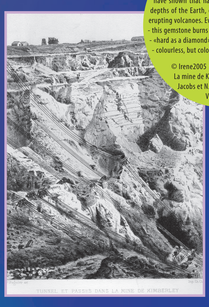
# Diamonds, Man, and the «carbon» family

To recreate the diamond, Man has had to trace its history and understand its characteristics and contradictions. He has finally, after much experimentation, succeeded in harnessing the stone to his needs. From here he has gone even further, to discover new members of the carbon family, with new applications.

**Extinct volcanoes, natural crucibles for diamonds.**
Big Hole Mine, South Africa

The mines in South Africa and theoretical studies have shown that natural diamond comes from the depths of the Earth, ejected through the chimneys of erupting volcanoes. Even more surprising,
- this gemstone burns
- «hard as a diamond» but it breaks
- colourless, but colourful, thanks to its impurities

© Irene2005 via Wikimedia Commons, La mine de Kimberley, *Le diamant* H. Jacobs et N. Chatrian 1884 & Eddy Vleeschdrager



## From the diamond's origins…

**Natural diamonds** initially came from India, Borneo, Brazil, and, since 1867, South Africa. Thanks to one of these mines, the Big Hole Mine in Kimberley, South Africa, scientists have been able to understand the diamond's origins: **the miners were mining the chimney of a volcano** and their diamonds came from layers 150 km deep.

## …to its artificial descendants

It was not until the middle of the 20th century that theoretical research work helped scientists determine the conditions of stability of diamond and graphite: in order to produce a diamond, temperatures of 1100-1500°C were required with pressures greater than 45,000 atmospheres. It is possible today to achieve these conditions and **we are, therefore, now able to «cultivate» diamond**.

## Mastering the production process

Whilst natural diamonds are primarily reserved for jewellery, their artificial counterparts are essential for industry (machining), energy (drilling for oil), surgery (scalpels) and tomorrow's electronics.

## The extended «carbon» family

We have so far spoken of diamond and graphite, but the **story continues**; nanomaterials have been discovered recently with completely different arrangements of carbon atoms.

**The great carbon family**

All the members of the carbon family have similar but differing structures. This is true of the diamond and graphite structures containing flat or distorted hexagonal carbon rings. And it is also the case of the new recently discovered members in the family. These can form
- nano-foot- or rugby balls!
- extremely small tubes
- extremely thin sheets and...

some of these carbon compounds could have applications in nanoelectronics.

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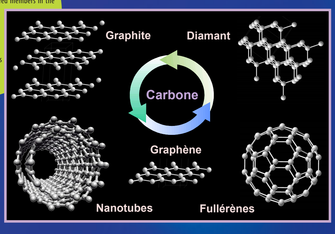


**Diamond ... a jewel in industry's crowns**

We now know how to grow both graphite and diamond. The world's production of industrial diamond is eight times that of natural diamond. It mainly involves nanocrystalline diamond. Manufacturers now have access to good quality synthetic diamonds but these are generally more expensive and smaller than natural diamonds.

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