REMEMBERING PROFESSOR BOŽO TEŽAK

Božo Težak and *Croatica Chemica Acta*

Professor Božo Težak (1907–1980) became member of the Editorial Board of *Croatica Chemica Acta*, then named *Arhiv za kemiju* (Archive for Chemistry), 50 years ago in 1949. Since he has been the most influential and ground-breaking Editor-in-Chief of *Croatica Chemica Acta*, we have decided to commemorate this anniversary by telling the story of his editorship of our journal.

Božo Težak was one of the most devoted members of the Croatian Chemical Society (established on January 23, 1926). He served the Society first as Secretary General (1946–1950) and then as President (1952–1954). Težak was appointed Editor-in-Chief of *Croatica Chemica Acta* at the annual assembly of the Croatian Chemical Society on March 25, 1953. He realized the importance of the Croatian Chemical Society and the *Croatica Chemica Acta* for the Croatian chemical community at large. Sadly, the Croatian Chemical Society never reached the level of influence that he was hoping it would. However, *Croatica Chemica Acta* became an internationally recognizable chemistry journal and the leading Croatian scientific journal through his efforts and efforts of his close collaborators.

When Težak took over *Croatica Chemica Acta*, the Editorial Board was made up of four members (Petar Alaupović (1925), Ivan Filipović (1911–1998), Eugen Guštak (1916–1975) and Dionis Sunko (1922)) and he was assisted in running the journal by two assistant editors (Egon Matijević (1922) and Velimir Vouk (1919–1984)). This was the beginning of a new era for *Arhiv za kemiju*. Before being taken over by Božo Težak, *Arhiv za kemiju* was a small and inconspicuous chemical journal with articles of variable quality, though some excellent papers appeared in it, *e.g.,* those written by Vladimir Prelog (1906–1998; the Nobel prize co-winner in 1975). As soon as Težak became Editor-in-Chief, he turned to the future and started introducing changes into the editorial policy. In the Editorial to Volume 25 (1953) of *Arhiv za kemiju*, Težak exposed his conception of running the journal. The authors were advised to submit manuscripts in one of the major world languages (later on, in *Croatica Chemica Acta*, English became the only language used by authors since English had become the *lingua franca* of modern science) and the acceptance criteria became stricter. Težak's efforts to have the articles published in foreign languages met with fierce opposition from people who maintained that *Croatica Chemica Acta* should be a na-

tional journal for chemistry, publishing papers in Croatian only. There were also those who tried to make *Croatica Chemica Acta* a Yugoslav journal (with articles written in the languages of the Yugoslav peoples). Težak succeeded in overcoming these national and Yugoslav trends, and the success of the journal is the result of its international orientation.

Papers received for publication started to be sent to referees, both in Croatia and abroad. At first, manuscripts by Croatian authors were sent to a foreign and to a domestic referee while, later on, only to foreign referees. Starting from Volume 26 of *Arhiv za kemiju* (1954), card files were introduced with abstracts written according to the rules of the Chemical Abstracts Service (CAS). Cards with abstracts were taken over by CAS and they have been directly published in Chemical Abstracts.

The year 1955 was very tempestuous for the journal. A motion to change the name *Arhiv za kemiju* into *Croatica Chimica Acta* was submitted to the annual assembly of the Croatian Chemical Society, held on February 16, 1955 in the main lecture hall of the Department of Chemical Technology, Technical Faculty, at Marulićev trg 20 in Zagreb. The motion was signed by Krešimir Balenović, Božo Težak, Karlo Schulz, Dionis Sunko, Petar Alaupović, Egon Matijević, Velimir Vouk and Josip Kratohvil. In another motion, Professor Drago Grdenić proposed the name *Arhiv za kemiju Hrvatskog kemijskog društva* (Archive for Chemistry of the Croatian Chemical Society). This motion was supported by Professor Tomislav Pinter (1899–1980), the then president of the Croatian Chemical Society. After a long and exhausting discussion, it was decided to conduct a poll among the members. The following three choices were offered:

