NANOTECHNOLOGY RESEARCH CENTER ¨HEPHAISTOS¨

University of Cyprus - School of Engineering

PRESENTER: Mr. James A. Carouso
Economic/Commercial Section Chief
U.S. Embassy Nicosia

About the Speaker: Following a career in banking and finance with the Irving Trust Company, Shearson Lehman Brothers, and a small software company, Mr. Carouso joined the U.S. Department of State in 1995 and has been posted at the U.S. embassies in the Dominican Republic, South Africa, Australia and Thailand prior to his posting in Nicosia. He also served as the State Department official for economic affairs in Indonesia and East Timor while in Washington.

With his specialization in economic and business issues, Mr. Carouso has worked on such global issues as protection for intellectual property rights, international civil aviation and telecommunications policy, and energy and the environment. He has been part of the U.S. delegations negotiating Free Trade Agreements with Australia and Thailand and the international conferences for reconstruction and development of East Timor.

He has a degree in economics from Hamilton College in New York State and a Master's in International Management from the American Graduate School of International Management.

PRESENTER: Mr. Charis Charalambous, Chairman of the Board University of Cyprus

About the Speaker: Mr. Charis Charalambous was born in 1951 at the Kato Zodia village and was raised in Nicosia. He graduated from the positive science branch of the Kykkos Gymnasium. After his military service he studied Mechanical Engineering and was awarded the MSc degree. He worked at the Laikon coffee-grinder plant for 29 years and since 2003 he held the position of the General Director. He served the Administrative Board of EAC in the period 1988-1993 and the Administrative Board of Eurocypria Airlines in the period of 2000-2005. During 2003-2005 he was the Vice President of Eurocypria. He followed integrated programs of Finance, Accounting, Computers, Food Business Management etc. in Cyprus, the Netherlands and the U.S.A. Between August 2005 and June 2006 he was Vice President of the Administration Board of EAC. He served as the Minister of Health of the Democracy from June 2006 until July 2007. Since September 2007 he is the General Director of the pharmaceutical industry MEDOCHEMIE Ltd in Limassol. Since June 2008 he has been appointed as the President of the Board of the University of Cyprus. He is married to Mrs. Angela Charalambous and has two children, of ages 29 and 24 years.

TITLE: Molecular Opto-Electronics: Recent Progress and Stimulating Future Challenges

PRESENTER: Dr. Stelios. A. Choulis, Associate Professor
Department of Mechanical Eng. & Materials Science & Engineering
Cyprus University of Technology

Abstract: Molecular semiconductors are of increasing interest as new materials for electronic devices, owing to their easy processing on flexible substrates and potential for low-cost fabrication. Organic light-emitting diodes (OLEDs), field-effect transistors (FETs), photodiodes, and solar cells are the electronic applications under the most intense study. The presentation will discuss the material properties and device structures-processing requirements for molecular and hybrid based, solar cells, light emitting diodes (LEDs) and Lasers. The presentation will focus on the device physics parameters that control charge transport, charge injection/extraction, nano-morphology (charge separation/recombination) and issues connected with their lifetime performance. Several strategies for optimizing the above key parameters for high performance devices will be presented. Since this type of materials can be processed by solutions at low temperatures may ultimately allow for the printing of organic electronic devices. The application of printing technology as a fabrication tool indicates the potential of these novel materials for future electronic and opto-electronic applications.

About the Speaker: Stelios Choulis (PhD University of Surrey 2001, Physics), has conducted research as a Postdoc research associate at Advanced Technology Institute (2001-2002, Surrey University UK) and at the center of electronic materials and devices at Imperial College London (2002-2004, UK), device engineer at OSRAM Opto-semiconductors Inc (2002-2004, USA) and device group leader at Konarka technologies worldwide activities in the field of polymer photovoltaics (2006-2008). He is currently Associate Professor in the department of Mechanical Engineering and Material Science and Engineering (MEMSE) at the Cyprus University of Technology (Jan 2008- Present). His research focused on the experimental physics and engineering aspects of molecular and nanostructured electronic materials and optoelectronic devices. Stelios Choulis has authored and co-authored more than 45 refereed Journal publications and over 8 family (EU, USA and World) patents in the area of organic and inorganic semiconductor material, devices and processing.

