

# CONTRIBUTIONS BY CANADIANS TO NAMED THINGS IN CHEMISTRY AND PHYSICS

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Department of Chemistry, York University  
4700 Keele Street, Toronto, ONTARIO M3J 1P3, CANADA

For suggestions, corrections, additional information, and comments please send e-mails to [jandraos@yorku.ca](mailto:jandraos@yorku.ca)

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Avery, Oswald Theodore	1877 - 1955	Canadian-American (b. Halifax, Nova Scotia, Canada)	DNA as source of heredity <b>(1944)</b>
<i>Bader, Richard Frederick W.</i>	1931 -	Canadian (b. Kitchener, Ontario, Canada)	Atoms in molecules (AIM) <b>(1981)</b>
<i>Becke, Axel D.</i>	1953 -	?	Density functional theory (DFT) <b>(1964)</b> , along with R.G. Parr, W. Kohn, W. Yang, C. Lee; B3LYP (Becke-Lee-Yang-Parr) method <b>(1988)</b>
Belleau, Bernard	1925 - 1989	Canadian (b. Montreal, Quebec, Canada)	Belleau's reagent <b>(1983)</b>
<i>Boyd, Russell Jaye</i>	1945 -	Canadian (b. Kelowna, British Columbia, Canada)	Boyd-Edgecombe electronegativity parameters <b>(1988)</b>
<i>Brook, Adrian Gibbs</i>	1924 -	Canadian (b. Toronto, Ontario, Canada)	Brook rearrangement <b>(1958)</b>
Brooks, Harriet	1876 - 1933	Canadian (b. Exeter, Ontario)	Transmutation of the elements <b>(1904)</b>
<i>Cox, Robin</i>	1943 -	British-Canadian (b. England)	Cox-Yates acidity function <b>(1978)</b>
Eadie, George Sharp	1895 - 1976	Canadian-American (b. Toronto, Ontario, Canada)	Eadie plot <b>(1942)</b>

<i>Edgecombe, Kenneth E.</i>	?	Canadian ?	Boyd-Edgecombe electronegativity parameters <b>(1988)</b>
Edward, John (Jack) Thomas	1919 - 1999	British-Canadian (b. London, England)	Edward-Lemieux effect (anomeric effect) <b>(1969)</b>
Giauque, William Francis <b>Chemistry Nobel 1949</b>	1895 - 1982	Canadian-American (b. Niagara Falls, Ontario)	Absolute zero temperature <b>(1927+)</b> , partition functions <b>(1930)</b>
<i>Gillespie, Ronald G.</i>	1924 -	British-Canadian (b. London, England)	Gillespie-Nyholm model <b>(1957)</b> , Valence shell electron pair repulsion theory (VSEPR) <b>(1963)</b> , magic or super acid <b>(1968)</b> (with G.A. Olah)
<i>Good, Norman Everett</i>	1917 -	Canadian-American (b. Brantford, Ontario, Canada)	Good buffer solutions <b>(1966)</b>
Hanes, Charles Samuel	1903 - 1993	Canadian (b. Toronto, Ontario, Canada)	Hanes plot, Hanes-Woolf plot <b>(1932)</b>
<i>Kamen, Martin</i>	1913 -	Canadian-American (b. Toronto, Ontario, Canada)	Discovery of carbon-14 isotope <b>(1941)</b>
Keyes, Frederick George	1885 - 1976	Canadian-American (b. Kingston, Ontario)	
<i>Kresge, Alexander Jerry</i>	1926 -	American-Canadian (b. Wilkes Barre, Pennsylvania, USA)	Fractionation factor theory <b>(1964)</b> , with V. Gold
<i>Lalancette, Jean Marc</i>	1934 -	Canadian (b. Drummondville, Quebec, Canada)	Lalancette reagent <b>(1972)</b>
Lemieux, Raymond Urgel	1920 - 2000	Canadian (b. Lac la Biche, Alberta, Canada)	Lemieux-Johnson reaction <b>(1956)</b> , Lemieux-Johnson reagent <b>(1956)</b> (sodium periodate-osmium tetroxide), Lemieux-von Rudloff reagent <b>(1955)</b> (sodium periodate-potassium permanganate), Edward-Lemieux effect (anomeric effect) <b>(1969)</b>
<i>Lever, A. Barry P.</i>	1936 -	British-Canadian (b. London, England)	Lever electrochemical parameters <b>(1990)</b>

