Scientific References for Nobel Chemistry Prizes

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1901 - Jacobus Henricus van't Hoff
"in recognition of the extraordinary services he has rendered by the discovery of the laws of chemical dynamics and osmotic pressure in solutions."

Van't Hoff's law, theory of dilute solutions

van't Hoff, J.H., *Z. Physik. Chem.* **1887**, 1, 481
van't Hoff, J.H., *Chem. Ber.* **1877**, 10, 669

Van't Hoff law of osmosis

Van't Hoff, J.H., *Phil. Mag*. **1888**, 26, 81

Van't Hoff plot, Van't Hoff equation

van't Hoff, J.H. *Etudes de Dynamique Chimique*, Muller: Amsterdam, 1884, p. 114 - 118

Law of mass action

Van't Hoff, J.H. *Z. Physik. Chem.* **1887**, 1, 481

1902 - Hermann Emil Fischer
"in recognition of the extraordinary services he has rendered by his work on sugar and purine syntheses."

Fischer projection

Fischer, E., *Chem. Ber.* **1891**, 24, 1836
Fischer, E., *Chem. Ber.* **1891**, 24, 2683

Peptide Protein Structure

Fischer, E.; Fourneau, E. *Chem. Ber.* **1901**, 34, 2868
Fischer, E. *Chem. Z.* **1902**, 26, 939

Theory of peptide protein synthesis

Fischer, E.; Fourneau, E. *Chem. Ber.* **1901**, 34, 2868
Fischer, E. *Chem. Z.* **1902**, 26, 939

1903 - Svante August Arrhenius

"in recognition of the extraordinary services he has rendered to the advancement of chemistry by his electrolytic theory of dissocation"

Ionization theory

Arrhenius, S. *Z. Physik. Chem.* **1887**, 1, 631

1904 - William Ramsay

"in recognition of his services in the discovery of the inert gaseous elements in air, and his determination of their place in the periodic system."

Element 2 (Helium)

Ramsay, W. *Proc. Roy. Soc. London* **1895**, 58, 65
Ramsay, W. *Proc. Roy. Soc. London* **1895**, 58, 81
Collie, J.N.; Ramsay, W. *Proc. Roy. Soc. London* **1895 - 1896**, 59, 257
Ramsay, W. *Proc. Roy. Soc. London* **1895 - 1896**, 59, 325
Ramsay, W.; Collie, J.N. *Proc. Roy. Soc. London* **1896 - 1897**, 60, 53
Ramsay, W.; Collie, J.N. *Proc. Roy. Soc. London* **1896 - 1897**, 60, 206
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1897**, 61, 267
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1897 - 1898**, 62, 316
Crookes, W. *Proc. Roy. Soc. London* **1898**, 63, 408
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1897 - 1898**, 62, 225
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1900**, 67, 329

Element 10 (Neon)

Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1898**, 63, 437
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1900**, 67, 329

Element 18 (Argon)

Rayleigh, Lord; Ramsay, W. *Proc. Roy. Soc. London* **1894 - 1895**, 57, 265
Crookes, W. *Proc. Roy. Soc. London* **1894 - 1895**, 57, 287
Olszewski, K. *Proc. Roy. Soc. London* **1894 - 1895**, 57, 290
Hartley, W.N. *Proc. Roy. Soc. London* **1894 - 1895**, 57, 293
Rayleigh, Lord; Ramsay, W. *Phil. Trans. Roy. Soc.* **1895**, 186A, 187
Crookes, W. *Phil. Trans. Roy. Soc.* **1895**, 186A, 243
Olszewski, K. *Phil. Trans. Roy. Soc.* **1895**, 186A, 253
Ramsay, W.; Young, S. *Phil. Trans. Roy. Soc.* **1895**, 186A, 257
Collie, J.N.; Ramsay, W. *Proc. Roy. Soc. London* **1895 - 1896**, 59, 257
Ramsay, W.; Collie, J.N. *Proc. Roy. Soc. London* **1896 - 1897**, 60, 53
Ramsay, W.; Collie, J.N. *Proc. Roy. Soc. London* **1896 - 1897**, 60, 206
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1897**, 61, 267
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1897 - 1898**, 62, 225
Crookes, W. *Proc. Roy. Soc. London* **1898**, 63, 408
Ramsay, W. *Proc. Roy. Soc. London* **1898-1899**, 64, 181
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1898-1899**, 64, 183
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1900**, 67, 329

