



# Einstein

News from the National Physical Laboratory  
Winter 2005 | Issue 18

Albert Einstein was born in Ulm, Germany in 1879. When he died in 1955 he had transformed our understanding of the world in the most profound and fundamental ways. Some of his most important breakthroughs were published in 1905, and the National Physical Laboratory (NPL) is supporting the centenary of that year.

Einstein's discoveries included:

- time can stretch or shrink
- matter and energy can change into each other
- time flows at different rates in different places
- light behaves as streams of particles
- a way of mathematical modelling the universe
- the nature of gravity
- many ways of measuring atomic size

After an eventful upbringing in Germany, Italy and Switzerland, Einstein settled for a while in Switzerland, working in the patent office and producing some of his most important work in 1905. A number of university appointments followed as his prestige grew. During the First World War he campaigned for peace and developed his theory of gravity (general relativity).

A demonstration of the distortion of starlight during a solar eclipse in 1919 led to world-wide fame. When the Nazis came to power in 1933, Einstein campaigned against them - and they against him - and he left Germany,



settling finally in the United States. After the war, though plagued by illness, he worked tirelessly for peace, campaigning against the hydrogen bomb, and McCarthyism. Scientifically, his major contributions ended in the 1920s but for the rest of his life he worked on a new theory that would unify all forces together with time, space and matter: a theory he never completed but which set the direction for today's embryonic 'Theories of Everything'.

To measure directly the effects at the velocities that vehicles can achieve on earth, or those caused by the Earth's gravity, extremely accurate clocks - atomic clocks - are required. The first operational atomic clock was developed at NPL, and NPL was involved in a recent verification of relativity using an atomic clock (see page 2).

In 1905, Einstein showed that light can be viewed as a stream of many tiny particle-like packets of energy called photons. Most light sources (such as lasers, light bulbs or stars) generate photons at enormous rates so that a continuous beam is all we can see, but NPL is making photons one by one (see page 4).

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Date 28 April 2005

Dear Mr Bagchi

**Re: Visit to the National Physical Laboratory, Teddington**

Thank you for your letter of 22 April.

We are delighted to be able to invite you to visit the National Physical Laboratory in May to discuss some of the design-related research you have undertaken for advanced laboratory facilities.

**NPL's new  
address and  
entrance**

National Physical Laboratory  
Hampton Road  
Teddington  
Middlesex  
United Kingdom  
TW11 0LW

Telephone 020 8977 3222  
(Switchboard)

NPL Helpline 020 8943 6880  
Facsimile 020 8943 6458

[www.npl.co.uk](http://www.npl.co.uk)



The new map can be found at:  
[www.npl.co.uk/location](http://www.npl.co.uk/location)

air tickets,

**Tech.Presentations & Visits during the WORLD YEAR OF PHYSICS – 2005 ( WYP 2005 )- To celebrate 100 years of 4 epoch-making & outstanding contributions of Einstein in 1005 which formed the basis modern Physics.**

- 01.VIBRATION ANALYSIS FOR INDUSTRIAL MACHINES AND AN ANALOGY WITH ATOMIC AND MOLECULAR VIBRATIONS IN OPTICAL AND INFRARED FREQUENCIES. ( INDUSTRY ORIENTED– ACADEMIC WORK )  
**Symp. on Optics and Opto-Electronics ( SOOP- 05) jointly organized by Optical Society of India and National Physical Laboratory at N.P.L New Delhi. Ref. abs. AB5-4, pp 98, 19- 21stJan. 2005**
  
- 02.VIBRATION ISOLATION SYSTEM DESIGN FOR HIGH RESOLUTION OPTICAL INSTRUMENTS USED IN METROLOGY AND AEROSPACE APPLICATIONS. **Symp. on Optics and Opto-Electronics ( SOOP- 05) jointly organized by Optical Society of India and National Physical Laboratory at N.P.L New Delhi. Ref. abs. P1-9, pp 124., 19- 21stJanuary . 2005**
  
- 03.INDUSTRIAL DESIGN AND OPTIMISATION TECHNIQUES USED FOR VIBRATION ISOLAION RELATED TO METROLOGY AND AEROSPACE APPLICATIONS. **5<sup>th</sup>.Intl Conf.on Advances in Metrology at National Physical Laboratory at N.P.L New Delhi.Feb. 2005 (Abs.no.2 pp12) Feb.2005.**
  
04. SYMMETRY ASPECTS AND OPTIMIZATION CONCEPTS IN VIBRATION & SHOCK ISOLATION SYSTEM DESIGN FOR INDUSTRIAL APPLICATIONS. **Technical presentation for Design Programe, Dept. of Mechanical Engineering, Indian Institute of Technology , IIT KANPUR March 2005**
  
05. SEISMIC AND MICROSEISMIC WAVE PROPAGATION THROUGH STRATIFIED MEDIA AND ITS ANALOGY WITH THE DIFFRACTION OF ELECTRO-MAGNETIC WAVES AT INFRARED FREQUENCY BAND -  
**Technical presentation at National Seminar on Perspectives in Engineering Optics & Spectroscopy at Indraprastha Engineering College, Sahibabad 201 010 ( April 2005 )**
  
06. DESIGN AND APPLICATION OF VIBRATION ISOLATION SYSTEMS FOR APPROACHING AN ISOLATION OF MICRO- DIMENSIONAL ORDER FOR MICRO-FABRICATION LABS.  
**Tech. Presentation at Dept. of Physics and Astrophysics , University of Delhi , May 2005**

07. AN OVERVIEW OF VIBRATION AND SHOCK ISOLATION TECHNIQUES FOR ADVANCED LABORATORY FACILITIES AND RELATED DESIGN CONCEPTS AND RESULTS.

**Technical Presentation at National Physical Laboratory, NPL England , Teddington, U.K. for academic interaction and discussion in May 2005**

08. THE CONCEPTS OF PHYSICS RELATED TO VIBRATION AND SHOCK SPECTRA AND AN ANALOGY BETWEEN MECHANICAL VIBRATION AND MOLECULAR VIBRATION.

**Tech. presentation at M/S SOCITEC group BMP ,Sartrouville, Cedex , FRANCE ( May 2005 )**

**--- visited for Computerized Design interactions using Non linear Wire rope isolators.**

- 09 MICRO-SEISMIC SHOCK ISOLATOR DESIGN USING MATHEMATICAL MODELING AND FUZZY LOGIC CONCEPTS OF ELECTRONIC CONTROL INSTRUMENTATION

**Proceedings of Symp. on Seismic Hazard Analysis and Microzonation at IIT Roorkee pp 399 – 407 , Sept. 2005**

- 10 APPLICATION OF SYMMETRY CONCEPT OF PHYSICS TO MECHANICAL SUB -SYSTEM & ASSEMBLY DESIGN FOR HIGH RESOLUTION INSTRUMENTS AND EXPERIMENTS .

**Paper presented at International Conference on Optics and Opto-Electronics Instruments Research & Development Establishment , Instrument Research & Development Establishment, IRDE Dehradun Dec. 2005**

- 11 SYSTEM DESIGN OPTIMIZATION & APPLICATION OF VIBRATION AND SHOCK ISOLATORS IN INDUSTRIAL ENVIRONMENT . .

**Invited lecture at National Conf. on Optimum and Reliable Product Design organized by Numerical Simulation Tech. and Applied Mechanics Dept. of Indian Institute of Technology at IIT Delhi , Dec. 2005**

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