Keynote Forum
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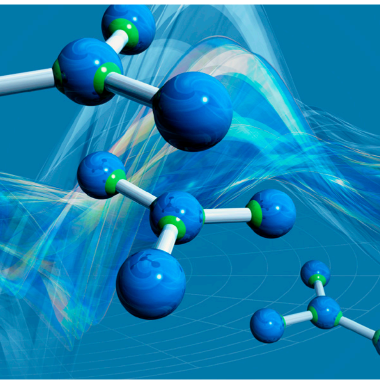
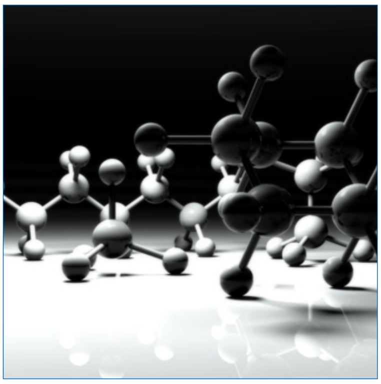
Materials Physics 2018

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Anatoliy V Glushchenko

University of Colorado, USA

Influence of nanoparticles on the properties of liquid crystal polymer composites

Liquid crystal polymer composites are the timely response to the needs of a modern optical industry for low driving voltage adaptive materials providing large phase retardation (for UV, visible, and IR) within a sub-millisecond time frame. We consider liquid crystals immersed into a nano-structured sponge like polymer network. The network's long chains impose a desired alignment for liquid crystal molecules enabling the creation of thick homogeneous liquid crystal slabs (up to 1mm, in comparison with available today only 50microns thick aligned liquid crystal layers). The properties of these materials are enriched tremendously by adding various nanoparticles. For example, mixing ferroelectric nanoparticles with a liquid crystal, generates ultrahigh electric fields within the liquid crystal, which combined with their small size, produces a uniquely exciting and largely unexplored system of composite materials which exhibit novel collective particle host interactions. These interactions promise a variety of exotic electro-optic and other applications. In this case, ferroelectric nanoparticles share their high intrinsic sensitivity to electric fields with the entire liquid crystal matrix. Therefore, doping the liquid crystal with ferroelectric nanoparticles brings benefits of a lower driving voltage and faster switching speed than in any liquid crystal devices available today. As a result, we demonstrate the power of nanotechnology to amplify by orders of magnitude the natural properties of liquid crystals by doping them with nanoparticles and hosting them in a nano confining polymer matrix.

Speaker Biography

Anatoliy V Glushchenko received his PhD in physics in 1997 from the Institute of Physics, National Academy of Science, Ukraine. He is a professor of physics at the University of Colorado at Colorado Springs (UCCS) where he teaches advanced physics classes, directs the Center for Advanced Technologies & Optical Materials, and leads the broad range of fundamental and applied research in biophysics and soft condensed matter. He is the author of more than 200 research papers and patents and made more than 250 presentations at various conferences.

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Daniel Chateigner

University of Caen Normandy, France

Combined Analysis: XRD, XRF, Raman and IR spectroscopies: SOLSA European project

Combined analysis is further developed to encompass even larger materials science disciplines than previously, extending it to XRF, Raman and IR spectroscopies. It will first be used within the frame of the European project SOLSA. The SOLSA project aims to construct an analytical expert system for on-line-on-mine real-time mineralogical and geochemical analyses on sonic drilled cores, an unprecedented challenge both in terms of instrumental, methodological and software developments. Two instrumental developments will be carried out during this European project, one at the laboratory scale (ID1) deserving methodological testing, the other at the operational on-mine scale (ID2). At present, only ID1 is achieved for first tests. This instrument will perform simultaneously x-ray diffraction experiments, coupled to x-ray fluorescence, Raman and IR spectroscopies. It consists in a 4 circles diffractometer equipped with a curved position sensitive detector and a Cu micro source, a fluorescence detector, and an innovative system of fiber optics and mirrors to achieve Raman and IR probing. All the four experiments are able to probe a flat surface sample within approximately the same sampled volume. In order to benefit of the complementarity of the four techniques, an expert system able to refine all datasets has to be developed. For the x-ray diffraction and fluorescence parts, the actual combined analysis methodology is operational for structure, microstructure, texture, stress, phases and element analyses. Complementing the combined analysis approach by Raman and IR spectroscopies are targeted in this project to help phase identifications and quantifications. In this aim the expert system will use open databases, either already existing like the crystallography open database, or to be developed like the Raman open database. We will illustrate the actual state-of-the-art combined analysis and envision its near-future developments within the spectroscopy's context.