Element 36 (Krypton)

Crookes, W. *Proc. Roy. Soc. London* **1898**, 63, 408
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1898**, 63, 405
Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1900**, 67, 329

Element 54 (Xenon)

Ramsay, W.; Travers, M.W. *Proc. Roy. Soc. London* **1900**, 67, 329

1905 - Johnann Friedrich Wilhelm Adolf von Baeyer

"in recognition of this services in the advancement of organic chemistry and the chemical industry, through his work on organic dyes and hydroaromatic compounds."

Synthesis of phthalein dyes

Baeyer, A. *Chem. Ber.* **1876**, 9, 1230
Baeyer, A. *Ann. Chem.* **1876**, 183, 1
Baeyer, A.; Burkhardt, J.B. *Chem. Ber.* **1878**, 11, 1297; 1299
Baeyer, A.; Schraube, C. *Chem. Ber.* **1878**, 11, 1301
Baeyer, A.; Burkhardt, J.B. *Ann. Chem.* **1880**, 202, 111; 126
Baeyer, A. *Ann. Chem.* **1880**, 202, 50; 66; 68; 90; 135; 153
Baeyer, A.*Ann. Chem.* **1882**, 212, 340; 347
Baeyer, A.; Kochendoerfer, E. *Chem. Ber.* **1889**, 22, 2196

Synthesis of triphenylmethane dyes

Baeyer, A.; Villiger, V. *Chem. Ber.* **1903**, 36, 2774
Baeyer, A.*Chem. Ber.* **1904**, 37, 597
Baeyer, A.; Villiger, V. *Chem. Ber.* **1904**, 37, 1183; 2848; 3191
Baeyer, A.*Chem. Ber.* **1905**, 38, 569; 1156
Baeyer, A.*Chem. Ber.* **1907**, 40, 3083
Baeyer, A. *Ann. Chem.* **1907**, 354,
Baeyer, A.*Chem. Ber.* **1909**, 42, 2624
Baeyer, A. *Ann. Chem.* **1910**, 372,

Synthesis of indigo

Baeyer, A. *Chem. Ber.* **1878**, 11, 1296
Baeyer, A. *Chem. Ber.* **1879**, 12, 456

1906 - Henri Moissan

"in recognition of the great services rendered by him in his investigation and isolation of the element fluorine, and for the adoption in the service of science of the electric furnace called after him."

Element 9 (fluorine)

Moissan, H. *Ann. Chem. Chim. Phys.* **1887**, 12[6], 472
Moissan, H. *Ann. Chem. Chim. Phys.* **1892**, 25[6], 125

1907 - Eduard Buchner

"for his biochemical researches and his discovery of cell-free fermentation."

Cell-free fermentation

Buchner, E.; Rapp, R. *Ber.* **1897**, 30, 117

1908 - Ernest Rutherford

"for this investigations into the disintegration of the elements, and the chemistry of radioactive substances."