TITLE: Metals with Amorphous Atomic Structures and Unique Micro- and Nano-Forming Capabilities

PRESENTER: Dr. Marios D. Demetriou, Senior Research Fellow
Department of Materials Science
California Institute of Technology

Abstract: Amorphous metals (metallic glasses) are regarded as a new class of materials. They differ fundamentally from conventional crystalline metals in their atomic structure, which is "glassy" (randomly inhomogeneous at the atomic level) and thus lacks microstructural defects typically found in crystal lattices such as grain boundaries, dislocations, vacancies, or interstitials. Owing to this atomic-level heterogeneity, amorphous metals exhibit physical properties such as strength, elasticity, rheology, and corrosion resistance that are fundamentally different from conventional metals. Specifically, compared to crystalline metals, amorphous metals exhibit very high strength and hardness, large elastic limit, excellent corrosion resistance, and an ability to deform "thermoplastically," that is, to relax and flow when equilibrated at the glass transition. Evidence from recent synchrotron radiation investigations revealed that the overall physical behavior of amorphous metals is essentially controlled by defects at the nanoscopic level, which represent clusters of several hundred atoms that tend to operate cooperatively promoting the "glassy" global response observed at the macroscopic level.
From a micro- and nano-technology perspective, the heterogeneity of these materials at the nanoscopic rather than microscopic level is thought to be an attractive feature that may be utilized for micro- and nano-structure fabrication by means not previously possible with ordinary metals. For example, when relaxed at the glass transition, amorphous metals are able to replicate features down to the nano-scale level, a process not possible with ordinary metals due to the existence of a microstructure. Hence by combining the "nano-replication" ability with the "thermoplastic forming" ability of these materials, a "nano-forming" capability arises that can be utilized to fabricate metallic micro-and nano-structures and components by means of forming rather than by conventional MEMS and NEMS fabrication methods. Recent progress in utilizing the "nano-forming" capability of amorphous metals to fabricate micro-and nano-structures and components will be presented, and potential nano-technology applications will be discussed.

About the Speaker: Dr. Marios D. Demetriou received his Ph.D. in Mechanical Engineering in 2001 from the University of California, Los Angeles. He has been appointed in the department of Materials Science at California Institute of Technology as Post Doctoral Scholar from 2001 to 2005, and as Senior Research Fellow from 2005 to present. He has held several Guest Instructor appointments at the Mechanical Engineering department of the University of California, Los Angeles, and served as technical consultant for Liquidmetal Technologies, Inc between 2001 and 2008.

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TITLE: Nanotechnology Research in Cyprus

PRESENTER: Prof. Charalabos C. Doumanidis, Marie Curie Chair
Interim Director, Hephaistos Nanotechnology Research Center
University of Cyprus

Abstract: This presentation overviews joint research programs in nanotechnology between the *Hephaistos* Nanotechnology Research Center in Cyprus and U.S. institutions. Nanocomposite foils fabricated by ultrasonic welding are explored collaboratively with MIT, the Univ. of Washington and Univ. of Delaware. Nanoheaters made of ignitable reactive bimetallic thin film multi-layers are studied jointly with the Univ. of Massachusetts Lowell, Northeastern Univ. and Tufts Univ. Nano-consolidates by ultrasonic and laser compaction are pursued with Northeastern Univ. and CSGI in Italy. Nanofiber scaffolds produced by electrospinning are investigated for tissue engineering and environmental nanosensors with SUNY-Stony Brook, institutions in Greece and Univ. of Oxford in the UK. Nanorobotic capsules with magnetic guidance and functionalization for targeted drug delivery are researched in collaboration with Northeastern Univ. and the Univ. of Orleans in France. The presentation also presents research administration and dissemination activities in Nanomanufacturing, such as organization of the International Symposium on Nanomanufacturing (ISNM) and other conferences, in cooperation with the National Science Foundation (NSF).

