

## Acknowledgements

*But even if you do obtain a solution, you may then discover, to your delight, the existence of a whole family of enchanting though perhaps difficult problem children for whose welfare you may work, with a purpose, to the end of your days.*

*Karl R. Popper (1983, p. 8)*

First of all, I want to thank Albert Pilot, my promoter, for the constructive way he guided me for many years through the difficult process of finishing my thesis. In the same period I had to apply myself to mostly work-related activities. There were times, I realize, when I have tried Albert's patience to its limits, times which we managed to overcome, though, thanks largely to Albert's common sense and bonhomie. Furthermore, Albert had the ungrateful job of catching me in midstream: he was so kind to take over from Adri Verdonk, my former promoter. The latter took early retirement in 1995 in order to be able to take care of his lovely wife, Emy Verdonk. I want to thank you, Adri, for the inspiring way you discussed the topic of my research with me and Wobbe, called by us at the time briefly '*vakstructuur*' (disciplinary structure), and for providing a stimulating atmosphere for research and critical discussion in our group.

Sadly, Wobbe de Vos, my co-promoter passed away in July 2002, after a courageous struggle with the cancer in his body, his mind witty and alert to the very end. It was Wobbe, who helped me on a day-to-day basis with clarifying my ideas and framing my hypothesis on *vakstructuur*, with the writing of papers, and the analysis of educational materials relating to school chemistry, and the responses of Forum members. In all of this, Wobbe had developed an uncanny sharp intuition about, what he called, the *vakstructurele* reflex. I am very grateful, that I could express my appreciation to him at that time in person, as I am now doing in print.

Secondly, I have good memories of the collaboration with colleagues I met at the Centre for Science and Mathematics Education in the days of Adri and Wobbe. That is, to: Joke van Aalsvoort, Jeannine Acampo, Joop Buddingh', Jan Broertjes, John Derissen, Cees van Driel, Jan van Driel, Harrie Eijkelfhof, Maaïke Fennis, Rupert Genseberger, Lida de Gier, Martin Goedhart, Nicole Hezeken, Geeske van Hoeve-Brouwer, Onno de Jong, Erik Joling, Wolter Kaper, Hanno van Keulen, Kees Klaassen, Piet Lijnse, Cees Loffeld, Lidy van Prooje-Belle, Jurrie Reiding, Herma Roebertsen, Peter van Roon, Thom Somers, Olle van Sprang, Marjolein Vollebregt, Henk ten Voorde and Arend Jan Waarlo.

Also, I want to thank the next generation of researchers in chemical education: Astrid Bulte, Gjalt Prins, Machiel Stolk and Hanna Westbroek who helped me out in various ways in the latter phases of writing up my thesis. Special thanks here to Riet Leewis, Frits Pater and Henk ('Apple') Erkelens who assisted me with all the 'nuts and bolts' needed for doing classroom based research at different locations. Louis Galesloot, my former chemistry teacher at secondary school, was very generous with the time he took for the visit and the interview I had with him.

Due to the international character of my research, I further want to thank two groups of people. First, my thanks go to the members of the University of York Science Education Group (UYSEG), I was privileged to work with in the 1990s. Thank you for your contributions to my research, and, on a more personal note, for your hospitality

during my stay in York, England: Mary Aitken, Judith Bennett, Georg Burton, David Edwards, John Holman, John Lazonby, Peter Nicolson, Robin Millar, Judith Ramsden, and David Waddington, and the Ph.D. students present at the time, Vanessa Barker, Christie Borgford and Mary Beth Key. Special thanks to Francesca Garforth who was kind enough to share with me so many of her ideas on the development of Salters' Chemistry. I hope that the UYSEG members will forgive me for the critical stance I came to take on the developmental process of the Salters' Chemistry courses. Though I also refer to the achievements and potential of their original design criteria approach to curriculum development, I can imagine they might still see me as something of a 'cuckoo in their nest'.

Last but not least, a word of thanks to the school, teacher and the students in Yorkshire who kindly allowed me to perform my classroom based Salters' research in their midst.