Disintegration of the elements

Rutherford, E. *Phil. Mag.* **1900**, 49, 1
Rutherford, E.; Soddy, F. *Phil. Mag.* **1903**, 5, 576
Rutherford, E. *Phil. Mag.* **1911**, 21, 669
Rutherford, E. *Radio-activity*, Cambridge University Press: Cambridge, 1904
Rutherford, E. *Radioactive Substances and their Radiations*, Cambridge University Press: Cambridge, 1913
Rutherford, E. *Radioactive Transformations*, Yale University Press: New Haven, 1906

Alpha particles

Rutherford, E. *Phil. Mag.* **1903**, 5, 177
Rutherford, E.; Royds, T.*Phil. Mag.* **1909**, 17, 281
Bragg, W.H. *Phil. Mag.* **1904**, 8, 719
Ramsay, W.; Soddy, F. *Proc. Roy. Soc. London* **1905**, 72, 204
Geiger, H; Nuttall, J.M.*Phil. Mag.* **1911**, 22, 613

Atomic nucleus

Rutherford, E. *Phil. Mag.* **1911**, 21, 669

1909 - Wilhelm Ostwald
"in recognition of his work on catalysis and for his investigation into the fundamental principles governing chemical equilibria and rates of reaction."

Catalysis

Ostwald, W. *J. Prakt. Chem*. **1883**, 27, 1

Ostwald dilution law

Ostwald, W.F., *Z. Physik. Chem*. **1888**, 2, 36
Ostwald, W.F., *Z. Physik. Chem.* **1889**, 3, 170

1910 - Otto Wallach
"in recognition of his services to organic chemistry and the chemical industry by his pioneer work in the field of alicyclic compounds."

Wallach, O. *Ann. Chem.* **1906**, 347, 316
Wallach, O. *Ann. Chem.* **1911**, 381, 51
Wallach, O. *Ann. Chem.* **1913**, 396, 264
Wallach, O. *Terpene und Camphor Zusammenfassung eigener Untersuchungen auf den Gebeit der alicyclischen Kohlenstoffverbindungen*, Viet & Co.: Leipzig, 1914

1911 - Marie Curie, née Sklodowska
"in recognition of her services to the advancement of chemistry by the discovery of the elements radium and polonium, by the isolation of radium and the study of the nature and compounds of this remarkable element."

Element 88 (Radium)

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

Element 84 (Polonium)

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

1912 - Victor Grignard

"for the discovery of the so-called Grignard reagent, which in recent years has greatly advanced the progress of organic chemistry."

Grigard reagent (aryl or alkyl magnesium halides)

Grigard, V., *Compt. Rend.* **1900**, 130, 1322

Grignard reaction

Grignard, V., *Compt. Rend*. **1900**, 130, 1322

1912 - Paul Sabatier

"*for his method of hydrogenating organic compounds in the presence of finely disintegrated metals whereby the progress of organic chemistry has been greatly advanced in recent years."*

Sabatier, Paul; Senderens, J.-B. Fr. Annales de Chimie et de Physique (1905), 319-432.
Sabatier, Paul; Senderens, J.-B. Fr. Annales de Chimie et de Physique (1905), 4 433-488
Sabatier, Paul; Mailhe, A. Compt. rend. (1907), 145 18-21.
Sabatier, Paul; Mailhe, A. Compt. rend. (1908), 146 1376-8.
Sabatier, Paul; Mailhe, A. Compt. rend. (1908), 147 16-8.
Sabatier, Paul; Mailhe, A. Annales de Chimie et de Physique (1909), 16 70-107.
Sabatier, Paul; Mailhe, A. Compt. rend. (1908), 147 106-8
Sabatier, Paul; Mailhe, A. Compt. rend. (1909), 148 1734-6
Sabatier, Paul; Mailhe, A. Compt. rend. (1910), 150 823-6
Sabatier, Paul; Mailhe, A. Annales de Chimie et de Physique (1910), 20 289-352.
Sabatier, Paul; Mailhe, A. Compt. rend. (1910), 150 1569-72
Sabatier, Paul; Mailhe, A. Compt. rend. (1911), 152 669-73.
Sabatier, Paul; Mailhe, A. Compt. rend. (1912), 154 49-52
Converting heavy hydrocarbons into lighter hydrocarbons. Sabatier, P.; Mailhe, A. (1915), US 1124333 19150112
Converting heavy petroleum hydrocarbons into volatile hydrocarbons. Sabatier, P.; Mailhe, A. (1915), US 1152765 19150907
Cracking oils. Sabatier, P.; Mailhe, A. (1914), GB 1416791 19140714
Catalysts. Sabatier, P.; Mailhe, A. (1915), GB 152011 19150208
Sabatier, P.; Mailhe, Alph.; Gaudion, G. Compt. rend. (1919), 168 926-30.
Sabatier, Paul. Journal of Industrial and Engineering Chemistry (Washington, D. C.) (1926), 18 1005-8
Sabatier, Paul; Fernandez, Antonio. Compt. rend. (1927), 185 241-4.

