

In Celebration of the 65th Birthday of Professor Yitzhak Apeloig

This special issue of *Chemistry—A European Journal* is dedicated to our friend and colleague Yitzhak Apeloig on the occasion of his 65th birthday. The manuscripts published in this issue cover a large variety of themes spanning from



Professor Yitzhak Apeloig

organic to silicon and computational chemistry, and constitute a tribute from his friends to mark his contribution to Science through his exceptional achievements in chemistry.

Yitzhak Apeloig was born in Bukhara, Uzbekistan (1944) to Polish–Jewish parents who fled into the USSR escaping the Nazi invasion of Poland. In the USSR they were considered as “enemy agents” and were sent to an enforced labor camp in Siberia for more than three years. When they were released in 1947, they immigrated to Palestine, then under

the British Mandate, which became a few months later the State of Israel.

Yitzhak grew up in the Tel-Aviv area and after 2.5 years of mandatory army service in the paratroopers he enrolled in the Hebrew University of Jerusalem to study chemistry and physics, where he received a B.A. degree (*summa cum laude*) (1967), and where he continued with his graduate studies and completed (*summa cum laude*) his M.Sc (1969) and Ph.D (1974) degrees, under the supervision of Prof. Zvi Rappoport. The title of his Ph.D Thesis was: “Intermediates in S_N1 Vinylic Substitution”. This research led to several important publications in the field of experimental mechanistic organic chemistry; the first one, which remains vivid for Yitzhak, was entitled: “Vinylic Cations from Solvolysis. The Stereochemistry of the S_N1 Reaction of 1,2-Dianisyl-2-phenylvinyl Halides” (*J. Am. Chem. Soc.* **1969**, *91*, 6734). During the two years of his postdoctoral studies with Professors Paul von Ragué Schleyer and John A. Pople (Nobel Laureate in Chemistry, 1998), who formed one of the most fruitful and remarkable partnerships in chemistry, Yitzhak became fascinated by the application of quantum mechanical calculations to chemistry and this outlined his future independent way in chemistry, using theory and experiment in synergy, an approach which leads his research to this date.

In the year 1976 he joined the Department of Chemistry at the Technion–Israel Institute of Technology where he rapidly rose to the rank of full Professor in 1988 and a Chair incumbent in 1993. From the beginning of his career at the Technion, he established a research group that conducted *both* experimental and theoretical research. At that time, 30 years ago, he was one of the first experimentalists in the world, and the first in Israel, who recognized the vast potential of *ab initio* quantum mechanical calculations and he started to apply these calculations to a broad spectrum of “real” chemical problems. He was one of the world’s leading “prophets” of the role that theoretical calculations can play in the communities of organic and later silicon chemists. Yitzhak did so despite the general reluctance of these communities to accept computational chemistry as a legitimate research tool.

As stated above, a unique characteristic of his research activities is the *synergistic* use of *both* experimental techniques and theoretical methods to solve important chemical questions. Yitzhak's research has indeed convincingly made the case that such synergy is an immensely effective way for discovering and exploring new chemistry, setting an example to many other chemists. Indeed, the pioneering idea underlying his line of research is now widely accepted in many fields of chemistry. In 1996, Yitzhak Apeloig and Sason Shaik, from the Hebrew University of Jerusalem, established the *Lise Meitner Minerva Center for Computational Quantum Chemistry*, and he has served as the co-director of the Center since its inception. This center has played a major role in promoting computational chemistry in Israel and serves as a know-how center that attracts many leading researchers from abroad.

Experimental and theoretical studies of organic compounds were the main focus of Apeloig's research until the

late 1980s. In the early 1990s silicon chemistry captured his interest because it was an *unexplored territory* with many challenges and vast opportunities, both for theoretical predictions and for creating a new field of experimental chemistry. Soon silicon chemistry became the main topic of his experimental and theoretical research. The predictions, synthesis, characterization and isolation of stable silenes, metal-substituted bis-silenes, silylenes, silylenoids, α - and β -silyl-substituted carbocations, silyl cations, silyl radicals, bismetalated silyl species and a silene–organometallic complex are few of the seminal contributions of his research group to the field of organosilicon chemistry. In many cases, his theoretical predictions in this dynamic field have inspired and guided other experimental chemists. One example that beautifully illustrates Yitzhak's impact in science is the theoretical prediction of how the then unknown silynes, one of the “Holy Grails” of silicon chemistry, could be stabilized. Following his theoretical prediction, the existence of the first known silynes in the gas phase was demonstrated exper-

Table 1. Students and colleagues of Yitzhak Apeloig (in alphabetical order).

