a wonderful pianist, Vlasta Boháčková of the Department of Physical Chemistry at Charles’ University, and other string players to perform piano quintets and larger string ensembles.

To illustrate the intermixing of music with our lives at the Institute let me tell you this anecdote: Eduard came to the Laboratory one morning carrying a big pile of sheet music. He had been at the music store in town and had found Voříšek’s *Missa Brevis* there. He bought the score and all the parts and we were just

inspecting them when Eduard looked around at the forty or so students present and said: "Anybody here can read music?" Tentatively, a few hands went up. We handed out the parts, and after a shaky start we premiered to everybody's delight the Kyrie Eleison right there in the laboratory of Physical Chemistry. There are not many universities in the world where you could have done that.

This incident had a sequel. We had so much enjoyed our choral singing that all of us were secretly hoping that some day we might perform the Missa Brevis in a real church. Somebody discovered an abandoned pilgrimage church high up in the mountains of Northern Bohemia. We assembled a group of friends, borrowed an open truck and drove to the church overnight. During the day we rehearsed the Mass thoroughly, and the plan was to return the next day, which was the Sunday of Pentecost, and perform the Mass without stopping, just for ourselves. When we did arrive at the church next morning it was full of people, and the vicar greeted us at the door. Somebody had seen us on the open truck with our instruments and had spread the rumor that the National Theater had come to the region. People from the surrounding villages had walked long distances to reach the church and the vicar had come from a larger town. We were deeply embarrassed and not ready for this, but there was nothing for it, we had to go up to the choir, our organist started

Department of Physical Chemistry of ICT Prague in 1958. Lower row sitting down E. Erdős, A. Reiser, E. Hála



the Introitus, fortissimo, and at the right moment we burst into the Kyrie. It sounded great in the full church, and we calmed down. One of our group knew the order of Mass and he made us pause at the right moments and sing the responses. All went well. What could have been a catastrophe ended in a friendly get together with the parishioners.

Some time after the establishment of the Institute most of us had found research subjects. Eduard who had been closely concerned with the building of the student laboratory had realized the great advantages of a glass blowing workshop in combination with an instrument maker. There is an American saying: "If all you have is lemons, make lemonade!" With a glass blower and with Jiří Sládeček at hand, complex glass apparatus with all kinds of control instruments were built, and that is how a number of sophisticated distillation experiments got under way. The data generated by these experiments turned out to be very helpful to people in industry who had to design and to run integrated chemical production lines. Within a very short time the work of the Hála group at the School was respected as useful and important. As an underpinning of the experimental work Eduard developed the thermodynamics of vapor-liquid equilibria from the fundamentals to the point of actual practice. This combination made it possible to describe the behavior of practically important systems in a compact and usable manner. An uncommonly successful field of research had been established.

Eduard was helped in this work by Jiří Pick, by Vojta Fried, a genius in complex calculations, and by Otakar Vilím. The four published many papers in Czech and in English, and the Prague school of liquid/vapor thermodynamics became accepted abroad. Eduard and the others decided to collect their experiences in a book. When it finally appeared it was soon translated into English by George Standart. The English version was published by the Pergamon Press in Oxford and became an instant success. There had never been a text that combined thermodynamic theory with experimental practice. This thoroughly practical book filled a real need in the laboratories of chemical plants, of distilleries etc. A few years later when I came to the West and was looking for a job at ICI and at other chemical manufacturers, the "liquid/vapor equilibrium" book was lying open on the workbenches wherever I interviewed. The book is still a classic, and Eduard and his friends became well known and respected all over the world. They were routinely invited to important thermodynamics meetings, and Eduard was elected to the presidium of the Czechoslovak Academy of Sciences. He used to quietly apologize for that, but he really did not have to. He deserved it more than anybody else, and I know that nobody in the world would have suspected him of careerism.

The rest you know. Eduard was made the head of the Institute of Chemical Process Fundamentals, the organization which is sponsoring this symposium. This Institute is well known and respected. In its way it is a unique institution which, to this day, carries Eduard Hála's imprint. Looking around and recognizing some of you which I knew when we were all much, much younger, and seeing the younger generation so clearly eager to continue the good work, I know that Eduard Hála did a wonderful job!

