Yesterday's Toy Becomes

A chemistry set has often crystallized a science career.

Accidents will happen, and chemistry sets have undoubtedly caused their share in kitchen, bedroom, and basement "laboratories" over the years. It is no accident, however, that these same outfits inspired John Brodemus and countless other young people to pursue careers in science. Since the early 1900s, chemistry sets have entertained and educated millions of American boys and girls, giving many an appetite that could only be satisfied by choosing chemistry as their profession. Even for those who chose other careers, fond memories of this favorite "toy" have made the sets treasured and often valuable collectibles.

> *"At around the age of 12, my next door neighbor received a chemistry set for his birthday. We set up a lab in his kitchen and proceeded to mix a batch that contained almost anything we could put our hands on. All was noneventful until some sodium bicarbonate was added to the reaction tube. It was stoppered and shaken. It suddenly erupted, spraying its contents all over the ceiling. We tried to wash it off, but it left areas remarkably white in contrast to the unsprayed areas. Our penalty for unauthorized experimentation was to repaint the whole ceiling."*
>
> —John Brodemus, teacher, H. L. Richards High School, Oak Lawn, IL

The heritage of the modern chemistry set is centuries old. William Jensen, Oesper Professor in the History of Chemistry and Chemical Education at the University of Cincinnati, points to books on "natural magick" containing chemical magic tricks and scientific puzzles dating from 17th-century Europe as the progenitors of the chemistry set. Actual chemistry sets, designed for druggists, for medical students, or for the amusement and edification of the upper classes, appeared in the late 18th century. The era of World War I, which hastened the growth of America's nascent chemical industry, also catalyzed a rebirth of the chemistry set. The two eminent manufacturers of chemistry sets, the Porter family and A. C. Gilbert, helped foster an enhanced awareness of chemistry and chemists during this period, especially among young people. These efforts corresponded to similar educational efforts made by the American Chemical Society and some of the larger chemical companies.

IMAGE: A. C. GILBERT CO.

Tomorrow's Trade

James M. Schmidt

Porter Chemical

John J. Porter was already an established chemist and successful businessman when he founded the Porter Chemical Company in 1914. He earned his B.S. degree in chemistry from the University of Cincinnati in 1908. While an assistant professor at the university, Porter flourished in his part-time consulting business, earning a good reputation for his work in the field and in the laboratory, as well as for writing technical reports. In 1914, he became president and operations manager of a cement company in Hagerstown, MD.

When he moved to Hagerstown, Porter decided to act on his plan to start a company to package and market branded chemical products, such as mothballs. John persuaded his brother, Harold Mitchell Porter, to leave the University of Cincinnati, where he had just finished his third year studying chemistry, to manage the business. They started the Porter Chemical Company in 1914 with Harold as president and operating head. John served as vice president and consultant.

John and Harold had both experimented with chemicals in their youth. They recognized that many experiments producing color changes and other visual effects could be performed with chemicals that were relatively harmless, and with minimal apparatus. Soon after starting the Porter Chemical Company, they began to produce their first chemistry sets. John did most of the research for the experiments, while Harold wrote the first manuals. Harold also emerged as the first salesman; his earliest customers were the fashionable department stores in the Washington, DC, area.

Using the "Chemcraft" trademark, the Porters commenced business in 1914 with two "chemical magic" sets, both selling for less than a dollar. By the early 1920s, the company offered a line of sets in six different sizes, retailing for prices from 50 cents to $25. Beginning in the 1930s, the company began to broaden its scope, manufacturing microscopes, biology and atomic energy sets, and other scientific toys. From its start in the early 1900s, until the Lionel Toy Corporation acquired it in 1961, Porter Chemical sold well over a million Chemcraft sets. Indeed, at one point the company was the world's largest single consumer of test tubes!

Chemistry and science were truly family vocations for the Porters. John and Harold's father, Jermain G. Porter, was an astronomer with the U.S. Coast and Geodetic Survey and a professor at the University of Cincinnati while John studied chemistry. John's son, Jermain D. Porter, was also a chemist. He obtained his Ph.D. in chemistry in 1932 from Cornell University. While in college, he authored two of the Porter chemistry set manuals. He then held teaching posts

in physical and theoretical chemistry until retiring in 1964 to teach chemistry in Laos as part of the International Voluntary Services program. John's wife, Edith, assisted in manufacturing sets during the company's earliest years.

