CONTRIBUTIONS OF WOMEN TO NAMED THINGS IN CHEMISTRY AND PHYSICS

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Baló, Ilona (née Banga)	1906 -	Hungarian (b. Hódmezovásárhely, Hungary)	Wife of **Joseph Baló** D.Sc. 1929 Szeged; collaborator of Albert Szent-Györgyi (Vienna, Budapest) Discovered actomyosine and pancreatic elastase (with Joseph Baló)
Bell-Burnell, Susan Jocelyn	1943 -	British (b. England)	Ph.D. Cambridge 1968 (Antony Hewish); discoverer of pulsars
Blodgett, Katherine Burr	1898 - 1979	American (b. Schenectady, New York, USA)	Langmuir-Blodgett film **(1932)**; never married; Ph.D. 1926 Cambridge (Ernest Rutherford)
Brooks-Pitcher, Harriet	1876 - 1933	Canadian (b. Exeter, Ontario)	BA 1898 McGill (Ernest Rutherford); Sorbonne (M. Curie)
Brown, Sarah (née Baylen)		American (b. ?)	Wife of **Herbert C. Brown**; collaborator
Cleve-Euler, Astrid	1875 - 1968	Swedish (b. Uppsala, Sweden)	First wife of **Hans von Euler-Chelpin**; 1898 Stockholm (botanist, geologist, and chemist)
Cori, Gerty Theresa (née Radnitz) **Nobel Prize Medicine 1947**	1896 - 1957	Czech-American (b. Prague, Czech Republic)	Wife of Carl Ferdinand Cori; MD 1920 Carl Ferdinand U, Prague; Cori cycle **(1928)**; Cori ester **(1937)**
Cornforth, Rita (née Harradence)	?	British ?	Wife of **John Warcup Cornforth**; Ph.D. 1941? Oxford (Sir Robert Robinson)
Creutz, Carol	1944 -	American (b. Washington, D.C., USA)	Creutz-Taube complex, ion **(1969)**; Ph.D. 1970 Stanford (Henry Taube)
Curie, Marie (Manya née Sklodowska) **Nobel Prizes Chemistry 1911 and Physics 1903**	1867 - 1934	French (b. Warsaw, Poland)	Wife of **Pierre Curie**; co-discoverer of radium (element 88) and polonium (element 84) in **1898** with Pierre Curie in Paris, France curie unit of radiation, curium (element 96) Wife of **Pierre Curie**; D.Sc.

			1902 Sorbonne (Antoine Becquerel)
Ehrenfest-Afanassjewa, Tatyana Alexeyevna	1876 - 1964	Ukranian (b. Kiev, Ukraine)	Wife of **Paul Ehrenfest**; studied at Women's Univ. in St. Petersburg (Orest D. Chvolsou) and in Goettingen (Felix Klein; David Hilbert); mathematical physicist
Euler-Chelpin, Elisabeth von	1887 - ?	Swedish (b. Forsmark, Uppland, Sweden)	Second wife **of Hans von Euler-Chelpin**; studied in Lund and Stockholm; biochemist
Fieser, Mary Peters	1909 - 1997	American (b. Atchison, Kansas, USA)	Wife of **Louis Fieser**; M.A. 1936 Harvard (Louis Fieser)
Franklin, Rosalind Elsie	1920 - 1958	British (b. London, England)	Ph.D. 1945 Cambridge (Ronald G.W. Norrish)
Goeppert-Mayer, Maria **Nobel Prize Physics 1963**	1906 - 1972	Polish-American (b. Kattowitz, Upper Silesia, now Katowice, Poland)	Wife of **Joseph Mayer**; Bigeleisen-Goeppert-Mayer heavy atom approximation **(1947)**; Nuclear shell model **(1949)**; Ph.D. 1930 Gottingen (Max Born)
Haber-Immerwahr, Clara	1870 - 1915	Polish-German (b. Polkendorf, Silesia)	Wife of **Fritz Haber**; Ph.D. 1900 Breslau (Richard Abegg)
Hodgkin, Dorothy Mary (née Crowfoot) **Nobel Prize Chemistry 1964**	1910 - 1994	British (b. Cairo, Egypt)	x-ray crystallographic structures of penicillin **(1949)**, vitamin B12 **(1957)**, insulin **(1969)**; Ph.D. 1937 Cambridge (John D. Bernal)
Ingold, Edith Hilda Usherwood	1898 - 1988	British (b. London, England)	Wife of Sir Christopher K. Ingold; Ph.D. 1923 Imperial College London (Sir Christopher K. Ingold); Electronic theory of organic chemisry **(1926)**; concept of partial charges in chemical structures **(1926)**
Joliot-Curie, Irene	1897 - 1956	French (b. Paris, France)	Daughter of **Pierre** and **Marie**

