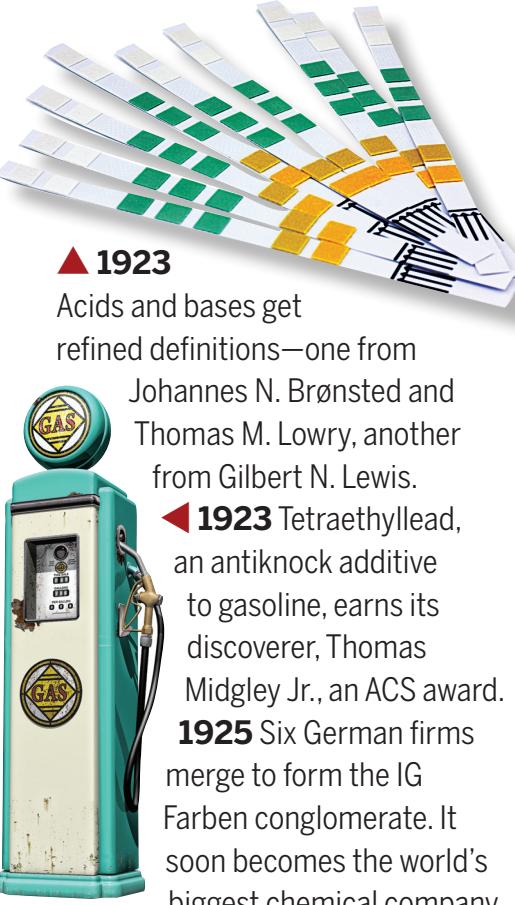


**1923** Chemical & Engineering News begins as the News Edition of Industrial & Engineering Chemistry.



▲ **1923**

Acids and bases get refined definitions—one from Johannes N. Brønsted and Thomas M. Lowry, another from Gilbert N. Lewis.

◀ **1923** Tetraethyllead, an antiknock additive to gasoline, earns its discoverer, Thomas Midgley Jr., an ACS award.

**1925–27** Six German firms merge to form the IG Farben conglomerate. It soon becomes the world's biggest chemical company.

**1925–27** Work from Werner Heisenberg, Wolfgang E. Pauli, and Erwin Schrödinger ushers in the era of quantum mechanics.

**1926** Four U.K. chemical companies merge to form Imperial Chemical Industries (ICI). In its heyday it will become the British Empire's largest manufacturing firm.

**1930s** Sulfonamides (sulfa drugs) are introduced. They are the first antibiotics commercialized.

**1931** Harold C. Urey discovers deuterium.

**1932** James Chadwick discovers the neutron.

**1932** Albert Szent-Györgyi and Charles G. King independently isolate vitamin C.



▲ **1935** DuPont chemists Wallace H. Carothers (pictured) and Gerard Berchet invent nylon.

**1935** ICI patents the process for making polyethylene, one of today's most common plastics.

**1937** Eugene J. Houdry develops industrial-scale catalytic petroleum cracking, setting the stage for the modern oil refinery.

► **1941** To show that his chlorofluorocarbon (CFC) coolant, Freon, is nontoxic and nonflammable, Thomas Midgley Jr. takes the stage at an ACS national meeting, inhales a lungful of Freon, and blows out a candle.



**1941** Archer J. P. Martin and Richard L. M. Synge begin publishing work that would lead to partition chromatography, revolutionizing analytical chemistry.

**1942** ACS renames its flagship magazine *Chemical & Engineering News*.

**1942** Mustard gas, 1,1-thiobis (2-chloroethane), a chemical weapon in World War I, becomes the first compound used in chemotherapy for treating cancer.

**1943** Experimenting on himself, Albert Hofmann experiences the world's first lysergic acid diethylamide (LSD) trip.

**1944** Selman Waksman isolates the antibiotic streptomycin, the first effective treatment for tuberculosis.

**1945** The U.S. explodes first atomic weapon in Alamogordo, N.M., and drops two bombs over Japan to end World War II.

**1953** Stanley L. Miller and Harold C. Urey make a splash in origin-of-life research, forming amino acids from gases they believed mimicked early Earth's atmosphere.

**1955** Frederick Sanger determines the first complete amino acid sequence of a protein, insulin.

**1955** Melvin E. Calvin traces the complete path that carbon takes in a plant during photosynthesis.

► **1955** Procter & Gamble scientists develop the first fluoride-containing toothpaste shown to prevent cavities.

**1957** Bisphenol A is first used commercially to make plastics and epoxy resins.

▼ **1958** Mass spectrometry is used to analyze amino acids and peptides for the first time.

**1962** Neil Bartlett proves that noble gases can form chemical compounds by preparing  $XePtF_6$ .

▼ **1962** Rachel Carson's book "Silent Spring" alerts the public to environmental damage from industrial chemicals, including DDT.

**1962** IBM's Gerd Binnig and Heinrich Rohrer develop scanning tunneling microscopy, which Donald M. Eigler later uses to manipulate individual atoms.

**1962** The Quantum Chemistry Program Exchange (QCPE) begins. It provides an inexpensive way for theoretical chemists and other scientists to exchange software.

**1963** Hoffmann-La Roche launches the sedative Valium (diazepam).

**1964** First commercial quadrupole mass spectrometer debuts.

**1964** Chemical Abstracts Service introduces the CAS Registry, the first computer-based system for storing chemical representations.

**1967** Congress passes the Toxic Substances Control Act to regulate the chemicals in everyday products.

**1980** In large part because of Love Canal, Congress passes the Comprehensive Environmental Response, Compensation & Liability Act (Superfund).