"Gilbert the Great"

The Porters' main competition in the "instructional toy" business was famed inventor and toymaker Alfred Carlton Gilbert. Born in Salem, OR, Gilbert was a talented athlete from an early age, excelling in gymnastics, wrestling, boxing, football, and especially track and field. In 1908, he won the gold medal in pole vaulting at the London Olympic Games. Gilbert's second great love, after sports, was magic. Gilbert practiced and perfected tricks at every opportunity, earning as much as $100 a night performing shows as "Gilbert the Great", while a medical student at Yale. Upon earning his M.D. in 1909, Gilbert and his friend John Petrie formed the Mysto Manufacturing Company, producing boxed magic sets for sale in department stores and their own retail shops.

Gilbert's true success came a few years later, when he introduced the "Erector Set" in 1913. The famous toy was inspired by the construction work he witnessed on train trips as he made sales calls up and down the East Coast. Within a short time, the newly named "A. C. Gilbert Company" was a huge success, selling tens of millions of Erector Sets in 20 years. In 1917, with the Erector Set firmly established, the company brought out several new products. In his autobiography, Gilbert recalled: "the most important of these was our chemistry set, which has throughout the years been one of our best items. It was perfectly safe, and yet a boy could do hundreds of interesting experiments with it. I worked hard on the manual that went with it, making sure that it would be fun. It was chock-full of fascinating experiments and tricks, so boys liked it and learned a lot from it."

After the attack on Pearl Harbor, Gilbert offered his entire manufacturing facility to the government for war work. To meet this obligation they stopped making all Erector Sets, model trains, and other toys that required critical metals. Even so, they continued to make chemistry sets throughout the entire war! Yale Professor Robert Treat Johnson insisted that it was Gilbert's duty to continue producing them. After polling his students, Johnson identified chemistry sets as a factor in the great increase in the number of chemistry majors at Yale. Government authorities were aware of the professor's endorsement and encouraged the company to continue producing the sets. Johnson later helped redesign the entire line of Gilbert chemistry sets and wrote several Gilbert manuals.

"My brother received a chemistry set one year for Christmas; I received a doll. At that point there was a hostile takeover of the chemistry set on my part (I was about 10 years old), and the rest is history. Let's hear it for enlightened parents who gift their girls with chemistry sets—who knows but that a budding chemist is among them?"

—Mary Virginia Orna, director of educational services, Chemical Heritage Foundation, Philadelphia; also professor, College of New Rochelle (NY)

"I first got hooked on chemistry as a kid when my father dug out his old (circa 1940s) chemistry set. Dad decided it was too old to do much with, so for Christmas I got the biggest chemistry set from the Sears catalog, and that was when you could get some good, slightly dangerous supplies. There was a balance, an alcohol burner, and centrifuge; not great ones, but real laboratory equipment."

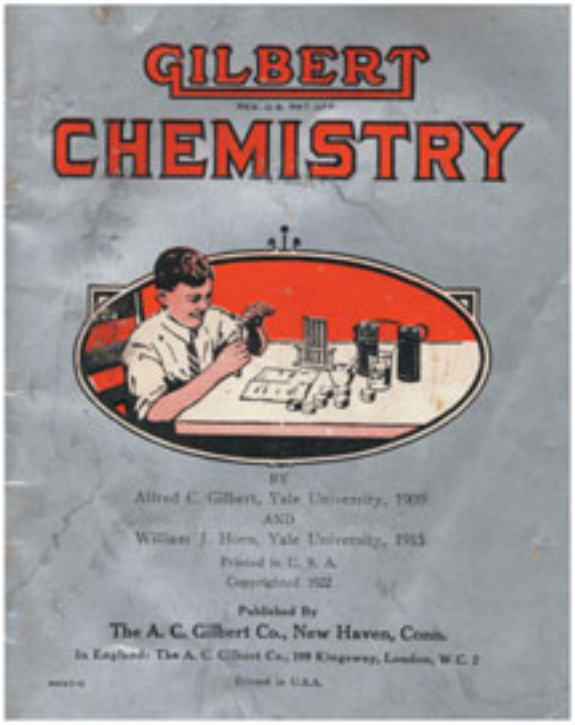
—James Dyer, surface chemist, Space Dynamics Laboratory, Utah State University, Logan, UT