All the things I told you this morning are true, but they still do not quite convey the essence of Eduard's contribution to our lives. We all respected him and admired



Prof. Hála at the *Phase Equilibria* conference excursion 19 May 1957, Kowicz, Poland. From left to right W. Semenosenko, E. Hála, J. Proszty, St. Landa, G. Schay, T. Vrbaski, A. F. Kapustinski, W. Trabczynski, G. Rawicz, Al. Kraglewski, J. Stecki, H. Knopf, H. Kehiaian

J. Drahoš (non dated)



his work, but we had known him for a long time and, naturally, we took him for granted. What we could not see at the time, was that a whole generation of young scientists was gradually forming and growing up around him. A group of talented young people who had found a focus of activity with Eduard, and who are now sailing into the world. From the ashes of the German occupation a part of Czech Science had been reborn; at least in Physical Chemistry we had re-joined the world. That, I believe, is Eduard Hála's true legacy.

Arnošt Reiser

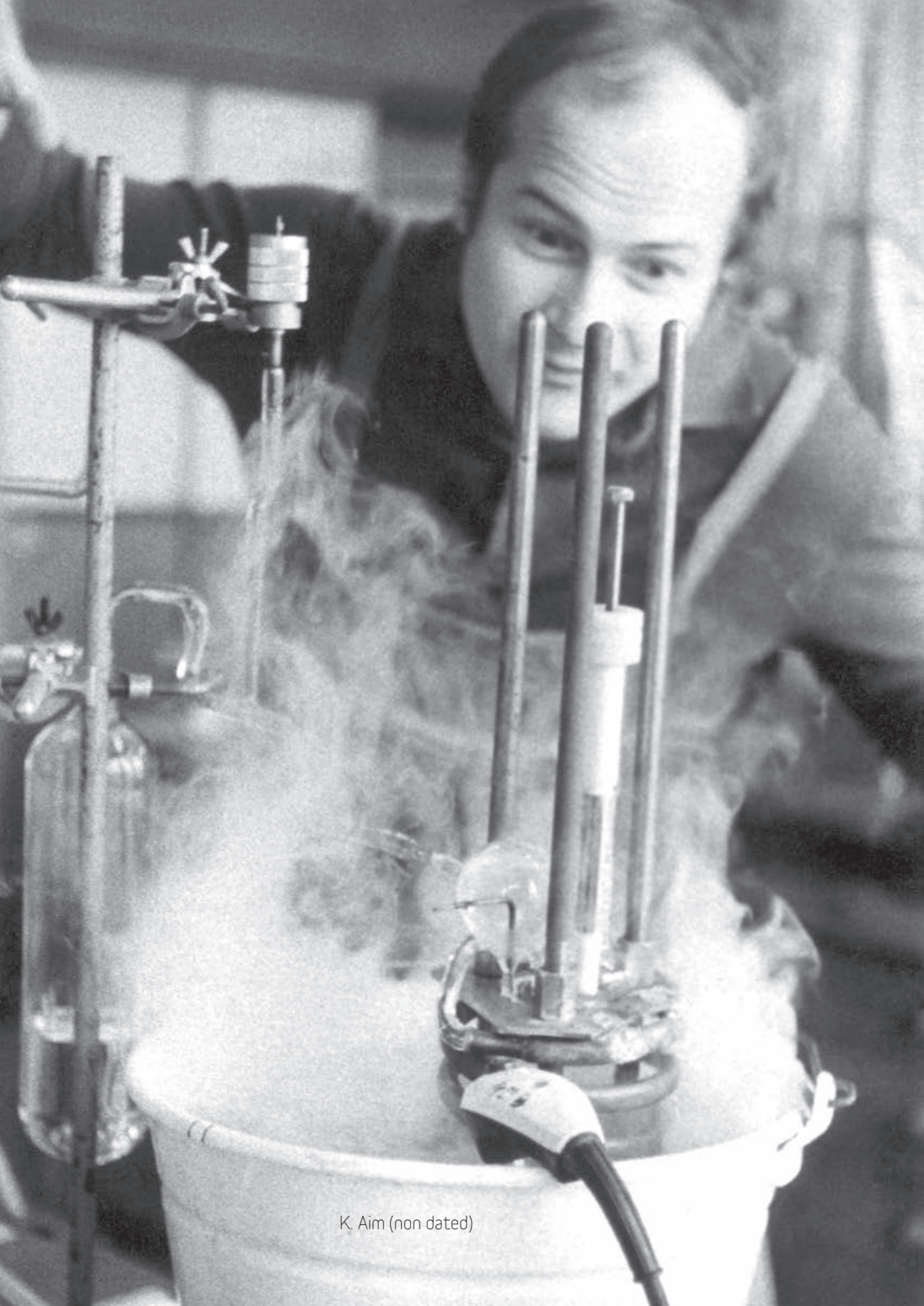
Drahoš, a good man

I got to know Professor Hála during my undergraduate studies in physical chemistry in the Summer Term of 1971 when, in his very own and unforgettable way, he taught us statistical thermodynamics. I then came to his office at the Institute of Chemical Process Fundamentals at the then Czechoslovak Academy of Sciences in Suchbátka to take the exam and was surprised to get an A grade. This helped me very much two years later when, still in uniform at the end of my military service, I applied for a PhD vacancy in his research group. The interview was a very short one; Prof. Hála had only had a brief look into his notebook and stated that on my exam, he noted "Drahoš – a good man" and that set it! I quickly found out on my stay in the Hála group that once Prof. Hála formed an opinion on someone, he wasn't very much willing to change his mind. This became evident several times to me: even when I would make a mistake and would expect him to hit the roof or at least show a gloomy face, Professor Hála would tend to look for excuses or at least downplay the situation. In this regard, my exam in chemical reaction kinetics that I took with Prof. Erdős as part of my PhD exams curriculum was perhaps one of my most terrible experiences. My performance on the occasion was somewhat messy. Therefore even though I passed the exam I started to apologize to Prof. Hála when he came to see me in the laboratory, saying I was an embarrassment to him and that I felt bad about the exam etc. Professor Hála only put his hand around my shoulders and comfortingly told me to never mind, because he was convinced that starting with a certain age, nobody should be examined, as this was in his opinion against nature. To have a good reputation with Prof. Hála thus really paid in my case, but the good man was most certainly him.

Jiří Drahoš

What would Hála possibly say about this?