▼ **1981** IBM's Gerd Binnig and Heinrich Rohrer develop scanning tunneling microscopy, which Donald M. Eigler later uses to manipulate individual atoms.

**1986** Cambridge Scientific Co. debuts the ChemDraw structure-drawing program for computers.

▼ **1986** Johannes G. Bednorz and Karl A. Müller discover the first high-temperature superconductor.

**1986** The Chernobyl nuclear power plant in the Soviet Union has a reactor core meltdown, releasing massive amounts of radiation.

**1986** Congress creates the Toxics Release Inventory of hundreds of chemicals released into air, water, or land.

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debuts the ChemDraw structure-

drawing program for computers.

▼ **1986** Dow Chemical wins Supreme Court decision in the Daubert case, requiring judges to use peer-reviewed science in court.

**1994** Calgene's Flavr Savr tomato becomes the first genetically modified food to hit the market.

**1995** Eric A. Cornell and Carl E. Wieman make the first Bose-Einstein condensate, which displays quantum mechanical properties on the macroscopic scale.

**1996** The Food Quality Protection Act and amendments to the Safe Drinking Water Act require EPA to develop a program to screen chemicals for their potential to interact with the human endocrine system.

**1993** Robert A. Holton patents a route to Taxol that begins with a compound in yew tree needles, sparing the trees.

**1993** Dow Chemical wins Supreme Court decision in the Daubert case, requiring judges to use peer-reviewed science in court.

**1994** Eli Lilly & Co. receives approval to market Prozac (fluoxetine) to treat depression.

**1997** Nations begin signing the Montreal protocol, an international treaty designed to protect the ozone layer.

**1997** FDA approves azidothymidine (AZT) to treat HIV/AIDS.

**1998** Intergovernmental Panel on Climate Change is established.

**2000** Masashi Miyano, Krzysztof Palczewski, and Ronald E. Stenkamp get first glimpse of a G protein-coupled receptor: a class of membrane proteins that are the targets of as many as 30% of marketed drugs.

◀ **2000s** Hydraulic fracturing (fracking) leads to a boom in U.S. natural gas production.

**2004** Andre Geim and Konstantin Novoselov isolate individual sheets of graphene, sparking interest in the 2-D material's superlative properties.

▼ **2004** The cholesterol-managing drug Lipitor (atorvastatin) becomes the first drug to top \$10 billion in annual sales.

**2000** A black and white photograph of a yew tree branch with red berries.

**2000** A black and white photograph of a shale rock formation.

**2000** A black and white photograph of an oil rig.

**2004** A molecular structure diagram of graphene.

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**1947** Erika Cremer and Fritz Prior devise the first gas chromatograph (GC).

**1949** Dow Chemical introduces Saran Wrap, a thin, clingy plastic film for preserving foods.

▼ **1950** Congress establishes the U.S. National Science Foundation.

**1951** Post World War II, the Allies break up IG Farben, Bayer, Hoechst, and BASF emerge.

**1951** Linus C. Pauling correctly proposes the  $\alpha$ -helix structure for proteins.

▲ **1953** James D. Watson and Francis H. C. Crick determine DNA's double-helix structure.

**1953** Theodor H. Maiman demonstrates the first working laser.

**1961** Patricia Jeffress finds strains of *Staphylococcus aureus* resistant to the antibiotic methicillin.

**1961** Countries begin to pull the morning-sickness aid thalidomide from the market because it causes severe birth defects.

**1962** Neil Bartlett proves that noble gases can form chemical compounds by preparing  $XePtF_6$ .

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**2004** The U.S. launches the Human Genome Project.

**2005** Congress amends the Clean Air Act, making air pollution standards significantly tougher.

► **1996** Dolly, a sheep, is the first cloned animal.

**1997** EPA finalizes the U.S. phaseout of leaded gasoline.

**1997** Low doses of bisphenol A are found to have endocrine-disrupting effects in laboratory animals.

Controversy begins over safety of bisphenol A in plastics.

**1998** C&EN Online debuts.

► **1998** FDA approves use of Viagra (sildenafil) to treat impotence.

**1998** Andrew Z. Fire and Craig C. Mello demonstrate that small RNA molecules can inhibit gene expression in the worm *C. elegans*.

**2001** Brian K. Kobilka and Roger Sunahara determine the first structure of a G protein-coupled receptor with its G protein partner.

**2002** FDA approves Humira (adalimumab), the first fully human monoclonal antibody drug, for the treatment of rheumatoid arthritis.

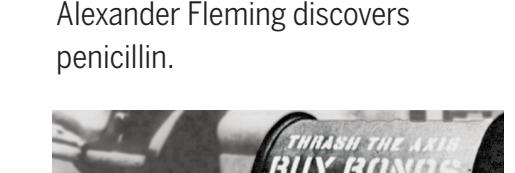
**2013** The U.S. Supreme Court rules that human genes cannot be patented.

**2013** C&EN turns 90.

# How Chemistry Changed The World

Official sponsor of C&EN's 90th anniversary  
+ SHIMADZU Excellence in Science

▼ **1928–29** Examining mold, Alexander Fleming discovers penicillin.



**1928** C. V. Raman reports a light-scattering effect, which he observed after musing on the Mediterranean Sea's deep blue color. Adolf Smekal predicted this phenomenon in 1923.

**1930** U.S. Congress formally establishes the National Institute of Health, precursor to the National Institutes of Health.

<b