Current Research Group		
Senior Research Fellows	Graduate Students	Graduate Students
Bravo-Zhivotovskii, Dmitri	Dobrovetsky, Roman	Molev, Victoria
Karni, Miriam	Kaushenskii, Alexander	Roderfer, Ilya
Tumanskii, Boris	Kostenko, Arseni	Sheberla, Dennis
	Molev, Gregory	Zborovsky, Libi
Former Ph.D. and M.Sc. Students		
Abu-Freih, Awad	Korogodsky, Gady	Peleg-Wasserman, Hanan
Arad, Dorit	Kosa, Monica	Pine, Pauline
Bendikov, Michael	Matzner, Eynatte	Sigal, Nadejda
Biton, Rivka	Melamed, Semion	Stanger, Amnon
Braude, Viviana J.	Merin-Aharoni, Osnat	Yuzefovich, Michael
Dar, Nitzan	Nakash, Moshe	Zharov, Ilia
Former Postdocs and Research Fellows		
Postdocs	Postdocs	Research Fellows
Albrecht, Karsten (Germany)	Müller, Thomas (Germany)	Berkovitz, Nadia
Borosky, Gabriela L. (Argentina)	Nordhoff, Karsten (Germany)	Gazit, Aviv
Danovich, David (Israel)	Shang, Zhenfeng (China)	Gilon, Arie
Maulitz, Andreas (Germany)	Sklenak, Stepan (Czech Republic)	Luba, Zina
Maxka, James (USA)	Xavier, Prince (India)	Nemirovsky, Dimitry
Moschny, Torsten (Germany)	Xi, Hongwei (China)	Panov, Vladislav
		Sirota, Igor
		Wallerstein, Mercedes
Collaborators ^[a]		
Auner, Norbert (Germany)	Holthausen, Max C. (Germany)	Nagase, Shigeru (Japan)
Becker, James Y. (Israel)	Jorgensen, William L. (USA)	Pauncz, Ruben (Israel)
Boese, Roland (Germany)	Kaftory Menahem (Israel)	Pople, John A. (USA)
Clark, Tim (Germany)	Kira, Mitsuo (Japan)	Rappoport, Zvi (Israel)
Cremer, Dieter (USA)	Klinkhammer, Karl (Germany)	Schleyer, Paul von R. (USA)
Cypryk, Marek (Poland)	Koch, Wolfram (Germany)	Schröder, Detlef (Germany)
Dilman, Alexander D. (Russia)	Lammertsma, Koop (Netherlands)	Schwarz, Helmut (Germany)
Frenking, Gernot (Germany)	Leigh, William J. (Canada)	Sekiguchi, Akira (Japan)
Fuchs, Benzion (Israel)	Leites, Larissa (Russia)	Shaik, Sason (Israel)
Ginsburg, David (Israel)	Lenoir, Dieter (Germany)	Siehl, Hans-Ullrich (Germany)
Godleski, Stephen A. (USA)	Maas, Gerhard (Germany)	Stang, Peter J. (USA)
Grader, Gidon S. (Israel)	Mandelbaum, Asher (Israel)	Voronkov, Mikhail (Russia)
Halton, Brian (New Zealand)	de Meijere, Armin (Germany)	Walsh, Robin (UK)
Hoffmann, Roald (USA)		West, Robert (USA)
		Zoller, Uri (Israel)

[a] Excluding students.

imentally. His research led to an impressive number of original and important scientific papers that shaped the field.^[1] The four-volume book series on “*The Chemistry of Organic Silicon Compounds*” covering 4000 pages, which he edited with Prof. Zvi Rappoport, is the most important and influential book in this field.

During all these years, Yitzhak has attracted an increasing number of students and postdocs from Israel and abroad to his laboratory (see Table 1). He has supervised more than 25 graduate students, many of whom now hold academic positions or important positions in industries. In addition to being an inspiring and attendant mentor to his students, Yitzhak is also an excellent and popular teacher who has educated a generation of students to appreciate physical organic and computational chemistry.

Yitzhak’s pioneering contributions during the last 33 years have earned him an outstanding international reputation and have helped put Israeli Science in the spotlight. As a result, Yitzhak has received numerous national and international awards, including the Wacker Silicone Award (2007), the Israel Chemical Society Prize (2002), the Alexander von Humboldt Senior Research Award, the Senior Visiting Professorship of the Japan Society for the Promotion of Science (JSPS) and an Honorary Doctorate from the Technical University of Berlin (2006). He has also participated in numerous National and International committees.

Since October 2001 Yitzhak has been serving as the President of the Technion–Israel Institute of Technology, Israel’s leading technological university. However, throughout his term as President, he has continued to teach, to supervise an active research group, to publish extensively in leading chemical journals, and to lecture at major conferences and in universities around the world. This is quite unusual and emphasizes his dedication to science and scientific endeavour.

