CROSS PURPOSES

Some stories of serendipitous discovery have the non-sequitur character of myth. People routinely recount the tale of the optical polarizer herapathite thus: a student of the Bristol toxicologist William Herapath dropped iodine into the urine of a dog fed on quinine, and precipitated green crystals that Herapath studied under the microscope. Noticing that the translucent, needle-like crystals were sometimes dark where they overlapped, Herapath realized that this was a polarizing medium. Not the first, for the silicate mineral tourmaline was already used in that respect. But tourmaline was rare and expensive, and that at a time when polarization effects had become central to optics.

But why was a dog being fed on quinine, and why collect its urine? Even in the mid-nineteenth century this seems an odd thing to do. Of course, quinine was then an important antimalarial drug, but that hardly solves the mystery. In any event, this story is usually drawn from the account of Edwin Land, the pioneer of Polaroid photography, who made herapathite famous in the polarizing filters of his new technology. Land came across herapathite in an account of the kaleidoscope by its inventor

David Brewster, who hoped to use Herapath's material in the eyepiece to make kaleidoscopic images from interference colours.

The problem with such applications was that it was tough to grow large crystals. Land took a different route, making a viscous colloidal dispersion of small needle crystals that he aligned in plastic sheets by squeezing the liquid through narrow slits. Land's initial motivation was not photography but antiglare films for vehicle headlights. In the Second World War, this application, which was never adopted for cars, improved the visibility of enemy vessels at sea by cutting out polarized reflections of sunlight on water.

All the same, it was a wartime shortage of quinine that put paid to herapathite filters. Supplies of quinine extracted from *Cinchona* trees in the Dutch East Indies were cut off, and the limited quinine available was needed as an antimalarial drug for troops fighting in the tropics. This forced Land to develop new filters based on aligned polyvinyl alcohol dyed with iodine. It was also what prompted his Polaroid Corporation in Cambridge, Massachusetts, to hire the dazzling young Harvard chemist Robert Woodward as a consultant, stimulating him to synthesize quinine

PHILIP BALL

with William von Eggers Doering in 1944.

Although herapathite did not at once fall wholly out of use, its diminished importance perhaps explains why its crystal structure has never been deduced, which meant that its polarizing properties have not been fully understood. Bart Kahr and colleagues at the University of Washington in Seattle have now solved this rather complex structure (*Science* **324**, 1407; 2009). It is lamellar, with the quinine molecules complexed to triiodine ions linked into extended chains. Delocalized excitons on these chains lie at the root of the light-absorbing properties. So herapathite now joins an illustrious list of historically important materials, including Prussian blue and Mayan blue, understood only by the grace of modern crystallography. □

LIQUID CRYSTALS

More than display fillings

With liquid-crystal displays now ubiquitous in everyday life, liquid-crystal research is moving beyond these applications and evolving in entirely new and unexpected directions.

Ralf Stannarius

Today, liquid-crystal (LC) devices have practically conquered the electronic-display market. With the advent of commercial 100 inch (2.54 m) displays, one might wonder whether everything desirable has been achieved in LC research. Time to move on to another research field? Not at all. The European Science Foundation (ESF) Exploratory Workshop¹

in Bando, France, organized by Jan and Sven Lagerwall, and bringing together European scientists representing different perspectives of LC soft-matter research, demonstrated impressively that the field has broadened enormously in recent years. It is being stimulated by contemporary trends in soft-matter science, and is fruitfully influencing scientists from neighbouring

research areas that sometimes didn't even realise that LC research was relevant to their work.

Scientists from Europe, starting with Reinitzer and Lehmann in the late nineteenth century, pioneered the discovery and investigation of LCs. Understanding of the field grew in particular during the last decades of