1. To leave the name *Arhiv za kemiju* unchanged. (Four expositions were given to support this proposal. The first was signed by Tomislav Pinter and co-signed by Drago Grdenić. Vladimir Njegovan (1884–1971; the first editor of the journal) was the author of the second exposition while the third was signed by Karlo Weber, Dragutin Tomić, Jelena Frketić, Mirjana Lokar, Ivo Broz and Rajka Kostelac. The fourth was authored by Ivan Brihta and co-signed by Vladimir Mladina, Pavica Luetić, Teodor Vrbaški and Dalimil Vranjican).
2. To change the name into *Croatica Chimica Acta*. (The exposition was signed by the eight above mentioned chemists, led by Krešimir Balenović and Božo Težak, all of whom participated in the work of the Editorial Board of *Arhiv za kemiju*. The name *Yugoslavica Chimica Acta* was also mentioned in their exposition).
3. To change the current name into *Arhiv za kemiju – Acta Chimica Croatica.* (This compromise proposal was made by Viktor Hahn (1912–1970).)

The majority of the Croatian Chemical Society members chose the name *Croatica Chimica Acta* (60%), however quite a few voted for the old name *Arhiv za kemiju* (29%). The third proposal obtained only 11% of the votes.

The results were announced at the extraordinary assembly of the Croatian Chemical Society, which was held on April 20, 1955. However, another activity was going on parallel to the polling. It was led by Professor Težak on behalf of the Croatian Chemical Society and was aimed at examining the opinion of chemical societies in other Yugoslav republics about renaming *Arhiv za kemiju* into *Yugoslavica Chimica Acta*. Luckily for the fate of *Croatica Chemica Acta*, the Serbian Chemical Society was against this proposal because they did not want the Croatian journal to become Yugoslav. This was the reason why they supported the Croatian name *Croatica Chimica Acta*. The mentioned assembly of the Croatian Chemical Society finally decided that the name *Arhiv za kemiju* was to be changed, but no agreement was reached about the new name (*Croatica Chimica Acta* or *Yugoslavica Chimica Acta*).

The third and final round of the fight for the new name for *Arhiv za kemiju* took place at the annual assembly of the Croatian Chemical Society on January 25, 1956. Like the preceding two assemblies, it was held in the main lecture hall of the Department of Chemical Technology of the Technical Faculty, at Marulićev trg 20, Zagreb. After a long and sporadically trying discussion, Professor Težak's proposal of *Croatica Chemica Acta* was adopted, with the provision that *Documenta Chemica Yugoslavica* should be written above that name on the front page. The adjective *Chimica* was changed into *Chemica* as more correct in Latin, though both terms are found in the Latin names of international journals, *e.g.* Helvetica *Chimica* Acta and Acta *Chemica* Scandinavica. Thus, the era of the journal under the name *Croatica Chemica Acta* started in 1956, and Božo Težak remained its Editor-in-Chief for 25 years, until his premature death of a heart attack in 1980. The name *Croatica Chemica Acta* has been kept until today while *Documenta Chemica Yugoslavica* disappeared together with the artificial state called Yugoslavia and the establishment of free and independent Croatia.

The Editorial to Volume 28 of *Arhiv za kemiju* (1956) explained the reasons for the change of its name into *Croatica Chemica Acta*. The change was motivated by the often confusing citations of *Arhiv za kemiju* (Arhiv kem.) as Arkiv Kemi, the abbreviation of the much better known chemical journal *Arkiv für Kemi,* published by the Swedish Academy of Science. The choice of the name *Croatica Chemica Acta* was supported by the following arguments:

1. The Latin name indicates that the articles are written in one of the major world languages;
2. Croatica indicates the national origin;
3. *Croatica Chemica Acta* was chosen in place of *Acta Chemica Croatica*, which would be more in the spirit of the Latin language, because there are many journals whose names start with *Acta*, and therefore *Croatica Chemica Acta* would be less distinguishable.

Names under which the journal *Croatica Chemica Acta* has been known since its foundation until today are:

1927–1938 *Arhiv za hemiju i farmaciju* (Archive for Chemistry and Pharmacy)

1938–1939 *Arhiv za hemiju i tehnologiju* (Archive for Chemistry and Technology)

1939–1941 *Arhiv za kemiju i tehnologiju* (Archive for Chemistry and Technology)

1941–1945 *Kemijski vjestnik* (Chemical Gazette)