<b>Macdonald, Stewart Ferguson</b>	1913 -	Canadian (b. Toronto, Ontario, Canada)	Macdonald coupling ( <b>1952</b> )
<i>Marcus, Rudolph Arthur</i> <b>Nobel Prize Chemistry 1992</b>	1923 -	Canadian-American (b. Montreal, Canada)	RRKM theory ( <b>1952</b> ), Marcus equation ( <b>1956</b> ), BeMaHaPoThLe principle, Marcus-Hush relationship, Marcus inverted region
Menten, Maud Leonora	1879 - 1960	Canadian (b. Port Lambton, Ontario, Canada)	Michaelis-Menten kinetics ( <b>1913</b> )
<i>Moffatt, John Gilbert</i>	1930 -	Canadian-American (b. Victoria, British Columbia, Canada)	Pfizzner-Moffatt reagent ( <b>1963</b> ) (dimethylsulfoxide-dicyclohexylcarbodiimide)
Patterson, Arthur Lindo	1902 - 1966	New Zealander-British (b. Nelson, New Zealand)	Patterson functions ( <b>1934</b> )
Saunders, Frederick A.	1875 - 1963	Canadian (b. London, Ontario, Canada)	Russell-Saunders coupling ( <b>1925</b> )
<i>Siebrand, Willem</i>	1932 -	Dutch-Canadian (b. Ijsselmuiden, Netherlands)	Albery-Siebrand model ( <b>1986</b> )
<i>Taube, Henry</i> <b>Nobel Prize Chemistry 1983</b>	1915 -	Canadian-American (b. Neudorf, Saskatchewan)	Creutz-Taube complex, ion ( <b>1969</b> )
Winstein, Saul	1912 - 1969	Canadian-American (b. Montreal, Quebec, Canada)	Anchimeric assistance ( <b>1939</b> ); Normal salt effect ( <b>1940</b> ) with C.K. Ingold; Winstein equation; Grunwald-Winstein equation ( <b>1948</b> ); intimate and solvent separated ion pairs ( <b>1952</b> ) with D.J. Cram; special salt effect ( <b>1954</b> ); Winstein-Holness equation ( <b>1955</b> )
<i>Wolfe, Saul</i>	1933 -	Canadian (b. Toronto, Ontario, Canada)	Gauche effect ( <b>1972</b> )
<i>Yates, Keith</i>	1928 -	British-Canadian (b. Preston, England)	Cox-Yates acidity function ( <b>1978</b> )
Zerner, Michael Charles	1940 - 2000	Canadian-American (b. Boston, Massachusetts, USA)	ZINDO program ( <b>1991</b> )

Note:

Italicized names are those scientists that are still alive today.

Fischer, Hermann Otto Laurenz: Banting Institute, University of Toronto (1937 - 1948), synthesis of optically pure  $\alpha$ -monoglycerides and  $\alpha$ -glycerophosphoric acids; demonstrated action of lipase enzymes on above compounds.

Herman Francis Mark left I.G. Farbenindustrie in Germany (under Kurt H. Meyer) and worked for two years (1938 – 1940) as a Research Manager at International Paper Company, Hawkesbury, Ontario before taking up an academic position at Polytechnic Institute, Brooklyn, New York, USA.

Frederick Soddy worked at McGill University (1900 - 1903) with Ernest Rutherford. He came to Canada to increase his chances for a faculty position at the University of Toronto, however the University of Toronto was not interested in him.

Frederick Albert Saunders studied chemistry at the University of Toronto (1890's) then switched to physics.

Frederic Phillip Olsen was a professor at McMaster University, Hamilton, Ontario.

Donald Frank Stedman (Stedman columns) worked at the National Research Council in Ottawa (1930 - 1967)

Ernst Max von Rudloff (Lemieux-von Rudloff) is at the Prairie Research Labs of the NRC in Saskatoon.

