

In memoriam

Prof. Dr. Sc. Božidar Grabarić
(December 19, 1942 – August 13, 2012)

On Monday, 13 August 2012 at the age of 69 Prof. Dr. Sc. Božidar Grabarić, a retired professor from the Faculty of Food Technology and Biotechnology of the University of Zagreb, passed away. It was an inevitable ending of his ten-year struggle with illness, during which he had faced death several times. He made it through this difficult period with loving and tender care of his devoted family. The last months of his life he spent with his wife in the wonderful surroundings of Opatija, Brijuni, Portorož, and the hometown of his ancestors Premantura – places washed by the sea he loved so much. His health improved during that time, and it seemed things were looking up (was it euphoria before death?). But then his big and good heart suddenly and without any warning stopped beating; nevertheless, it seems that he left us calm and happy.

B. Grabarić was born on 19 December 1942 in Zagreb, and graduated from Faculty of Technology of the University of Zagreb in 1967, under the supervision of Prof. Ivan Filipović. During his diploma work, this Nestor of chemistry woke in young Grabarić great curiosity and passion for science, which stayed with him his entire working career. Further steps in Grabarić's education in chemistry were imprinted in his Master's thesis (1969, Faculty of Pharmacy and Biochemistry, University of Zagreb) and PhD thesis (1973, Faculty of Technology) with the topic of spectrophotometric studies of organic complexes with cobalt(II), nickel(II) and copper(II).

Recognizing his scientific and teaching potential, Prof. Filipović supported his appointment as an assistant in 1967. In 1975 he was promoted to assistant professor, in 1979 to associate professor and in 1985 to full professor (all at the Faculty of Technology, University of Zagreb). For many years he performed his duties as Head of the Department of General and Inorganic Chemistry. Upon returning from Spain, where he was invited as a visiting professor, Prof. Grabarić moved to the Faculty of Food Technology and Biotechnology, where he succeeded Prof. Piljac as head of the Laboratory of General and Inorganic Chemistry. Following the scientific activity in the area of electrochemistry, promoted by B. Grabarić, the laboratory was renamed into Laboratory for General and Inorganic Chemistry and Electroanalysis. Until his retirement in 2008, Prof. Dr. Sc. B. Grabarić remained head of that Laboratory.

Prof. B. Grabarić, despite being highly dedicated and committed lecturer, whose lectures were many a time rewarded by an applause, was by vocation a true scientist. In his desire for perfection and acquiring new knowledge he early decided to go into the world, but he was always careful in choosing who to collaborate with, always selecting centers of excellence. The first step in his scientific education was a two-year (1975–1977) postdoctoral fellowship at the Department of Inorganic Chemistry, University of Melbourne, Victoria, Australia, where he worked with Prof. Alan M. Bond. He also spent some time as a visiting scientist at the Department of Chemistry, Northwestern University, Evanston, Illinois, USA, working with Prof. Donald E. Smith, and at the New Mexico State University, Las Cruces, New Mexico, USA, where he worked with Prof. Joseph Wang (within an international joint project YU-US/EPA no. JFP 769). As a renown scientist and lecturer, between 1993 and 1998 Prof. Grabarić was a visiting professor in the group of Prof. Miquel Esteban and Enric Casassas *professor emeritus* at the Department of Analytical Chemistry, University of Barcelona, Catalunya, Spain, and later on in a group of Prof. Jaume Puy at the Department of Chemistry, University of Lleida, Catalunya, Spain.

Early scientific papers of Prof. Grabarić are related to coordination chemistry – an area to which he would return even in his later research. He published more than twenty manuscripts on this topic, in which spectrometric and electrochemical behaviour, as well as determination of stability constants of more than 60 carboxylate and carbonyl complexes or complexes with crown ethers and Schiff's bases are described. Since the reliable determination of stability constants requires precise measurements and often complex computations, Prof. Grabarić very early envisaged the potential of the use of computer-aided instruments in chemical experiments.

As a result of joint efforts of Professors B. Grabarić, M. Tkalčec and I. Piljac, the Department of General and Inorganic Chemistry of the Faculty of Technology was already in the mid-1970s, a time when computers were still a rarity, among few electrochemical laboratories in the world that were able to perform fully computerized polaro-

