

Have you ever used a bubble jet printer? They've been around for only 20 years, but now most home computer users wouldn't want to be without one.

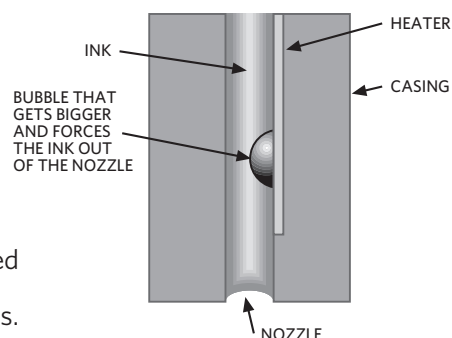
Bubble jet printers store ink in cartridges. When the printer is ready to print, ink moves to the print head. The print head has up to 600 tiny nozzles. Tiny jets of ink come out of these nozzles to make dots on the paper. Each dot is smaller than the diameter of a human hair. And every dot ends up in exactly the right place to make the shapes of the letters and pictures in the document.



## How do ink jets come out of the nozzles?

- In each nozzle, a tiny electric heater transfers heat to the ink
- Next to the heater, a tiny amount of ink vaporizes to make a bubble
- The bubble gets bigger.
- The expanding bubble pushes ink out of the nozzle.
- When the bubble 'pops', more ink moves from the cartridge to the print head.

Forcing jets of liquid through small holes isn't new. More than twelve hundred years ago Banu Musa of Baghdad, Iraq, used sophisticated techniques to make incredible water fountains that directed water in particular directions.



## What's in ink?

Ink has always been a mixture of a liquid 'carrier' with dyes or pigments. A thousand years ago, scientists of the Islamic world worked hard to make better and better ink for pens. Now, scientists continue to develop inks for both pens and printers. Most bubble jet printer ink is a mixture of chemicals. The mixture includes:

- A pigment to colour the ink. Pigments are tiny crystals. The most important pigment is carbon black. This is the 'soot' made by burning hydrocarbon compounds (like oil or natural gas) without much air. Coloured ink needs coloured pigments. Years ago, these pigments were compounds of metals like lead. Then scientists realised they were poisonous. So they developed safer coloured pigments based on carbon compounds.
- A liquid to mix with the pigment crystals and carry them from the ink cartridge and onto the paper. The pigment crystals do not dissolve in the liquid. Water is used most often. A few years ago, other liquids were used. But scientists discovered that some of these cause cancer. So they cannot be added to ink for home use.
- Additives to improve the quality of the ink. These include:
  - o Driers to make the ink dry quickly on the paper
  - o Chemicals to stop ink drying on the printer
  - o Biocides to stop micro-organisms living in the ink
  - o Deodorants to cover up bad ink smells

