



# Heartland Science



Ohio's Legacy of Discovery & Innovation



## Communications

From Greenbacks to Lexis-Nexis

### Improved LCD Displays

Two Ohioans have had a great impact on the liquid crystal display (LCD) market. James Ferguson of Kent State University, in 1969 discovered the twisted nematic field effect of liquid crystals, which led to a better LCD, used in pocket calculators, digital wristwatches, and computer displays. And, John L. Janning, of Dayton, discovered a way to permanently align molecules in liquid crystal materials. It opened the way to large-scale manufacture of liquid crystal displays in the early 70's. Janning's 250 other inventions include "Stay-Lit" Christmas lights. The technology of LCDs were first integrated into watches and calculators, but have now impacted many industries from medical to industrial equipment, and consumer electronics, toys, and accessories.



### Ferguson's Impact

In 1970, James Ferguson made the first operating LCDs. Previously, LCDs required a lot of power and worked for only a limited time. They also had poor contrast, making them a bit hard to read. Ferguson joined the Liquid Crystal Institute at Kent State University during the 60s. While serving as Associate Director there, Ferguson discovered the twisted nematic field effect of liquid crystals. He then left the University and founded his own company, International Liquid Crystal Company (ILIXCO), in Kent, OH. Ferguson then focused on developing an improved display, based on the twisted nematic field effect. The result was a longer lasting, easier to read device, which became the industry standard. Ferguson did not make a patent application at the time, however, and two men (Wolfgang Helfrich and Martin Schadt) who worked at F. Hoffmann La Roche in Basel, Switzerland, published a paper on the same effect in 1971. Later, Hoffmann La Roche purchased Ferguson's patent rights.



### About Janning

John L. Janning of Dayton, Ohio, has over 50 U.S. Patents and 250+ worldwide. He began his career at NCR, and then launched his own business - JLJ, Incorporated - to focus full time on his research and inventions. Janning developed the liquid crystal molecular alignment invention which improved the display and made large scale manufacturing a profitable venture. In addition to his work on LCDs, Janning also invented the thermal printing wafer, which is used in thermal fax machines, and the familiar orange plasma displays seen in many checkout counters. Another invention is the Stay Lit® Christmas light set, which incorporates a microchip into each socket that regulates the voltage across each socket. This technology keeps a string of lights bright even if there are broken, loose, or burned out bulbs.

## What is an LCD?

LCD stands for Liquid Crystal Display -- a special type of display that is used on portable computers, digital watches, and other products. LCDs incorporate two sheets of special polarized materials with a liquid crystal solution sandwiched between. When an electric current is passed through the liquid, it causes the crystals to align themselves so that light cannot pass through. Each crystal behaves like a miniature shutter, able to either block or allow light to pass through.



## Find out more...

- [Ferguson Patents](http://www.fergasonpatents.com/)  
(<http://www.fergasonpatents.com/>)
- [International Liquid Crystal Company History](http://www.ilixco.com/background.html)  
(<http://www.ilixco.com/background.html>)
- [Marquis Who's Who Publications: Janning](http://www.marquiswhoswho.net/STAYLIT1225/)  
(<http://www.marquiswhoswho.net/STAYLIT1225/>)
- [How LCDs Work](http://www.howstuffworks.com/lcd.htm)  
(<http://www.howstuffworks.com/lcd.htm>)