

WATERLOO INSTITUTE FOR NANOTECHNOLOGY

distinguished lecture series



flat-Panel Electronic Displays – a Triumph of Physics, Chemistry, and Engineering

PROFESSOR CYRIL HILSUM

CBE. FRS. FEng HonFInstP, University College London

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Almost overnight a few years back High Street shops changed their television stocks. Out went the familiar cathode ray tubes, and flat panels were everywhere. The picture you saw was much the same, but the TV set was very different. That change was the result of inspired science and engineering. How that happened, and the interplay between the people involved, is described in this talk.

Any versatile flat panel display will exploit an electro-optic effect, a transparent conductor, and an addressing system to deliver data locally. The first need is to convert an electrical signal into a visible change. Two methods are available, the first giving emission of light, the second modulating ambient illumination. The most common light-emitting media are semiconductors, historically exploiting III-V or II-VI compounds, but more recently organic or polymer semiconductors. Gas discharge plasmas can emit many colours, and phosphors excited by novel cathodes remain a potential candidate. The modulating, or subtractive, effects that have been studied include liquid crystals, electrophoresis, electrowetting, and electrochromism.

The transparent conductor makes it possible to apply a voltage to an extended area while observing the results. The design is a compromise, since the free electrons which carry current also absorb light.

Delivering data unambiguously to a million or so picture elements across the display area is no easy task. The need is an electronic switch, but it must be realized in a semiconductor that can be deposited on the panel cheaply and reliably, for the eye can tolerate only a few missing pixels. The search for a solution was protracted; the final answer unexpected.

An endeavor that coupled such vital scientific interest with huge commercial benefit naturally attracted strong personalities, international friction, and patent controversies, and those interactions weave together in a fascinating tapestry. Success in that endeavour has led to many applications for flat panel displays, including television, flexible displays, electronic paper, electronic books, and advertising signs.



Thursday, June 16th, 2011 3:30 - 4:30 pm

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