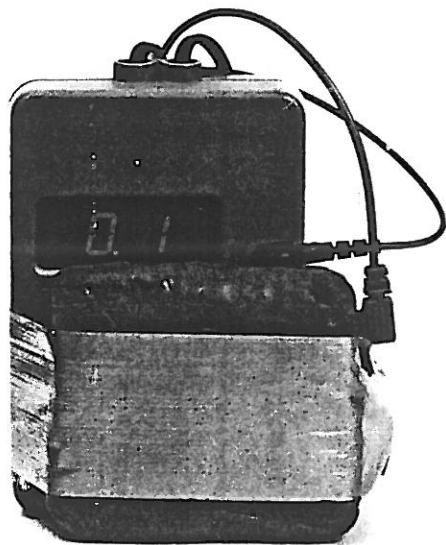


Sonia Kalausová

## CZECH INVENTI



If one were to ask a layperson what the Czech Republic has given the world, most likely the answer would be beer. But although the Pilsner form of the amber nectar was first brewed in West Bohemia, it was actually a Bavarian by the name of Josef Groll that invented the national tipple. So what does that leave the residents of this small republic? Surprisingly, quite a lot.

## THE CONTACT LENS

Many of you will be reading this magazine blissfully unaware of how much you owe Czech chemist, Otto Wichterle. While working in the Czechoslovak Academy of Sciences, Wichterle produced the first hydrogel contact lenses, the same kind that are used today. Previous incarnations had been constructed from brown glass and were neither particularly effective nor were they particularly comfortable and could only be worn for an hour or two at a time. Today, about 125 million people wear contact lenses across the globe.

Fate and coincidence often play a large role in inventions. The Czech chemist Otto Wichterle, born in 1913, already had a successful career behind him, with synthetic fibres being his most notable discovery. Wichterle was born in the Moravian town of Prostějov and studied at the Faculty of Chemical and Technological Engineering (ČVUT), where he later went on to work as a research assistant. The occupation of Czechoslovakia and the ensuing closure of Universities by the Nazis led Wichterle to seek work at the research and development department of the Baťa shoe company. It was here that he succeeded in developing a stretching polyimide silicon fibre. After the war, this material was sold as Silon (Czechs today call stockings "silonky"). In Czechoslovakia, this discovery represented a breakthrough in synthetic material production. Wichterle soon became a professor at the Technical University

in Prague, from where he continued to experiment with polymers. In 1953, he patented a method used for the production of hydrophilic gels for medical uses. And it is this material that would later be used for Wichterle's most famous invention, the contact lens.

Wichterle was by no means a darling of either the Nazi or communist regimes. During the war, the Nazis imprisoned the chemist, and life under the communists, despite his anti-Nazi credentials, was also not rosy. In 1958, Wichterle was forced to abandon his position as a professor, but his indispensability was soon recognised, and Wichterle was given another "chance". He was soon entrusted with creating an Institute of Macromolecular chemistry, and became its first head. The Soviet invasion of 1968 marked the decline of Wichterle's career. The chemist openly criticised the new puppet government and signed a petition opposing its actions. The onset of President Gustav Husák's normalisation led to Wichterle being stripped of all of his positions. He was only allowed to continue working as a researcher, and his name was not allowed to feature on any lists of Czechoslovak professors.

But let us return to Wichterle's most famous invention. Back in 1952, on a journey from Olomouc to Prague, Wichterle saw one of his fellow passengers reading an article about metal artificial eye implants. He began to talk to the reader and soon started to think about a synthetic material that might be better suited to the eye. By coincidence, the passenger was the secretary of a health ministry commission, which was studying the usage of synthetic materials in healthcare. Wichterle did not immediately know of any particular material that could be used in the eye, but the idea of hydrophilic polymers was soon coalescing in his mind. Directly translated "water-loving" material would be ideal for this purpose. In such

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[ A LOOK AT SOME OF THE CZECH REPUBLIC'S  
MOST FAMOUS AND INFAMOUS INVENTIONS. ]

a material, interwoven chains of organic macromolecules create a mesh and are surrounded by molecules of water. When the material dries up, it loses its properties and becomes as fragile as thin glass. The more water is present, the softer the material and the less it irritates human tissue, particularly the eye. For a contact lens to be feasible, the material also had to be porous in order to allow the eye to breathe.