One could not end this preface without talking about the person himself and his attractive human qualities. Besides

being extremely fair and honest, Yitzhak is a warm and particularly attentive person. He always listens and patiently advises his students and colleagues, showing considerable respect and tolerance. Over the years, countless friends, colleagues and visitors have enjoyed the hospitality of the Apeloig household. Those of us who had the immense pleasure of working in the same department as Yitzhak know him to be a tremendous supportive colleague. He has shown great leadership over the years, always making himself available to those who need his advice and encouragement. His leadership is marked by patience, goodness and tenacity.

Every one of us who has worked with him knows how important his family is to him. His wife, Tzipi, has been extremely supportive of Yitzhak and of his many friends. She has thereby created an atmosphere of warmth and kindness that thus surrounds the Apeloigs.

Undoubtedly, his devotion to research and teaching has influenced and will continue to influence everyone fortunate enough to know him. His recent leadership as President of the Technion has made major impacts on how Science should be considered. Many of us try to adhere to the “Yitzhak Apeloig” style in our academic endeavours.

On behalf of the contributing authors and many friends and colleagues, we present this special issue to Yitzhak Apeloig in recognition of his major contributions to Chemistry and for being a “Mentsch”.

Dr. Miri Karni^[a] Prof. Ilan Marek^[a] Prof. Sason Shaik^[b]

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[1] A complete list of Yitzhak Apeloig’s publications can be found at http://schulich.technion.ac.il/faculty_member.php?id=18 and his full Curriculum Vitae and a more detailed autobiography can be found at http://schulich.technion.ac.il/researchers_cv/cv/YitzhakApeloig.pdf.

A Personal Note from Yitzhak Apeloig

First, I wish to thank the three guest editors: Dr. Miri Karni, Prof. Ilan Marek and Prof. Sason Shaik, all of whom are long-time friends and collaborators, who took the initiative to put together this special volume of *Chemistry—A European Journal*, marking my 65th birthday. Second, I wish to thank all the authors of the excellent papers that comprise this volume. I am humbled and honored by this impressive parade of excellent science covering a wide range of topics dedicated to me. I have known and collaborated with many of the authors for more than 30 years and have benefited from their wisdom and friendship. I could not have imagined a more precious birthday present! This volume also provides me with the opportunity to thank my teachers and colleagues who have strongly influenced my career; great scientists from whom I have learned so much. Here, due to space limitations, I can mention only a few.

From Prof. Zvi Rappoport, my Masters and doctoral thesis supervisor, I have absorbed the love for understanding reaction mechanisms and learned the importance of accuracy and reliability of experiments and in reporting results. He taught me how to critically analyze experimental results avoiding “wishful thinking” interpretations. Zvi is also the legendary editor of the “*The Chemistry of the Functional Groups*” series who convinced me at a later stage of my career to join him in editing four volumes in the series on “*The Chemistry of Organic Silicon Compounds*”.

Prof. Paul Schleyer, my postdoctoral mentor at Princeton University, introduced me to the magical world of computational quantum chemistry and its vast potential. He also taught me that “chemistry is one” and that the borders between organic chemistry and inorganic chemistry are entirely artificial. I was, and still am, amazed by Paul’s enthusiasm about chemistry, the constant flow of new ideas and his unbelievable productivity.

Prof. John Pople introduced me to the beauty of his mathematical quantum mechanical models and the miracles of the Gaussian series of programs that for the first time allowed experimental chemists, like myself, to enter the “holy playground” of theoretical chemists and carry out by myself accurate and reliable quantum mechanical calculations, which until then was the sole territory of theoretical chemists.

When I joined the Technion in 1976 as a young faculty member, Prof. David Ginsburg’s guidance in the complex roads of “science politics” was extremely valuable to me and I learned a lot from his wisdom.

My sabbatical year at Cornell University with Prof. Roald Hoffmann was one of the most enjoyable years in my career. Roald Hoffmann’s group meetings, lasting several hours each, covering topics from chemistry to arts and literature, were an extremely stimulating intellectual experience. My sabbatical year with Prof. Helmut Schwarz in Berlin was yet another unique experience. The combination of an excellent research group with enthusiastic students, a city undergoing a dramatic transformation due to its reunification, and of Helmut Schwarz’ wonderful hospitality, created a truly unique experience, which I will always treasure. From Helmut I have learned the fascinating rich world of experiments that one can do by sophisticated mass-spectroscopy and how to “hunt” for non-existent molecules and this way expand our basic knowledge of nature.

Special thanks are due to my research group and in particular my long-time collaborators: Dr. Dmitry Bravo-Zhivotovskii and Dr. Miri Karni, who made such a crucial contribution to my research effort and who are responsible for the fact that I could continue with my research during the eight years in which I served as President of the Technion–Israel Institute of Technology. And finally I wish to thank my life-long supporter and partner—my wife Tzipi—without whose devotion and support none of what I described above would have been possible.