INDBYDELSE

Alle 3 CNC maskiner er nu i drift, og det vil vi gerne demonstrere for jer:

torsdag den 30. april kl. 13 på værkstedet.

Vi byder på lidt ”klemmer og en fadbamse”.

Alle er velkomne!

VÆRKSTEDET

GENERAL PHYSICS COLLOQUIUM

Title: Investigating the thermodynamics of small systems with fluctuation relations

Speaker: Alberto Imparato
Department of Physics and Astronomy, AU

Time: **Tuesday**, 28 April 2009 at 3:15 p.m.

Place: Physics Auditorium

Abstract

In recent years, a number of manipulation experiments have been performed with the aim of gathering information on the equilibrium properties of microscopic systems, such as biopolymers. For example, controlled forces have been applied to the free ends of proteins and nucleic acids. Usually, because of technical limitations, these experiments are performed in out-of-equilibrium conditions. However, the system thermodynamic variables can be evaluated by exploiting some remarkable results recently obtained in the field of out-of-equilibrium statistical mechanics, namely the fluctuation relations.
I shall review some fluctuation relations involving the work done on a microscopic system by an external force, with an eye on their application to biopolymers, and in particular to the free energy evaluation of RNA and proteins.

Coffee/tea and cake will be served at 3 p.m.

AMO PHYSICS SEMINAR

AMO
Atomic
Molecular
Optical

Siddharth Ramachandran

DTU-Fotonik; Danish Technical University

Non-Zero-Order Light: Beams that can do what a Gaussian cannot

Time: May 28, 15.15 to 16.00

Place: Fys. Aud.

When we think of laser light, we think of a beam that looks like a spot, or more precisely, like a Gaussian. This ground state solution, in free space, resonators, waveguides, etc., has several well-known properties – for instance they diffract, carry energy (or momentum) in the direction of the beam, are blocked by opaque obstructions, etc. However, many of these properties are dramatically altered if one were able to generate and stably propagate beams that are higher-order, spatially variant solutions of an optical system. For instance, certain non-uniform polarisation distributions of light, when focussed, result in beams that carry no energy along the optic axis. Alternatively, beams with special Bessel-functional profiles can be shown to be strictly diffraction-free, and can even navigate around dark objects.

This talk will introduce the physics of such interesting beam shapes. In particular, we will describe how an optical fiber is an attractive, and perhaps in many cases the only, means to realise these solutions. We will discuss the utility of such fiber devices, both from the standpoint of studying fundamental physical phenomena and quantum systems, and from the standpoint of realising novel devices with applications in emerging areas such as sensing, high-power lasers and biology.

Peter Staanum and Nicolai Nygaard

Coffee, tea and cake will be served at 15.05

*i*NANO lecture of the week
- open to all

Enrico Traversa

NAST Center & Dipartimento di Scienze e Tecnologie Chimiche,
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Title: Tuning Hierarchical Architectures of 3D Polymeric Scaffolds for Cardiac Tissue Engineering

Time: Friday April 24th, 2009, at 10:15-11:00.
Coffee and bread will be served from 10:00

