

AICHE Centennial Recognizes Contributions to the Profession

To mark AIChE's milestone anniversary this year, the Awards and Recognition Subcommittee of the Centennial Celebration Committee has developed lists of those who contributed to the profession and society in a variety of times and ways. These lists highlight individuals for their contributions before and during World War II ("Foundation Age") and after ("Modern Era"), as well as the authors of ground-breaking textbooks, industrial executives, astronauts, and chemical engineers who achieved fame in other pursuits. Additionally, the subcommittee has identified the profession's forerunners.

These lists are being rolled out in *CEP* throughout 2008. This month, we begin with "Fifty Forerunners of Importance." These forerunners illustrate how chemical engineering thought and practice evolved through history, beginning well before the formal founding of the profession and the Institute. If you play this game, matching the names with the descriptions, you'll likely learn something new about our profession's "ancestry." How many can you figure out — without using Google? The answers will be posted on the AIChE website, www.aiche.org/100.

These lists were created in a spirit of celebration, not as rankings of technical accomplishment to be cast in stone. Please keep in mind that no single list can be exhaustive or definitive. The names on these lists were suggested by many, many AIChE members. The subcommittee, composed of diverse and distinguished colleagues, used multiple secret ballots to select engineers, narrowing down from roughly 700 names considered.

Barry Tarmy, an AIChE Fellow with an avid interest in the history of chemical engineering, chairs the subcommittee.

The Achievements

- 1515 – Conceived use of parabolic mirror concentrators for dyeing cloth
- mid-1700s – Derived equation relating potential and dynamic flow energies
- mid-1700s – Proposed equations describing conservation of mass and momentum for inviscid fluids
- 1775 – Invented soda water as cure for scurvy (it didn't); published papers on electrical discharges and electrical conductivities of charcoals
- 1780 – Developed process for making soda ash from common salt, used to make glass, soap, paper and more
- early 1800s – With George Stokes, added viscous transport to Euler equations
- early 1800s – Built solar furnace that could melt platinum
- 1802 – Broke ground for superior explosives plant on Brandywine River, Delaware
- 1823 – Patented waterproofing method using India rubber dissolved in coal-tar to cement layers of wool cloth together
- 1829 – Developed relationship relating rate of advection of a flow to its rate of diffusion
- 1829 – Found that gas diffusion is inversely proportional to the square root of densities and, hence, molecular weights
- 1839 – Accidentally vulcanized rubber lump while attempting to harden gum by boiling with sulfur
- 1843 – Invented first successful multiple-effect vacuum process for producing sugar
- 1845 – Patented process for manufacturing gelatin (Jell-O); founded first free college in U.S.
- 1856 – Patented conversion of aniline into purplish mixture after alcohol extraction when 18 years old
- 1846 – Developed ether as surgical anesthetic
- 1855 – Formulated law of gas diffusion across membranes, which led to technique to measure cardiac output
- 1859 – Produced oil drilling tools and drilled Edwin Drake's Titusville, PA, oil well; was paid \$2.50/day
- 1861 – Developed process for manufacturing soda ash using ammonia, carbon dioxide and lime soda
- 1860s – Invented celluloid by combining nitrocellulose, camphor and alcohol heated under pressure
- 1866 – Formulated kinetic theory of gases (early statistical mechanics concept); with Maxwell, found that average molecular motion is the same in all directions
- 1869 – Established gas/liquid relationships; accounted for molecular volumes/forces
- 1871 – Discovered scattering of light or other electromagnetic radiation by particles much smaller than the wavelength of the light
- 1872 – First environmentalist, published "Air and Rain" studies of the chemistry of atmospheric precipitation
- 1876 – Developed graphical method for analyzing multi-phase chemical systems