The U.S. Pavilion at Expo 67 in Montreal was designed by Richard Buckminster Fuller. The geodesic dome design inspired Harold Kroto, Richard Smalley, and Robert Curl, Jr. to name the newest form of carbon, C<sub>60</sub>, buckminsterfullerene when it was discovered in 1985.

George Olah (Nobel Chemistry 1994) worked as a research scientist at Dow Chemical in Sarnia, Ontario (1957 - 1965).

Arthur L. Patterson did his Ph.D. at McGill in 1928 under the direction of Arthur S. Eve who was a former student of Ernest Rutherford. Rutherford had been a professor of experimental physics at McGill from 1898 to 1907. Eve was the official biographer of Rutherford and had published a book "Rutherford. Being the Life and Letters of the Rt. Hon. Lord Rutherford, O.M.", Cambridge University Press: Cambridge, 1939. Rutherford and Patterson were both New Zealanders born in Nelson, New Zealand.

## **References:**

### **Absolute zero temperature**

Giauque, W.F. *J. Am. Chem. Soc.* **1927**, 49, 1864  
 Giauque, W.F.; Clark, C.W. *J. Am. Chem. Soc.* **1932**, 54, 3135  
 Giauque, W.F.; MacDougall, D.P. *Phys. Rev.* **1933**, 43, 768  
 Giauque, W.F.; MacDougall, D.P. *Phys. Rev.* **1933**, 44, 235  
 Giauque, W.F.; MacDougall, D.P. *Phys. Rev.* **1935**, 47, 885  
 Giauque, W.F.; MacDougall, D.P. *J. Am. Chem. Soc.* **1935**, 57, 1175  
 Giauque, W.F. *Ind. Eng. Chem.* **1936**, 28, 743

## Albery-Siebrand model

Albery, W.J.; Bartlett, P.N.; Wilde, C.P.; Darwent, J.R., *J. Am. Chem. Soc.* **1985**, 107, 1854  
 Siebrand, W.; Wildman, T.A., *Acc. Chem. Res.* **1986**, 19, 238

## Anchimeric assistance (neighbouring group participation)

Winstein, S.; Lucas, H.J. *J. Am. Chem. Soc.* **1939**, 61, 1576  
 Winstein, S.; Buckles, R.E. *J. Am. Chem. Soc.* **1942**, 64, 2780; 2787; 2796  
 Winstein, S.; Grunwald, E.; Buckels, R.E.; Hanson, C. *J. Am. Chem. Soc.* **1948**, 70, 816  
 Winstein, S.; Grunwald, E.; Ingraham, L.L. *J. Am. Chem. Soc.* **1948**, 70, 821  
 Winstein, S.; Lindegren, C.R.; Marshall, H.; Ingraham, L.L. *J. Am. Chem. Soc.* **1953**, 75, 147  
 Baird, R.; Winstein, S. *J. Am. Chem. Soc.* **1957**, 79, 756; 4238

## Atoms in Molecules (AIM)

Biegler-Koenig, F.W.; Nguyen-Dang, T.T.; Tal, Y.; Bader, R.F.W.; Duke, A.J. *J. Phys. B* **1981**, 14, 2739  
 Bader, R.F.W.; Nguyen-Dang, T.T. *Adv. Quantum Chem.* **1981**, 14, 63  
 Biegler-Koenig, F.W.; Bader, R.F.W.; Tang, T.H. *J. Comput. Chem.* **1982**, 3, 317  
 Bader, R.F.W. *Acc. Chem. Res.* **1985**, 18, 9  
 Bader, R.F.W.; Larouche, A.; Gatti, C.; Carroll, M.T.; MacDougall, P.J.; Wiberg, K.B. *J. Chem. Phys.* **1987**, 87, 1142  
 Bader, R.F.W.; Carroll, M.T.; Cheeseman, J.R.; Chang, C. *J. Am. Chem. Soc.* **1987**, 109, 7968  
 Bader, R.F.W. *Pure Appl. Chem.* **1988**, 60, 145  
 Bader, R.F.W.; Gillespie, R.J.; MacDougall, P.J. *J. Am. Chem. Soc.* **1988**, 110, 7329  
 Bader, R.F.W.; Laidig, K.E. *THEOCHEM* **1991**, 80, 75  
 Bader, R.F.W.; Popelier, P.L.A. *Int. J. Quantum Chem.* **1993**, 45, 189  
 Bader, R.F.W. *NATO ASC Ser., Ser. C* **1993**, 406, 313  
 Bader, R.F.W. *Int. J. Quantum Chem.* **1994**, 49, 299  
 Bader, R.F.W. *Atoms in Molecules: a quantum theory*, Oxford University Press: Oxford, 1994

