Foreword

André E. Merbach was born in Lausanne (Switzerland) on March 6, 1940; of German origin, he became a Swiss citizen in 1957. He received his early schooling in Lausanne, where he got a high-school degree in sciences in 1958. He then attended the Polytechnic School of the University of Lausanne, known at that time under the acronym EPUL, majoring in chemical engineering and obtaining his diploma degree in 1962. His interest in physical sciences was already strong so that he enrolled as tutor in physics under the guidance of Professor *Dominique Rivier*, who later became a prominent rector of the University of Lausanne. During the last year of his chemical engineering curriculum, *André Merbach* joined the research group of *Hans Dahn*, an organic chemistry professor, to carry out the experimental part of his diploma thesis on the kinetics of diazaketone hydrolysis. He then completed his chemical education by enrolling in the Institute of Analytical and Inorganic Chemistry (ICMA) located in the 1893-built 'École de Chimie et de Physique', Place du Château 3, at the top of a

historical hill hosting most of the state administration, Lausanne castle, and the 12th century gothic cathedral (*Fig. 1*). He pursued a Ph.D. thesis under the guidance of Professors *Robert Flatt* and, when the latter passed away, *Georges Brunisholz*.

Fig. 1. *École de Chimie et de Physique in Lausanne, host of the chemistry institutes from October 1893 through August 1994*

At that time, the scientific equipment of the institute was quite limited, and the analytical work was carried out in windowless laboratories, cluttered with numerous thermostats in which vast numbers of test-tubes were equilibrating. Ph.D. Students were usually assigned a phase diagram to elucidate, and *André Merbach* studied the 298 K isotherm of the quaternary system $K^+ - NH_4^+ - CrO_4^- - SO_4^{2-}$. Elaboration of this isotherm was completed in less than two years thanks to his capacity to efficiently organize the systematic work needed and to his skills in classical titration methods. In parallel, he was asked to teach a course in analytical chemistry as a replacement to the late *R. Flatt*. He received his Ph.D. degree in July 1964, with *magna cum laude*, and departed shortly after for the *Lawrence* Radiation Laboratory of the University of California, Berkeley, thanks to grants from the US Atomic Energy Commission and the Swiss industry fund '*Stiftung für Stipendien auf dem Gebiet der Chemie*'.

In Berkeley, *André Merbach* became acquainted with modern aspects of inorganic chemistry, particularly with NMR spectroscopy; he focused his work on the ionization of strong electrolytes by this method, under the direction of Professors *L. Brewer*, *O. Redlich*, and *C. Soderholm*. He developed a real passion for the application of NMR to inorganic chemistry, and this postdoctorate stay definitively polarized his scientific carrier, since, not only did he remained faithful to NMR until today, but he was also a major instigator of the establishment of a NMR culture at the University of Lausanne.

Back in Lausanne, *André Merbach* established a strong research axis in inorganic reaction mechanisms; his main innovation at that time was the use of NMR spectroscopy to determine ligand-exchange reactions. He took advantage of the acquisition by the Institute of Organic Chemistry of a *Varian A60* spectrometer operating at 60 MHz (without *Fourier* transformation!) to investigate adduct formation of niobium and tantalum chlorides with various *Lewis* bases. His career developed rapidly, and not only was he in charge of the practical teaching in general and inorganic chemistry, but he was also granted the titles of lecturer ('chargé de cours') in 1967, invited professor at the University of Dalhousie in Halifax, Canada in 1970, assistant professor in 1971, and full professor of inorganic and analytical chemistry in 1973. The same year, the *Swiss Chemical Society* awarded him the prestigious *Werner Medal* and *Werner Prize* for his work on metal halogenides. In parallel to developing his research group, *André Merbach* introduced several modern methods of instrumental analysis at ICMA, and his enthusiasm for new technologies deeply motivated the young collaborators of the institute. Extending his work, he became interested in activation volumes and, with a Ph.D. student, *H. Vanni*, built in 1976 a high-pressure ^{1}H-NMR probe-head working up to 4 kbar and with a resolution of 0.6 Hz [1]. Application of high-pressure NMR in inorganic chemistry soon became closely associated with *André Merbach*'s research group, especially after Dr. *Lothar Helm* joined the group in 1980 and started to develop simulation methods. Other experimental techniques, such as high-pressure stopped-flow NMR in the early 1980's, neutron scattering at the end of the 1980's and high-pressure stopped-flow absorption and emission spectrometry in the 1990's [2] completed the initial methods used by the group. Today, several common textbooks in inorganic chemistry show a chart with the mean lifetimes of a water molecule coordinated onto metal ions, originating from the systematic work of the Lausanne group [3].