- 1883 – Formulated fundamental relationships for transitions from laminar to turbulent flow
- 1886 – Invented electrolytic aluminum manufacturing process
- 1886 – Defined chemical engineering as conversion of laboratory processes into industrial ones
- 1888 – Developed MIT's "Course X," which combined mechanical engineering with industrial chemistry
- 1889 – Creator of the modern American chemical industry; thought of as both an engineer and a chemist
- 1890 – Developed milk quality tester, allowing widespread use of dairy products; paved the way for vitamins A and D
- 1891 – Invented underground extraction process using superheated water to liquefy/deliver sulfur from deep deposits
- 1893 – Developed mathematical basis for interpretation of distillation of binary solutions; published "La rectification de l'alcohol"
- 1900 – Recognized convection and diffusion mixing as key in vapor-phase oxidation of sulfur dioxide to sulfuric acid
- 1902 – Identified chemical compositions of dyes, milk, alkaloids and wine using the capillarity of paper; later became known as the grandfather of paper chromatography
- 1904 – Published chemical engineering concepts as "A Handbook of Chemical Engineering"
- 1904 – Revolutionized fluid mechanics with concept of a boundary layer between surfaces and moving fluids
- 1906 – Made fundamental contributions to electrochemistry, solid-state chemistry, photochemistry and more
- 1906 – Used selective adsorbents and extraction to purify chlorophyll from plants; termed it "chromatography"
- 1908 – Formulated continuous-flow stirred-tank plug-flow equations; received 1932 Nobel prize for monolayer and two dimensional physics
- 1908 – Received Nobel Prize for reproducing colors photographically based on the phenomenon of interference
- 1908 – Received Nobel Prize for work in hematology and chemotherapy; predicted autoimmunity ("horror autotoxicus")
- 1909 – Received Nobel Prize for fundamental work on catalysis, chemical equilibrium and reaction velocities
- 1910 – Developed carbon-free chromium, tungsten, molybdenum and vanadium processes using direct oxide reductions
- 1912 – Developed theory of boundary layers and fluid flow to calculate air resistance of aircraft and rockets, leading to the first all-metal cantilevered wing
- 1913 – Introduced concept of velocity fluctuations in turbulent flows, critical to development of solid mechanics
- 1915 – Devised basic heat-transfer relationships later bearing his name
- 1923 – Developed first viable catalytic cracking process using anhydrous aluminum chloride as catalyst
- 1928 – Accidentally created bacteria-free penicillin annulus in staphylococcus culture even if diluted eight-hundredfold
- 1931 – Confirmed his discovery of mass-2 hydrogen (deuterium); proposed centrifugal separation of uranium

The Forerunners

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| • Babcock, Stephen | • Graham, Thomas | • Peclet, Jean Claude Eugène |
| • Becket, Fredrick | • Hall, Charles | • Perkin, William Henry |
| • Bernoulli, Daniel | • Hyatt, John | • Prandtl, Ludwig |
| • Boltzmann, Ludwig | • Knietzsch, Rudolf T. J. | • Priestley, Joseph |
| • Cooper, Peter | • Langmuir, Irving | • Reynolds, Osborne |
| • daVinci, Leonardo | • Lavoisier, Antoine | • Rillieux, Norbert |
| • Davis, George E. | • LeBlanc, Nicolas | • Smith, Angus |
| • Dow, Herbert | • Levinstein, Ivan | • Smith, William A. ("Uncle Billy") |
| • du Pont, Eleuthère Irénée | • Lippmann, Gabriel | • Solvay, Ernest |
| • Ehrlich, Paul | • Macintosh, Charles | • Sorel, E. |
| • Euler, Leonhard | • McAfee, Almer McDuffie | • Strutt, John William (Lord Rayleigh) |
| • Fick, Adolf Eugen | • Morton, William T. G. | • Taylor, Geoffrey Ingram |
| • Fleming, Alexander | • Navier, Claude-Louis | • Tswett, Mikhail S. |
| • Frasch, Herman | • Nernst, Walther | • Urey, Harold C. |
| • Gibbs, Josiah Willard | • Norton, Lewis | • van der Waals, Johannes Diderik |
| • Goodyear, Charles | • Nusselt, Wilhelm | • von Karman, Theodore |
| • Goppelsroeder, Friedrich | • Ostwald, Wilhelm | |

Next Time: Ten Chemical Engineers in Space!