Wichterle experimented by trying out his lenses on himself. Initially, they were unrefined, and they burned his eyes, but the inventor soon realised that despite the setbacks, he was definitely on to something. But Wichterle was greeted with apathy back at his place of work. The Institute of Macromolecular chemistry was still under construction and so Wichterle chose to do much of his hydrogel work at home assisted by his wife Lydia, a doctor by profession. By Christmas 1961, Wichterle built, with the aid of some of his son's toys(!)

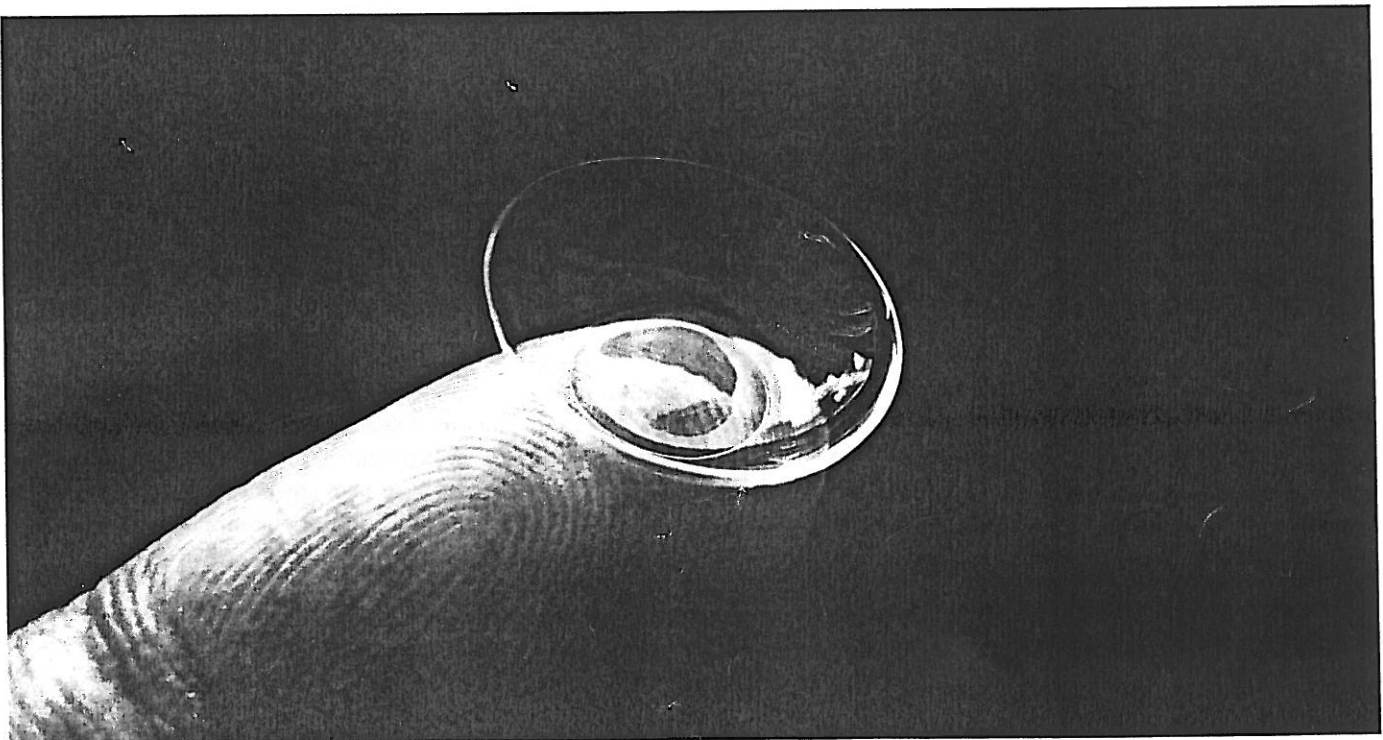
a prototype mould from which he fashioned four particularly uniform lenses. This proved that contact lenses could be mass-produced – indeed, in the ensuing months, Wichterle produced more than five thousand of them.