I met Professor Hála for the first time in 1969 as an undergraduate student when I came to ICPF CAS to apply to be what was called "auxiliary scientific worker" and to discuss the topic of my master thesis with Tomáš Boublík. I have to admit that my horizon was limited then by the Institute of Chemical Technology in Prague and that I knew next to nothing about researchers in physical chemistry who worked at the Czechoslovak Academy of Sciences. Meeting Hála in person thus came with a certain amount of surprise; I had originally thought that Hála (who was by then already a classic, but whom I had never met at the ICT) emigrated, same as Arnošt Reiser.



K. Aim (non dated)

Hála was the principal author of the book *Vapour-Liquid Equilibrium* the English translation of which was published by Pergamon Press. At that time it was already an internationally appraised work – it was actually a very novel “cookbook” and in a sort of way a bible of every thermodynamicist and chemical engineer. An entire generation of postgraduates born around 1940 was brought up using this textbook; they became in 1970s world-renowned experts: Henri Renon, John O’Connel, Aage Fredenslund, Jakob de Swaan Arons, to name but a few. This became obvious to us (or at the very least to me) only stepwise and quite later on when we started meeting those colleagues during the first instances of the international CHISA congresses and then on gradually renewing our international contacts.

It was typical of Hála that when he “sized someone up” and selected the person as his collaborator, he started trusting them completely and they had his full support in every possible way. This showed fully in his generosity, patience, and with us the “young ones” in his leniency towards our small lapses of various kinds. Along with his reputation these were in my opinion the main ingredients of his unpretentious and I would even say inconspicuous way of leading people. The way he addressed someone was then a tell-tale sign of his mood – if it was your surname and you were on first-name terms, you had every reason to think that something went wrong. If, however, it was your first name, but without your being on first-name terms with Hála, you could feel good about yourself and even proud. I never heard Professor Hála raise his voice or scold someone.

A story in itself was Hála’s activity in the management bodies of the institute and of the Academy of Sciences. He was the only non-member of the Communist Party at the Presidium of CAS, so correspondingly Hála’s role was quite specific in the peculiar decision processes of those times. He had a strong sense of measure and therefore often must have been prone to frustration that he only shared with us in intimations. Attending official events related to his activities at the Presidium equally was not his cup of tea (“I’ve yet again had to sit it out, guys”).

Being human, even Professor Hála had his weaknesses. He liked playing chess, he also loved being a back-seat driver to others, but wasn’t a good player himself. He hated loosing though, so when in a spare moment he challenged one of us to a game of chess, we knew we would have to play for as long as to eventually let him win.