1946–1956 *Arhiv za kemiju* (Archive for Chemistry)

since 1956 *Croatica Chemica Acta*

Under Težak's editorship, *Croatica Chemica Acta* became a scientific journal of international reputation. The number of articles as well as their quality have been increasing since 1956. Papers are refereed pursuant to international standards. Each paper is sent to two referees, three or more if necessary. Referees are chosen among international authorities in the field of the paper. The Editorial Board got gradually rejuvenated. Dr Siniša Maričić, who succeeded Božo Težak as Editor-in-Chief, joined the Editorial Board in 1959. The current Editor-in-Chief, Dr Nenad Trinjastić, became a member of the Editorial Board in 1967, and Professor Vladimir Simeon, who served as Editor-in-Chief after Maričić, in 1968. All editors after Professor Težak have accepted and extended his editorial policy, thus creating a journal that has become an established chemical quarterly, publishing papers that cover all fields of chemistry, that is, physical and theoretical chemistry, organic chemistry, biochemistry, inorganic and structural chemistry, analytical chemistry, materials chemistry, marine chemistry and occasionally papers from the history of chemistry.

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Božo Težak and Communication with the Scientific World The *Ruđer Bošković* Conferences on the Chemistry of Solid/Liquid Interfaces

Looking back at the fate of the Zagreb school of colloid chemistry, an important part of Težak's activities was communicating with the colloid chemistry world. He realized that scientific papers in the English language, as a medium of communication, were of utmost importance both to him and to the domestic science establishment already in the 1940s and early 1950s, long before his peers admitted it. Težak was keen on advancing his own ideas on colloid stability, which were running against the mainstream of the international colloid science. He often came into conflict with reviewers and their critique of papers from a peripheral country, which were only reluctantly accepted. It became obvious early on that it was necessary to go beyond scientific publications, and to engage in direct, face-to-face communication with his peers at international gatherings. It is the aim of this paper to highlight the Conferences on the Chemistry of Solid/Liquid Interfaces that were held in Croatia between 1969 and 1989. The first five Conferences (1969, 1970, 1972, 1975 and 1979) were attended and strongly dominated by the ideas and contributions of Professor Težak. In the many years of the Conferences, the organizational framework and the ideas behind them were causing many disputes, even divisions among the organizers, and sometimes heated discussions about their direction and purpose.

International discussions on the theory of stability of colloids and on the electrochemical double layer, initiated in the late 1930s, were continued in the post-W.W.II years, featuring the priority disputes between the Russian school of Deryaguin and Landau, and the Dutch school of Verwey and Overbeek. These were marked by two discussions of the Faraday Society (now a division of the Royal Society of Chemistry), one in Sheffield in 1954, and the other in Nottingham, in 1966. Little room was left, or time devoted to ideas Težak had been advancing in his early publications, promoting the colligative properties of matter and chemical specificity as the main forces of colloid stability or coagulation. By 1954 the Dutch school had conceded that Deryaguin and Landau were the initiators of the theory, that they achieved it independently, elaborated and advanced it in publications during the Second World War. Since that time, the theory of colloid stability has been known under the acronym DLVO.

In the mid–1960s Težak finally started to attract some attention from two distinguished US scientists, notably Victor K. LaMer (Columbia University, New York) and Albert C. Zettlemoyer (Lehigh University, Bethlehem, Pa.). Much of this attention was the result of the work of Egon Matijević, who after a year in Cambridge (1956) immigrated in 1957 to the USA, taking up a professorship at Clarkson University in Potsdam, N.Y. At a pre-

cious occasion, during the Faraday discussion in Nottingham in 1966, when LaMer was apparently taking seriously Težak's arguments on the shortcomings of the DLVO theory, particularly based on experimental evidence of the chemical specificity in colloid interaction, he unfortunately and unexpectedly passed away. With this opportunity lost, and with no forceful backer of his ideas behind him any more, the dispute on the theory of colloid stability seemed to have been settled in favor of the, slightly modified, but generally accepted DLVO theory.