1913 - Alfred Werner

"in recognition of his work on the linkage of atoms in molecules by which he has thrown new light on earlier investigations and opened up new fields of research especially in inorganic chemistry."

Co-ordination numbers in inorganic compounds

Werner, A., *Ber.* **1907**, 40, 1433
Werner, A, *Z. Physik. Chem.* **1901**, 38, 331
Werner, A., *Z. Physik. Chem.* **1894**, 14, 506

1914 - No Prize Awarded due to WWI

1915 - Theodore William Richards (prize for 1914 not awarded due to WWI, awarded in 1915)
"in recognition of his accurate determinations of the atomic weight of a large number of chemical elements."

Atomic weight determinations of the elements

Richards, T.W. *J. Chim. Physique Phys. Chim. Biol.* **1908**, 6, 92
Richards, T.W. *J. Am. Chem. Soc.* **1912**, 34, 959
Richards, T.W. *J. Franklin Inst.* **1916**, 182, 78
Richards, T.W. *Bull. Soc. Chim. Fr.* **1922**, 31, 929
Richards, T.W. *Chem. Rev.* **1924**, 1, 1

1915 - Richard Martin Willstätter (prize for 1915)
"for his researches on plant pigments, especially chlorophyll"

Willstätter, W.R.; Mieg, W. *Ann. Chem.* **1907**, 350, 1
Willstätter, W.R. *Ann. Chem.* **1907**, 350, 48
Willstätter, W.R.; Hocheder, F. *Ann. Chem.* **1907**, 354, 205
Willstätter, W.R.; Mieg, W. *Ann. Chem.* **1908**, 355, 1
Willstätter, W.R.; Pfannenstiehl, A. *Ann. Chem.* **1908**, 358, 205
Willstätter, W.R. *Zurich Pharm. Post* **1908**, 41, 597
Willstätter, W.R.; Hocheder, F.; Hug, R. *Ann. Chem.* **1910**,
Willstätter, W.R.; Fritzsche, H. *Ann. Chem.* **1910**, 371, 33
Willstätter, W.R.; Asahina, Y. *Ann. Chem.* **1910**, 373, 227
Willstätter, W.R.; Oppe, A. *Ann. Chem.* **1911**, 378, 1
Willstätter, W.R.; Stoll, A. *Ann. Chem.* **1911**, 378, 18
Willstätter, W.R.; Mayer, E.W.; Huni, E. *Ann. Chem.* **1911**, 378, 73
Willstätter, W.R.; Stoll, A. *Ann. Chem.* **1911**, 380, 148
Willstätter, W.R. *J. Am. Chem. Soc.* **1915**, 37, 323
Willstätter, W.R.; Utzinger, M. *Ann. Chem.* **1911**, 382, 129
Willstätter, W.R.; Stoll, A.; Utzinger, M. *Ann. Chem.* **1912**, 385, 156
Willstätter, W.R.; Asahina, Y. *Ann. Chem.* **1912**, 385, 188
Willstätter, W.R.; Stoll, A. *Ann. Chem.* **1912**, 387, 317
Willstätter, W.R.; Isler, M. *Ann. Chem.* **1912**, 390, 269
Willstätter, W.R.; Forsen, L. *Ann. Chem.* **1913**, 396, 180
Willstätter, W.R.; Fischer, M.; Forsen, L. *Ann. Chem.* **1914**, 400, 147
Willstätter, W.R.; Fischer, M. *Ann. Chem.* **1914**, 400, 182
Willstätter, W.R. *Angew. Chem.* **1914**, 26, 641
Willstätter, W.R.; Page, H.J. *Ann. Chem.* **1914**, 404, 237

