*In Memoriam*

# Sergio Trasatti

## 1937–2021

Professor Sergio Trasatti, one of the leading figures in Electrochemical Science during the last sixty years, passed away on June 13, due to sudden illness, while still active in science and knowledge dissemination and still in work contact with a number of colleagues and friends.

Sergio Trasatti was born on March 13, 1937, in Fermo, near Ascoli Piceno. This region of the central Adriatic coast, with its natural beauty and wealth of monuments, was already inhabited by the Italic people of Picentes (AG, πικεντες) in pre-Roman times. His physical aspect, the imposing stature, dark hair and eyes, the noble trait, did to some extent reflect his ancestry. Long since settled in Milano and already a citizen of the World, he was always proud of his origin and preserved a slight residual picene accent, which made his Italian speech even more elegant.

His constant strong commitment to knowledge, indefatigable theoretical and experimental activity, then the high international acknowledgment of his production, never modified his human values, nor decreased his refined sense of humor. These components of his rich personality were fundamental to motivate younger co-workers and students in their work.

Scrupulous and effective in scientific meetings, in his different roles, as organizer, chairman, speaker or simple delegate, he never forgot appreciation of the cultural and human components accompanying the scientific experience. Those who had the opportunity to collaborate and entertain scientific exchange with him, could appreciate his open-minded and humble attitude, and his intellectual honesty.

Sergio Trasatti received his scientific education and professional training at the *Università Statale di Milano*, where he obtained the degree in Industrial Chemistry in 1961.

In 1964 he was already appointed lecturer of Metal Science, in the degree course in Industrial Chemistry. In 1967 he became assistant professor in the Institute of Electrochemistry of the *Università Statale*, where, in the group of scientists headed by Professor Giuseppe Bianchi, he started his research activity in the field of Corrosion Science. By 1980 he was appointed to the chair of Industrial Electrochemistry and in 1989 was called to take the chair of Electrochemistry. During his long and productive academic career, Sergio Trasatti extended his research to different areas of electrochemistry, from the correlations between electron work function and electrode properties to the thermodynamics of the Hg/solution interface, and from the characterization of platinum electrodes to electrocatalysis at dimensionally stable electrodes. In this context, it is interesting to observe that most of these activities were undertaken essentially in the same period, roughly between the end of the sixties and the end of the seventies. Those who had the privilege to work under his guidance in those years could fully appreciate the powerful and rigorous approach on which he constantly based his action: original and unprejudiced approach, extreme care in experiment performance, and exhaustive bibliographic documentation. Typically, on Saturdays, he used to devote time to accurate

check of the physical chemistry section of Chemical Abstracts, and all issues in any way correlated with electrochemical phenomena were systematically filed. This would be a major task even now, with all the available computer aids. A refined experimentalist, in the lab he could design and make parts of more complex pieces of equipment, and readily assemble them. In fact the capacitance bridge and the capillary electrometer, by which all the measurements on the Hg/solution interface were carried out, had been almost literally made by himself. Beyond methodology, as far as the research content is concerned, the practically simultaneous interdisciplinary development of different research themes took place within a thoroughly unifying, interdisciplinary, conceptual frame, allowing completely original interpretations and models. Sergio Trasatti investigated subjects like the congruence of adsorption isotherms of neutral species at the Hg/solution interface, the correlation of electron work function of metals and electrode properties, the components of electrode potential, under a unifying vision, as different aspects of the behavior of solvent and solute molecules adsorbed at the electrode surface. Along these lines, for instance, the question of the congruence of adsorption isotherms with respect to the electrical variable, was completely revisited in terms of dependence of isotherm shape parameters, like the lateral interaction one, on the electrical variable, in the form of charge density at the electrode surface or electrode potential. The same style and interdisciplinary approach can be readily recognized in his paper [J. Electroanal. Chem, **29**(1971) App. 1] on a completely different subject, that of $RuO_2$-based film electrodes, in the first fundamental contribution of which, based on electrochemical data, he demonstrated the metal-like conductivity of $RuO_2$, in substantial agreement with the conclusions from solid-state physics. But the fundamental work on electron work function in electrochemistry, and the set of papers on the prediction of electrochemical behavior of metals, based on their solid-state and surface physics, remains the best example of Sergio Trasatti's view of electrochemistry and its innovation. We should in fact consider that only a few years before, after preliminary measurements on Ga electrodes, the authoritative conclusion of D.C. Grahame was that there were no important differences between Ga/ and Hg/solution interfaces, and only the work of A.N. Frumkin and his school started producing important evidence showing substantial differences. The first acknowledgment of the importance of this part of Sergio Trasatti's work was expressed to him by A.N. Frumkin, with a letter of positive comments and encouragement to the young scientist. It was the beginning of friendly exchange between the two scholars. On the other hand, from the correlations between electron work function and electrochemical properties, a first indication on the anomalous behavior of Au and Ag could be found, whose interpretation revealed the importance of atomic density at the metal electrode surface, and a whole research field was generated, on electrochemistry at Au and Ag single-crystal faces, where, once more, Sergio Trasatti made a substantial and innovative contribution.