After my return from an extended stay at Lehigh University (1964–1967) and working with Professor Zettlemoyer, I discussed the implications of the seemingly settled dispute and the demise of LaMer for the future of colloid and surface chemistry in Zagreb, particularly at the *Ruđer Bošković* Institute. An idea was coined between several of us (Božo Težak, Mirko Mirnik, Marko Branica and myself) that the liberalization of the political scene in the then communist Yugoslavia, was allowing us to enter the world scene by organizing an international Conference of our own design to be held in Dubrovnik/Cavtat in the summer of 1969. Težak and Mirnik were overwhelmingly concerned with their critique of the DLVO theory of colloid stability and in promoting their own ideas, while the two of us, scientists in our late thirties, were insisting on a broader outlook onto the newest theoretical and experimental developments in the fields of surface chemistry and electrochemistry. In preparing the Conference, invitations were sent to the Dutch school: Overbeek declined to attend, but suggested Johannes (Hans) Lyklema. The British colloid chemistry establishment was represented by Samuel Levine and Geofrey Parfitt; the theory of the electrochemical double layer was most notably represented by Roger Parsons. Our insistence on scientists excelling in related fields brought to us Werner Stumm (at that time at Harvard, later on at ETH, Zürich), Al Zettlemoyer, John Turkevich and George Nancollas, to name only a few. For a number of years these scientists formed the core group of Conference lecturers. Great credit is due to Professor Težak for the fact that he, from the very beginning, agreed to and actively supported this multidisciplinary format of the Conference.

It would suffice to look into the proceedings of that Conference to see its full success. Težak used the opportunity to sum up more than 30 years of his endeavors in colloid chemistry. His contribution to the proceedings of the Conference was contained in two important papers.[1]

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[1] The first of these papers, under the title: Solid/Liquid Interfaces – General Introduction, *Croat. Chem. Acta* **42** (1970) 81–100 (in the special volume) was a general overview of his viewpoints. The second paper uder the title: Methorics of Precipitation from Electrolytic Solutions as Revealed through Relatinship between Concentrational Factors and Kinetics of Solid Phase Formation, *ibidem* **42** (1970) 351–362 (in the special volume) were examples of his experimental results.

The Conference was, however, dominated by Mirnik's presentation of his viewpoints on the ion-exchange theory of coagulation.[2] His advocacy of the alternative approach to the theory of stability of colloids was based on thermodynamics, showing a viable alternative to the DLVO theory. In the ensuing discussion at the Conference he was vocally opposed by Samuel Levine, who at the time was the most outspoken representative of a modified DLVO theory. Indeed, Mirnik's success lay in his being instrumental in the inclusion of the notion of chemical specificity, postulated by Težak, into Levine's modification of the DLVO theory. The dispute between Mirnik and Levine, the two proponents of adversary schools, at its height in the 1960s, resulted in a draw, and vanished from the frontiers of colloid and surface science in the next decade. Neither Težak's term *Methorics*, nor Mirnik's ion exchange based theory gained prominence among the followers of Overbeek.

An everlasting milestone of interfacial chemistry came at the time, unexpectedly, in the form of the paper by Stumm and collaborators,[3] published in the Conference Proceedings volume in *Croatica Chemica Acta*: this paper entered the list of 100 most cited papers in chemistry in the world, for the period between 1945 and 1990.

The quality of presentations and the high class of the, sometimes fierce, discussions, made us feel that we were on the right path. Enouraged by this success and the response of the international community, the Conferences adopted the title of the Chemistry of Solid/Liquid Interfaces and were organized again at short intervals, altogether 8 in 20 years. The specific feature was, besides the multidisciplinarity, a hybrid format of a Summer School and a Conference. The Summer School format offered young scientists and graduate students a competent, critical review of chosen fields of colloid, surface and electro-chemistry because new achievements were presented by distinguished active scientists of international stature. The true international character of the conferences was maintained by limiting the number of lecturers from one country: besides one or two Croatian scientists, there was always one lecture given by a scientist from Ljubljana (mostly in catalysis or biophysics) and one from Belgrade (from its distinguished electrochemistry group). The proceedings were entirely in the English language, and the collected papers were published in *Croatica Chemica Acta,* always within a year.[4]

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[2] M. Mirnik, Ion Exchange Theory of Coagulation and its Experimental Verification, *Croat. Chem. Acta* **42** (1970) 161–214 (in the special volume). The paper is a review of Mirnik's contribution to colloidal science, quoting most of his important work on this topic, including two crucial papers in *Nature* in 1961 and 1963.

[3] W. Stumm, C. P. Huang, and S.R. Jenkins, Specific Chemical Interaction Affecting the Stability of Dispersed Systems, *Croat. Chem. Acta* **42** (1970) 223–285.