1916 - No Prize awarded due to WWI

1917 - No Prize awarded due to WWI

1918 - No Prize awarded due to WWI

1919 - Fritz Haber (prize for 1918 not awarded due to WWI, awarded in 1919)
"for the synthesis of ammonia from its elements"

Haber nitrogen fixation process (ammonia synthesis)

Haber, F., *Chem. Ztg*. **1910**, 34, 345
Haber, F., *Z. Elektrochem.* **1910**, 16, 244
Haber, F., *Z. Elektrochem.* **1914**, 20, 597
Ger. Patent 229,126 (June 15, 1909)
Brit. Patent 14,023 (June 9, 1910)
U.S. Patent 999,025 (July 25, 1910)

1920 - No Prize Awarded due to WWI

1921 - Walther Hermann Nernst (prize for 1920 not awarded due to WWI, awarded in 1921)
"in recognition of his work in thermochemistry."

Nernst equation

Nernst, H.W., *Z. Physik. Chem.* **1889**, 4, 129
Nernst, H.W., *Z. Physik. Chem.* **1888**, 2, 613
Nernst, H.W., *Wied. Ann. Physik* **1892**, 45, 360

Nernst heat theorem (third law of thermodynamics)

Nernst, W. *Sitzber. Preuss. Akad. Wiss.* **1906**, 933
Nernst, W. *Chem. Ber.* **1908**, 40, 4617
Nernst, W. *Berlin J. Physique* **1910**, 9, 721
Nernst, W.; Koref, F.; Lindemann, F.A. *Berlin Sitzber. Kgl. Preuss. Akad. Wiss.* **1910**, 12(13), 247
Nernst, W. *Berlin Sitzber. Kgl. Preuss. Akad. Wiss.* **1910**, 12(13), 261
Nernst, W. *Berlin Sitzber. Kgl. Preuss. Akad. Wiss.* **1911**, 65; 306
Nernst, W.; Lindemann, F.A. *Berlin Sitzber. Kgl. Preuss. Akad. Wiss.* **1911**, 494
Nernst, W. *Z. Elektrochem. Angew. Physik. Chem.* **1911**, 17, 265
Nernst, W. *Physik. Z*. **1911**, 12, 976
Nernst, W. *Ann. Physik* **1912**, 36, 395
Nernst, W.; Lindemann, F.A. *Z. Elektrochem. Angew. Physik. Chem.* **1912**, 18, 817
Nernst, W. *Sitzber. Kgl. Preuss. Akad. Wiss.* **1912**, 134
Nernst, W. *Proc. Acad. Wettenschappen* **1913**, 14, 201
Nernst, W. *Z. Elektrochem. Angew. Physik. Chem.* **1914**, 20, 357
Nernst, W. *Sitzber. Kgl. Preuss. Akad. Wiss.* **1913**, 972
Nernst, W.; Schwers, F. *Sitzber. Kgl. Preuss. Akad. Wiss.* **1914**, 355
Nernst, W. *Kraftstoff* **1940**, 16, 299

1921 - Frederick Soddy (prize for 1921)
"for his contributions to our knowledge of the chemistry of radioactive substances, and his investigations into the origin and nature of isotopes."

Disintegration of the elements

Rutherford, E.; Soddy, F. *Phil. Mag.* **1903**, 5, 576

Group displacement law

Soddy, F. *Chem. News* **1913**, 107, 97
Fajans, K. *Ber.* **1913**, 35, 240

Isotope concept

Soddy, F. *J. Chem. Soc.* **1911**, 99, 72

Alpha particles

Ramsay, W.; Soddy, F. *Proc. Roy. Soc. London* **1905**, 72, 204

1922 - Francis William Aston (prize for 1922)
"for his discovery, by means of this mass spectrograph, of isotopes, in a large number of non-radioactive elements, and for his enunciation of the whole-number rule."