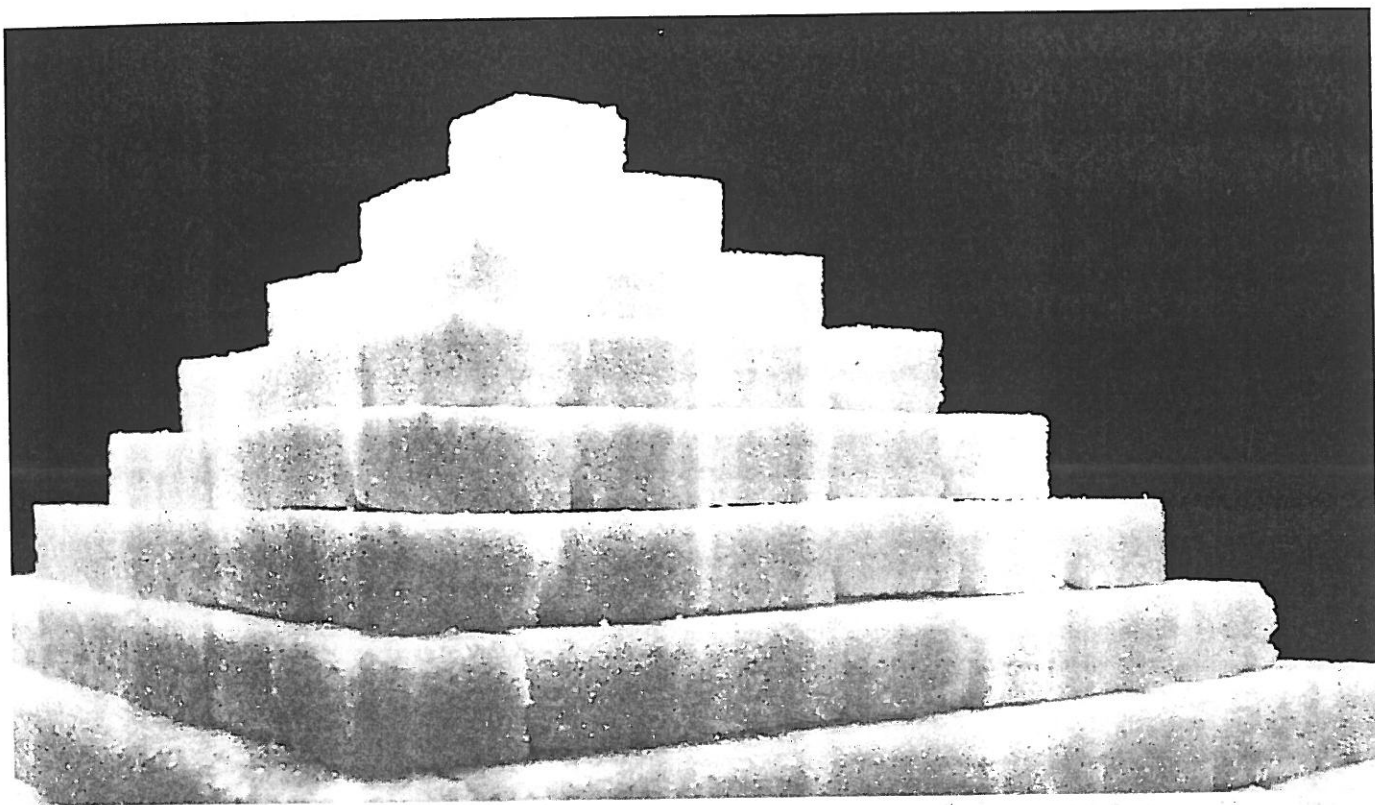
Of course, Wichterle was not the first to toy with the idea of a contact lens. Such esteemed names as Leonardo da Vinci and René Descartes can claim that credit. But the former never had the means to even attempt to create such an invention; the latter merely focused on the mathematical complexities of such a device. The first glass lenses were created in 1887 by the German glassmaker F.E. Müller, but it was Wichterle who created a functional design that could be worn far longer, and was far more affordable.

Wichterle travelled around the world with his invention, and demonstrated its usage and functionality on himself – he took a lens out of his eye, threw it on the floor and stood on it. Then, he washed it in his mouth, and put it back in his eye.