Location: Auditorium 3rd floor, Dept. of Physics,

Abstract

The aging of population is one of the problems to be considered for sustainable development. Elder people needs healthcare treatments to improve their quality of life. The approach of regenerative medicine is of paramount importance for the rescue of patients with severe cardiac diseases, which can be treated only with transplants, since the number of donors is very limited. Tissue engineering combines the fields of engineering, chemistry, biology, and medicine to fabricate replacement tissues able to restore, maintain, or improve structurally and functionally damaged organs. The challenge for successful exploitation of cardiac regenerative medicine is to identify the suitable combination between the best cell source for cardiac repair and the design of the optimal scaffold as a template for tissue replacement. Adult stem cells have the potential to improve regenerative medicine with their peculiar feature to self-renew and differentiate into various phenotypes. Insights into the stem cell field lead to the identification of the suitable scaffold features that enhance the ex vivo proliferation and differentiation of stem cells. Scaffolds composed of natural and/or synthetic polymers can organize stem cells into complex architectures that mimic native tissues. To achieve this, a proper design of the chemical, mechanical, and morphological characteristics of the scaffold at different length scales is needed to reproduce the tissue complexity at the cell-scaffold interface. Hierarchical porosities are needed in a single construct, at the millimetre scale to help nutrition and vascularization, at the micrometer scale to accommodate cells, and at the nanometre scale to favour the expression of extra-cellular matrix components. This talk will present work undertaken to setup strategies to integrate stem cells and tailored scaffolds, as a tool to control cardiac tissue regeneration. Among the many available techniques for scaffold fabrication, porogen leaching, phase separation, and electrospinning were selected as low-cost and user-friendly technologies to fabricate tuneable, hierarchically porous matrices that mimic aspects of the cell native surroundings. The biological validation of these scaffolds was performed by implanting adult stem cells. Cardiac progenitor stem cells were able to differentiate into cardiac phenotype and to grow on PLLA scaffolds with a given porosity in aligned direction where the scaffold stiffness match mechanical properties of cardiac tissue.

Title: Nanostructured Materials for Solid Oxide Fuel Cells

Abstract

Environmental problems lead to the need for new technologies in the fields of energy production and storage for sustainable development, to reduce pollutant emissions from fossil fuel combustion and to increase energy safety. Fuel cells seem to be very promising as electrochemical power sources either for application in portable technology and in electric vehicles, or for stationary energy production. The use of nanosized materials offer great promise for the development of improved materials for fuel cells. For solid oxide fuel cells (SOFCs), the present state-of-the-art commercial technology allows operation at 1000°C for cells using yttria-stabilized zirconia (YSZ) as electrolyte. However, the major trend in the present research activities on SOFCs is the reduction of the operation temperature to reduce costs and improve lifetime. This can be achieved either by reducing the thickness of the electrolyte to reduce ohmic drop, or by using alternative electrolytes such as ceria, lanthanum gallate, bismuth oxides, or protonic conductors. One of the main drawbacks of reducing operation temperature is the increase of polarization drops at the electrode/electrolyte interfaces. An increase in the triple phase boundary (TPB) at these interfaces can improve the electrode performance. If SOFCs can operate at temperatures below 700°C, the use of stable nanocrystalline or mesoporous oxides can be foreseen as electrode (both anode and cathode) materials to extend the TPB length, thus decreasing ohmic drops. This talk will show examples of recent works on the study of nanostructured oxides for SOFCs performed in the lab of the author.

PHYSICAL REVIEW B **79**, 155424 (2009)

Modeling ultrashort-pulse laser ablation of dielectric materials

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An approach to modeling ablation thresholds and depths in dielectric materials is proposed. The model is based on the multiple-rate-equation description suggested by Rethfeld [Phys. Rev. Lett. **92**, 187401 (2004)]. This model has been extended to include a description of the propagation of the light into the dielectric sample. The generic model is based on only a few experimental quantities that characterize the native material. A Drude model describing the evolution of the dielectric constant owing to an excitation of the electrons in the material is applied. The model is compared to experimental ablation data for different dielectric materials from the literature.

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AARHUS UNIVERSITET
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Naturvidenskabelig kvalifikationseksamen
Forskeruddannelsens Del A

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Kandidat:	Magnus Albert
Vejleder:	Michael Drewsen
Ekstern censor:	Jan W. Thomsen
Intern censor:	Arne Nylandsted Larsen
Eksaminatorer:	Erik Lægsgaard og Uffe V. Poulsen
Tid og sted:	28. april kl. 14:15 i lokale 1525-323
Emne:	**Coupling of ion Coulomb crystals to a cavity field at the single photon level**

INSTITUT FOR FYSIK OG ASTRONOMI
AARHUS UNIVERSITET
Department of Physics and Astronomy, University of Aarhus

Specialeeksamen

Kandidat:	Tommy Hansen
Vejleder:	Arne Nylandsted Larsen
Censor:	Kjeld Pedersen
Tid og sted:	29. april kl. 13:15 i 1520-616
Emne:	Effekten af lokaliserede overfladeplasmoner i Au nanodots på solceller