Mass spectrometry

Aston, F.W., *Isotopes*, E. Arnold: London, 1922
Aston, F.W. *Mass Spectra and Isotopes*, London, 1933
Aston, F.W. *Phil. Mag.* **1919**, 38, 707
Demptster, A.J. *Phys. Rev.* **1918**, 11, 316
Aston, F.W., *Nature* **1936**, 137, 357
Aston, F.W., *The London Edinburgh, and Dublin Phil. Mag.* **1920**, 40, 628

Whole number rule for isotopes

Aston, F.W. *Mass Spectra and Isotopes*, Edward Arnold: London, 1933
Aston, F.W. *Nature* **1929**, 123, 313

1923 - Fritz Pregl
"for his invention of the method of micro-analysis of organic substances."

Microanalytical methods for organic substances

Pregl, F. *Die quantitative organische Mikroanalyse*, 3rd ed.; Julius Springer: Berlin, 1930
Pregl, F.; Fyleman, E. *Quantitative Organic Microanalysis*, P. Blakiston's Son: Philadelphia, 1930

1924 - No Prize Awarded

1925 - No Prize Awarded

1926 - Richard Adolf Zsigmondy (prize for 1925)

"for his demonstration of the heterogenous nature of colloid solutions and for the methods he used, which have since become fundamental in modern colloid chemistry."

Zsigmondy, R. *Ann. Chem.* **1898**, 301, 29
Zsigmondy, R. *Ann. Chem.* **1898**, 301, 361
Zsigmondy, R.; Siedentopf, H.F.W. *Ann. Chem. Physik* **1904**, 10[4], 1
Zsigmondy, R., *Colloids and the Ultramicroscope: A Manual of Colloid Chemistry and Ultramicroscopy*; Alexander, J., Trans.; Wiley: New York, 1909
Zsigmondy, R.; Thiessen, P.A. *Das kolloide Gold*, Akademische Verlagsgesellschaft: Leipzig, 1925

1926 - The (Theodor) Svedberg (prize for 1926)
"for his work on disperse systems."

Svedberg, T., *Colloid Chemistry*, 2nd ed.; Chemical Catalog Co.: New York, 1928
Svedberg, T., et al. *The Ultracentrifuge*, Clarendon Press: Oxford, 1940

Svedberg, T.; Fahraeus, R. *J. Am. Chem. Soc.* **1926**, 48, 430
Svedberg, T.; Nichols, J.B. *J. Am. Chem. Soc.* **1923**, 45, 2910
Svedberg, T; Stein, D.S. *J. Am. Chem. Soc.* **1923**, 45, 2613

1927 - No Prize Awarded

1928 - Heinrich Otto Wieland (prize for 1927)
"for his investigation of the constitution of the bile acids and related substances."