Speaker Biography

Daniel Chateigner is a professor at IUT of Caen University of Caen Normandy, France in the CRISMAT-ENSICAEN, CNRS lab. He was a lecturer at University of Maine (1997-2000). He received his habilitation research fellow in the earth and planetary science department at University of California at Berkeley (1996). He was a research fellow in the Laboratory of Crystallography, France. He received his CNRS-Grenoble (1995) PhD from Grenoble in physics and crystallography in 1994. He was an editor of combined analysis, ISTE-Wiley (2010**).**

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Codjo Hountondji

Sorbonne University, France

Mass Spectrometric identification of a ribosomal protein promotor of cancer, targeted by anticancer drugs

Increasing evidence points to a connection between protein synthesis and cancer cells growth. For example, cycloheximide that had been shown to be a strong inhibitor of eucaryotic translation, was also shown to inhibit cancer cells growth in vitro and in vivo, suggesting that this translation inhibitor may serve as lead in the development of new cancer therapeutics. Here, by combining affinity labeling studies and mass spectrometric analyses on human 80S or E. coli 70S ribosomes, we have identified the ribosomal proteins (rPs) targeted by the small-molecule inhibitors of translation. These are rP-eL42 of human 80S ribosomes and rPbL12 of E. coli 70S ribosomes. We have recently demonstrated that these rPs assist catalysis of peptide bond formation at the elongation step of translation. The human rP-eL42 was previously shown to be overexpressed in human hepatocellular carcinoma (HCC) as well as in several human tumor cell-lines, while an increased exposure of intestine to bacterial rPbL12 was previously observed in colorectal cancer patients. It is generally accepted that ribosomal protein overexpression might promote tumorigenesis by interactions with the p53 tumor suppressor pathway, and that these overexpressed proteins could represent targets for cancer therapy. Therefore, we have designed anticancer drugs analogous to cycloheximide capable of targeting rPs eL42 and bL12 in order to block the hyper-proliferation of tumor cells by reducing the rate of protein synthesis. These molecules are thiosemicarbazones, two of which having a potent antiproliferative effect on tumor cell lines and selectively inhibiting translation. They are now ready to undergo clinical trials.

Speaker Biography

Codjo Hountondji is distinguished professor at Sorbonne University (Campus Pierre et Marie Curie, Jussieu, Paris) where he has been teaching biochemistry and molecular Biology for 35 years. He is currently director of the research Group "Enzymology of RNA". He has served as assistant professor of Biochemistry at the University Paris XI (Orsay) 1982-1986. At the University Pierre et Marie Curie (Paris), he has served as chair of the division (department of biochemistry and molecular biology 2010-2014). He has been a visiting scientist at Penn State University School of Medicine in Philadelphia in 1981-1982. He published more than 40 research papers and articles in international journals. He supervised numerous master and PhD students for their research projects. His career research focus has been on the mechanism of the translation process. His current research interest concerns a "Targeted molecular therapy of cancer: Structure-assisted design of anticancer drugs targeting the ribosomes in cancer cells".

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Denis L Nika

Moldova State University, Republic of Moldova

Phonon Engineering at Nanoscale

Phonons manifest themselves in all major processes in semiconductors: they carry heat, limit electron mobility, affect optical response and transmit sound. Rapid miniaturization of electronic devices to nanoscale range requires new approaches for the efficient management of their heat and electrical conductions. One of these approaches, referred to as phonon engineering, is related to the optimization of thermal and electronic properties of nano-dimensional structures due to modification of their phonon properties.

In this talk a brief review of recent theoretical and experimental results on the phonon and thermal properties of quasi one- and two-dimensional semiconductor nanostructures and graphene will be presented. Different possibilities for phonon engineered optimization of their electrical and thermal conduction will be discussed. It will be theoretically demonstrated that strong reduction of lattice thermal conductivity can be achieved in semiconductor segmented nanowires or cross-section modulated nanowires due to the phonon filtering, i.e. trapping of the certain phonon modes in nanowire segments. It will be shown that the unique nature of quasi two-dimensional phonon transport in graphene, twisted graphene and graphene nanoribbons translates to unusually strong dependence of the lattice thermal conductivity on extrinsic parameters: flake size and shape, edge roughness, defects and strain distribution.

Speaker Biography

Denis L Nika is the chair of the Perlin department of theoretical physics and head of the E Pokatilov laboratory of physics and engineering of nanostructures at the Moldova State University. He received his PhD in theoretical and mathematical physics from the same University in 2006. As a visiting researcher he worked in the University of Antwerp, Belgium, Institute for Integrative Nano sciences, Germany and in the nano-device laboratory, University of California, USA. His research interests include various topics in physics of nanostructures such as phonons and thermal transport at nanoscale; multi-band theory of the electron, hole, exciton and impurity states. He was twice awarded the honorary title "The Best Young Scientist of the Republic of Moldova". He has over 80 technical journal publications, 7 reviews, 4 book chapters. His H-index is 30 and his papers were cited more than 4400 times (ISI Web of Science, 2018).

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Magnus S Magnusson

University of Iceland, Iceland

T-patterns and self-similarity from the RNA world to cell city, naked apes and string-controlled mass-social humans

The biology of animal and human behavior is recent indeed, with its first Nobel prize in 1973 shared between N. Tinbergen, K. Lorenz and K. von Frisch. The smallest animals of interest then where insects. Many have been amazed to learn that millions of years before apes existed, insects invented mass-societies, agriculture and animal farming. The title of Konrad Lorenz's Nobel prize lecture was: "Analogy as a source of knowledge". But there was no talk of behavior of nano scale entities nor their societies or self-similarity. Like the RNA world billions of years before, humanity has in a biological eyeblink developed its own external memory also based on purely informational strings, text, allowing mass societies with their science and technology and most recently the discovery their own building blocks, biological cells, protein mass societies, thus exemplifying the (fractal) self-similarity recently discovered so widely throughout the universe.