He was endowed with a sort of a sixth sense for the development of thermodynamics; even though the possibilities of communicating with the outer world were limited, he always had a remarkable up-to-date and broad knowledge of what was going on elsewhere, starting with experimental methods, over data analysis and processing using practical semi-empirical correlation relationships, to the development of equations of state based on statistical thermodynamics.

When he unexpectedly left us in 1989, we were quite baffled; what we felt for some time afterwards is difficult to describe and may perhaps be compared with the loss of a father. He would be turning seventy in December of that year. However, he was not there anymore to comment neither on the special issue of *Coll. Czech. Chem. Commun.* dedicated to him nor on the Velvet revolution events in November 1989.

It is worth noting that naming the thermodynamic laboratory at the ICPF in honor of Eduard Hála was an idea that did not come from us, but rather from Pro-



Laboratory of chemical thermodynamics, ICPF CAS in 1973. From left to right I. Wichterle, K. Procházka, K. Hlavatý, J. Mikšovský, K. Aim, J. Linek, T. Boublík, E. Hála. Sitting down J. Polednová

Laboratory of chemical thermodynamics, ICPF CAS in 1983. Upper left E. Hála, I. Nezbeda, J. Linek, I. Červenková, K. Aim, T. Boublík. Lower left I. Wichterle, Z. Wagner



fessor Jakob de Swan Arons (TU Delft) who suggested this at the 12th European Seminar on Applied Thermodynamics ESAT in 1991 in Berlin. I'm very happy that even after the reorganization that took place at ICPF at the beginning of 2014, the name of E. Hála remains alive in the name of the Laboratory of Separation Processes of the ICPF.

Spending 20 years of my life (I am reluctant to say of my career) near Eduard Hála was a gift from heavens. Even now I sometimes catch myself unwittingly thinking "what would Hála possibly say about this".

Karel Aim

I don't need anything from you...

I met Professor Hála as a student when he taught us statistical thermodynamics as external Professor at the Institute of Chemical Technology in Prague. At work, I am now sitting at the desk at which I sat down to take my exam with him. I don't recall the problem I was assigned anymore. I was deriving the required relationships and wasn't ready yet when Hála came to have a look. When he saw that I had already outlined the derivation logic he told me: "From this point on, it is only a mathematical exercise, no need to go on anymore." He made a word up for exercise, "macha" from the German verb machen.

As I was able to find out over the following years, Professor Hála was full of such one-liners. If he thought that someone's work was taking too long and that it wasn't leading anywhere, he would urge us to "rush to the goal". Even though he wasn't my supervisor, he was interested in what I was doing. Once he came into the lab and asked me: "Wagner, how's your trade going?"

The lab wasn't yet equipped with a commercial chromatograph at the time I was beginning to work there, we only had a device built in our local workshops. It was controlled by a JPR-12 computer, the programming of which I was trying to master as well. The output was printed using a teletype that would make noises similar to a machine gun fire. And our punched tape puncher made in Poland was no less louder than a pneumatic drill. Hearing those sounds, Professor Hála would sometimes come to see where they were coming from. Seeing the tape full of small holes streaming from the puncher he would say: "The entropy just wells up here!"

And sometimes Professor Hála only wanted a small break from his work. He would then come to the lab and say, "I don't need anything from you, guys, I only came to stretch my bottom."

Zdeněk Wagner

Don't bother me with petty business!