Wieland, H.; Sorge, H. *Z. Physiol. Chem.* **1916**, 97, 1
Wieland, H.; Sorge, H. *Z. Physiol. Chem.* **1916**, 98, 59
Wieland, H.; Sorge, H. *J. Chem. Soc. Abstracts* **1916**, 110(I), 710
Wieland, H.; Sorge, H. *J. Chem. Soc. Abstracts* **1917**, 112(I), 685
Wieland, H.; Stender, H. *Z. Physiol. Chem.* **1919**, 106, 181
Wieland, H.; Kulenkampff, A. *Z. Physiol. Chem.* **1920**, 108, 295; 306
Wieland, H.; Adickes, F. *Z. Physiol. Chem.* **1922**, 120, 232
Wieland, H. *Z. Physiol. Chem.* **1924**, 134, 140
Wieland, H.; Mothes, W. *Z. Physiol. Chem.* **1924**, 134, 149
Wieland, H.; Schlichting, O. *Z. Physiol. Chem.* **1924**, 134, 276
Wieland, H.; Revery, G. *Z. Physiol. Chem.* **1924**, 140, 186
Wieland, H. *Z. Physiol. Chem.* **1925**, 142, 191
Wieland, H.; Schlichting, O. *Z. Physiol. Chem.* **1925**, 150, 267
Wieland, H.; Jacobi, R. *Z. Physiol. Chem.* **1925**, 148, 232
Wieland, H.; Schlichting, O.; von Langsdorff, W. *Z. Physiol. Chem.* **1926**, 161, 74
Wieland, H.; Schlichting, O.; Jacobi, R. *Z. Physiol. Chem.* **1926**, 161, 80
Wieland, H. *Z. Physiol. Chem.* **1927**, 167, 70
Wieland, H.; Vocke, F. *Z. Physiol. Chem*. **1928**, 177, 68-85
Wieland, H. *Angew. Chem.* **1929**, 42, 421
Wieland, H.; Wiedersheim, V. *Z. Physiol. Chem.* **1930**, 186, 229
Wieland, H.; Vocke, F. *Z. Physiol. Chem.* **1930**, 191, 69
Dane, E.; Wieland, H. *Z. Physiol. Chem.* **1931**, 194, 119
Wieland, H.; Noguchi, T. *Z. Physiol. Chem.* **1931**, 194, 248
Wieland, H.; Posternak, T. *Z. Physiol. Chem.* **1931**, 197, 17
Wieland, H.; Ertel, L.; Schonberger, W. *Z. Physiol. Chem.* **1931**, 197, 31
Wieland, H.; Deulofeu, V. *Z. Physiol. Chem.* **1931**, 198, 127
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1932**, 206, 225; 243
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1932**, 210, 268
Wieland, H.; Dane, E.; Maiweg, L. *Z. Physiol. Chem.* **1932**, 211, 164
Wieland, H.; Dane, E.; Schonberger, W. *Z. Physiol. Chem.* **1932**, 211, 177
Wieland, H.; Kraft, K. *Z. Physiol. Chem.* **1932**, 211, 203
Wieland, H.; Scholz, E. *Z. Physiol. Chem.* **1932**, 211, 261
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1932**, 212, 41
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1932**, 212, 263
Wieland, H.; Kishi, S. *Z. Physiol. Chem.* **1933**, 214, 47
Wieland, H.; Posternak, T. *Z. Physiol. Chem.* **1933**, 214, 59
Wieland, H.; Dane, E.; Martius, C. *Z. Physiol. Chem.* **1933**, 215, 15
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1933**, 216, 91
Wieland, H.; Kennelly, M.A. *Z. Physiol. Chem.* **1933**, 219, 138
Wieland, H.; Dane, E. *Z. Physiol. Chem.* **1933**, 219, 240
Wieland, H.; Kraus, K.; Keller, H.; Ottawa, H. *Z. Physiol. Chem.* **1936**, 241, 47
Wieland, H.; Hanke, G. *Z. Physiol. Chem.* **1936**, 241, 98

Wieland, H.; Dietz, E.; Ottawa, H. *Z. Physiol. Chem.* **1936**, 244, 194
Wieland, H.; Seibert, W. *Z. Physiol. Chem.* **1939**, 262, 1

1928 - Adolf Otto Reinhold Windaus (prize for 1928)
"for the services rendered through his research into the constitution of the sterols and their connection with the vitamins."

Vitamins

Antirachitic

Windaus, A.. Nalurwissenschaften (1926), 14 963
Windaus. Pharmazeutische Monatshefte (1927), 7 48-9.
Windaus, Adolf; Hess, Alfred. Nachr. Ges. Wiss. Gottingen, Math. Physik. Klasse (1926), 175-84.
Windaus, A.; Auhagen, E. Z. physiol. Chem. (1931), 197 167-72
Windaus, A.; Luttringhaus, A. Z. physiol. Chem. (1931), 203 70-5
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"for their investigations on the fermentation of sugar and fermentative enzymes"

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"for his researches into the constitution of haemin and chlorophyll and especially for his synthesis of haemin."

