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PROFILE

Corning: from Pyrex to Vaccine Vials

The US group that invented Pyrex has also developed ultra-tough glass for smartphone screens and high-tech ceramics for catalytic converters in cars.

Now it's manufacturing vials adapted to COVID-19 vaccines that must be stored at -70°C .



Corning's Eagle glass enables manufacturers to innovate with LCD screens that are designed to be slimmer, lighter and more eco-friendly. (©Corning Incorporated)

By **Benoît Georges**

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What do your smartphone screen, the [Pyrex dishes](#) you cook with, the ceramic essential to the catalytic converter in your car, the fiber optics that connect you to the Internet, and a vial of COVID-19 vaccine have in common? All these products were invented by a 100-year-old company that you've probably never heard of:

the US company Corning. A global giant with 50,000 employees and a turnover of 11 billion dollars whose 108 plants worldwide supply the major telecom operators, Nasa, Mercedes, Apple, and Pfizer.

Corning is also the name of a small town with a population of 10,500, and a five hour drive from Manhattan in an area of upstate New York that is mostly known for its lakes and vineyards. Ever since a businessman, Amory Houghton, moved his glassworks there from Brooklyn in 1868, the destinies of Corning (the town) and Corning (the company) have been intertwined. The group provides jobs for 7,000 people in the region, where it has always had its headquarters and main R&D lab. At the entrance to the town, a monumental glassware museum is the leading attraction. Every day of the week, a siren sounds the start and end of the workday, like a throwback to the golden age of American industry.



“Virtue of Blue” by sculptor Jeroen Verhoeven, at the Corning Museum of Glass. (©Victor J. Blue/Bloomberg)

In 1879, a youthful inventor, Thomas Edison, asked the company to develop glass suited to his latest creation: the electric light bulb. For years, Corning Glass Works was Edison’s main supplier at a time when the magic of electricity was starting to overtake the world. Manufacturing light bulbs, which were then hand-

blown by glass blowers, soon became Corning's main business activity and supplied both Edison's firm, General Electric, and his main competitor Westinghouse. With the invention and patenting of an innovative signal lens by one of Amory Houghton's sons, the company also equipped another iconic 19th-century sector: railroads.

The largest glassworks museum in the world

In Corning, a small town of 10,500 souls nestled between New York and Lake Ontario, you can admire the works of Robert Rauschenberg or Jean-Michel Othoniel, discover a 3,500-year-old Mesopotamian pendant, view magnificent stained glass from the Tiffany workshops and even watch glass blowers while they work! Opened in 1951 in celebration of the company's 100th anniversary, the Corning Museum of Glass claims to be the largest glassworks museum in the world with its collection of over 50,000 items and its 150 employees, a dozen of whom are master glass blowers. It is also the region's main tourist attraction, and welcomed almost half a million visitors every year prior to the pandemic.

Inspired by German inventor Otto Schott

These initial products shaped Corning's strategy: apply the latest scientific discoveries to a material which, though ubiquitous, was at the time essentially handmade. Accordingly, in addition to glass blowers, the company recruited chemists and engineers. By 1908, it opened one of the first private research laboratories in the United States.