The large number of junior scientists attending the proceedings strongly influenced the quality and directions of research conducted at the universities and the host Institute. Many useful contacts were established, thus promoting directed and planned exchange visits and fellowships for young scientists. Indeed, by the third conference, organized in 1972, co-sponsored, unofficially, as an Euchem Conference, the Conferences had gained an established place in scientific exchange.

It is interesting to analyze Professor Težak's contributions to the Conferences. In the 1970s, his principal field of work was shifting to scientific information and documentation, while he acted as director of the newly established Referral Centre of the University of Zagreb. Colloid chemistry took second place in his attention, and particularly the new direction of solid phase formation in biopolymer matrices, initiated in the Laboratory that he was still heading at the *Ruđer Bošković* Institute by his senior collaborator Helga Füredi-Milhofer.

Težak's opening lecture at the 1972 Conference[5] was a review of his lifelong endeavors to highlight the chemical specificity in precipitation phenomena. Three years later, in 1975, he offered an interesting »partisan review« of 75 years of research into precipitation, crystallization, coagulation and flocculation phenomena.[6] His opening address showed his respect for and devotion to the great old men, whom he rightly considered »unionists« of modern science: Albert Einstein, Jean Perrin, and The Svedberg. His paper was a rare and invaluable piece of an integralist view of developments in this important part of physical chemistry of ionic solutions, with carefully distributed credit for major contributions. This paper should be recommended to be read by everyone entering this field of science.

His final contribution to the 5th Conference of 1979 was a parting address, a monument to many years of research into the phenomena of precipitation, coagulation and flocculation phenomena of silver halides.[7] For

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[4] The Proceedings were published as follows: 1st: Vol. **42** (1970) No.2; 2nd: as a Conference was not published as a proceedings volume; 3rd: **45** (1973) No. 1; 4th: **48**(1976) No.4; 5th: **53** (1980) No.2; 6th: **56** (1983) No.4; 7th: **60** (1987) No. No. 3; 8th: **63** (1990) No. 3.

[5] B. Težak, Chemistry of Interfaces with Special Respect to Precipitation Phenomena, *Croat. Chem. Acta* **45** (1973) 1–11.

[6] B. Težak, 75 years of Study of Precipitation, Crystallization, Coagulation, and Flocculation in Ionic Solution – A Partisan Review, *Croat. Chem. Acta* **48** (1976) 391 – 421.

[7] B. Težak, Where are we in Explanations of Ionic Solubility, Precipitation, Coagulation, and Flocculation Phenomena (Processes of Aggregation as Spatial-temporal

the last time Težak raised his voice against the (over)simplified tenets of the DLVO theory: the balance between the van der Waals attraction forces and the electrochemical double layer repulsion, calling them »a serious hindrance to (the) progress in this field«. While his opinion and his viewpoints were seriously listened to, modern research was leaving the dispute unresolved, the DLVO theory accepted as the best available, and was redirected to some greener fields. The main features of the DLVO theory were used in many various instances, some of them in papers by Lyklema, Alan Walton, and George Nancollas, all of whom described, at one or the other of these Conferences, their new efforts in experimental approaches to the interaction of man-made and biopolymers with inorganic colloids.

Težak's manuscript for the Proceedings volume of the 1979 Conference was received on the same day that he passed away in 1980. The volume of *Croatica Chemica Acta* carried his photograph and an eulogy, but his written contributions, and even more his influence on establishing these Conferences, remain a lasting monument to a man who grew larger than the small Croatian scientific community ever warranted.

The 6th Conference in 1982 was dedicated to the memory of this great man. Most notably, Helga Füredi-Milhofer did not only present her own research into interfacial phenomena in biological mineralization but influenced the programming of the Conference by inviting and incorporating a sizeable number of authors and their papers that dealt with polymer adsorption and phenomena connected with interactions of biopolymers with solid particle matrices. Thus, Težak's ideas were spreading, being carried on by his students, into newer fields, commensurate with times, but far beyond topics he had ever dreamed of.

The new era of progressing specialization in scientific research, new directions taken by many scientists, and last but not least, the political disturbances and the war in Croatia (1990–1995) discontinued this series of Conferences. It might be that they have fulfilled their role and purpose, remaining a document not only of the times but also of the gigantic role Težak has played in colloid science.

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Indicators of Dynamical Structures in the Electrolytic Solution, the Emerging Solid Phase, and the Methoric Layer between the Solid-liquid Bulk Phase, *Croat. Chem. Acta* **53** (1980) 115–121.