During the 1980's, *André Merbach* mainly focused his research on the global analysis of complete temperature and pressure dependences of numerous ligand-exchanging metal complexes, which enabled him to extract the activation parameters of interest, enthalpy, entropy, volume, and to determine the exchange mechanism. Lanthanides were among the investigated ions, but were not initially dealt with systematically. However, the challenge arising from their very fast water-exchange rate fascinated *André Merbach*, and his research concentrated gradually more and more on these ions and their complexes, yielding seminal papers, for instance on the change in coordination number in the middle of the series [4]. Moreover, studies on the gadolinium aqua ion naturally stirred his interest in contrast agents for magnetic resonance imaging (MRI). These trends materialized in *André Merbach* playing a major role in the setup of a chemistry program within the *COST* (*European Cooperation in the Field of Scientific and Technical Research*) organization. In 1990, he became the Swiss representative of the *COST Technical Committee* in Brussels, which he chaired from 1997 to 1999, as well as the chair of the corresponding Swiss committee (1991–1999). In 1993, he started to coordinate the project '*Synthesis and Physico-chemical Studies of Lanthanide and Transition Metal Chelates of Relevance to Magnetic Resonance Imaging*' within the D1 action. The initial group of lanthanide chemists included professors *E. Brücher* (Kossuth University, Debrecen), *C. F. G. C. Geraldes* (University of Coimbra), *J. Claveness* (University of Oslo), *J. Peters* (Delft University

of Technology), *S. Aime* (University of Turin), *J.-F. Desreux* (University of Liège), and *R. Müller* (University of Mons-Hainaut). The project was so successful that, at its end in September 1997, it was re-conducted within the *D8* action under the name '*Rational Design of Lanthanide Chelates for Biomedical Applications*' (April 1997 – April 2001) and then within the *D18* action (April 2000 – March 2006). Presently, the annual meetings of this group are attended by *ca.* 80 scientists from more than 15 countries.

André Merbach has been (and still is) an active member of the *Management Committees* of several *COST* actions, *D6* (Chemical Reactions and Processes under Extreme Conditions, 1992 – 1997), *D10* (Innovative Methods and Techniques for Chemical Transformations, 1997 – 2002), *D18* (Lanthanide Chemistry for Diagnosis and Therapy, 1999 – 2006), and *D30* (High Pressure Tuning of Chemical and Biochemical Processes, 2002 – 2007).

Another aspect of *André Merbach*'s activities is his involvement in the management of the Institute of Inorganic and Analytical Chemistry, which he chaired as Director from 1986 (see *Fig. 2*) to 1991. He has also been in charge of the Chemistry Section of the University of Lausanne (1994 – 2001) and of its services (1991 – 2001). In parallel, he became deeply involved in the *Swiss Chemical Society* and the *Swiss Association of Industrial Chemists* that he managed to merge in 1991; and he was the president of the *Swiss Chemical Society* (from 2001 to 2004). After the transfer of the Chemistry Section of the University to the *Swiss Federal Institute of Technology, Lausanne* (*EPFL*) in 2001, he was appointed as a member of the Direction of the Faculty of Basic Sciences.

Fig. 2. *Newly appointed as chair of the Institute of Inorganic and Analytical Chemistry of the University of Lausanne,* André Merbach (5th from the left, first row) *poses with the members of the institute on the steps of 'l'Esplanade du Château' in 1986.*

As recognition of his outstanding contributions to inorganic chemistry, *André Merbach* was awarded two doctorates *honoris causa*, one from the University of Debrecen and the other one from the University of Geneva in 2003. He has been a member of the *National Council* of the *Swiss National Science Foundation* (1985 – 1996) and vice-chairman of Division II (Mathematics, Natural and Engineering Sciences, 1992 – 1996). He has organized the '*XXIXth International Conference on Coordination Chemistry*' in Lausanne in 1992, an event attended by 1100 scientists and accompanying persons. Until now, he has authored and co-authored 340 research papers, co-edited two books [5][6], and presented 530 communications and invited lectures. He has been the Ph.D. advisor of 59 doctoral students.

Always curious, *André Merbach* never hesitated to investigate demanding systems and to ask difficult questions. One example is the study, in collaboration with *Afredo Pasquarello* from The IRRMA institute ('*Institut Romand de Recherche Numérique en Physique des Matériaux*'), of the aqua ion of divalent copper. The generally accepted picture assumes an octahedrally solvated copper ion with a distorted geometry resulting from a *Jahn – Teller* effect, axial bonds being longer than the four equatorial ones. However, a careful study by means of neutron diffraction complemented by thorough molecular-dynamics calculations allowed the team to conclude that divalent copper is penta- and not hexacoordinate (the results of this study appeared in *Science* [7]). *André Merbach* has always been ahead by one idea, he encouraged numerous young researchers to join the large family of inorganic chemists, and his contribution to the field, and to chemistry in general, is outstanding. Although *André Merbach* has reached 65, nobody expects that this will be the end of his contributions to chemistry, and we wish him the best in all of his future endeavours.

Jean-Claude Bünzli

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