About the Speaker: Prof. Charalabos (Haris) Doumanidis holds his Diploma in Mechanical Engineering from the *Aristotelian Univ. of Thessaloniki* (1983), his M.S. from *Northwestern University* (1985), and his Ph.D. from *MIT* (1988). He has been a Professor of Mechanical Engineering and Director of the *Hephaistos Thermal Manufacturing Laboratory* at *Tufts University* in Medford, Massachusetts (1991); Chief Scientist with *Axcelis Technologies* (Thermal Processing Systems) in Beverly, Massachusetts (2000); the founding Director of the *Nanomanufacturing Program* at the *National Science Foundation* (NSF) in Arlington, Virginia (2001); Visiting Professor of Mechanical Engineering at *MIT* (2002); and a consultant for automation, optoelectronics, biomedical imaging and automotive industries. His research and teaching interests include nanomanufacturing, thermal manufacturing, material deposition and joining processes, rapid prototyping, rapid thermal processing and laser annealing of semiconductors, distributed parameter system modeling and control, robotics and mechatronics, and biomedical instrumentation. He is Associate Editor of three international journals, the organizer and chair of over 25 symposia, the speaker of over 60 keynote and invited lectures, and the author of over 200 papers (including 3 best paper awards) and several patents and book chapters. He is the recipient of the *Marie Curie Chair of Excellence* (2004) by the European Commission, the *ASME Blackall Award* (2002), the *White House Presidential Faculty Fellow Award* (1996), the *NSF Young Investigator* (1994) and the *Research Initiation Award* (1992), as well as several grants from NSF, NAE, SME, DoE, NIST, Honda R&D Americas etc.

PRESENTER: Ms. Anita Eisenstadt, Senior Foreign Affairs Officer
Office of Science and Technology Cooperation
US Department of State

About the Speaker: Anita Eisenstadt is a Senior Foreign Affairs Officer in the Office of Science and Technology Cooperation at the U.S. Department of State. Ms. Eisenstadt formulates U.S. foreign policy in science and promotes scientific collaboration between the U.S. science community and its counterparts in Western Europe. Ms. Eisenstadt is the Head of the U.S. Science and Technology Delegation currently visiting Cyprus for the signing of the first Science and Technology Agreement between the United States and Cyprus. Prior to joining the State Department, Ms. Eisenstadt served as Assistant General Counsel at the National Science Foundation. She received a law degree from Wayne State University and a Bachelor of Arts Degree from the University of Michigan, where she majored in Anthropology.

TITLE: Nanoelectronic Research and Development in the USA

PRESENTER: Dr. Kos Galatsis, Executive Director
Nanoelectronics WIN and FENA Centers
University of California Los Angeles

Abstract: I plan on providing a quick overview (10min) on our nanoelectronic Centers that consist of 17 universities and over 70 faculty. The two industry led centers, Center on Functional Engineered Architectonics (FENA) www.fena.org and the Western Institute of Nanoelectronics (WIN) www.win-nano.org, headquartered at the University of California, Los Angeles explores research paths to circumvent the fast approaching time crunches facing the semiconductor industry in continuing to scale CMOS. Taking on such a grand challenge has led the community to somewhat shift and evolve a new paradigm of exploratory research that focuses on a unique distributed research model we have pioneered linking Government, Universities and the Private sector. A taste of research highlights within our portfolio will also be discussed that includes new logic and memory devices based on Dilute Magnetic Semiconductors Group IV compounds, graphene, aligned CNTs, spin waves, self assembled QDs and CNTs using DNA and PNA, rotaxanne molecules, II-VI, III-V nanowires and others.

About the Speaker: Kosmas is the Executive Director of the largest industry lead nanoelectronics Centers in the USA which are headquartered at University of California, Los Angeles (UCLA). The FENA Center (www.fena.org) explores beyond CMOS materials, devices and architectures and WIN (www.win-nano.org) seeks to develop spintronic devices. In addition, his research interests include emerging logic, memory devices and nanoarchitetures, ferromagnetic materials such as diluted magnetic semiconductors, patterning and lithography and carbon electronics. He has experience in the management of high-impact high-risk nanotechnology programs working with Intel, MICRON, IBM, AMD, SRC, DARPA, UCLA, USC and Stanford. He holds an MBA in Financial Management and a PhD in EE from Australian universities.