Nobel Prize Chemistry 1935			**Curie**; Wife of **Frederic Joliot**; D.Sc. 1925 Sorbonne
Karle, Isabelle (née Lugoski)	1921 -	American (b. Detroit, Michigan, USA)	Wife of **Jerome Karle**; Ph.D. Michigan 1943 (Lawrence O. Brockway)
Kornberg, Sylvy R. (née Levy)	?	American ?	Wife of **Arthur Kornberg**; collaborator
Leslie, May Sybil	1887 - 1937	British (b. Woodlesford, Yorkshire, England)	M.Sc. 1909 Leeds (H.M. Dawson); Paris (Marie Curie); transmutation of the elements (radon from thorium and actinium) **(1911 – 1912)**; ionization in non-aqueous solution **(1913)**; optimized process for the manufacture of nitric acid (during WWI, published in **1922**)
Libby, Leona Woods Marshall	1919 - 1986	American (b. La Grange, Illinois, USA)	Second wife of **Willard F. Libby**; Ph.D. 1923 Yale (Robert S. Mulliken)
Lonsdale, Kathleen (née Yardley)	1903 - 1971	Irish (b. Newbridge, Ireland)	D.Sc. 1927 Roy. Inst. Gr. Brit. D.Sc. 1936 UC London (Sir William H. Bragg)
Lyubimova, Militza	?	Russian (b. ?)	Wife of **Vladimir A. Engelhard**t; co-discoverer of aerobic resynthesis of ATP, established how myosin obtains energy to function
Mangold, Hilde (née Proscholdt)	1898 - 1924	German (b. ?)	Wife of Otto Mangold; co-discoverer of organizer in embryogenesis **(1924)**; Ph.D. 1924 Freiburg (Hans Spemann)
Meitner, Lise	1878 - 1968	Austrian (b. Vienna, Austria)	co-discoverer of protactinium (element 91) **(1917)** with Otto Hahn in Berlin, Germany Nuclear fission **(1939)**; never married; Ph.D. 1906 Vienna (Franz Exner)

Menten, Maud Leonora	1879 - 1960	Canadian (b. Port Lambton, Ontario, Canada)	Michaelis-Menten kinetics **(1913)**; Ph.D. 1916 Chicago (Albert P. Mathews)
Meyer-Bjerrum, Kirstine	1861 - 1941	Danish (b. Skaerbaek, North Schleswig, Denmark)	Daughter of **Niels J. Bjerrum**; Ph.D. 1909 Copenhagen
Michael, Helen Cecilia Desilver Abbott	1857 - 1904	American (b. Philadelphia, Pennsylvania, USA)	Wife of **Arthur Michael**; M.D. 1903 Tufts College
Needham, Dorothy Mary (née Moyle)	1896 - 1987	British (b. London, England)	Wife of **Joseph Needham**; D.Sc. 1939 Cambridge; biochemist
Noddack, Ida Eva Tacke	1896 - 1978	German (b. Lackhausen, Germany)	Wife of **Walther Noddack**; Ph.D. 1921 U. Berlin-Charlottenburg (chem. eng.) co-discoverer of rhenium (element 75) **(1925)** with Walther Noddack in Berlin, Germany
Noyes, Mary Chilton	1855 - 1936	American (b. ?)	Sister of **William A. Noyes**; Ph.D. 1892 Iowa State or Ph.D. 1895 (Case Western Reserve or Cornell); first woman to obtain doctorate in physics in U.S.
Olah, Judith A. (née Lengyel)	?	American ?	Wife of **George A. Olah**; collaborator
Perutz, Gisela (née Peiser)	?	Austrian ?	Wife of **Max F. Perutz**; collaborator
Perey, Marguerite Catherine	1909 - 1975	French (b. Villemomble, France)	discoverer of francium (element 87) **(1939)** in Paris, France; Ph.D. 1920s Paris
Pockels, Agnes	1862 - 1935	German (b. Venice, Italy)	Inventor of quantitative method for measuring surface tension; sister of **Friedrich Pockels**; no Ph.D.
Robinson, Gertrude Maud Walsh	1886 - 1954	British (b. Winsford, England)	Wife of **Sir Robert Robinson**; M.Sc. 1908 Manchester