Bader, R.F.W. *Can. J. Chem.* **1998**, 76, 973

Bader, R.F.W. *Can. J. Chem.* **1999**, 77, 86

Hernandez-Trujillo, J.; Bader, R.F.W. *J. Phys. Chem. A* **2000**, 104, 1779

### **Bell-Evans-Polanyi principle,**

### **Be(II)-Ma(rcus)-Ha(mmond)-Po(lanyi)-Th(ornton)-Le(ffler) principle**

Evans, M.G.; Polanyi, M., *Trans. Faraday Soc.* **1938**, 34, 11

Bell, R.P., *Proc. Roy. Soc. London Ser. A.*, **1936**, 154, 414

Thornton, E.R., *J. Am. Chem. Soc.* **1967**, 89, 2915

### **Belleau's reagent (2,4-bis(4-phenoxyphenyl)-1,3-dithia-2,4-diphosphetane-2,4-disulfide)**

Lajoie, G.; Lepine, F.; Maziak, L.; Belleau, B. *Tetrahedron Lett.* **1983**, 24, 3815

Lajoie, G.; Lepine, F.; Lemaire, S.; Jolicoeur, F.; Aube, C.; Turcotte, A.; Belleau, B. *Int. J. Peptide Protein Res.* **1984**, 24, 316

Sauve, G.; Rao, V.S.; Lajoie, G.; Belleau, B. *Can. J. Chem.* **1985**, 63, 3089

### **Boyd-Edgecombe electronegativity parameters**

Boyd, R.J.; Edgecombe, K.E., *J. Am. Chem. Soc.* **1988**, 110, 4182

### **Brook rearrangement**

Brook, A.G., *J. Am. Chem. Soc.* **1958**, 80, 1886

### **Concept of DNA as substance of heredity**

Avery, O.T.; MacLeod, C.; McCarty, M. *J. Exp. Med.* **1944**, 79, 137

### **Cox-Yates acidity function**

Cox, R.A.; Yates, K., *J. Am. Chem. Soc.* **1978**, 100, 3861

Cox, R.A.; Yates, K., *Can. J. Chem.* **1981**, 59, 2116

### **Creutz-Taube complex, ion**

Decaamine- $\mu$ -(pyrazine-N<sup>1</sup>:N<sup>4</sup>)diruthenium(5+) or

$\mu$ -pyrazine-bis[pentaammineruthenium(III,II)]

Creutz, C.; Taube, H. *J. Am. Chem. Soc.* **1969**, 91, 3988

Creutz, C.; Taube, H. *J. Am. Chem. Soc.* **1973**, 95, 1086  
 Creutz, C. *Prog. Inorg. Chem.* **1983**, 30, 1

## Density functional theory

Hohenberg, P.; Kohn, W. *Phys. Rev.* **1964**, 136, B864  
 Kohn, W.; Sham, L.J. *Phys. Rev.* **1965**, 140, A1133  
 Merwin, N.D. *Phys. Rev.* **1965**, 137A, 1441  
 Schlüter, M.; Sham, L.J. *Physics Today* **1982**, 35(2), 36  
 Becke, A.D., *Phys. Rev. A* **1988**, 38, 3098  
 Lee, C.; Yang, W.; Parr, R.G., *Phys. Rev. B* **1988**, 37, 785

