

The Point Of It All

It can write under water, in outer space and on almost any surface. It's been used to solve complex equations, create striking works of art and has been sucked on by schoolkids in a million exams. And it's the weapon of choice for crossword warriors the world over. But let's get to the point ...

By MICHAEL FRANCO





When a passer-by spotted a black substance clinging to the roots of an oak tree upturned in a storm in Borrowdale, England in 1565, he couldn't have imagined that he'd just stumbled upon something that would change the world.

Actually, his first thought was that this hard, black substance would be perfect for marking his sheep. But it wasn't long before the graphite he'd found was being cut into rods and wrapped in string that could be unwound. Later, the rods were inserted into wooden cases and the pencil was written into existence.

The practicality, utility and portability of the pencil is something we take for granted, but at one time it was considered as revolutionary as the personal computer. It made writing convenient, and in one stroke replaced a range of cumbersome tools including charred sticks, metal wires, wax-covered stone tablets and messy inks.

The graphite in the Borrowdale deposit was of an extremely high quality, and by the early 1600s, England's "black lead" was being widely exported.

So lucrative was the trade that when sufficient reserves had been extracted, mines were often flooded to keep scavengers out.

But this rich vein of graphite eventually began to wear out. France, which in the late 1700s was fighting several European countries, including Britain, in what were known as the French Revolutionary Wars, suffered a particular shortage of pencils due to an economic blockade against it.

To solve this problem, Frenchman Nicolas-Jacques Conté invented a way to use lower-quality graphite from other mines, grind it to a fine powder, combine it with clay and then bake it to produce pencil lead. Increasing the clay content gave a harder and lighter pencil, while increasing the graphite made a softer and darker pencil. This set the stage for the different grades of pencils we use today.

The Conté Method was guarded like a prized family recipe, so would-be copycats had to derive their own formulas. Those looking to get rich quick, like "bunglers" (anyone who was working outside of one of the all-important labour guilds) in Germany resorted to selling pencils with only an inch or two of graphite, or even fake blackened wood sticks that only looked like pencils.

Demand pushed innovation and soon the German Lothar von Faber mastered the Conté process and began creating quality pencils that would cement the name of Faber-Castell - as the company is now known - as one of the world's greatest pencil-makers.

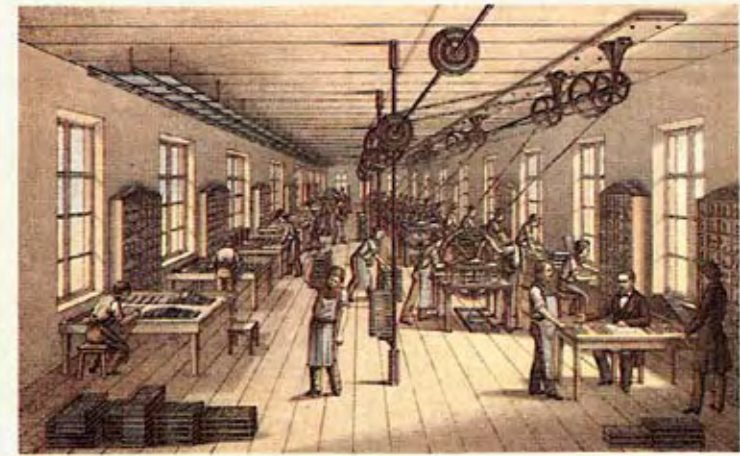
Meanwhile, as the 18th century waned in the United States, a school-girl from Massachusetts whose name is lost to history had been given some Borrowdale graphite. She pounded it to a powder, combined it



Henry David Thoreau's family pencil-making business saw success in the US by combining low quality graphite with clay.

WHY WE THINK IT'S LEAD

Back in ancient Rome, scribes used sticks of lead (the metal) for writing with - but it was far from perfect as the marks it made were faint and it could damage parchment, the predominant leather-derived writing material. Nothing replaced it for centuries, and some people were still using lead sticks in England up to the 1500s, in place of quill and ink. So when the new writing material was discovered in Borrowdale, it was called "black lead" - which led to the business part of a pencil being called "lead."



PHOTOS (FROM TOP): FABER-CASTELL; CORBIS

PHOTOS (FROM TOP): FABER-CASTELL; PHOTOLIBRARY



An artist's impression of a German pencil-making factory from the 1850s (top) gives an idea of the different processes involved in producing the product, while a poster from the 1890s extols the virtues of Eurite's triangular-leaded pencils.

HOW A PENCIL IS MADE

It takes three stages to make a pencil, all of which are automated today. They are graphite processing, wood processing and pencil building. Here's how:

1 GRAPHITE

Chunks of mined graphite are ground into a powder and processed to remove impurities. The graphite powder is combined with purified clay and water and the resultant paste is extruded through tiny holes to make spaghetti-like strands of "lead." After drying, the leads are baked in ovens at 900 degrees Celsius for one hour and then soaked in an oil or wax bath to add smoothness. For coloured pencils the clay is combined with pigments instead of graphite.