Staudinger, Magda (née Woit)	1902 - 1997	Estonian (b. Elwa, Estonia)	Wife of **Hermann Staudinger**; Ph.D. 1920s Berlin (Gottlieb Haberlandt); biochemist, natural scientist
Stieglitz, Mary Rising	1889 - 1977	American (b. Ainsworth, Nebraska, USA)	Second wife of **Julius Stieglitz**; Ph.D. 1920 Chicago (Julius Stieglitz)
Strassmann-Heckter, Maria Caroline	1898 - 1956	German (b. Hannover, Germany)	Wife of **Fritz Strassmann**; Dr. Ing. 1934 Hannover (Gustav Keppeler)
Truter, Mary Rosaleen (née Jackman)	?	British (b. ?)	Ph.D. 1952 Leeds (Sir Ernest G. Cox) ; x-ray crystallographer, collaborated with **Charles Pedersen** at UC London
Wiedemann, Clara Laura (née Mitscherlich)	1827 - ?	German (b. Berlin, Germany)	Wife of Gustav H. Wiedemann
Wu, Chien-Shiung	1913 - 1997	Chinese-American (b. Shanghai, China)	Ph.D. 1940 UC Berkeley (Emilio Segré); discovered non-conservation of parity in beta decay
Zucker, Lois Mason	1913 -	American (b. Franklin, Pennsylvania, USA)	Zucker-Hammett hypothesis **(1939)**; Ph.D. 1940 Columbia (Louis P. Hammett)

Note: Italicized names are those believed to be still alive at the time of this writing.

Kathleen Blodgett (1898 - 1979)
Kathleen Blodgett was the first female research scientist ever employed at General Electric in Schenectady, New York. Her father was the head of the patent department at the GE plant though he had already been dead before Kathleen was born. After completing her M.Sc. at U Chicago she worked as an assistant to Irving Langmuir from 1918 to 1924. She then obtained a Ph.D. degree in physics from Cambridge University under Ernest Rutherford, the first woman to have received a doctorate from that institution. Her entrance to Cambridge required the persuasion of Langmuir to overcome biases of faculty and administrators.

E. Hilda Usherwood Ingold (wife of Sir Christopher K. Ingold) was also a chemist. She and her husband described mesomeric and inductive effects in a series of papers beginning with *J. Chem. Soc.* **1926**, 1310.

Her work is cited in C.K. Ingold's celebrated classic "*Structure and Mechanism in Organic Chemistry*" in which she also assisted her husband in preparing the manuscript.

Marie Anne Lavoisier (1758 - 1836)

Marie Lavoisier married Antoine when she was 14 years old. Her training was in draftsmanship and she transcribed and translated Antoine's chemistry texts. She published Antoine's *Memoires de chemie*. It is speculated that she worked in her husband's laboratory as she is depicted in a painting by Jacques Louis David (1788) as working alongside Antoine. Her father and Antoine were guillotined in 1794 due to their involvement as tax farmers during the French Revolution. Soon after she married Count Rumford in 1805 after an affair, however the marriage did not last. They separated in 1809. Little else is known about her.

Maud Leonora Menten (1879 - 1960)

Text of plaque in front of Medical Sciences Building, University of Toronto, Queen's Park erected by the Ontario Heritage Foundation, Ministry of Culture and Recreation:

"An outstanding medical scientist, Maud Menten was born in Port Lambton. She graduated in medicine from the University of Toronto in 1907 and four years later became one of the first Canadian women to receive a medical doctorate. In 1913, in Germany, collaboration with Leonor Michaelis on the behaviour of enzymes resulted in the Michaelis-Menten equation, a basic biochemical concept which brought them international recognition. Menten continued her brilliant career as a pathologist at the University of Pittsburgh from 1918, publishing extensively on medical and biochemical subjects. Her many achievements included important co-discoveries relating to blood sugar, hemoglobin, and kidney functions. Between 1951 and 1954 she conducted cancer research in British Columbia and returned to Ontario six years before she died."