## Discovery of carbon-14

Ruben, S.; Kamen, M.D. *Phys. Rev.* **1941**, 59, 349  
 Kamen, M.D. *Science* **1963**, 140, 584  
 Kamen, M.D. *Adv. Tracer Methodology* **1965**, 2, 1  
 Kamen, M.D. *J. Chem. Educ.* **1963**, 40, 234

## Eadie plot

Eadie, G.S., *J. Biol. Chem.* **1942**, 146, 85

## Edward-Lemieux effect (anomeric effect)

Edward, J.T. *ACS Symp. Ser.* **1993**, 539, 1  
 Booth, H.; Lemieux, R.U. *Can. J. Chem.* **1971**, 49, 777  
 Lemieux, R.U.; Koto, S. *Tetrahedron* **1974**, 30, 1933  
 Lemieux, R.U.; Koto, S.; Voisin, D. *ACS Symp. Ser.* **1979**, 87, 17  
 Lemieux, R.U.; Pavia, A.A.; Martin, J.C.; Watanabe, K.A.  
*Can. J. Chem.* **1969**, 47, 4427  
 Thoegersen, H.; Lemieux, R.U.; Bock, K.; Meyer, B. *Can. J. Chem.* **1982**, 60, 44  
 Lemieux, R.U.; Bock, K. *Arch. Biochem. Biophys.* **1983**, 221, 125  
 Praly, J.P.; Lemieux, R.U. *Can. J. Chem.* **1987**, 65, 213

## Fractionation factor theory

Kresge, A.J., *Pure Appl. Chem.* **1964**, 8, 243  
 Gold, V., *Adv. Phys. Org. Chem.* **1969**, 7, 259  
 Kudish, A.I.; Wolf, D.; Steckel, F. *J. Chem. Soc. Faraday Trans. I* **1972**, 68, 2041

## Gauche effect

Wolfe, S. *Acc. Chem. Res.* **1972**, 5, 102  
Phillips, L.; Wray, V. *Chem. Commun.* **1973**, 90

## Gillespie-Nyholm model

Gillespie, R.J.; Nyholm, R.S. *Quart. Rev. London* **1957**, 11, 339

## Good buffer solutions

Good, N.E.; Winget, G.D.; Winter, W.; Connolly, T.N.; Izawa, S.; Singh, R.M. *Biochemistry*, **1966**, 5, 467  
Good, N.E.; Izawa, S. *Methods Enzym.* **1972**, 24B, 53  
Ferguson, W.J.; Braunschweiger, K.I.; Braunschweiger, W.R.; Smith, J.R.; McCormick, J.J.; Wasmann, C.C.; Jarvis, N.P.; Bell, D.H.; Good, N.E. *Anal. Biochem.* **1980**, 104, 300

## Grunwald-Winstein equation

Grunwald, E.; Winstein, S., *J. Am. Chem. Soc.* **1948**, 70, 846  
Grunwald, E.; Winstein, S.; Jones, H.W., *J. Am. Chem. Soc.* **1951**, 73, 2700

## Hanes-Woolf plot

Hanes, C.S., *Biochem. J.* **1932**, 26, 1406

## Intimate and solvent separated ion pairs

Cram, D.J. *J. Am. Chem. Soc.* **1952**, 74, 2129  
Winstein, S.; Schreiber, K. *J. Am. Chem. Soc.* **1952**, 74, 2165  
Denney, D.B.; Goldstein, B. *J. Am. Chem. Soc.* **1957**, 79, 4948  
Goering, H.L.; Levy, J.F. *J. Am. Chem. Soc.* **1962**, 84, 3853

## Lalancette reagent

Lalancette, J.M.; Freche, A.; Brindle, J.R.; Laliberte, M. *Synthesis* **1972**, 526

## Lemieux-Johnson reaction

Pappo, R.; Allen, D.S., Jr.; Lemieux, R.U.; Johnson, W.S., *J. Org. Chem.* **1956**, 21, 478

## Lemieux-Johnson reagent (sodium periodate - osmium tetroxide)

Pappo, R.; Allen, D.S., Jr.; Lemieux, R.U.; Johnson, W.S., *J. Org. Chem.* **1956**, 21, 478