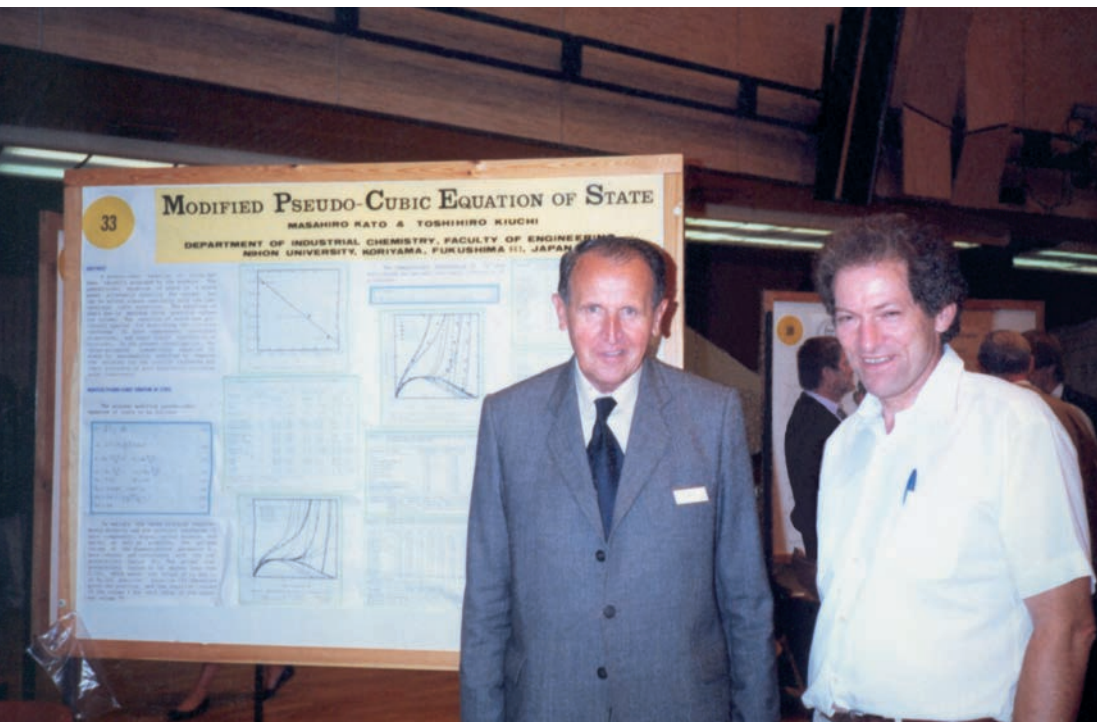
I'm currently the oldest member of the original Hála group at the ICPF and the memories are quickly fading away.

My first encounter with Hála took place at the Plumlov dam where we would often go bathing in summer when we were staying at our nearby family summer home. Some of the Hála's family used to live under the dam, in Mostkovice. It was there one day that with my brother we had an incident that almost spoiled our afternoon very soon after we had coaxed our father into going row-boating. On our way to the boat rental shop we were passing a beach court where Hála who



E. Hála Laboratory of Thermodynamics, ICPF ACSCR in 2009. From left to right J. Linek, M. Bendová, Z. Sedláková, K. Machanová, M. Lísal, I. Nezbeda, K. Aim, S. Pařez, I. Wichterle, J. Pavlíček, M. Předota, Z. Wagner

E. Hála and I. Wichterle at CHISA Congress in 1987



was an enthusiastic volleyball player was just having a game with his friends. The problem was, Dad got into a lengthy conversation with him, and our boating trip was getting delayed. We therefore started pestering Dad with “come on, come on, you promised...”, to shorten their meeting. I’m unable to recall the exact year in which this happened, but I think I wasn’t yet twelve years old then, so Hála must have been thirty two.

The following meeting was already a professional one. I became an intern at the Department of Physical Chemistry in my third year as undergraduate student at the Institute of Chemical Technology and took part in a laboratory exercise Hála designed specially for us; he taught me personally how to make glass ampoules for samples. However, I didn’t get to take the exam in physical chemistry with him, as he had just been sacked from the faculty for political reasons, but we kept in touch. I continued to work with him as his PhD student at the Czechoslovak Academy of Sciences and later as a member of his small four-member team that threw anchor at today’s ICPF in 1964.

It is worth noting in my opinion, that Hála was remarkably perspicacious, a fact illustrated by the following story. In 1962 the company Chemoprojekt organized one of the first courses in computer programming in Czechoslovakia; I was just beginning my PhD studies and Hála signed me up there without a clear idea (or any idea whatsoever for that matter) if that would be useful at all. However, the future development of science only confirmed his usually versatile intuition.

Hála’s main character features were his enormous magnanimity and nobility of character. In keeping with the saying “he gives twice who gives quickly” he was never mean. His liberal approach was quite harsh to us, his younger colleagues. I once had to leave earlier to run an errand, so I went to tell him. However, this made him angry and he told me to not to bother him next time with such petty business. He was convinced that everyone was responsible for their own work results. I’m not aware of anyone taking advantage of this.

Ivan Wichterle

Hála across disciplines

I met Eduard Hála while I studied chemistry at the Institute of Chemical Technology in Prague between 1947–1948; he had then recently been hired as junior lecturer and was our physical chemistry laboratory exercise supervisor. I remember him very well as a person who never acted superior with his younger colleagues and students, and would willingly provide consultations without depreciating the work of students.