Helen Cecilia deSilver Abbott Michael (wife of Arthur Michael of the Michael 1,4-addition reaction) was also a chemist. She published 15 papers between 1883 and 1896. She was his assistant in his private laboratory on the Isle of Wight. She also published a book "*Studies in Plant and Organic Chemistry and Literary Papers*," Cambridge, 1907. She was born on December 23, 1857 in Philadelphia. She studied medicine at Tufts University and obtained her medical degree in 1903. She also studied chemistry with Prof. Michael at Tufts College in Boston and married him in June 1888. She died of grippe on November 29, 1904. (See Grinstein, L. S.; Rose, R.K.; Rafailovich, M.H., *Women in Chemistry and Physics: A Biobibliographic Sourcebook*, Greenwood Press: Westport, Conn., 1993, pp. 405 – 9; Tarbell, A.T.; Tarbell, D.S. *J. Chem. Educ.* **1982**, 59, 548 – 9)

Marguerite Perey (1909 - 1975)

Marguerite Perey was the first woman to be admitted to the French Academy of Sciences. She was a lab assistant in the labs of Marie Curie at the Radium Institute in Paris. When Perey first met Curie, Curie thought that Perey was the lab's secretary and not a coworker. Despite this first encounter her talents

impressed Curie enough to forge a lasting mentor relationship. Due to her work with radioactive materials she too died of cancer as did Curie.

Margaret Hilda Thatcher (née Roberts) (1925 -) earned a B.Sc. in Chemistry from Somerville College, Oxford. She worked with Dorothy Mary Hodgkin (née Crowfoot) (1910 - 1994), b. Cairo, Egypt, Nobel Laureate in Chemistry 1964) on the structure of nucleic proteins by x-ray crystallography.

References:

Beisswanger, G. *Chem. Unserer Zeit* **1991**, 25, 96 (biography of Agnes Pockels)

Dawson, H.M. *J. Chem. Soc.* **1938**, 151 (biography of May Sybil Leslie)

Fässeler, P.E.; Sander, K. *Wilhelm Roux Archives of Developmental Biology* **1996**, 205, 323 (biography of Hilde Mangold)

Grinstein, L. S.; Rose, R.K.; Rafailovich, M.H., *Women in Chemistry and Physics: A Biobibliographic Sourcebook*, Greenwood Press: Westport, Conn., 1993.

Hamburger, V. *The Heritage of Experimental Embryology: Hans Spemann and the organiser*, Oxford University Press: Oxford, 1988 (biography of Hilde Mangold)

Hodgkin, D.M.C. *Biog. Memoirs Fellows Roy. Soc.* **1975**, 21, 447 (biography of Kathleen Lonsdale)

Kauffman, G.B.; Adloff, J.P. *Educ. Chem.* **1989**, 26, 135 (biography of Marguerite Perey)

Larner, J. *Biog. Memoirs Fellows Natl. Acad. Sci.* **1992**, 61, 111 (biography of Gerty Theresa Cori)

Leffek, K.T. *Sir Christopher Ingold: a major prophet of organic chemistry*, Nova Lion Press: Victoria, BC, 1996

Maddox, B. *Rosalind Franklin : Dark Lady of DNA*, Harper Collins Publishers: London, 2002 (biography of Rosalind Franklin)

Ogilvie, Marilyn; Harvey, Joy (eds.) *The Biographical Dictionary of Women in Science*, Routledge: New York, 2000

Piper, A. *Trends Biochem. Sci.* **1998**, 23, 151 (biography of Rosalind Franklin)

Rayner-Canham, M.; Rayner-Canham, G., *Women in Chemistry: Their Changing Roles from Alchemical Times to the Mid-Twentieth Century*, ACS: Washington, 1998.

