

Brief Report of the Lecture Workshop on "Recent Trends in Physics"

A lecture workshop on "Recent Trends in Physics" was held at the department of Physics, Amritapuri Campus, Amrita Vishwa Vidyapeetham, Kollam- 690525 during March 23-25, 2011. The workshop was sponsored by the Joint Science Education Programme of the three Academies- Indian Academy of Sciences, Bangalore, The National Academy of Sciences India, Allahabad and Indian National Science Academy, New Delhi. Prof. M. Lakshmanan, Centre Nonlinear Dynamics, Bharathidasan University was the convener of the programme and Prof. V.M.Nandakumaran, Department of Physics, Amrita Vishwa Vidyapeetham was the local co-ordinator. There were 103 participants who were mostly Post Graduate students from the nearby colleges and also from the host institution. A wide spectrum of topics in different areas of Physics was covered during the workshop.

List of resource persons

1. Prof. M. Lakshmanan, Centre for Nonlinear Dynamics, Bharathidasan University Tiruchirappally.
2. Prof. E.S.Rajagopal, Indian Institute of Science, Bangalore.
3. Prof. K.A.Suresh, Centre for Soft Matter Research, Bangalore.
4. Prof. V.P.N.Nampoori, International School of Photonics, CUSAT.
5. Prof M.R.Anantharaman, Department of Physics, CUSAT.
6. Dr Anil Shaji, IISER, Thiruvananthapuram
7. Prof. V.M.Nandakumaran, Department of Physics, Amrita Vishwa Vidyapeetham, Kollam

The workshop was inaugurated by Prof M. Lakshmanan on March 23, 2011. The following topics were discussed during the workshop.

- Nonlinear Dynamics
- Liquid Crystals
- Nonlinear Optics
- Quantum Computing
- Nano Science and Nano Technology
- Measurement Techniques
- Bose Einstein Condensation of Photons.

Prof. Anantharaman delivered one lecture on Nano Science and Nano Technology. He spoke generally about low- dimensional systems and their properties. He also presented interesting results involving ferromagnetic- ferroelectric interfaces and the effect of electric and magnetic fields on these systems.

Prof. Suresh delivered two lectures on the Physics of Liquid Crystals. After giving a general survey of soft matter in general and liquid crystals in particular, he discussed in detail the structural, thermal, optical, electrical and the magnetic properties of different types of liquid crystals. He also spoke about polymer liquid crystals which combine the properties of liquid crystals and polymers.

Prof. M. Lakshmanan talked about "Nonlinear Dynamics – A science of complexity: an introduction" In his two lectures Prof Lakshmanan considered the questions of integrability and chaos in nonlinear dynamical systems. Starting from Newton's laws he systematically described the conceptual

developments in dynamics and covered a wide range of topics such as solitons, propagation of tsunamis Inverse Scattering Transforms ,chaos, synchronization of chaotic systems nonlinear MLC circuits and neural networks.

Dr. Anil Shaji gave two lectures. He talked about Quantum Information Theory and Quantum Computation and discussed the notions of classical and quantum information, quantum logic, computational complexity, quantum circuits and how universal quantum gates and circuits can be implemented using solid state systems.

Topics in nonlinear optics were presented by Prof. V.P.N.Nampoori. He briefly surveyed the properties of nonlinear materials and discussed harmonic generation, phase conjugation, optical bi-stability, optical logic gates and optical computing.

The title of the talk by Prof Rajagopal was "How to measure a phenomenon which is not felt". He treated the Earth as an elastic solid having its own tides which can often become as high as 0.5 meters at the equator. He pointed out that in the absence of a proper standard of reference this is a difficult quantity to measure and needs knowledge from many areas of Physics and also needs ultra high precision measurement techniques.

Prof. V. M. Nandakumaran spoke about the Bose- Einstein Condensation (BEC) of photons. It is generally believed that photons cannot Bose condense since it is not a number conserving system. Recently, however, BEC has been observed for photons confined to a spherical micro-resonator filled with dyes. The conservation of photon number on an average is achieved due to the presences of the dye molecule.

The lectures were planned in such a way that the participants were gradually led from the fundamentals to the frontier areas in each of the topics.

The workshop was concluded at 4:00 pm on March 25.

V. M. Nandakumaran

"Workshop on "Recent Trends in Physics"

Programme

23.3.2011, Wednesday

1. 9.30 am - 10.30 am : Inaugural Session
2. 10.30 am - 10.45 am : Tea Break
3. 10.45 am - 12.15 pm : Prof..M.R.Anantharaman - Introduction to nano-science and technology
4. 12.15 pm - 1.30 pm : Lunch Break
5. 1.30 pm - 3.00 pm : Dr.Anil Shaji - Quantum computing I
6. 3.00 pm - 3.15 pm : Tea Break
7. 3.15 pm - 4.45 pm : Dr.Anil Shaji - Quantum computing II

24.3.2011, Thursday

1. 9.30 am - 11.00 am : Prof. K.A.Suresh - Introduction to liquid crystals-I
2. 11.00 am - 11.15 am : Tea Break
3. 11.15 am - 12.45 pm : Prof.M.Lakshmanan-Non-linear dynamics-a science of complexity: an introduction-I
4. 12.45 pm - 1.45 pm : Lunch Break
5. 1.45 pm - 3.15 pm : Prof.V.P.N. Nampoothiri-Non linear optics
6. 3.15 pm - 4.45 pm : Prof. K.A.Suresh- Introduction to liquid crystals-II

25.3.2011, Friday

1. 9.30 am - 11.00 am : Prof. M. Lakshmanam- Non-linear dynamics-a science of complexity: an introduction-II
2. 11.00 am - 11.15 am : Tea Break
3. 11.15 am - 12.45 pm : Prof. E S R Gopal- How to measure phenomenon which is not felt?
4. 12.45 pm - 1.45 pm : Lunch Break
5. 1.45 pm - 3.15 pm : Dr.V.M.Nandakumaran- Bose- Einstein condensation in photons
6. 3.15 pm - 3.30 pm : Tea Break
7. 3.30 pm - 4.00 pm : Concluding Session