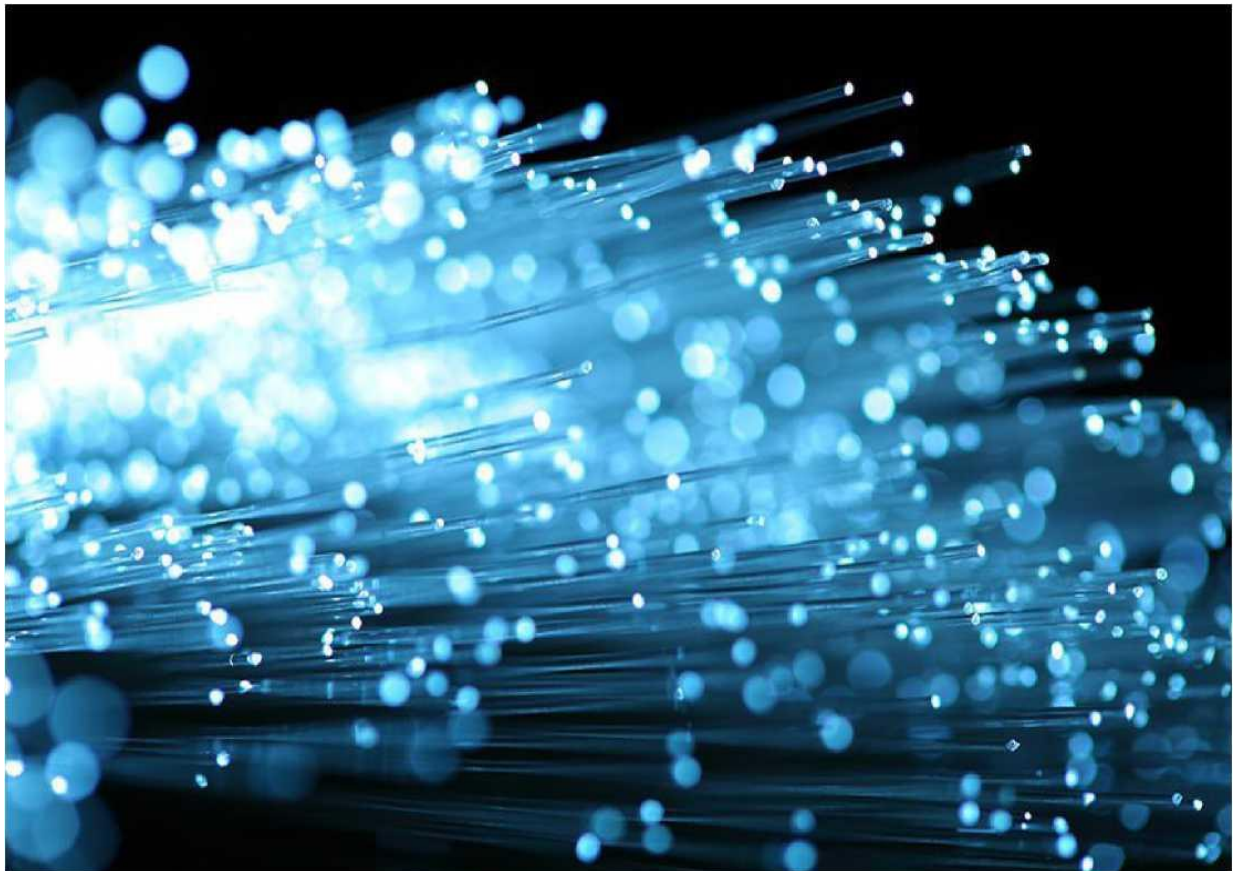
Inspired by the work done by [Otto Schott, the German inventor of borosilicate glass](#), the lab director adapted the formula to create flame-resistant cookware. Launched in 1915, Corning's Pyrex brand became an international success and was even enshrined in a song by Serge Gainsbourg. The company produced tableware until the end of the 1990s before divesting its consumer business line.

After more than a century, Corning has become an R&D giant, with 3,000 researchers and eighteen research facilities in the United States, in Asia, and in Europe where its main site is located in Avon (Seine-et-Marne), France, just outside the forest of Fontainebleau. Corning devotes nearly one billion dollars a year to research, i.e., 8% of its turnover, whereas the industry average is around 3%.

“Corning is rather unique because it’s a company that is both high-tech and highly industrial,” says Martin Yang, analyst at Oppenheimer & Co. “Its core activity, material science, is also unique: Corning has over one hundred years’ experience in manipulating glass and ceramic, which are very unstable materials.”

Operational fiber optics

After having produced light bulbs, tableware and cathode ray tubes, in the 1970s Corning underwent a major transformation through two of its innovations in the fields of fiber optics and catalytic converters. In both cases, these were not actually inventions, but developments that fostered the widespread use of emerging technologies. In fact, the concept of replacing copper wiring with fiber optics to boost telecommunication speeds was first introduced in Germany in the middle of 1960s in one of the Telefunken laboratories.



A fiber optics bundle. Fiber optics are one of the group’s business lines. (@nikkytok/Shutterstock/Corning Incorporated)

But this technology had remained a niche for several years due to the impurities in glass and the fiber production costs. Corning did away with these two obstacles in 1970 and 1983, respectively. Fiber optics' high performance levels paved the way for the high-speed Internet revolution and for a while ensured Corning's fortune on the stock market. The price of Corning shares had risen fifteenfold by the end of the 1990s - in the midst of the "dot.com" bubble - before collapsing when that bubble burst.

Fortunately, technology's glassmaker has always made sure not to put all of their eggs in one basket. This was particularly true for catalytic converters, another technology that was developed in the 1970s at the request of General Motors. "We were in a meeting with GM and we were trying to sell them glass for windshields," Dr. George Beall, research fellow at Corning, recalled in a 2016 interview.

"The CEO told us that they weren't interested in our windshield at all but that GM had a problem with its engine emissions. Congress had just passed the 'Clean Air Act' that required manufacturers to produce cleaner cars, and GM was looking for an efficient and inexpensive ceramic to use in catalytic converters, which their engineers had just invented. But they didn't have either the material or the process to make it."