Rayner-Canham, M.F.; Rayner-Canham, G.W. *Harriet Brooks: pioneer nuclear scientist*, McGill-Queens University Press: Montreal, 1992

Rayner-Canham, M.F.; Rayner-Canham, G.W. *Am. J. Phys.* **1990**, 58, 1036

Smeaton, W.A. *Ambix* **1989**, 36, 1 (biography of Madame Lavoisier)

Sime, R.L. *J. Chem. Educ.* **1989**, 66, 373 (biography of Lise Meitner)

Vare, E.A.; Ptacek, G. *Patently Female: from AZT to TV dinners, stories of women inventors and their breakthrough ideas*, Wiley: Chichester, 2002

Rulev, A.Y.; Voronkov, M.G. *New J. Chem.* **2013**, 37, 3826

Original Scientific Literature:

Bigeleisen-Goeppert-Mayer heavy atom approximation

Bigeleisen, J.; Goeppert-Mayer, M., *J. Chem. Phys*. **1947**, 15, 261
Bigeleisen, J, *J. Chem. Phys*. **1949**, 17, 675

Concept of energy production from ATP via enzyme catalysis

Engelhardt, V.A.; Lyubimova, M.N. *Nature* **1939**, 144, 668

Cori cycle

Cori, C.F.; Cori, G.T. *J. Biol. Chem.* **1928**, 79, 309; 321
Cori, C.F.; Cori, G.T. *J. Biol. Chem.* **1929**, 81, 389

Cori ester

Cori, C.F.; Cori, G.T. *Proc. Soc. Exp. Biol. Med.* **1936**, 34, 702
Cori, C.F.; Colowick, S.P.; Cori, G.T. *J. Biol. Chem.* **1937**, 121, 465

Creutz-Taube complex, ion

Decaamine-μ-(pyrazine-N^1:N^4)diruthenium(5+) or
μ-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

Curie unit of radiation

Curie, P; Desains, P., *Compt. Rend*. **1880**, 90, 1506
Curie, M. *Compt. Rend.* **1898**, 126, 1101
Curie, M.S., Curie, P., *Compt. Rend.* **1898**, 127, 175
Curie, M.S.; Curie, P.; Bémont, G., *Compt. Rend.* **1898**, 127, 1215

Discovery of francium (element 87)

Perey, M. *Compt. Rend.* **1939**, 208, 97
Perey, M.; Lecoin, M. *Nature* **1939**, 144, 326
Perey, M.; Lecoin, M. *J. Phys. Radium* **1939**, 10, 435
Perey, M.; Lecoin, M. *J. Phys. Radium* **1939**, 10, 439
Perey, M. *J. Chim. Phys.* **1946**, 43, 155
Perey, M. *J. Chim. Phys.* **1946**, 43, 262
Perey, M. *Intern. Congr. Pure Applied Chem. (London)* **1947**, 11, 159
Perey, M. *Bull. Soc. Chim. Fr.* **1951**, 779

Perey, M. *Scientia (Milan)* **1953**, 88, 267

Discovery of non-conservation parity laws

Wu, C.S. *Proc. Inter. School Physics Enrico Fermi* **1966**, 32, 52
Wu, C.S. *Alpha-, Beta-, and Gamma-ray Spectr.* **1965**, 2, 1313; 1365; 1415

Discovery of polonium (element 84)

Curie, M.S., Curie, P., *Compt. Rend.* **1898**, 127, 175

Discovery of pulsars

Hewish, A.; Bell, S.J.; Pilkington, J.D.H.; Scott, P.F.; Collins, R.A. *Nature* **1968**, 217, 709
Pilkington, J.D.H.; Hewish, A.; Bell, S.J.; Cole, T.W. *Nature* **1968**, 218, 126

Discovery of radium (element 88)

Curie, M.S.; Curie, P.; Bémont, G., *Compt. Rend.* **1898**, 127, 1215
Curie, M.S. *Chem. News* **1903**, 88, 85, 97, 134, 159, 169, 175, 187, 199, 211, 223, 247, 259, 271

Discovery of proactinium (element 91)

Hahn, O.; Meitner, L. *Physik. Z.* **1918**, 19, 208
Hahn, O.; Meitner, L. *Chem. Ber.* **1919**, 52B, 1812
Hahn, O.; Meitner, L. *Chem. Ber.* **1921**, 54B, 69
Hahn, O.; Meitner, L. *Z. Physik* **1922**, 8, 202

Discovery of rhenium (element 75)

Noddack, W.; Noddack, I. DE 483495 (Siemens & Halske A-G) 1925/06/19
CAN 24:1188
Noddack, W.; Noddack, I. *Continental Met. & Chem. Eng.* **1926**, 1, 109
Noddack, I. *Z. Elektrochem.* **1928**, 34, 629
Noddack, I.; Noddack, W. *Metallborse* **1930**, 20, 621
Noddack, I.; Noddack, W. *Z. Angew. Chem.* **1931**, 44, 215
Noddack, I.; Noddack, W. *Z. Physik. Chem.* **1931**, 154A, 207
Noddack, I.; Noddack, W. DE 606,448 (Siemens & Halske A-G) 1934/12/03
CAN 29:1595(3)