graphic measurements. In over fifteen scientific papers, published between 1975 and 1982, Prof. Grabarić describes the application of computerized electrochemical instruments in solving the problems of the background current correction in polarographic separation of overlapping voltammetric signals, determination of stability constants of complexes using voltammetric methods, as well as the study of kinetics and mechanisms of electrochemical reactions. Among these papers special mention needs to be made of the ones in which the advantages of digital computers (precise time control and the ability of synthesis of a complex excitation signals) were exploited in the development of electrochemical measuring techniques and in studying the kinetics of fast electrochemical reactions with complex mechanisms; some of these works were among his most cited ones. Prof. Grabarić was occupied with solving the problems of the resolution of complex voltammetric signals and the research of complex chemical equilibria by electrochemical methods even in his later research. During his stay in Catalunya, Spain he published a series of papers related to the application of multivariate resolution techniques to the analysis of global voltammetric signals and study of consecutive equilibria of weak complexes, and showed the advantages of such approach in cases when classic ('hard') modelling was not possible because of insufficient knowledge about the nature and number of equilibrium species. As first examples of the application of multivariate techniques in electrochemical research of complex equilibria, these manuscripts had a significant impact. At the same time, the research team of Prof. Grabarić at the Faculty of Chemical Engineering and Technology of the University of Zagreb, following his ideas, started research of the development and application of electrochemical biosensors, which opens this at that time rapidly expanding field of research for the first time in Croatia.

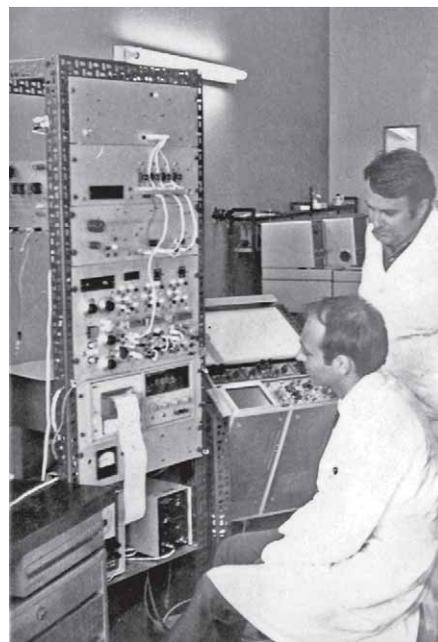
When Prof. Grabarić returned to Croatia, this research intensified and expanded in collaboration with related research groups, resulting in the development of new potentiometric and amperometric sensors for determination of surface-active substances, as well as analytes important in clinical chemistry and food analysis. Prof. Grabarić remained dedicated to this area of research until his last days – the last of his papers about biosensors was published only a month before he left us forever; thus he left a trodden path full of ideas that will inspire his younger colleagues for quite a while.

The results of Prof. Grabarić's research are presented in more than 70 scientific publications, among which most significant articles were published in renown journals such as *Analytical Chemistry*, *Analytica Chimica Acta*, *Inorganic Chemistry* and *Journal of Electroanalytical Chemistry*, and three of these papers have been cited between 51 and 69 times, while total citation (according to ISI WoS) until 2012 was 877.

As a world-renowned scientist who was occupied with an interesting and prosperous scientific field, Prof. Grabarić was often invited as a lecturer to scientific meetings, in numerous institutions, factories or professional societies. He was excellent and resourceful teacher and he was in charge of different under- and postgraduate courses at several university institutions in Croatia and abroad on the subjects of general and inorganic chemistry, stoichiometry, chemical sensors and chemometrics, coordination interactions and equilibria in solutions, computerized electrochemical instruments, and experimental planning and data analysis.

It is known that Wilhelm von Humboldt (as founder of the University of Berlin in 1810) changed the scholastic approach of rational pragmatism with a concept of unity of teaching and research (*Einheit von Lehre und Forschung*). Prof. Grabarić fully followed Humboldt's principle and introduced into teaching the results of his scientific research, which was manifested even more at the postgraduate level. We are witnesses that the Bologna Process, especially the bachelor's degree study, in Croatia, as well as at many European universities (see e.g.: K. P. Liessmann, *Theorie der Unbildung, Die Irrtümer der Wissensgesellschaft*, Wien, Paul Zsolnay Verlag, 2006) has almost completely erased the scientific component from the schooling. Prof. Grabarić was one of few professors who bitterly opposed this 'rationalization' and stereotyping. Although this opposition had cost him his health, it was a logical consequence of his erudition and a reflection of his firm belief that 'Croatia is too small to allow narrow specialization', instead for the prosper of all, 'everybody needs to know everything' – the thoughts he stubbornly tried to implement into generations of his students.

In the end, it seems appropriate to quote Horatius Flaccus from *Carminum Libri III: Exegi monumentum aere perennius* (I have erected a monument more lasting than bronze). Without any exaggeration, this thought applies to life achievements of Prof. Grabarić, especially to the milestones he set in the development of electrochemical science.



Professors B. Grabarić (right) and M. Tkalčec working with a home-made polarographic instrument (mid-1970s, Laboratory for General and Inorganic Chemistry, Faculty of Technology, University of Zagreb)