This talk concerns a recurrent hierarchical self-similar fractal-like pattern type, called T-pattern characterized by significant translational symmetry. After its abundant detection with the dedicated algorithms of the THEMETM software in human, animal and neuronal behavior and interaction, that is, both between and within living brains, T-patterning turns out be characteristic of DNA and thus describe a multitude of phenomena on very different scales in time and space, from nano to human mass-social scales. It thus seems that nanoscale proteomic research not only has a great medical future, but also looking outwards where in a biological eyeblink the "naked ape" with the speed of lateral exchange of T-patterned information strings has created mass-societies unique among large-brained animals. Reflecting its innermost biological structure as the naked ape suddenly has become a string enabled and controlled mass-social citizen. Analogies of patterning across so many levels of organization and orders of magnitude suggesting something essential.

Speaker Biography

Magnus S Magnusson is a research professor and completed his PhD in 1983 at Copenhagen University. He is the author of the T-pattern model initially focused on the real-time organization of behavior and Co-directed DNA analysis. He worked on numerous papers and as well as keynotes at international mathematical, neuroscience, proteomics, bioinformatics and religion conferences in Europe, USA and Japan. He is the deputy director 1983-1988 in Museum of Mankind, Paris. He was an invited professor in psychology and biology of behavior at University of Paris (V, VIII & XIII). He is the founder and director of Human Behavior Laboratory, in the University of Iceland. In formalized collaboration between 32 European and American universities based on "Magnusson's analytical model" initiated at University Paris V, Sorbonne, in 1995.

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Osman Adiguzel

Firat University, Turkey

Nanoscale characterization of crystallographic phase transformations in shape memory alloys

Shape memory effect is a peculiar property exhibited a series alloy system in the β-phase fields. Shape memory alloys are sensitive to external condition and temperature, and crystal structure of these alloys change with changing temperature and stressing, by means of crystallographic phase transformations, called martensitic transformations. Shape memory effect is initiated by cooling and stressing, and by means of thermal and stress induced martensitic transformation. Thermal induced transformation occurs as martensite variants with lattice twinning in crystallographic scale on cooling below martensite finish temperature. Twinned martensite structures turn into detwinned martensite structure by means of stress induced martensitic transformation by stressing material in a strain limit in martensitic condition. Shape memory alloys are in the fully martensitic state below martensite finish temperature with fully twinned structure can be easily deformed through variant reorientation/detwinning process. Thermal induced martensitic transformation is lattice-distorting phase transformation and occurs with the cooperative movement of atoms by means of shear-like mechanism. Martensitic transformations occur by two or more lattice invariant shears on a {110}-type plane of austenite matrix which is basal plane or stacking plane for martensite, as a first step, and the transformed region consists of parallel bands containing alternately two different variants. In the martensitic transformation, the lattice of high temperature austenite phase has greater crystallographic symmetry than that of the low-temperature product phase. Copper based alloys exhibit this property in metastable β-phase region, which has bcc-based structures at high temperature parent phase field and these structures martensitically turn into the complex stacking ordered structures with lattice twinning reaction on cooling. Lattice invariant shears are not uniform in copper-based shape memory alloys, and the ordered parent phase structures martensitically undergo the non-conventional complex layered structures on cooling. The long-period layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice. The close packed planes exhibit high symmetry and short-range order as parent phase, but other planes do not exhibit symmetry. The unit cell and periodicity are completed through 18 layers in direction z, in case of 18R martensite, and unit cells are not periodic in short range in direction z. In the present contribution, x-ray diffraction and transmission electron microscope studies were carried out on two copper based CuZnAl and CuAlMn alloys. These alloy samples have been heat treated for homogenization in the β-phase fields. X-ray diffraction profiles and electron diffraction patterns reveal that both alloys exhibit super lattice reflections inherited from parent phase due to the displacive character of martensitic transformation. X-ray diffractograms taken in a long time, interval show that diffraction angles and intensities of diffraction peaks change with the aging time at room temperature. In particular, some of the successive peak pairs providing a special relation between Miller indices come close each other, and this result leads to the rearrangement of atoms in diffusive manner.

Speaker Biography

Osman Adiguzel graduated from department of physics, Ankara University, Turkey in 1974 and received PhD from Dicle University, Diyarbakir-Turkey in Solid State Physics with experimental studies on diffusion less phase transformations in Ti-Ta alloys in 1980. He has studied at Surrey University, UK, as a post-doctoral research scientist in 1986-1987, and He studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University, Turkey. He moved to Firat University in 1980, and became professor in 1996, He published over 50 papers in international and national journals. He joined over 80 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In last three years he joined (2014 - 2016) over 20 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. He supervised 5 PhD-theses and 3 M.Sc.- theses. He served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate which is being awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

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