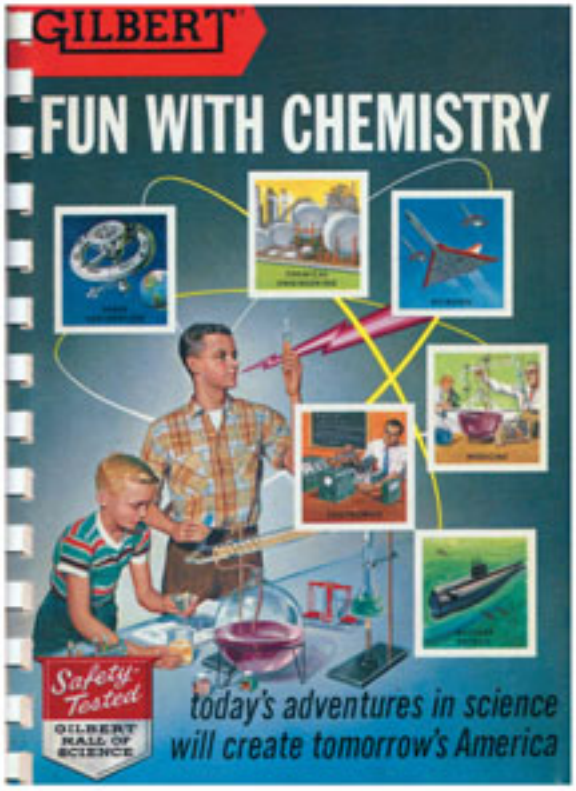
Anatomy of a Chemistry Set

The pieces in James Dyer's gift were typical of basic chemistry sets at midcentury. For example, the "Chemcraft Junior Chemistry Outfit No. 411" included a metal rack with test tubes, glass tubing, litmus paper, stirring rods, a spatula, and glass jars of phenolphthalein, ammonium chloride, sodium carbonate, sodium ferrocyanide, cobalt chloride, calcium oxide, ferric ammonium sulfate, and tannic acid. The manual began with hints for putting on a "chemical magic" show for friends and family, including publicity, costume, and sound-effect suggestions, and instructions for about 50 demonstrations of chemical "mysteries".

The balance of the book included instructions for another 250 experiments under the headings "What Things Are Made Of", "Our Chemical World", and "Chemistry in Our Homes and Industries". An appendix listed more than 60 chemicals and a variety of apparatus to be ordered directly from the Porters at a nominal cost of 10–90 cents. The Chemcraft manuals were well regarded by educators for their range of experiments, safety precautions, and systematic introduction to the principles of chemistry. Indeed, the 1935 edition of the manual

IMAGE: PORTER CHEMICAL CO.





received a detailed and favorable review in the *Journal of Chemical Education* (**1938**, *15*, 100).

The largest Chemcraft and Gilbert sets contained many dozens of chemicals and additional equipment such as balances, alcohol lamps, and torches for glassblowing. Although the most familiar, Porter and Gilbert were by no means the only manufacturers. Chemistry sets were also sold under such names as Handy Handy (by Skil Craft) and Chem-Pak (Chicago Apparatus Company).

A dedicated cadre of collectors scours flea markets, antique toy dealers, and auctions for vintage sets. Rare chemistry sets in mint condition have recently fetched hundreds of dollars in online auctions. Members of organizations such as the A. C. Gilbert Heritage Society specialize in collecting scientific toys. As part of its Gilbert Project, The Eli Whitney Museum in Hamden, CT, has a permanent Gilbert Collection, including several vintage chemistry sets.

Winning Hearts and Minds

The adage "they don't make them like they used to" may be as true for chemistry sets as it has become for other elements of American life. Indeed, the reality is that they hardly are being made at all. A recent trek to a local hobby store revealed only a few sets to choose from—a far cry from the plethora available in the chemistry set heyday of the 1940s and 1950s. Liability concerns have forced most of what was "dangerous" out of the sets, no doubt also forcing out some of their mystery and appeal. A veterinarian confessed to the author that he buys vintage chemistry sets to satisfy his teenaged son's interest in chemistry, as they were both disappointed in the choices now available.

There are any number of reasons why young men and women choose to pursue a career in science. The fun and learning of having had a chemistry set is only one of many. One hopes that the 21st century will find its own "natural magick" to keep the heritage of chemistry sets alive.

"On my seventh birthday, my Uncle Si and Aunt Pauline presented me with an A. C. Gilbert Chemistry Set No. 1. My Aunt Anne insists that it was she who gave me the set, but receiving my first chemistry set was such a crucial event in my life that I am certain I correctly remember the donors. From the time I received this present, there was never any question as to my future career."

—George B. Kauffman, professor, Department of Chemistry, California State University–Fresno

Acknowledgments

I must acknowledge the invaluable cooperation of William Jensen, Darryl Brock, the Crystal Lake (IL) Public Library, the chemical professionals who replied to my queries on ProfNet and the CHEM-HIST newsgroup, and several collectors of vintage chemistry sets.

Further Reading

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James M. Schmidt *is an associate pharmacologist in the drug metabolism department of Abbott Laboratories, near Chicago. Comments and questions for the author may be addressed to the Editorial Office as listed on page 6.* ◆