

# LCDs

## Liquid Crystal Displays

A not fully understood presentation by...

By **Stephen Lucas** (well actually mostly the textbook, wikipedia and howstuffworks.com)



# But Stephen, I am a poor boy, I know not of Liquid Crystal Displays ☹

Well have no fear, another inappropriate PowerPoint is here!

- Liquid crystal displays are a form of display that works by shining polarised light (light that has been restricted to one plane only) through a panel of liquid crystals. When a voltage is applied to the crystals, they twist and block out the light. An array of transistors and crystals can be used to produce a moving image.  
If you don't believe me just ask the website I copied this off!
- You can see an example of wasted money...I mean a liquid crystal display in the conference room, the hd television uses liquid crystal displays to show an image on the screen, this is superb for senior leadership to have video conferences, but not so good if you're a year 9 using toilet paper as an exercise book.



**Light**

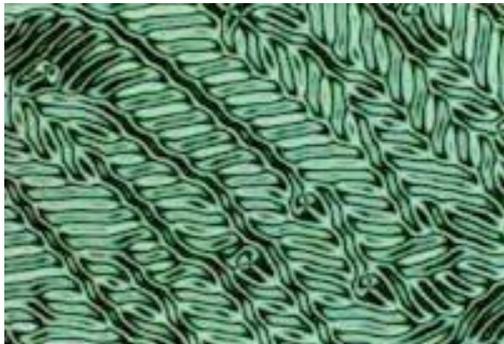
**Polarising  
Filter**



# So is de liquid crystals like da stains in ma pants?



Well no Charles, a liquid crystal is a liquid in which the molecules arrange themselves in some sort of ordered pattern, similar to that of a solid, but they can also move around to different positions like the molecules in a liquid. Think of it as a crowd at a Sean Paul concert, the crowd all face the stage but are free to nod and touch their groins whilst bouncing to the generic Jamaican accent.





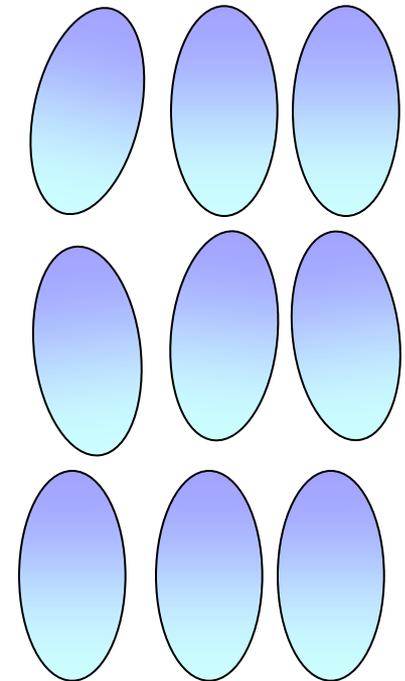
# **SUBLIMINAL MESSAGE**

# Ahhh Mate Dey Sound Banging, What else is dere about dem?

Well, my alliterate, uneducated Neanderthal friend, the liquid crystals are closer to a liquid state than a solid and are therefore affected by temperature. If you were to take your laptop to the beach, you might notice the screen plays up. LCDs have some advantages over cathode ray tubes as they draw much less power and are generally thinner and lighter.

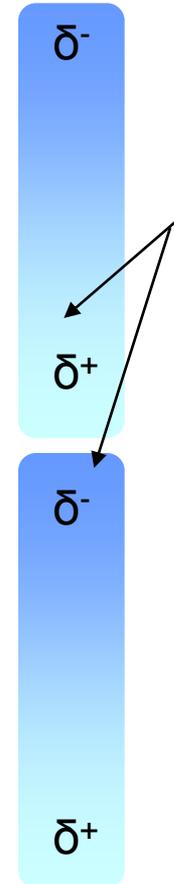


OMG DAT IZ WELL TIGHT, UNLIKE MY...



# Nematic Liquid Crystals

- The type of LCDs in use today use nematic liquid crystals. A nematic liquid crystal consists of long thin molecules that tend to arrange themselves with their long axes parallel to each other. This occurs because of the unequal distribution of charge, which makes the molecules polar. Therefore one end is slightly positive and the other slightly negative, although overall the molecule has neutral charge. The slightly positive end is attracted to the slightly negative end of the neighbouring molecule, causing them to line up.