## Lemieux-von Rudloff reagent (sodium periodate - potassium permanganate)

Lemieux, R.U.; von Rudloff, E., *Can. J. Chem.* **1955**, 33, 1701

## Lever ligand electrochemical parameters

Lever, A.B.P., *Inorg. Chem.* **1990**, 29, 1271

Masui, H.; Lever, A.B.P. *Inorg. Chem.* **1993**, 32, 2199

## Macdonald coupling (pyrromethanes)

Macdonald, S.F. *J. Chem. Soc. Abstr.* **1952**, 4176; 4184

Macdonald, S.F. *J. Am. Chem. Soc.* **1957**, 79, 2659

Arsenault, G.P.; Bullock, E.; Macdonald, S.F. *J. Am. Chem. Soc.* **1960**, 82, 4384

Macdonald, S.F.; Stedman, R.J. *Can. J. Chem.* **1955**, 33, 458

## Magic or super acid

Gillespie, R.J. *Acc. Chem. Res.* **1968**, 1, 202

Gillespie, R.J.; Pez, G.P. *Inorg. Chem.* **1969**, 8, 1233

Gillespie, R.J. *Can. Chem. Educ.* **1969**, 4, 9

Olah, G.A.; Commeyras, A. *J. Am. Chem. Soc.* **1969**, 91, 2929

Olah, G.A.; Ku, A.T.; Olah, J.A. *J. Org. Chem.* **1970**, 35, 3925

Gillespie, R.J.; Peel, T.E. *Adv. Phys. Org. Chem.* **1971**, 9, 1

Gillespie, R.J.; Peel, T.E.; Robinson, E.A. *J. Am. Chem. Soc.* **1971**, 93, 5083

Olah, G.A.; Szilagy, P.J. *J. Org. Chem.* **1971**, 36, 1121

Olah, G.A.; Ku, A.T.; Olah, J.A. *J. Org. Chem.* **1971**, 36, 3582

Olah, G.A.; McFarland, C.W. *Inorg. Chem.* **1972**, 11, 845

Gillepsie, R.J.; Morton, M.J. *Inorg. Chem.* **1972**, 11, 591

Gillepsie, R.J.; Morton, M.J. *Inorg. Chem.* **1972**, 11, 586

Gillespie, R.J. *Endeavour* **1973**, 32, 3

Gillespie, R.J.; Peel, T.E. *J. Am. Chem. Soc.* **1973**, 95, 5173

Gillepsie, R.J. *Proton Transfer React.* **1975**, 1

Gillespie, R.J.; Liang, J. *J. Am. Chem. Soc.* **1988**, 110, 6053

Gillespie, R.J. *Can. Chem. News* **1991**, 43, 20

## Marcus-Hush relationship

Hush, N.S., *Trans. Faraday Soc.* **1961**, 57, 557

Hush, N.S., *Prog. Inorg.Chem.* **1967**, 8, 391  
 Marcus, R.A., *J. Chem. Phys.* **1965**, 43, 679  
 Marcus, R.A., *Ann. Rev. Phys. Chem.* **1964**, 15, 155

### **Marcus equation, Marcus inverted region**

Marcus, R.A., *J. Chem. Phys.* **1956**, 24, 966  
 Marcus, R.A., *J. Phys. Chem.* **1968**, 72, 891  
 Marcus, R.A., *J. Chem. Phys.* **1963**, 38, 1858  
 Marcus, R.A., *Ann. Rev. Phys. Chem.* **1964**, 15, 155

### **Michaelis-Menten equation**

Michaelis, L.; Menten, M.L., *Biochem. Z.* **1913**, 49, 333

### **Normal salt effect**

Bateman, L.C.; Church, M.G.; Hughes, E.D.; Ingold, C.K.; Taher, N.A.  
*J. Chem. Soc.* **1940**, 979  
 Fainberg, A.H.; Winstein, S. *J. Am. Chem. Soc.* **1956**, 78, 2763  
 Winstein, S.; Klinedinst, Jr., P.E.; Robinson, G.C. *J. Am. Chem. Soc.* **1961**, 83, 885  
 Huisgen, R. *Angew. Chem. Int. Engl. Ed.* **1970**, 9, 751

