

## Rudi van Eldik – Kinetics Extraordinaire

*This special issue of Macroheterocycles is dedicated to Professor Rudi van Eldik on the occasion of his 75<sup>th</sup> birthday*

At the end of the 2<sup>nd</sup> World War, Rudi van Eldik, most popular as ‘Rudi’ was born on August 8, 1945 in Amsterdam (The Netherlands) as one of twin boys.



*The twins Peter and Rudi in 1948*

His parents immigrated to South Africa in 1952 where he completed his school and university education, and earned his PhD degree at the formerly known Potchefstroom University (now the University of the North-West) while working with Professor Jan van den Berg. Thereafter, he worked as post-doc with Professor Gordon M. Harris at SUNY at Buffalo, USA (1972 and 1978) and as an Alexander von Humboldt Fellow (1977) he joined Professor Hartwig Kelm at the Goethe University, Frankfurt am Main, Germany.



*Hartwig Kelm (left)  
and Gordon M. Harris (right) in 1983*

At the end of 1979 he moved with his family to Frankfurt am Main, where he completed his Habilitation in Physical Chemistry in 1982. After faculty positions at the Private University of Witten-Herdecke (Full Professor in Inorganic Chemistry 1987-1994), and at the Friedrich-Alexander University Erlangen-Nuremberg (Chair of Inorganic and Analytical Chemistry 1994-2010) he retired in 2010, and joined the Faculties of Chemistry of the Jagiellonian University in Krakow and the Nicolaus Copernicus University in Torun, Poland, where he is still working full time and continuing his research actively. He has published 175 research papers, reviews and monographs in refereed journals during the period after his retirement.

Rudi is the recipient of many awards and honors in chemistry, including Honorary Doctor of Science, Potchefstroom University, South Africa (1997), Honorary Doctor of Science, University of Kragujevac, Serbia (2006), Honorary Fellow of the Royal Society of South Africa (2007), Federal Cross of Merit (‘Bundesverdienstkreuz’) awarded by the Federal President of Germany (2009), Inorganic Mechanisms Award, Royal Society of Chemistry, London (2009), Honorary Doctor of Science, Jagiellonian University, Krakow, Poland (2010), Honorary Doctor of Science, University of Pretoria, South Africa (2010), Honorary Doctor of Science, Ivanovo State University of Chemistry and Technology, Russia (2012) and Alumni Award – Research Category from the North-West University, South Africa (2017). Despite his numerous achievements he has always been a down to earth person with wise and well balanced personality. In many of his award addresses we found Rudi acclaiming the contributions of others including his co-workers and collaborators.



*Award address by Rudi  
on receiving an honorary doctoral degree*



Rudi as a guest of Ivanovo State University of Chemistry and Technology, June 2012

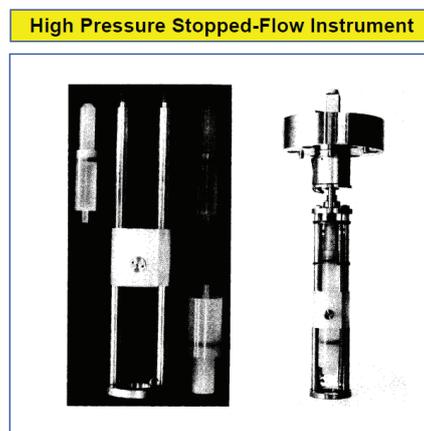
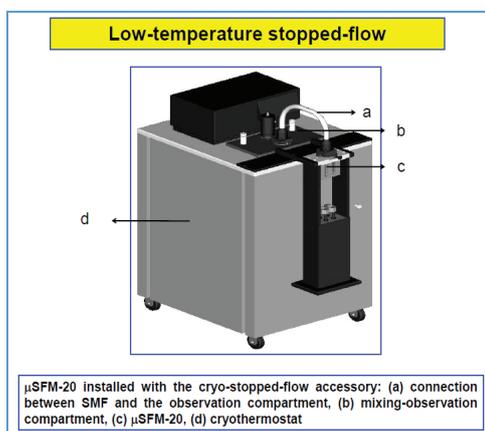
Since the beginning of his independent research work, Rudi focused on the elucidation of inorganic and bioinorganic reaction mechanisms with the application of fast kinetic techniques. However, he retained strong interest in fast kinetic studies throughout his career and with his stunning experimental skill he utilizes high pressure thermodynamic and kinetic techniques to construct volume profiles for inorganic/bioinorganic reactions in solution, low temperature rapid-scan/stopped-flow techniques to characterize and study the behavior of reactive intermediates in catalytic reactions.

Rudi's long-lasting interest in studying *NO chemistry* (and *NO to HNO chemistry*) can be traced in many of his research publications over the past few decades. Apart from using high pressure  $^{17}\text{O}$ -NMR for measuring water-exchange rate constants and the activation volume, his strategy of using flash photolysis techniques as a function of temperature and pressure, proved to be rewarding to resolve the critical mechanistic issues relating to NO binding and NO release. In this work, his group focused on the interaction of NO with several model metallo porphyrins, as well as functional model enzymes to reveal the details of the underlying reaction mechanisms. The work was extended

to cytochrome  $\text{P450}_{\text{cam}}$  and the mechanism of the reaction of the resting state, as well as the camphor bound state, with NO. It turned out that in both cases the Fe(III) center reacts very efficiently with NO to form the diamagnetic Fe(II)-NO<sup>+</sup> product. This work formed the basis for the subsequent activation of peroxides described in the next paragraph.