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"in recognition of their contributions to the invention and development of chemical high pressure methods."

Chemical high pressure methods

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1932 - Irving Langmuir
"for his discoveries and investigations in surface chemistry."

Kinetics of adsorption

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1933 - No Prize Awarded

1934 - Harold Clayton Urey
"for his discovery of heavy hydrogen."

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1935 - Frédéric Joliot and Irène Joliot-Curie
"in recognition of their synthesis of new radioactive elements."

Synthesis of radioactive elements

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"for his contributions to our knowledge of molecular structure through his investigations on dipole moments and on the diffraction of X-rays and electrons in gases."

X-ray diffraction

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Dipole moment

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1937 - Walter Norman Haworth
"for his investigations on carbohydrates and vitamin C."

Vitamin C

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1937 - Paul Karrer
"for his investigations on carotenoids, flavins, and vitamins A and B2."

Vitamin A

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1938 - No Prize awarded

1939 - Richard Kuhn (prize for 1938)
"for his work on carotenoids and vitamins."

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Vitamin B6 (Pyridoxine)

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1939 - Adolf Friedrich Johann Butenandt
"for his work on sex hormones."

Female sex hormones

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1939 - Leopold Ruzicka

"for his work on polymethylenes and higher terpenes."

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1940 - No prize awarded

1941 - No prize awarded

1942 - No prize awarded

1943 - No prize awarded

1944 - George de Hevesy (prize for 1943)
"for his work on the use of isotopes as tracers in the study of chemical processes."

Radioactive tracers

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"for his discovery of the fission of heavy nuclei."

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"for his research and inventions in agricultural and nutrition chemistry, especially for his fodder preservation method."

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1946 - James Batcheller Sumner
"for his discovery that enzymes can be crystallized."

Crystallization of enzymes

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"for their preparation of enzymes and virus proteins in a pure form."

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1947 - Robert Robinson

"for his investigations on plant products of biological importance, especially the alkaloids."

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1948 - Arne Wilhelm Kaurin Tiselius

"for his research on electrophoresis and adsorption analysis, especially for his discoveries concerning the complex nature of serum proteins."

Electrophoresis

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"for his contributions in the field of chemical thermodynamics, particularly concerning the behaviour of substances at extremely low temperatures."

Absolute zero measurements

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1950 - Otto Paul Hermann Diels and Kurt Alder
"for their discovery and development of the diene synthesis."

Diels-Alder reaction

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"for their discoveries in the chemistry of the transuranium elements."

Element 93 (Neptunium)

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"for their invention of partition chromatography."

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"for his work on nucleotides and nucleotide co-enzymes"

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Synthesis of adenosine diphosphate
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"for his discovery and development of the polarographic methods of analysis."

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1963 - Karl Ziegler and Giulio Natta
"for their discoveries in the field of the chemistry and technology of high polymers."

Ziegler-Natta catalyst (titanium tetrachloride, triethylaluminum)

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1964 - Dorothy Crowfoot Hodgkin
"for her determinations by X-ray techniques of the structures of important biochemical substances."

X-ray structure of vitamin B12

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1965 - Robert Burns Woodward
"for his outstanding achievements in the art of organic synthesis."

Synthesis of quinine

Woodward, R.B.; Doering, W.E. *J. Am. Chem. Soc.* **1944**, 66, 849
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Synthesis of cholesterol

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"for their development of the use of boron and phosphorus containing compounds, respectively, into important reagents in organic synthesis."

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"for his work on the mechanisms of electron transfer reactions, especially in metal complexes."

Creutz-Taube complex, ion

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

μ-pyrazine-bis[pentaammineruthenium(III,II)]

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Merrifield solid-phase synthesis of peptides

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