### **Oxymercuration of Olefins**

Brook, A.G.; Wright, G.F. *Can. J. Res.* **1950**, 28B, 623  
 Wright, G.F. *Chemistry in Canada* **1950**, 2(9), 29  
 Wright, G.F. *Ann. N.Y. Acad. Sci.* **1957**, 65, 436  
 Abercrombie, M.J.; Rodgman, A.; Bharucha, K.R.; Wright, G.F. *Can. J. Chem.* **1959**, 37, 1328

### **Partition functions**

Giauque, W.F. *J. Am. Chem. Soc.* **1930**, 52, 4808

### **Patterson functions (Fourier series in x-ray crystallography)**

Patterson, A.L. *Z. Krist.* **1931**, 76, 177; 187  
 Patterson, A.L. *Phys. Rev.* **1934**, 46, 372  
 Patterson, A.L. *Z. Krist.* **1935**, 90, 517; 543

### **Pfitzner-Moffatt reagent (dimethylsulfoxide - dicyclohexylcarbodiimide)**

Pfizer, K.E.; Moffatt, J.G., *J. Am. Chem. Soc.* **1963**, 85, 3027

### **Rice-Ramsperger-Kassel-Marcus theory**

Marcus, R.A. *J. Chem. Phys.* **1952**, 20, 359

Marcus, R.A.; Rice, O.K. *J. Phys. Colloids Chem.* **1951**, 55, 894

Rice, O.K.; Ramsperger, H.C. *J. Am. Chem. Soc.* **1927**, 49, 1617

Rice, O.K.; Ramsperger, H.C. *J. Am. Chem. Soc.* **1928**, 50, 617

Kassel, L.S. *J. Phys. Chem.* **1928**, 32, 225; 1065

Kassel, L.S. *Proc. Natl. Acad. Sci. USA* **1928**, 14, 23

### **Russell-Saunders coupling**

Russell, H.N.; Saunders, F.A., *Astrophys. J.* **1925**, 61, 38

Russell, H.N.; Saunders, F.A., *Astrophys. J.* **1925**, 62, 1

### **Special salt effect**

Winstein, S.; Clippinger, E.; Fainberg, A.H.; Robinson, G.C.

*J. Am. Chem. Soc.* **1954**, 76, 2597

Fainberg, A.H.; Winstein, S. *J. Am. Chem. Soc.* **1956**, 78, 2763

Winstein, S.; Klinedinst, Jr., P.E.; Clippinger, E.

*J. Am. Chem. Soc.* **1961**, 83, 4986

### **Transmutation of the elements (radon from radium)**

Brooks, H. *Nature* **1904**, 70, 270

Brooks, H.; Rutherford, E. *Phil. Mag.* **1902**, 4[6], 1

Brooks, H.; Rutherford, E. *Trans. Roy. Soc. Canada* **1901**, [3], 21

### **Valence shell electron pair repulsion theory (VSEPR)**

Bent, H.A., *Chem. Rev.* **1961**, 61, 275

Gillespie, R.J., *J. Chem. Educ.* **1963**, 40, 295

Burdett, J.K., *Chem. Soc. Rev.* **1978**, 7, 507

Hall, M.B., *J. Am. Chem. Soc.* **1978**, 100, 6333

Gillespie, R.J.; Hargittai, I., *The VSEPR Model of Molecular Geometry*, Allyn & Bacon: Boston, 1991

Gillespie, R.J., *Chem. Soc. Rev.* **1992**, 21, 59

### **Winstein-Holness equation**

Winstein, S.; Holness, N.J., *J. Am. Chem. Soc.* **1955**, 77, 5562

## ZINDO program

Kanis, D.R.; Ratner, M.A.; Marks, T.J.; Zerner, M.C. *Chem. Mater.* **1991**, 3, 19

Sommerer, S.O.; Baker, J.D.; Zerner, M.C.; Palenik, G.J. *Inorg. Chem.* **1992**, 32, 563