

Building a super nose

What is a super nose?

Scientists have been working on a new way to detect, monitor and treat disease. They have been working on a super sensitive breath analyser. They hope that this will help them develop easy tests to monitor and treat patients by monitoring levels of cell damage and possibly diagnose cancer.

Where did the idea come from?

The research began when petrochemical engineers working for Shell approached physicist Miles Padgett for help improving a device they were building to detect ethane leaks from their pipes. The physicist, through his work in medicine, realised that a version of their detector could also be used in cancer detection.

How does the detector work?

All gases absorb and emit specific wavelengths of light. (eg sodium street lights are always yellow, neon lights are red). The science of recognising compounds from these wavelengths is called spectroscopy.

The detector uses tiny semiconductor laser diodes to generate light of the specific wavelength absorbed by ethane (3.4 microns). The sample breath is sucked into a glass tube, and mirrors are used to bounce the laser light hundreds of times up and down the tube. If a small amount of ethane is in the tube then the intensity of the light is reduced. The detector measures the deduction?

Link to medicine

The device being created by Shell was designed to detect ethane. Oil companies search for ethane in the deserts and other areas because it may indicate that a new source of oil is nearby. The physicist on the project, Miles Padgett, had also worked with a medical researcher, Chris Longbottom. Longbottom's research showed the ethane was related to cell damage and death. It was enough to measure the ethane in a person's exhaled breath to get a good indication of cell death – which could likely be a sign of cancer.

What does all this have to do with Einstein?

Einstein suggested that light could be thought of as particles as well as waves. He used this to explain the photoelectric effect where, if you shine a light of a certain wavelength on metal, electrons can be released. In a laser, you give the electrons more energy, which can be released and emitted as light. Einstein won his Nobel Prize in 1921 for his work on the photoelectric effect.

Where can I find out more?

<http://science.howstuffworks.com/laser1.htm>

http://www.einsteinyear.org/facts/photoelectric_effect/fact_view