

LASERS – Case Study of an Industrial Trust Programme

GCSE students from Peers Technology College, Oxford visited Sharp Laboratories of Europe Ltd to learn about lasers and their application.

Background

Peers Technology College is an 11-19 specialist Technology College secondary school with around 1100 students drawn from all over Oxford. It is set in an area known for its concentration of high technology businesses (Oxford Science Park is close by) and the school has links with many local employers.

Sharp Laboratories of Europe Ltd is a dedicated research laboratory located in the Oxford Science Park. It is part of a worldwide network of laboratories that carry out research for the Sharp Corporation of Japan. It has developed new technologies which are used in many Sharp products around the world. Key areas of current research include solid state lasers for read and write applications; novel liquid crystal displays, including displays which create a 3-Dimensional image; artificial intelligence including language translation software, and novel software for circuit design.

Learning objectives

The school had worked with Sharp Laboratories of Europe Ltd in the past. The teacher saw an opportunity to enliven teaching about the electromagnetic spectrum, and specifically the wavelength of light. After discussions with the company about the learning points that the school wanted the visit to achieve, a format for the event was agreed. The plan was to show some of the practical applications of science by bringing to life various learning points about the visible light spectrum and to illustrate these with examples of everyday uses of lasers. In advance of the visit the teacher briefed the students to ensure that they were properly prepared to benefit from what they were about to see.

The visit

The visit centred on lasers: their application and the work Sharp has done on the development of blue-violet laser diodes for the next generation of DVDs. It lasted around 1½ hours and was structured to engage and involve the students as much as possible, making use of presentations, discussions, demonstrations and practical examinations of semi-conductor materials.

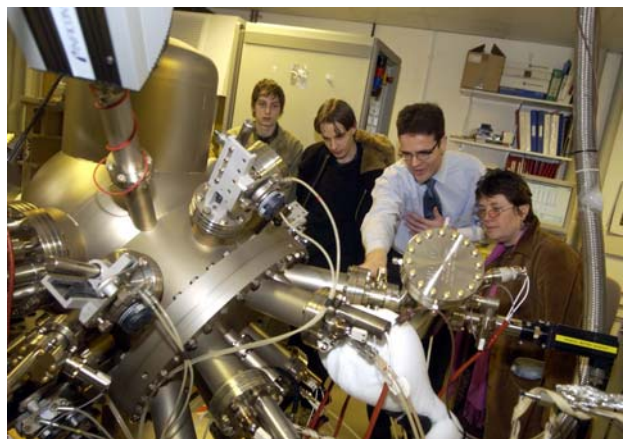


Image courtesy of Newsquest Oxfordshire

The presentations started with basics of white light and the familiar "rainbow spectrum" then progressed, through descriptions of early laser technology, to the very latest laser technology which scientists are currently developing. They illustrated, in a practical and understandable way, the relationship between light wavelength and colour, the amplification of light (lasers) and how lasers of different colours have different properties. Scientists were able to explain how, by using lasers with shorter wavelengths, it had been possible to develop CDs (which store up to 76 minutes of music) into DVDs (2 hours of video). But that research and development work to produce the materials required to make lasers that emit blue-violet light meant that the next leap forward, the new "Blue-ray standard", would allow 13 hours of video to be recorded on one disc. The students were also able to view the machinery used for making the semi-conductors needed to produce the blue-violet lasers.

The students were greatly enthused by what they saw. They showed their grasp of the subject matter through their questioning of the scientists present; for example about further steps in laser development and how far along the visible light spectrum it might be possible to progress. Its focus on the application of the technology for home entertainment (i.e. CDs, DVDs, video) gave the theoretical inputs real, practical meaning for the students who identified readily and enthusiastically with the scientists' challenge.

Learning outcomes

By the end of the visit the students had a much better understanding of lasers and their application. In particular they had learned:

- How lasers work.
- Their application, for example in surgery, in communications, as bar code scanners and in consumer electronics (e.g. CDs, DVDs).
- The different types of laser and the different materials used to make them (and how these materials themselves are made).
- The relationship between laser wavelength and the storage capacity of optical discs.
- The significance and practical implications of using lasers of different wavelength and colour.

They were also given a graphic illustration of the link between scientific theory (and research and development) and practical household items that they themselves use every day.

Conclusion

The school felt that the visit had been very successful and that it had had a significant impact on the students attending, giving them a far better understanding of the relevant parts of the science curriculum. It had also generated a new enthusiasm for science at a time when students were considering their post-16 options.

Sharp Laboratories of Europe Ltd were also pleased with the visit which had given their scientists an opportunity to demonstrate their work to young people and to share with them some of the excitement that scientific research holds: possibly encouraging them to aspire to be scientists themselves in the future.

"This experience brought together theory and practice in a very exciting way. Too rarely do students get a chance to see industry at first hand, especially high tech science. The visit to Sharp Laboratories Europe showed the practical applications of scientific theory and the potential for interesting careers." **Chris Dark, Headteacher, Peers Technology College.**