Naturally, such an unhygienic approach would raise eyebrows today. The presentations were successes, yet, for a long time it seemed that contact lens was far more of an attractive gimmick that would simply not catch on. Then, a company expressed interest in purchasing the patent. The Czechoslovak academy did not waste any time, and without the knowledge of the inventor, it sold the patent to the US company National Patent Development Corp. for a mere million dollars. When one considers how many billions of dollars have been spent on contact lenses, this sum seems all the more laughable. Further, Wichterle only received a paltry cut of this sum. As a person who spent his whole life carrying the burden of his talents in the face of the various Czechoslovak regimes, Wichterle remained philosophical, telling the British *Guardian* newspaper “I would have had problems with what to do with that sum of money.”

But Otto Wichterle did finally receive some recognition for his efforts. After





1989, he was elected to serve as the head of the Czech Science Academy and during the nineties, he remained active in the field of synthetic lenses for patients that had undergone <sup>cataract</sup> removal. Among many other rewards, in 1993 Wichterle was honoured by having an asteroid named after him in recognition of his work. In the Czech Television series "The Greatest Czech" Wichterle was voted number 23. He died in 1998.

### THE SUGAR CUBE

There is something about the sugar cube that makes one believe that it is such a logical invention that it must have always been in existence. Not so.

Dačice is a Czech town of around 8000 people not far from the Austrian border. The locals are proud of their clean air, largely achieved through a preference for gas power as well as a lack of industrial pollutants. They are also proud of their historical landmarks scattered densely across the town. But more than any of that, Dačice's inhabitants are proud of their sugar cube.

In fact, Dačice even has a granite sugar-cube shaped memorial (constructed in 1983) to the town's most prolific invention. During the 19<sup>th</sup> century, Karl Dalberg, an earl from the town, invited

the Grebner brothers to hear a proposal to build a beet sugar refinery in the town. František and Tomáš Grebner had credentials and experience in this field in countries such as Germany and France and their plans were eventually accepted.

Dačice lies about 500 metres above sea level, not ideal conditions for the cultivation of sugar beet. In 1829, the Grebner brothers planted three hectares worth of crops, which soon failed. After several more attempts, they were forced to give up on the idea of growing sugar in the region. But in 1833, a sugar refinery opened in Dačice which refined imported sugar from Italy and later also domestic sugar. In the early 1840s, a new manager came to Dačice by the name of Jakub Kryštof Rad. Rad, a Swiss national, expanded the factory and soon it was exporting across Europe. In 1842, it became the first sugar factory to use steam power.

The successful manager was also something of a handyman. In those days, sugar was sold in a solid state and in larger quantities, usually in the shape of a loaf. This was less than ideal for the domestic kitchen, as before each use, the sugar would have to be chipped off the large block. Juliana, Rad's wife, keenly observed this limitation. Once, while

hacking at her sugar loaf, she injured herself. With a bandaged finger, she ran to her husband, imploring him, as the manager of a sugar factory, to come up with a better solution.

The end result of this marital squabble was a mould for a sugar cube, which Mr Rad built himself. The mould contained 400 small holes and would then be pressed between two plates, which shrunk the sugar to half its size. The cubes would then be dried for around twelve hours, and then they could be wrapped up and sold.

Soon after, Juliana received her first box of sugar cubes. All this occurred some time around 1841. Within two years, Rad managed to gain a licence and patent for the manufacture of sugar cubes. Soon, the cubes found their way to Vienna, and from there, the rest of Europe. The Dačice refinery was highly successful during the 1840s. However, the problem of its less than ideal altitude and location soon became an issue again. Specifically, costs were increased due to the need to import raw materials from afar. As a result, and despite the lucrative sugar cube, the refinery closed in 1852, and Rad soon returned to Vienna, where his part in the sugar cube was soon forgotten. It wasn't until 20th century sugar

historian R.E. Grottkas pointed to Rad's contribution during the 1930's that this invention was again highlighted. Thus, the citizens of Dačice continue to be proud of their invention, even though its inventor was in actuality a Swiss citizen from Vienna.

## SEMTEX

One of the most famous Czech inventions is also, by definition, one of the most notorious. It is certainly an invention that Czechs are not particularly proud of, namely the explosive Semtex.

When on the 21st October 1988, a Pan Am airplane blew up and crashed on the Scottish town of Lockerbie, a small Czech invention gained notoriety around the world. Results showed that the 259 passengers and a further 11 people in Lockerbie had died because of an explosion on board the plane – traces of Hexogen and Penitrite were found in the wreckage, unmistakably the hallmark of a Czechoslovak manufactured plastic explosive known as Semtex.