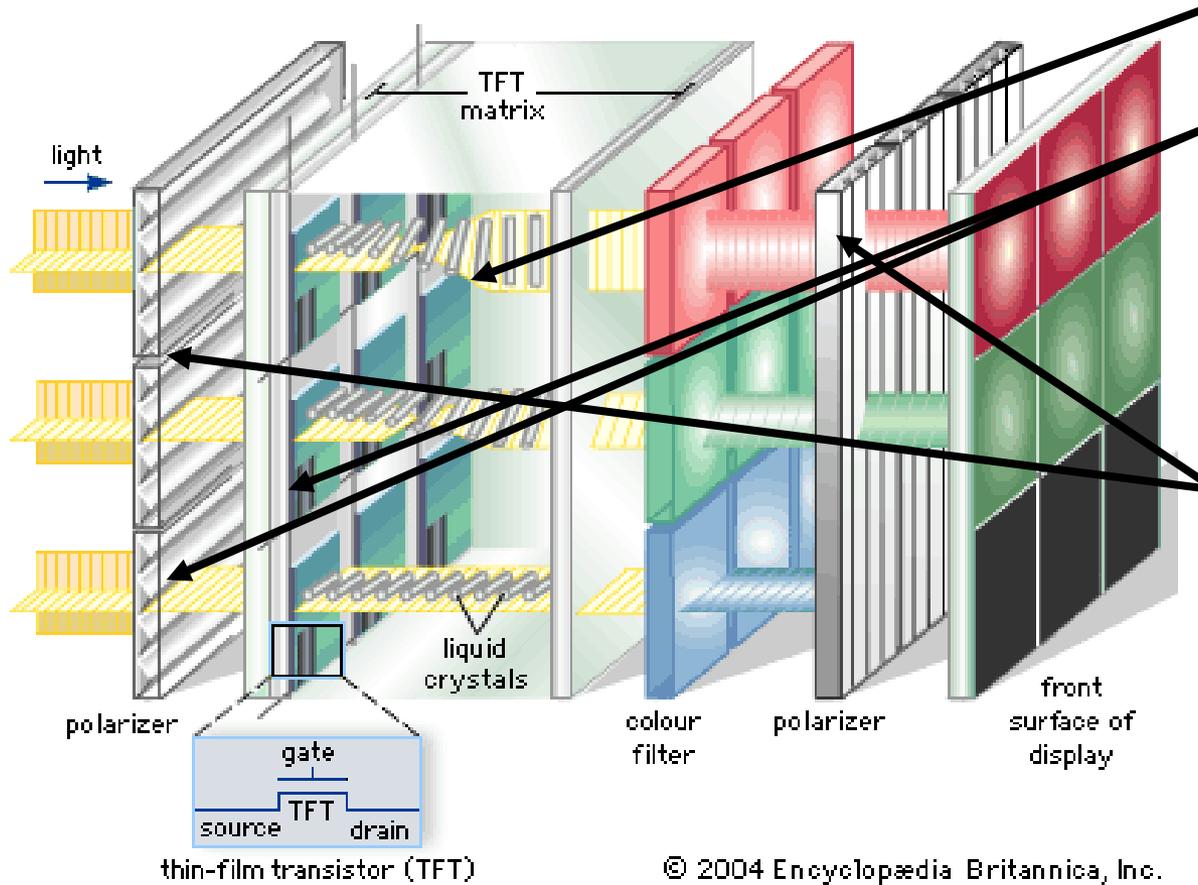
This is similar to Van der Waals forces, if you don't remember this you were probably taught by Miss. Thomas, I hope she doesn't come in whilst this slide is up, but for the record Shilling wrote it not me.