Ionization in non-aqueous solvents

Dawson, H.M.; Leslie, M.S. *Trans. Chem. Soc.* **1913**, 99, 1601

Langmuir-Blodgett film

Langmuir, I.; Blodgett, K.B., *J. Am. Chem. Soc*. **1932**, 54, 3781
Langmuir, I.; Blodgett, K.B., *Kolloid Z*. **1935**, 73, 257
Langmuir, I.; Blodgett, K.B., *Phys. Rev*. **1937**, 51, 964

Michaelis-Menten equation

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

Nuclear fission

Meitner, L. *Naturwissenschaften* **1934**, 22, 759

Hahn, O.; Meitner, L. *Naturwissenschaften* **1935**, 23, 37; 230; 320
Hahn, O.; Meitner, L.; Strassmann, F. *Naturwissenschaften* **1935**, 23, 544
Hahn, O.; Meitner, L.; Strassmann, F. *Chem. Ber.* **1936**, 69B, 905
Meitner, L.; Hahn, O. *Naturwissenschaften* **1936**, 24, 158
Hahn, O.; Meitner, L.; Strassmann, F. *Chem. Ber.* **1937**, 70B, 1374
Meitner, L.; Hahn, O.; Strassmann, F. *Z. Physik* **1937**, 106, 249
Hahn, O.; Meitner, L.; Strassmann, F. *Naturwissenschaften* **1938**, 26, 475
Hahn, O.; Meitner, L. *Scientia* **1938**, 63, 12
Hahn, O. *Ann. Physik* **1939**, 36, 368
Hahn, O.; Strassmann, F. *Naturwissenschaften* **1939**, 27, 11; 89; 163
Hahn, O.; Strassmann, F. *Physik. Z.* **1939**, 40, 673
Meitner, L.; Frisch, O.R. *Nature* **1939**, 143, 239; 471
Hahn, O.; Strassmann, F. *Naturwissenschaften* **1940**, 28, 455
Hahn, O.; Strassmann, F. *Forschungen u. Fortschr.* **1940**, 16, 31
Hahn, O. *Scientia* **1941**, 68, 8
Hahn, O. *Chem. Ztg.* **1942**, 66, 317
Hahn, O.; Strassmann, F. *Naturwissenschaften* **1943**, 31, 499
Meitner, L. *Rev. Modern Phys.* **1945**, 17, 287

Nuclear shell model

Mayer, M.G. *Phys. Rev.* **1949**, 75, 1969
Mayer, M.G. *Phys. Rev.* **1950**, 78, 16
Mayer, M.G. *Phys. Rev.* **1950**, 78, 22
Mayer, M.G.; Moszkowski, S.A.; Nordheim, L.W. *Rev. Modern Phys.* **1951**, 23, 315
Mayer, M.G.; Jensen, J.H.D. *Elementary Theory of Nuclear Shell Structure* , Wiley: New York, 1955
Mayer, M.G. *Angew. Chem.* **1964**, 76, 729
Mayer, M.G.; Jensen, J.H.D. *Alpha-, Beta-, Gamma-Ray Spectrosc..* **1965**, 1, 557

Optimized process to manufacture nitric acid

Hall, J.A.; Jaques, A.; Leslie, M.A. *J. Chem. Soc. Ind. London Rev. Sect.* **1922**, 41, 285

Organizer in embryogenesis

Spemann, H.; Mangold, H. *Archiv fur mikroskopische Anatomie und Entwicklungsmechanik* **1924**, 100, 599
Willier, B.H.; Oppenheimer, J.M. *Foundations of Experimental Embryology*, Prentice-Hall: NJ, 1964

Planarity of benzene ring by X-ray crystallography

Lonsdale, K. *Proc. Roy. Soc. London A* **1929**, 123A, 494
Lonsdale, K. *Proc. Roy. Soc. London A* **1931**, 133A, 536
Lonsdale, K.; Orelkin, B. *Proc. Roy. Soc. London A* **1934**, 144A, 630

Transmutation of the elements (radon from thorium)

