

150 YEARS OF INVENTION

BAYER celebrates its spirit of innovation and ponders how to apply it next

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ASPIRIN, POLYCARBONATE, polyurethane, and the first synthetic insecticide are among the catalog of chemicals invented by scientists at Bayer. Ciba-Geigy, Hoechst, ICI, Rhône-Poulenc, and other European firms also have their place in the history of chemistry, but all have been dismantled and consumed by their competitors.

Bayer has survived for 150 years by shifting with the times. The company started by selling one specialty chemical, grew into the field of pharmaceuticals, came through the dark years of World War II, and more recently metamorphosed into a firm intent on fulfilling its mission statement “Science for a Better Life.”

“Our greatest achievement is our continuous ability to innovate,” Bayer Chairman Marijn E. Dekkers tells C&EN. “The company cannot exist in the long term without changing and adapting,” he says, evoking Charles Darwin’s

theory of evolution, a thesis published just four years before Bayer was established.

“I could pick numerous examples,” Dekkers says when asked to name the firm’s most important invention: “The discovery of the antibacterial effects of sulfonamides, the invention of the polycarbonate Makrolon or polyurethanes, the first synthetic insecticide, various seeds, our recent pharmaceutical product additions like Xarelto,” a drug for protecting people against blood clots. “Then of course there’s aspirin,” he says.

Bayer came into being in 1863 at a time when Europe’s demand for textile dyes was taking off. Friedrich Bayer, a dye salesman, and master dyer Johann Friedrich Weskott started the company together, which was initially named “Friedr. Bayer et comp.,” and

began producing aniline dyes. It was 13 years before Alexander Graham

Bell obtained a patent for the first telephone and the same year that London opened the world’s first underground rail network, albeit powered by horses.

The firm was initially located in Wuppertal, Germany, less than 20 miles from its current headquarters in Leverkusen. Within just 12 years, Bayer was selling dye-stuffs beyond Germany, including in the U.K. And by 1881, it had a staff of 300 and was producing a range of dyes. Although both founders died within 20 years of starting Bayer, they had created an organization capable of sustaining rapid growth.

Bayer kicked off celebrations for its 150th anniversary in February at its annual results conference in Leverkusen. Activities included the unveiling of an exhibition and the launch of a two-seat helium-filled airship constructed from many of the firm’s materials. The exhibition features 21 giant letters, each representing a company innovation. Collectively, the letters spell out Science for a Better Life. The airship and exhibition will be displayed at more than 25 venues on five continents during the course of the year.

The anniversary celebration focuses on a research heritage that continues to this day. In 2012, Bayer spent \$3.1 billion on R&D. Of the firm’s 110,500 employees, 12,900 are involved in research, and Bayer

1863 Company starts up

Friedrich Bayer (left), a dye salesman, and master dyer Johann Friedrich Weskott create the firm. The focus is solely on producing synthetic dyes.



1899 Invents aspirin

The medicine is still one of the firm’s best-selling drugs.



1913 Workforce hits 10,000



This aerial shot of Bayer’s Leverkusen, Germany, site was taken looking west from a zeppelin airship in the summer of 1913.

1937 Invents polyurethane

Employee Otto Bayer—no relation to the founder—devises the polymer.



Otto Bayer demonstrates a polyurethane foam experiment during a 1952 presentation.

BAYER THROUGH THE YEARS



1925 Merges into IG Farben

IG Farben is subsequently involved in war crimes during World War II, including provision of the pesticide Zyklon B, which was used in gas chambers during the Holocaust, and forced labor of—and experiments on—prisoners from the Auschwitz concentration camp.

1932 Discovers sulfonamide

Bayer scientist Gerhard Domagk discovers sulfonamide, the first family of antimicrobial drugs. In 1939, Domagk was awarded a Nobel Prize for his work.

has more than 600 collaborations with research organizations around the world. The belief among Bayer's current generation of senior executives is that the firm has a culture of enthusiasm for innovation that remains undimmed by the years.

"The light is still on at Bayer for inventors," says Patrick W. Thomas, chief executive officer of the firm's MaterialScience business. "The next 150 years will be all about science for a better life. Who knows what that will lead to, but we are well placed to ensure better productivity of food and longer and more fulfilling lives," Thomas says. "I see biology becoming so important."