Second, I want to thank here the members of the International Forum (IF), and also at this place, the Dutch Forum (DF) on Structures in School chemistry for their participation in my research. The international list of the IF members who contributed written responses, reads in alphabetical order: Dr. Philip Adey (UK), Dr. Michael F. Akeroyd (UK), Dr. Vanessa Barker (UK), Dr. Judith Bennett (UK), Prof. John D. Bradley (South Africa), Mr Neil Braund (UK), Dr. José A. Chamizo (Mexico), Dr. Glen Chittleborough (Australia), Prof. Roger Cross (Australia), Dr. Arthur J. Davies (Australia), Prof. Peter J. Fensham (Australia), Prof. Ronald J. Gillespie (Canada), Prof. Altfried Gramm (Germany), Dr. Vadim Grot (USSR), Prof. Stephen J. Hawkes (USA), Prof. Edgar W. Jenkins (UK), Prof. Richard F. Kempa (UK), Dr. Mary Beth Key (USA), Dr. Andrea Kisfaludi (Hungary), Prof. Peter G. Mahaffy (Canada), Prof. Robin Millar (UK), Dr. Mins Minssen (Germany), Dr. Brandan Schollum (New Zealand), Mr Neil C. Smith (UK), Prof. Dr. John S. Spencer (USA), Dr. Paul Strube (Australia); Prof. Dr. Elke Sumfleth (Germany) and Dr. Clive Sutton (UK). Some of the IF members who contributed verbally during visits and interviews are: Prof. Dr. Peter Buck (Germany), Prof. Dr. A.C. Banerjee (India), Prof. Bob Bucat (Australia), Prof. Ate Draaijer (South Africa), Prof. John Gilbert (UK), Dr. John Packer (New Zealand), Dr. Eduardo F. Mortimer (Brazil) and Prof. Robert Silberman (USA).

The Dutch list of DF members who contributed written responses reads, in alphabetical order: Drs. W. Akkermans, Drs. F. J. C. M. Arnold, Drs. S. A. Bakker, Drs. A. A. J. van Berkel, Ir. A. Beverloo, Drs. J. Bouma, Drs. F. Brants, Dr. J. van Driel, Ir. A.M. Edelbroek, Prof. Dr. M. J. Goedhart, Dr. H. G. de Graaf, Drs. A. v.d. Heijden, Drs. J. G. Hondebrink, Dr. C. de Jong, Dr. Ir. G. Laméris, Drs. H. van Lubeck, Prof. Dr. A. Rip, Drs. A. J. Schoneveld, Prof. Dr. H. A. M. Snelder, Dr. P. van der Vet, Dr. M. J. Vogelezang, and Dr. H. Zandvoort.

Some other people active in the field of chemical education contributed during an in-service course or to discussions at other places: Anemoon Brans, Hein Bruinesteijn, Marjan Bruinvels, Henny Kramers-Pals, Rob Loven, Arie van Muijlwijk, Wichard Rops, C. Rossewijn, Loes Verbeek-Beemsterboer, Lex Vroling and J.N.M. van Well.

Taking longer than usual to finish one's thesis has some disadvantages. But one advantage is to have a chance of meeting a new group of interesting people, in this case my esteemed colleagues at Joh. Enschedé Amsterdam B.V., a printing firm. They were more than willing to help my thesis through the desktop publishing, printing and pre-binding process. Special thanks go out to Chris Broersma, Director, and Michel Vastenhout, Manager of Operations, who reacted very enthusiastically and generously to my request to print my thesis at their firm. Thanks also to Jeroen Hoppenbrouwer who

managed the prepress processes and René Habraken, the order manager, Special thanks to Willem de Vries (DTP), who was assigned the difficult job of actually importing the text and work on the ultimate lay-out for all my pages, figures, quotes and notes in front of you. Martin Rietveld took care of the scanning of figures, and Ed Rosman of the final design and lay-out of cover and bookmark.

It is usual to give special thanks to one's wife, who after all has to endure all the vicissitudes of the husband working on his thesis. In this case it was even worse, since Mary Beth Key took it upon herself to edit my often convoluted text. She did this with meticulous care. Her way of editing is so intense that she changes in the process not only words and grammar, but also lay-out and content. Thank you, Mary Beth, also for your moral support and complete trust in my endeavor. The latter sentiment also applies to Fred Janssen, who read a number of my texts and always managed to see the broader picture, and the hidden structure in them. His contagious enthusiasm and originality with regard to the problems of science education never failed to uplift me.