The innovative and extensive research carried out by him during more than fifty years was accompanied by an effective dissemination activity, through the classical media, like scientific papers and books and also through scientific meetings, where he has taken part as invited speaker, since the beginning of the seventies. An impeccable lecturer, clear in presentations and always rigidly respectful of lecturing times, he was also an effective organizer of very successful international schools and conferences, whose scientific and

social structure was always carefully planned in advance, and then scrupulously accomplished with success. Important among the many others, are the *10th European Conference Chemistry of Interfaces* (S. Benedetto del Tronto, 1988), *Progress in Electrocatalysis, Theory and Practice* (Ferrara, 1993), *IUVSTA Workshop on Surface Science and Electrochemistry* (S. Benedetto del Tronto, 1994), the *Celebratory 50th ISE Meeting* (Pavia, 5-10 September 1999).

A further contribution to knowledge dissemination was accomplished through his work in scientific boards of international journals, like J. Electroanal. Chem., J. Appl. Electrochem., and Electrochimica Acta, of which he was Editor in Chief in the period 2003-2013.

The success of dissemination through scientific papers is exhaustively witnessed by the outstanding bibliometric parameters. With more than 270 papers, 20 chapters Sergio Trasatti has reached a number of citations around 18.000, with an h-index of 63. Citations in 2020 were more than 1000, and already almost 600 in 2021. Sixteen papers have citations above 200, while the paper where the correlations between electron work function and catalytic activity of metal electrodes toward hydrogen evolution were discussed already exceeds 1100 citations. Already in 1987, the paper describing and discussing the correlations between electron work function and potential of zero charge [J. Electroanal. Chem. **33**(1971)351] became a citation classic. Beyond bibliometric statistics, which remain a quantitative and objective basis on which scientific production can be evaluated, we can safely claim that Sergio Trasatti's scientific papers, the 20 chapters, and the two-volume book "Electrodes of Conductive Metal Oxides" substantially contributed to the opening of new frontiers in electrochemical science, and mentored electrochemists.

The scientific community, in turn, has unanimously acknowledged his contribution to the development of electrochemical science. Titular member of the IUPAC Commission on Electrochemistry since 1976, he then chaired the Commission in 1985-86, and was an elected member of the IUPAC Physical Chemistry Division Committee for the term 1987-90. Within the International Society of Electrochemistry S. Trasatti was an officer, in 1981 Sergio Trasatti chaired the former Division I (Thermodynamics) and in 1981 he was also National Secretary of Italy. He was then elected Vice-President in 1985, President Elect in 1987, and President in 1989-1990.

In 1975 he was awarded the "Miolati" Prize by the Italian Association of Physical Chemistry (AICF). In 1985 he was appointed Honorary Member of the Polish Chemical Society and in 1988 he was Distinguished Lecturer at the Clarkson University, Potsdam, NY. In 1993 Sergio Trasatti was awarded the Pergamon-Electrochimica Acta Gold Medal of ISE, in 1994 he was elected corresponding member of the National Academy of Sciences of Argentina. In 1997 he received the 75th Anniversary Medal of the Polish Chemical Society; he was also elected Corresponding Member of the Istituto Lombardo Accademia di Scienze e Lettere (Milan, Italy). In 2000 he received the Honorary Medal of the Institute of Physical Chemistry, Polish Academy of Sciences and was elected Fellow of the Electrochemical Society (USA). He became Member of the Royal Society of Chemistry (MRSC), has received the Frumkin Medal of the International Society of Electrochemistry

(2003), the Honorary Membership of ISE in 2004, the “Golden Seal” of the Italian Chemical Society in 2007, the Olin Palladium Medal of the Electrochemical Society (USA) in 2007.

Colleagues and friends will miss him, and will miss the perennial rich exchange of ideas they were used to having with him, but the contribution of Sergio Trasatti to electrochemical science will remain a durable highlight for future generations.

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