CHEMISTRY HAS A FUTURE at Bayer as well. The firm's new process for making polyols—a key polyurethane component—from waste carbon dioxide using a zinc-based catalyst encapsulates an interest in sustainable technologies. Bayer developed the process in association with RWTH Aachen University and is currently testing it at the pilot scale. "Societal pressure and government intervention will lead to a greener world," Thomas says.

New science has always motivated change at Bayer, Dekkers tells C&EN. "Bayer started with the manufacture of dyestuffs—nobody at that time would have foreseen the portfolio that we have today," he says. In fact, even prior to the 20th century the firm had already begun developing pharmaceuticals. By 1899, Bayer had introduced aspirin.

The drug still generates sales of about \$1 billion annually for Bayer. "There is hardly any other medicine that is linked to its inventor and marketer like aspirin," Dekkers says. "Don't

forget: Even the Apollo 11 team had it available on the flight to the moon." Ongoing research and potential new uses "mean it will likely continue to be around for the next 100 years as well," according to the firm.

Although Bayer has much to celebrate, the company also has dark periods in its history when its expertise was used against people. In 1925, the firm merged with other leading German chemical firms, including BASF, into a conglomerate named IG Farben. The conglomerate was involved in numerous war crimes during World War II, including the production of the pesticide Zyklon B, which was used in gas chambers during the Holocaust. IG Farben was seized by the Allies in 1945 and liquidated in 1952. Bayer was reestablished as an independent company in 1951.

Nor have all of the firm's recent inventions been welcomed with open arms. Currently, controversy surrounds Bayer's neonicotinoid insecticide, which has been linked to bee population decline in the region. Its use will be suspended in Europe starting in 2014. The irony, Bayer says, is that a ban on neonicotinoids will likely spur the application of older insecticides such as pyrethroids, which also have been linked to bee population decline.

For the past three decades, the firm has faced criticism from the Coalition against Bayer Dangers, a German activist group. In recent weeks the coalition has berated Bayer for ignoring aspects of its history

in its 150th-anniversary brochures. "The unpleasant periods of the company's history have totally been omitted from the celebrations," the organization says. "Topics such as environmental contamination, pesticide poisoning, worker protests, and collaboration with the Third Reich are simply ignored." The group is correct, but Bayer is hardly alone in focusing on highlights and milestones to celebrate an anniversary.

Bayer divested its basic chemicals business in 2005 and more recently has come under pressure to sell off the MaterialScience division. Questions about a sell-off rained down on Dekkers at the February financial results event. Dekkers maintains that Bayer will keep its three key divisions of pharmaceuticals, crop protection, and materials, despite current tough market conditions for the latter unit. "At this time, there is no need to change our portfolio. If you want to be around for another 150 years, you need to have a certain level of diversification to offset risks," he told journalists.

Bayer invented aspirin 36 years after starting out as a dyes company. Further shifts in the firm's focus are inevitable if it is to continue to thrive. Lightweight materials for a solar-powered airplane, polymers for bionic suits to help people with infirmities walk, and a plethora of new medicines are just a few of the products the company is investing in. As for what Bayer might be doing in another 150

years, there is only one thing Dekkers knows for certain that it will still be making. "Molecules," he says with a grin. ■

1952 IG Farben dissolved

Production is allowed to resume under the Bayer name after World War II.



1999 100 years of aspirin

The Bayer headquarters building in Leverkusen celebrates aspirin's centennial.



2001 Acquires Aventis CropScience

The firm becomes one of the world's leading agchem firms with the acquisition of Aventis CropScience for about \$7 billion.

2013 Steady growth

Bayer aims to continue with pharmaceuticals, agriculture, and materials despite the economic headwinds faced by its materials division.

Hermann Schnell (center) explains his invention in 1959.



1953 Invents polycarbonate

Bayer invents the hard plastic polycarbonate and starts producing it commercially in 1958.

2007 Out of diagnostics

Diagnostics division is sold to Siemens for \$5.4 billion.

2011 Dream Production

Bayer starts up a pilot plant for its Dream Production project to produce polyols for making polyurethane by using the global-warming gas carbon dioxide.

2165 Bayer of the future?

Chairman Marijn Dekkers tells C&EN that the only thing he can predict that the firm will be making in 150 years' time is molecules.