Even later on, I would look for his expertise in chemical thermodynamics; he gave me a copy of J. W. Gibbs’ original work. I also remember him as an excellent volleyball player, volleyball was then played on the empty space right in front of the school’s main entrance. He later also told me about his interest in music (he played violin) and his chamber music ensemble that he formed with other colleagues from the faculty.

He and E. Erdős had to leave ICT during the communist purges that happened in about 1958, although the three of them formed then together with A. Reiser an amazing team of physical chemists. All of us non-communists were concerned

about this unfair matter and worried about further development. Fortunately, prof. F. Šorm was able to balance these political decisions and as President of the Czechoslovak Academy of Sciences provided posts for both scientists at the Academy.

In later years, Prof. E. Hála became one of the distinguished and most respected members of the CAS management. To me, he was an example of a person strongly interested in science who without arrogance and without relying on acquaintances was able to become one of the significant leaders of the Academy and contribute to shaping and management of this influential institution. I will forever remember him as an outstanding scientist, erudite scholar, and noble person. *Jan Hlaváč*

| Harrowing of Hell

In 1958 we decided with Ruth to leave the communist Czechoslovakia to spare our children from police harassment. Eduard Hála was the only person in whom we confided with our plans. We knew we could trust Eduard completely.

We needed money to realize our plan, so we started looking around our flat for things to sell. We had an original print from 1500, “Christ in Limbo (Harrowing of Hell)” by Dürer that we inherited from our parents. We took the woodblock print into the State Antiquarian Bookshop at Malá Strana in Prague. Their expert, Mr. Šenborn (formerly count of Schönborn) tried to talk us out of selling the piece, but we stubbornly stood our ground and sold the print. Then we continued to prepare our escape.

We finally succeeded to flee and I was hired by the Kodak research laboratory in London. Several years later, Eduard obtained a permission to travel to England to a conference. We picked him up at the airport and took him home immediately. When Eduard opened his suitcase, there on top lied the Dürer print. Eduard bought it in the Antiquary Bookshop where we had sold it and brought it to us to England. And so the only object from our parents’ legacy could remain in our family. This memory is typical of Eduard Hála, a selfless and honest man.

Arnošt Reiser, March 2014

| In their memories, the authors make reference to the following works:

E. Hála. *Rovnováha kapalina-pára*. Nakladatelství ČSAV 1955; E. Hala, J. Pick, V. Fried, and O. Vilím. *Vapour-Liquid Equilibrium*. Second English edition. New York: Pergamon press 1968; Lewis, G. N., Randall, M. Revised by Pitzer, K. S. & Brewer, L. *Thermodynamics* (2nd Edition). New York, United States: McGraw-Hill Book Co. 1961.

Institute of Chemical Process Fundamentals AS CR, v. v. i.

Institute of Chemical Process Fundamentals of the Academy of Sciences of the Czech Republic, v. v. i., is one of the six institutes belonging to the AS CR chemical sciences section and is a research centre in a variety of fields such as chemistry, biochemistry, catalysis and environment. The institute was founded at the Czechoslovak Academy of Sciences in 1960 and, from its beginning, was intended to be a multidisciplinary research institution.

Its founder and first director, Professor Vladimír Bažant, was a chemical technologist with a broad perspective who valued modern concepts without which development of new processes would not be possible. This led him to invite Professor George L. Standart, a chemical engineer and a US native, who paved the way for the development of chemical engineering in the former Czechoslovakia in the 1950s and 60s. Chemical engineering research could not be done without a solid base in physical chemistry. This field of research was brought into the institute by the arrival in 1964 of Professor Eduard Hála and his team of physical chemists to the newly built site in the Prague suburban area of Suchbátka-Lysolaje.

Successively, new disciplines of chemical engineering and chemical technology research were being developed such as reaction engineering, homogeneous catalysis, studies of non-Newtonian fluids, sublimation, separation processes, dynamics and control of chemical systems etc.

In 1989 several restructurings had been carried out that led to a gradual decrease of staff by 50%. The research was rationalized into today's institute's structure.

Eduard Hála Laboratory of Separation Processes

As a consequence of reorganization at ICPF, the standalone Eduard Hála Laboratory of Thermodynamics became part of a larger E. Hála Laboratory of Separation Processes in 2014. The original Hála group, the Laboratory of Chemical Thermodynamics, joined the ICPF in 1964 after leaving the Institute of Physical Chemistry of CAS.

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