Semtex was invented in the 1960s by Stanislav Brebera. The name was derived from the words Semtín and Explosia. The first is the name of a small village near the Czech town of Pardubice where the substance was made, and the latter is the name of the company that created it. Semtex was initially created for industrial usage, but soon its use was extended to military, and later terrorist purposes.

Its use as a terrorist weapon is understandable: Semtex is resistant to high temperatures, pressures and is even waterproof. At first sight, it looks like simple plasticine, and can only be detonated with the aid of a detonator or other explosive. In the Lockerbie incident, it was later discovered that the Semtex had been hidden in a portable cassette player. From 1991, Semtex has been deliberately marked in order to make it more difficult to conceal – a special chemical is added which makes it visible to detectors.

The Czechoslovak government also contributed to Semtex's bad name by exporting it to countries such as Libya and Vietnam. However, the precise amounts exported by the communist government are almost impossible to calculate. From Libya, Semtex made its way to various terrorist groups, for example the IRA

and was also used in the Middle East. Semtex was also sold on the black market by members of the Czechoslovak army, and was even stolen by workers where it was manufactured.

Even today, Semtex remains accessible to members of the Czech underworld. It was used in the case of the so called Orlický Murders (a series of murders committed by competing business factions in the 1990s). It was also allegedly to be used by the former Czech ministerial adviser Karel Srb to murder the investigative journalist Sabina Slonková. Today, only small amounts of Semtex are still produced, but the fact that this explosive remains so durable, means that old stocks are still a threat.

## THE GREATEST OF THE GREAT

Any article on Czech inventors would be amiss if it did not mention one of the greatest historical figures of all time. Indeed, this particular Czech is so prolific that it is difficult to find a single invention that he himself did not discover or create. Who is this figure? His name is Jára Cimrman, actually a fictional character created by the comedians Zdeňek Svěrák and Jiří Šebánek. The Jára Cimrman phenomenon has become something of an ongoing joke in Czech society. Performers Ladislav Smoljak and Zdeňek Svěrák give presentations in which they try to piece together the mystical and elusive details of this great Czech's life. Very little is known about Cimrman beyond the fact that he is truly the greatest historical figure of all time – and in that lies the quintessentially Czech comedy. In the aforementioned Greatest Czech competition, Cimrman received a huge number of nominations. However, the organisers of the competition were forced to strike him from the list, because he was, after all, a fictional character. But the myth continues: In a recent poll by the news server *iDnes.cz*, on who would be the ideal candidate to oppose Czech president Václav Klaus in upcoming elections, Cimrman's name again dominated the list. ■

## OTHER CZECH INVENTORS

- **Václav Prokop Diviš** – inventor of the lightening rod & Denis d'or – first electrified musical instrument
- **Jakub Husník** – inventor of photolithography
- **Josef Ludvík František Ressel** – inventor of the ship propeller
- **Jaroslav Heyrovský** – inventor of polarographic effect and father of electroanalytical chemistry – nobel prize winner
- **Karel Václav Klíč** – inventor of photogravure
- **Otto Wichterle** – inventor of the contact lens
- **Miroslav Sedláček** – inventor of stream hydro-electrics
- **The Veverka cousins** – invented a turning plough, an advanced form of plough that not only ploughed but also turned the soil
- **Viktor Kaplan** – inventor of the water turbine – 'the Czech edison'
- **František Křižík** – first arc lamps
- **Johan Gregor Mendel** – founder of genetics
- **Jan Evangelista Purkyně** – author of cell theory
- **Sigmund Freud** – inventor of deep psychology, born in Moravia.
- **Johannes Evangelists Purkinje** – pioneer of fingerprinting
- **Jan Janský** – classification of blood groups and proponent of blood donation
- **Georg Franz August Graf von Buquoy (Jiří Buquoy)** – synthetic hyalite
- **Jan Hajek** – development of TCP/IP protocol
- **František Koláček** – first to describe electromagnetic theory of light dispersion
- **Jiří Procházka** – wrote first genuine textbook of physiology, created the concept of nerve conduction
- **Carl Freiherr von Rokitansky** – method of autopsy still used today – 70 000 autopsies, and personally performed over 30 000, averaging two a day, seven days a week, for 45 years
- **John Zelený** – inventor of electroscope