Leslie, M.S. *Compt. Rend.* **1911**, 153, 328
Leslie, M.S. *Le Radium* **1911**, 8, 356
Leslie, M.S. *Le Radium* **1912**, 9, 276
Leslie, M.S. *Phil. Mag.* **1912**, 24, 637

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

X-ray structure of penicillin

Hodgkin, D.C. *Advancement Sci.* **1949**, 6, 85
Abrahamson, S.; Hodgkin, D.C.; Maslen, E.N. *Biochem. J.* **1963**, 86, 514
Hodgkin, D.C. *Harvey Lect.* **1967**, 61, 205
Hodgkin, D.C. *Kristallografiya* **1981**, 26, 1029

X-ray structure of vitamin B12

Brink, C.; Hodgkin, D.C.; Lindsey, J.; Pickworth, J.; Robertson, J.H.; White, J.G. *Nature* **1954**, 174, 1169
Hodgkin, D.C. *Bull. Soc. Franc. Mineral. Cryst.* **1955**, 78, 106
Hodgkin, D.C.; Pickworth, J.; Robertson, J.H.; Trueblood, K.N.; Prosen, R.J.; White, J.G. *Nature* **1955**, 176, 325
Kamper, M.J.; Hodgkin, D.C. *Nature* **1955**, 176, 551
Hodgkin, D.C.; Johnson, A.W.; Todd, A.R. *Chem. Soc. (London)* **1955**, 3, 109
Hodgkin, D.C.; Kamper, J.; Mackay, M.; Pickworth, J.; Trueblood, K.N.; White, J.G. *Nature* **1956**, 178, 64
Hodgkin, D.C.; Kamper, J.; Lindsey, J.; Mackay, M.; Pickworth, J.; Robertson, J.H.; Shoemaker, C.B.; White, J.G.; Prosen, R.J.; Trueblood, K.N. *Proc. Roy. Soc. London* **1957**, A242, 228

X-ray structure of insulin

Adam, M.G.; Coller, L.; Hodgkin, D.C.; Dodson, G.G. *Am. J. Med.* **1966**, 40, 667
Harding, M.M.; Hodgkin, D.C.; Kennedy, A.F.; O'Conor, A.; Weitzmann, P.D. *J. Mol. Biol.* **1966**, 16, 212
Dodson, E.; Harding, M.M.; Hodgkin, D.C.; Rossmann, M.G. *J. Mol. Biol.* **1966**, 16, 227
Adams, M.J.; Blundell, T.L.; Dodson, E.J.; Dodson, G.G.; Vijayan, M.; Baker, E.N.; Harding, M.M.; Hodgkin, D.C.; Rimmer, B.; Sheats, S. *Nature* **1969**, 224(5218), 491
Hodgkin, D.C. *Verh. Schweiz. Naturforsch. Ges.* **1970**, 150, 93
Blundell, T.; Dodson, G.; Hodgkin, D.; Mercola, D. *Adv. Protein Chem.* **1972**, 26, 279
Bentley, G.; Dodson, G.; Hodgkin, D.; Mercola, D. *Nature* **1976**, 261(5556), 166
Hodgkin, D. *Proc. Int. Wolltextil-Forschungskonf. 5th* **1976**, 1, 361
Hodgkin, D. *Int. Congr. Ser. Excerpta Med.* **1977**, 413(Diabetes), 155

X-ray structures of helical ribonucleic acids; tobacco mosaic virus

Franklin, R.E.; Gosling, R.G. *Nature* **1953**, 172, 156
Franklin, R.E.; Klug, A. *Acta Cryst.* **1955**, 8, 777
Franklin, R.E. *Nature* **1955**, 175, 379
Franklin, R.E.; Holmes, K.C. *Biochim. Biophys. Acta* **1956**, 21, 405
Franklin, R.E. *Nature* **1956**, 77, 928
Franklin, R.E.; Klug, A. *Biochim. Biophys. Acta* **1956**, 19, 403
Franklin, R.E.; Klug, A.; Finch, J.T.; Holmes, K.C. *Disc. Faraday Soc.* **1958**, 25, 197
Franklin, R.E.; Holmes, K.C. *Acta Cryst.* **1958**, 11, 213

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Zucker, L.; Hammett, L.P., *J. Am. Chem. Soc*. **1939**, 61, 2779