While studying *peroxide activation in model enzymatic systems* (including cytochrome  $\text{P450}_{\text{cam}}$  itself), Rudi and his co-workers explored the utilization of low temperature fast kinetic equipment to identify the reactive intermediates *Compounds 0, I and II*, crucial in such catalytic reactions. The results of their studies significantly contributed not only towards resolving the important problems related to the nature and the reactivity of such intermediates, but also for tuning the reaction conditions to control the formation and reactivity of such species.

Researching the *chemistry of Ru<sup>III</sup>(edta) complexes* is an abiding interest of Rudi. With an understanding of the lability of the Ru<sup>III</sup>(edta) complex towards substitution reactions, he has established the amazing ability of Ru<sup>III</sup>(edta) in catalysing peroxide activation, oxidation of thiols and thio-molecules, NO production, S-nitrosylation of thiols and H<sub>2</sub>S. Since, kinetic information on the aforementioned





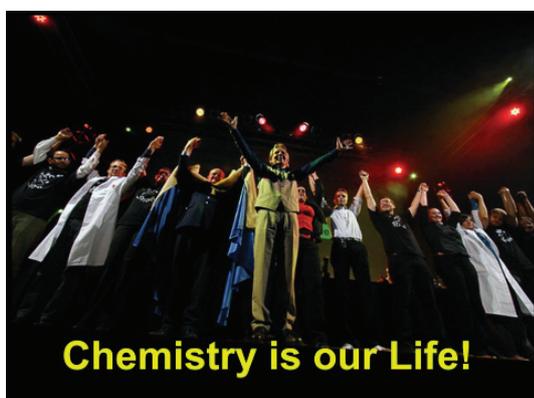
*A typical Rudi's group picture taken in 2006*

reactions appears to be of great significance to understand preferential reaction pathway(s), Rudi's work affording kinetic information about the nature of the active intermediate involved in the catalytic process would be of significance in the mechanistic understanding of the action of a group of enzymatic reactions in terms of redox regulation.

Additional interests are the mechanistic studies on *inorganic and bioinorganic reactions in ionic liquids*, and the *role of multiphase aqueous inorganic chemistry in air pollution and autoimmune diseases*. Noteworthy here, Rudi, in order to extend mechanistic insight through the application of DFT methods, established collaboration with the Computer-Chemistry-Centre in Erlangen, Germany.

During his Chemistry career of almost 50 years (1970-2020) Rudi has published roughly 950 original manuscripts and review papers in referred journals such as *Angew. Chem. Int. Ed.*; *Proc. Nat. Acad. Sci.*, *Chem. Rev.*, *J. Am. Chem. Soc.*, *Inorg. Chem.*, *Organometallics*, *J. Phys. Chem.*, *Dalton Transactions*, *PCCP*, and *Coord. Chem.*

*Rev. Rudi* acted as editor or as editorial board member in many top journals. However, it was a matter of honor for Rudi when he took over from Geoffrey Sykes as Editor of *Advances in Inorganic Chemistry* (Academic Press) from Volume 54 in 2003. Rudi's special effort towards production of thematic issues on specific topics including *Inorganic Photochemistry* (Vol. 63), *Inorganic/Bioinorganic Reaction Mechanisms* (Vol. 64), *Homogeneous Catalysis* (Vol. 65), *CO<sub>2</sub> Chemistry* (Vol. 66), *NO<sub>x</sub> Related Chemistry* (Vol. 67), *Insights from Imaging in Bioinorganic Chemistry* (Vol. 68), *Polyoxometalate Chemistry* (Vol. 69), *Inorganic Reaction Mechanisms* (Vol. 70), *Supramolecular Chemistry* (Vol. 71), *Materials for Sustainable Energy* (Vol. 72), *Computational Chemistry* (Vol. 73), *Water Oxidation Catalysts* (Vol. 74), *Medicinal Chemistry* (Vol. 75) and Volume 76 on *Nanoscale Coordination Chemistry* (published in July 2020), turned out to be a very successful change. These volumes reporting cutting-edge reviews of frontier research are a service to the *Inorganic Chemistry Community!*



*Rudi's magic chemistry team*



*Fantastic atmosphere in the Audimax!*

Rudi has been privileged to always have an active group of MSc, PhD, post-docs and visiting scientists around him. He has been truly a wonderful friend, collaborator and mentor to his many colleagues and coworkers. He is highly admired for his intellectual inquisitiveness and remarkable creativeness, for his passion and love for chemistry, his warm inspiration and generous spirit. Rudi, being overwhelmingly inventive even at his age of 75 works exploring the ligand substitution reactions of coordination compound at the solid-liquid interface. His role is an example for others!

Finally, we could not do justice if another aspect of Rudi's life is not articulated herein! He, with his research group at the University of Erlangen-Nuremberg developed an Edutainment (Education + Entertainment) concept during 1995–2009 for multi-media chemistry presenta-

tions that attracted much attention from school children, students and the general public in Erlangen and elsewhere. The show comprised a 3 h presentation of chemical demonstrations coupled to theatrical play, music, light effects, power point and film presentations, all centered around a central theme. The show was repeated 5 times at the start of the winter semester and enabled *ca.* 7000 spectators to see the performance in the Audimax of the University of Erlangen-Nuremberg each year. In this presentation, Rudi played the role of the show master as Magic Rudi. The show was so popular that parts of the show were broadcasted by national TV stations and have attracted millions of spectators. More information of the show can be obtained from the following German and English home pages: [www.zaubervorlesung.de](http://www.zaubervorlesung.de)

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