# Twisted Nematic & Super Twisted Nematic Displays

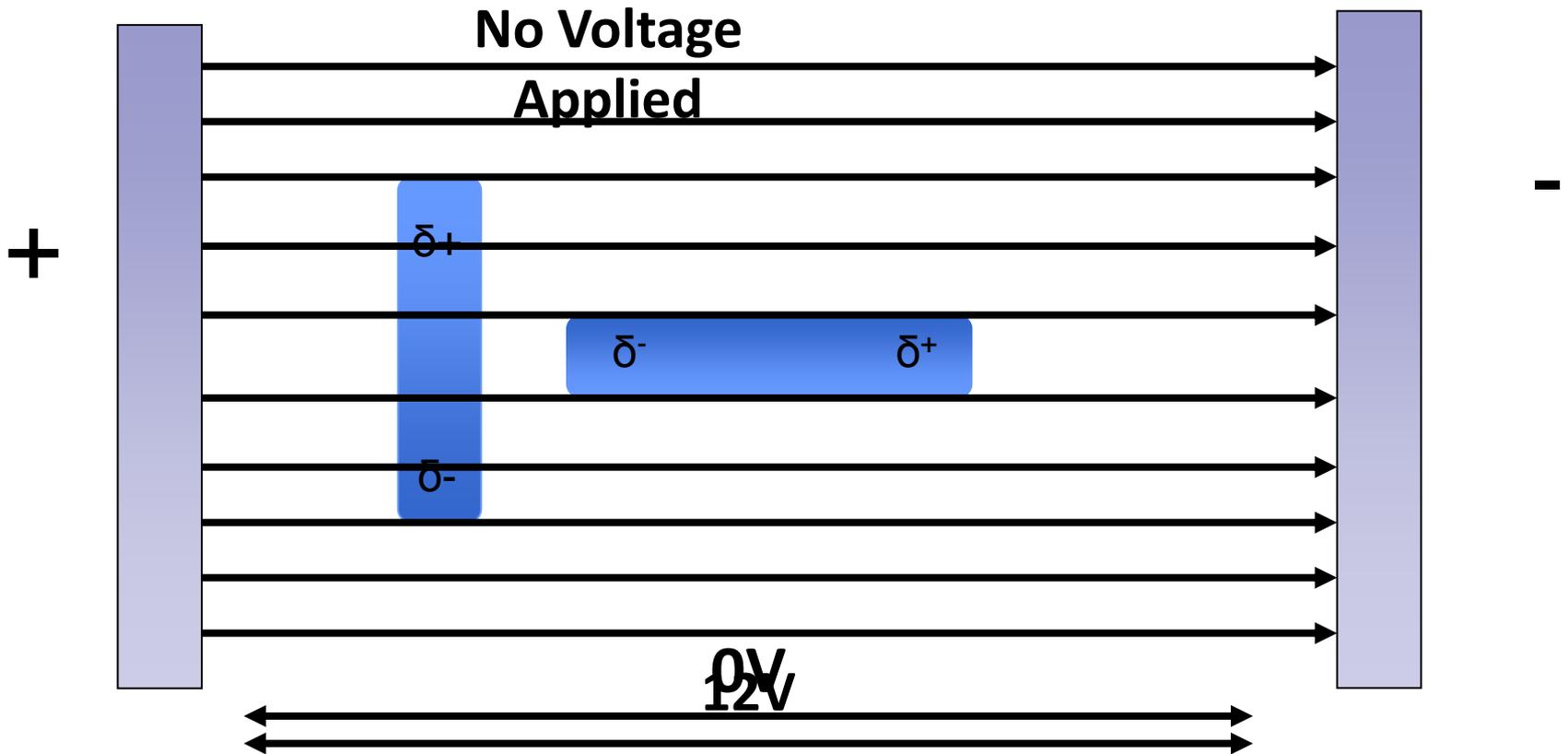
- A TN display consists of a thin layer of nematic liquid crystal between two glass plates whose surfaces have been coated with a very thin conducting layer and treated with a rubbed polymer layer that has the effect of creating small parallel grooves. The molecules prefer to lie along rather than across the grooves. The glass plates are orientated with one set of grooves at right angles to the other, which introduces a 90 degree twist in the molecular arrangement. Don't worry, I don't really get it either but maybe this picture will help...

# A liquid crystal display...



Each pixel in an LCD consists of a layer of liquid crystal molecules determined by the alignment at the surfaces. In a twisted nematic device, the liquid molecules are arranged between two transparent electrodes, and the liquid crystal is optically anisotropic. When the liquid crystal is in a twisted nematic configuration, light passing through the polarizing filter is rotated by the liquid crystal, which allows it to pass through the second polarized filter.

- When a voltage is applied across the electrodes, a torque acts to align the liquid crystal molecules parallel to the electric field, distorting the helical structure. This reduces the rotation of the polarization of the incident light, and the device appears grey, and can even block all of the incident light.



# Mr. Wikipedia Says...

- If the applied voltage is large enough, the liquid crystal molecules in the centre of the layer are almost completely untwisted and the polarization of the incident light is not rotated as it passes through the liquid crystal layer. This light will then be mainly polarized perpendicular to the second filter, and thus be blocked and the pixel will appear black. By controlling the voltage applied across the liquid crystal layer in each pixel, light can be allowed to pass through in varying amounts thus constituting different levels of gray.



Ahhhhhhh maybe, now I is well gonna know about LCDs before I stealz them like, naaaa what a mean? Dis presentation iz well offensive maan but dats okay cos now I know where to steal an LCD from and I can't read anyway so na worries blood