2 WOOD

"Pencil squares" are formed from felled trees, then seasoned for several months until completely dry. The squares are then cut into slats that are treated with wax and stain to create uniformity, and several parallel semi-circular grooves are cut into one side of each slat, then filled with an adhesive.

3 PENCIL

The lead strands are laid into the grooves and covered by the complementary slat. This pencil "sandwich" is then pressed and heat is applied. Once dry, the sandwiches are sliced, forming individual pencils. The pencils are then coated in paint and lacquer. An eraser can be attached by a metal collar or "ferrule."



PHOTOS (CLOCKWISE FROM TOP): © NACHO DOCE / REUTERS; FABER-CASTELL; NACHO DOCE / REUTERS

with glue and encased it in an elder branch, making the New World's first pencil. Author Henry David Thoreau, himself the son of a pencil-maker, in the mid-1830s improved upon her invention by deducing what Conté had arrived at through chemical analysis; Thoreau combined poor-quality American graphite with clay to make some of the finest pencils available in the young country.

By the late 1800s, approximately 240,000 pencils were being consumed daily in America alone. And an enterprising Hyman Lipman attached a rubber eraser to a pencil in 1858 and patented it. Prior to that, bread was used to remove graphite marks. Slowly but steadily, the pencil-making processes began to be automated and this mass production began to take a toll on the trees.

The preferred wood for pencils had been red cedar for its pleasant



Traditional methods of **blending graphite** (top) and **rolling the mixture** (below) are still used at the Viarco factory in Portugal.

odour and non-splintering quality when sharpened. As the supply dwindled in the early 1900s, pencil-makers began to recycle the wood from old cedar barns and fences. Pencil sharpeners were even declared illegal in Britain because of the amount of wood being wasted. This dwindling supply of suitable wood sparked a renewed interest in the mechanical, or "propelling" pencil. American Charles Keeran

VALUABLE AS DIAMONDS?

Pencil graphite is composed of the same substance as diamonds - carbon. In graphite, the atoms are arranged in sheet-like layers, with weak attraction between the sheets. Because these layers are not tightly bonded, the graphite is easily manipulated, which allows the graphite in a pencil to roll onto paper easily. Carbon atoms in diamonds, in contrast, are arranged in very strong three-dimensional bonds, making diamonds the hardest substance on earth. And thanks to its atomic structure, a pencil line drawn on a piece of paper can conduct electricity - which a diamond can't.



DISCOVER MORE
 The Pencil Revolution
www.pencilrevolution.com
 Pencil Images and More
www.penciltalk.org
 All Things Pencil
www.timberlines.blogspot.com

PHOTOS (FROM TOP, LEFT TO RIGHT): GETTY IMAGES; CORBIS; FABER-CASTELL



Pencil leads today are usually circular in shape, but **square** and **triangular** leads were often used in the past.

improved on previous designs and, in partnership with the Wahl Adding Machine Company, his "Eversharp" pencil was launched in 1915 to great acclaim.

Still, the public wanted something simple and wooden to write with. It was discovered that incense cedar, found in abundance in California and Oregon, was capable of making a good pencil - after the wood was dyed and perfumed to resemble red cedar. Incense cedar is still the wood of choice for making pencils today, and the trees are now harvested in a sustainable way to ensure a constant supply of wood.

Pencil-making is truly a multinational industry with annual sales topping 14 billion units - enough to put two pencils in the breast pocket of every person on earth. The pencil you buy might be made from material sourced from all over the world; US clay and wood, graphite from South America and the material for making the eraser from Europe.

Best of all, a pencil won't leak on a long plane ride, can write in extreme heat and cold, and can draw a continuous line 56 kilometres long. It can also write its history directly back over 450 years to an English hillside and a fallen oak. ■

FAMOUS PENCIL PUSHERS

1 Thomas Edison The inventor had his pencils specially made by Eagle Pencil to be three inches long (6.6 centimetres), fatter than ordinary pencils and filled with very soft lead.

2 Vladimir Nabokov The Russian writer famously stated: "I have rewritten - often several times - every word I have ever published. My pencils outlast their erasures."

3 John Steinbeck The author wrote obsessively in pencil, sometimes going through 60 in one day. It is said that he used 300 pencils to complete his novel, *East of Eden*.

4 Vincent van Gogh The Dutch artist is reported to have preferred a Faber-Castell pencil for his large studies. He claimed, "they are of ideal thickness; very soft and in quality superior to carpenter's pencils, a capital black and most agreeable ..."

KNOW YOUR LEAD There are 20 grades of pencil lead, from 9B (softest and darkest) to 9H (hardest and lightest). An alternative scale only grades five leads, but they roughly correspond to the most commonly used leads on the first scale.

DARKER										#1	#2	#2.5	#3	#4	LIGHTER				
9B	8B	7B	6B	5B	4B	3B	2B	B	HB	F	H	2H	3H	4H	5H	6H	7H	8H	9H