An order from Steve Jobs

It took Corning less than four years to find the solution and the first cars equipped with catalytic converters were marketed in 1975. This close collaboration with manufacturers has become Corning's preferred modus operandi, be it for the automobile, healthcare or flat screen industry. "We do a number of very different things, but our approach is always the same: invent and manufacture innovative processes and materials and focus on industries with strong growth where we can be a technological leader and where we can innovate jointly with our customers," explains Jeffry Evenson, Corning's Chief Strategy Officer.



Ultra-tough Gorilla Glass was first designed for use in iPhones. It is now available for use in the automobile industry, for example in curved dashboards. (©Corning Incorporated)

The best-known example of this collaborative design is Gorilla Glass, an ultra-tough glass developed for the first iPhone at the express request of Steve Jobs who did not want to use plastic screens. In the 1960s, the New York glassmaker had already developed a process that made glass unbelievably tough. But this product was a flop and its production had been discontinued in the 1990s. In his biography of Steve Jobs, Walter Isaacson recalls how the Apple CEO labored to convince Corning CEO Wendell Weeks to resume production in record time: “The Corning plant in Harrodsburg, Kentucky, which was producing LCD screens, was converted in a single night to full-time production of Gorilla Glass.”

When glass is in the spotlight on Netflix

Imagine “Top Chef” but with glass blowers instead of cooks, pitchers or sculptures instead of dishes, and ovens that can be heated to over 1,500°C: welcome to the Netflix reality show “Blown Away” in which ten master glassmakers compete in an immense workshop. That might seem like a wild idea but the results are spectacular; as glass is a particularly fragile material, the competition can quickly turn into a catastrophe. For Corning, at any rate, it’s an excellent showcase: the museum is one of the show’s sponsors and some of its works are on display. The winner of the second season, which aired in January 2021, was awarded an in-residence stay among Corning’s glassmakers as one of his prizes.

From smartphones to cars

Fifteen years later, Gorilla Glass is a tremendous success. “Corning has a very special relationship with Apple because it develops custom versions of its glass for the iPhone,” says Martin Yang. “But it does the same with [Samsung](#), which means it’s helping both market leaders stand out! In the meantime, the basic Gorilla Glass versions are used by most other makers - the version they use may not be the latest one, but it costs less and that’s fine with them. So, there’s Gorilla Glass everywhere!” Since 2007, this ultra-robust glass has equipped over eight billion devices and 45 different brands. But the story doesn’t end there, since the iPhone 12, which came out last year, heralds the appearance of a new, transparent and even tougher ceramic, also made by Corning.

“What we’re trying to do is to develop better knowledge of an industry and then push it into other sectors,” says Jeffrey Evenson. “When we make a breakthrough in fiber optics, for example, we think about how we could apply it to the glass used in electronics.” The group is currently adapting its glass to lenses for augmented reality applications or its ceramics for use in CO₂ capture facilities. As for Gorilla Glass, it is now available in an XXL version for use by carmakers. Mercedes is going to use it for its Hyperscreen, a 58” (1.47 m) touchscreen, unveiled this past January, that conforms to the shape of the vehicle’s entire dashboard.

Ultra-resistant vaccine vials

Corning's most recent noteworthy success is a much smaller object: a vaccine vial made of a new type of glass called "Valor". It was invented at the request of the pharmaceuticals industry, which had been asked by the US health authorities to come up with a material that could better withstand impacts and temperature changes than standard vials. Valor was approved by the Food and Drug Administration in October 2019, three months before COVID-19 was detected.



Valor glass vials can withstand impacts and temperature changes. (©Corning Incorporated)

The pandemic led to the rapid use of the Valor vial, which is particularly suited to vaccines like Pfizer's that must be kept at -70°C . This enabled Corning to be included in [Operation Warp Speed](#), launched by Donald Trump in May 2020, and to receive a 204-million dollar investment from BARDA, the US agency tasked with the mass production of the vaccines. For Jeffrey Evenson, "BARDA's investment was a win-win one: it increased the numbers of a rare and essential product - the vials - and that made it possible for us to increase our production capacity."

At the end of March, Corning received an additional 57 million dollars to further

increase its production. It plans to deliver 150 million vials in 2021 - enough to hold 1.2 billion doses of vaccine. Pending the opening of a plant in North Carolina near the Pfizer facilities, the group has already produced tens of millions of vials in a pilot facility on the outskirts of Corning ... just a few miles from Thomas Edison's light bulb factory...**By Benoît Georges**

Please see original in-language *Les Echos* feature [HERE](#).