

# Raising the Awareness of Laser Science

## What is PULSE?

**PULSE** is an acronym for **P**ublic **U**nderstanding of **L**aser **S**cience and **E**ngineering. It is an initiative by the CSIR National Laser Centre (NLC). The programme aims to raise awareness about lasers and their applications amongst the South African public, learners and students.

## Objectives of PULSE

- To reach out to learners and students and to teach them about lasers
- To encourage learners to take maths & science at school
- To encourage students at tertiary level to study laser physics and engineering
- To raise awareness about laser technology amongst the South African public

## PULSE activities

- Participation in science shows around the country
- Sponsorship of science centres with lasers and optics
- Outreach programmes
- Visits to CSIR NLC laboratories

## What is a LASER

A laser is a device that controls the way that energised atoms release photons. The word laser is an acronym for:

**L** Light  
**A** Amplification by  
**S** Stimulated  
**E** Emission of  
**R** Radiation

Laser light is very different from normal light. Laser light has the following properties:

- It comes in one wavelength i.e. one colour (monochromatic)
- It is coherent i.e. the waves are in phase with each other
- The light is very directional, i.e. it does not spread out as fast as other light sources

## Laser Applications in everyday life

- Supermarket scanners
- Laser printers
- Laser shows
- Eye surgery
- CD players
- Laser welding
- Laser cutting

## If you wish to follow a career in laser technology you need to:

- Study maths & science at school level
- Obtain a science degree at tertiary level, or
- Obtain an engineering degree at tertiary level, or
- Obtain a medical degree at tertiary level

## Contact details

If you would like to visit the CSIR National Laser Centre or you would like to invite a PULSE representative to your school, contact the PULSE office at:

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*The CSIR NLC is a highly specialised CSIR facility focusing on the development of lasers and laser application technology through Research, Development and Innovation.*



## History of Optics

Year	Names	Achievements
~300BC	Euclid	Law of reflection
~140AD	Claudius Ptolemy	Atmospheric refraction
~1590	Zacharius Jensen	Microscope
1621	Willebrord Snell	Refraction law
1666	Isaac Newton	Colour spectrum
1678	Christiaan Huygens	Wave theory of light
1704	Isaac Newton	Particle theory of light
1819	Joseph Fraunhofer	Theory of diffraction
1849	Armand Fizesu	Speed of light
1865	James Maxwell	Electromagnetic theory
1899	Lord Rayleigh	Theory of scattering
1900	Max Planck	Quantum law of light
1905	Albert Einstein	Theory of photons
1913	Neils Bohr	Absorption and emission of light
1955	Marvin Minsky	Confocal Scanning microscope
1961	Peter Franken	Second harmonic generation
1965	Joseph Giordmaine and Robert Miller	Optical parametric oscillators
1965	James Russell	Compact disk
1969	George Smith and Willard Boyle	Charge Couple Devices
1970	Charles Kao and George Hockham	Glass fibres
1974	John MacChesney and Paul O'Connor	Modified Chemical Vapor Deposition
1980	Linn Mollenauer	Soliton generation
1981	Gerd Binnig and Heinrich Rohrer	Scanning tunneling microscope
1986	David Miller	Self Electro-optic Effect Devices
1987	Larry Hornbeck	Digital Light Processing
1991	James Fujimoto	Optical coherence tomography
1991	Eric Betzig, Ray Wolfe, Mike Gyorgy, Jay Trautman and Pat Finn	Magneto-optic storage
1995	Corrado Dragone	Dense Wavelength Division Multiplexer
1998	Cees Decker	Nanotube transistor

## History of Lasers

Year	Names	Achievements
1916	Albert Einstein	Stimulated Emission (Theory)
1951	Charles Townes	MASER
1957	Gordon Gould	LASER
1960	Theodore Maiman	Ruby laser
1961	Robert Hall	Semiconductor laser
1961	Gardner Fox and Tingye Li	Optical resonators
1961	Ali Javan, William Bennet Jr. and Donald Herriot	Helium Neon (HeNe) laser
1963	Elias Snitzer	Fibre laser
1964	Joseph Geusic <i>et al</i>	ND:YAG laser
1964	Kumar Patel	Carbon Dioxide laser
1970	Nikolai Basov's Group	Excimer laser
1980	Steven Chu, Claude Cohen-Tannoudji and William Phillips	Laser cooling of atoms
1984	Dennis Matthew's Group	X-ray laser
1990	Wilson Sibbett	Ti:Sapphire laser (fs)
1994	Jerome Faist, Federico Capasso, Deborah Sivco, Carlo Sirtori, Albert Hutchinson and Alfred Cho	Quantum cascade laser

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