Recipient of the 2010 Frederic Stanley Kipping Award in Silicon Chemistry—Prof. Yitzhak Apeloig

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Professor Yitzhak Apeloig is a silicon pioneer whose most recent honor is receiving the Frederick Stanley Kipping Award, April 2010, for his “distinguished contributions to the field of silicon chemistry and for stimulating the creativity of others”. Born in 1944 in what was Russia and is now Uzbekistan, Apeloig left European refugee camps in 1947 for what was to become the State of Israel. Fascinated and excited by science, he went on to receive graduate degrees in chemistry from Hebrew University, Jerusalem, to do postdoctoral research with Paul von Rague Schleyer at Princeton and John A. Pople at Carnegie Mellon University, and to be awarded an honorary doctorate from the Technical University of Berlin.

As professor of chemistry, and then dean, and then president of the Technion in Haifa Israel, Apeloig has been a well-known, honored lecturer throughout the world of chemistry. The four-volume series “The Chemistry of Organic Silicon Compounds” which he edited with Zvi Rappoport is still considered the most authoritative book on organosilicon chemistry. During his time as president of the Technion, 2001–2009 (an elected position of great importance in Israel), Apeloig traveled and lectured extensively, yet still continued to direct his group in groundbreaking discoveries. He credits success to his “dedicated and talented coworkers”; his coworkers credit success to an “intelligent, compassionate, generous leader”.

Although Apeloig has received numerous scientific awards within the broader field of chemistry, many, as well as the Kipping award, are in particular recognition of his contributions to silicon chemistry, notably, the Israel

Chemical Society Prize and the Wacker Silicone Prize. These well-deserved awards are based on Apeloig’s many theoretical innovations and insights into fundamental properties of organosilicon compounds, in particular multiply bonded silicon compounds and reactive intermediates containing silicon.

Over the years, Apeloig’s insights and theoretical predictions have inspired silicon chemists to embark on new experiments—many of which have further verified his theoretical predictions and led the world to the discovery of new chemistry. For example, Apeloig was among the first to recognize the vast potential of quantum chemical calculations to silicon chemistry and to begin to apply modern computational methods to important problems in the field, at a time when many experimental chemists were reluctant to accept this as a new research tool.

The unique contribution of Apeloig’s research is the way his group uses a combination of experimental techniques and theoretical methods to solve important chemical problems. His research has convincingly exemplified the synergistic use of theory and experiment as an effective way of discovering and exploring novel compounds and expanding into new areas of silicon chemistry. In addition to important theoretical innovations, Apeloig and his group have carried out innovative research on numerous kinds of organosilicon compounds with novel chemical bonding. Examples of his discoveries include stable silylenes, triplet silylenes, silyl cations, stable silenes prepared by a novel method, disilenes, silyl cations and silyl radicals.

The innovative research of Professor Apeloig and his group has brought the field of silicon chemistry to the attention of a wide chemical audience. His work has inspired many experimentalists who tested his predictions, either independently or by collaborating with him and his coworkers, and these joint experimental-theoretical studies

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have led to important insights into the fundamental aspects of silicon chemistry. Professor Yitzhak Apeloig is a great pioneering scientists as well as a valued friend throughout the world of silicon chemistry.

Selected Papers on Silicon Chemistry by Prof. Apeloig:

1. Apeloig Y, Karni M (1985) The effect of substituents on the first transition in the visible spectra of silanediyls (silylenes). *J Chem Soc Chem Comm* 1048–1049
2. Apeloig Y, Stanger A (1987) The first demonstration of solvolytic generation of a simple silicenium ion (R_3Si^+). Access via 1,2-methyl migration. *J Am Chem Soc* 109:272–273
3. Apeloig Y, Stanger A (1988) Anomeric effect at silicon. *J Organomet Chem* 346:305–313
4. Apeloig Y (1989) A chapter “Theoretical aspects of organosilicon compounds. In: Patai S, Rappoport Z (eds) *The chemistry of organosilicon compounds*”. J. Wiley, pp 57–227
5. Maxka J, Apeloig Y (1990) Silylene dimers: highly fluxional molecules with unusual structures. *J Chem Soc Chem Commun* 737–739
6. Karni M, Apeloig Y (1990) Substituent effects on the geometries and energies of the Si=Si double bond. *J Am Chem Soc* 112:8589–8590
7. Bravo-Zhivotovskii D, Braude V, Stanger A, Kapon M, Apeloig Y (1992) A novel route to C=Si double bonds. *Organometallics* 11:2326–2328
8. Apeloig Y, Zharov I, Bravo-Zhivotovskii D, Ovchinnikov Y, Struchkov Y (1995) Synthesis and the electronic spectra of the first β -ketoacylsilanes and their lithium enolates. New insight into hyperconjugation in acylsilanes and their enolates. *J Organomet Chem (Special Issue Honoring Prof Hideki Sakurai)* 499:73–82
9. Apeloig Y, Müller T (1995) Do silylenes always dimerize to disilenes? Novel silylene dimers with unusual structures. *J Am Chem Soc* 117:5363–5364
10. Apeloig Y, Albrecht K (1995) Triple bonds to silicon. Relative stabilities and energy barriers separating silanitriles and silaisonitriles. An ab initio study. *J Am Chem Soc* 117:7263–7264
11. Apeloig Y, Karni M, Müller T (1996) Silylenes and multiple bonds to silicon: synergism between theory and experiment. In: Auner N, Weis J (eds) *Organosilicon chemistry II. From molecules to materials*. VCH, pp 263–286
12. Apeloig Y, Bendikov M, Yuzefovich M, Nakash M, Bravo-Zhivotovskii D (1996) Novel stable silenes via a sila-peterson-type reaction. Molecular structure and reactivity. *J Am Chem Soc* 118:12228–12229
13. Apeloig Y, Karni M (1997) Triple bonds to silicon. Substituent effects on the thermodynamic and kinetic stabilities of silynes relative to their isomeric silylidenes and silavinylidenes. *Organometallics* 16:310–312
14. Müller T, Apeloig Y, Sohn H, West R (1998) Silole and germole dianions and their dilithium derivatives—are they aromatic? In: Auner N, Weis J (eds) *Organosilicon chemistry III. From molecules to materials*. VCH, pp 144–151
15. Holthausen MC, Koch W, Apeloig Y (1999) Theory predicts ground state triplet silylenes. *J Am Chem Soc* 121:2622–2623
16. Schmedake TA, Haaf M, Apeloig Y, Muller T, Bukalov S, West R (1999) Reversible transformation between a diaminosilylene and a novel disilene. *J Am Chem Soc* 121:9479–9480
17. Apeloig Y, Sklenak S (2000) On the possible formation of Si=O, Si=S and Si=Se double bonds via the reaction of silylenes with oxirane, thiirane and selenirane, respectively. An ab initio study. *Can J Chem (a special invited issue dedicated to Professor A Brook)* 78:1496–1510
18. Buffy JJ, West R, Bendikov M, Apeloig Y (2001) Chemical shielding tensors for a silicon-carbon double bond. *J Am Chem Soc* 123:978–979
19. Danovich D, Ogliaro F, Karni M, Apeloig Y, Cooper DL, Shaik S (2001) Silynes ($RC\equiv SiR'$) and disilynes ($RSi\equiv SiR'$): why are less bonds worth energetically more? *Angew Chem Int Ed* 40:4023–4026
20. Apeloig Y, Pauncz R, Karni M, West R, Steiner W, Chapman D (2003) Why is methylene a ground state triplet while silylene is a ground state singlet? *Organometallics* 22:3250
21. Bravo-Zhivotovskii D, Korogodsky G, Apeloig Y (2003) Synthesis of the first long-lived bis-silene. *J Organomet Chem* 686:58–65
22. Karni M, Apeloig Y, Takagi N, Nagase S (2005) The quest for stable Si-Si triply-bonded compounds. An ab-initio and DFT study of the ^{29}Si NMR chemical shifts in $RSi\equiv SiR$. *Organometallics* 24:6319–6330
23. Bravo-Zhivotovskii D, Ruderfer I, Melamed S, Botoshansky M, Schmidt A, Apeloig Y (2006) $[(R_2Si)_3Li_4]^{2-}$ —an aggregated dianion form of 1, 1-dilithiosilane. *Angew Chem Int Ed* 45:4157–4159
24. Kosa M, Karni M, Apeloig Y (2006) Trisilaallene and the relative stability of Si_3H_4 isomers. A theoretical study. *J Chem Theory Comput* 2:956–964
25. Bravo-Zhivotovskii D, Dobrevsky R, Nemirovsky D, Molev V, Bendikov M, Molev G, Botoshansky M, Apeloig Y (2006) The synthesis and isolation of a metal-substituted bis-silene. *Angew Chem Int Ed* 45:4157–4159
26. Bravo-Zhivotovskii D, Dobrovetsky R, Nemirovsky D, Molev V, Bendikov M, Molev G, Botoshansky M, Apeloig Y (2008) The synthesis and isolation of a metal-substituted bis-silene. *Angew Chem Int Ed* 47:4343–4345
27. Molev G, Tumanskii B, Sherbela D, Botoshansky M, Bravo-Zhivotovskii D, Apeloig Y (2009) Isolable photoreactive polysilyl radicals. *J Am Chem Soc* 131:11698–11700
28. Epping JD, Yao S, Karni M, Apeloig Y, Driess M (2010) Si:X multiple bonding with four-coordinate silicon? Insights into the nature of the Si:O and Si:S double bonds in stable silanoic esters and related thioesters: a combined NMR spectroscopic and computational study. *J Am Chem Soc* 132:5443–5455
29. Dobrovetsky R, Lieby S, Botoshansky M, Bravo-Zhivotovskii D, Apeloig Y (2010) Isolation of silenolates $(R_3Si)_2Si[dbond]C(OLi)Ad$ with a doubly bonded silicon atom. *Angew Chem Int Ed* 49:4084