TITLE: Multilayer Graphene Heterojunctions for Post-CMOS Logic

PRESENTER: Dr. Matthew J. Gilbert, Assistant Professor
Dept. of Electrical & Computer Engineering
University of Illinois at Urbana-Champaign

Abstract: Harnessing collective motion of electrons is a promising approach to creating ultra-low power logic devices. In a switch that is based on a set of independently-moving electrons, switching requires a change in gate voltage large enough to shift *each electron's energy* by more than room temperature thermal energy. *With collective motion of electrons, one may hope to achieve switching with smaller changes in gate voltage: the energy of an entire ensemble of electrons can be shifted by more than room temperature thermal energy, turning on transport, even though each electron's energy is shifted by only a small fraction of that amount.* One of the most spectacular demonstrations of collective behavior in the last 10 years is the giant enhancement in tunnel current seen in semiconductor bilayer devices in the quantum Hall regime [1]. The enhanced tunnel current between the two layers occurs when electrons in the top layer bind with vacancies in the bottom layer to form "indirect excitons", which in turn organize into a Bose-Einstein condensate. This type of behavior may be viewed as spontaneous coherence, or "pseudospin ferromagnetism": selection of a particular superposition of states in the two layers (a particular direction of "pseudospin", where the layer degree of freedom is treated as if it were a spin) for the entire system. In order for this behavior to be useful in the context of a device, pseudospin ferromagnetism must survive at room temperature, rather than being restricted to cryogenic temperatures as in the GaAs heterostructures in which this effect was discovered. Room temperature operation is possible if the carrier densities in the two layers are equal but with opposite polarity: electrons in one layer, holes in the other. This condition is very difficult to engineer this in a semiconductor system, but could be feasible in graphene due to its unique linear bandstructure [2,3].

In this talk, I will discuss some of the recent theoretical work on the transport properties of indirect excitons at room temperature in electron-hole bilayer graphene. In particular, I will emphasize the possibility of using this strongly correlated state to make very efficient ultra-low power logic devices.

[1] I.B. Spielman et al., *Physical Review Letters* **84**, 5808 (2000).
[2] Hongki Min et al., *arXiv:0802.3462* (2008).
[3] C.-H Zhang and Yogesh N. Joglekar, *arXiv:0803.3451* (2008).

About the Speaker: Matthew J. Gilbert received his B.S. (Honors), M.S., and PhD. degrees in electrical engineering from Arizona State University in 2000, 2003 and 2005 respectively. He has held postdoctoral fellowships at the University of Texas at Austin and Stanford University. He has also served as the Assistant Director of the South West Academy of Nanoelectronics (SWAN). He is currently an Assistant Professor in the department of electrical and computer engineering at the University of Illinois at Urbana-Champaign and a Research Assistant Professor in the Micro and Nanotechnology Laboratory at the University of Illinois at Urbana-Champaign. He has contributed to research on quantum computing, decoherence mechanisms in nanostructures, many-body theory, and quantum transport. He has authored more than 40 refereed publications, 1 patent, 1 book chapter, and has given presentations at over 35 international conferences. His current research centers on spintronics, quantum transport in low-dimensional nanostructures, and strongly correlated condensed matter systems.

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TITLE: "Modeling and Simulation of Nanoscale Transport"

PRESENTER: Dr. Nicolas Hadjiconstantinou, *Associate Professor*
Dept. of Mechanical Engineering
Massachusetts Institute Of Technology

Abstract: The advent of nanoscale science and technology has uncovered a plethora of fascinating technical challenges. In this talk we focus on the scientific challenges associated with the breakdown of the classical macroscopic (continuum) transport descriptions when characteristic lengthscales approach the molecular scale. We will address both theoretical modeling as well as the development of efficient molecular simulation methods for nanoscale design and optimization. Particular emphasis will be given to recently-developed variance reduction approaches for stochastic particle methods for solving the Boltzmann transport equation. Examples will be drawn from a variety of applications, such as nanoscale convective heat transfer and separation of biological molecules using nanofilters.

About the Speaker:

Research Interests

Computational Fluid Dynamics, Computational Statistical Mechanics, Molecular Methods in Mechanics, Hybrid Atomistic-Continuum methods, Nanoscale Fluid Mechanics, Kinetic theory

Educational Background

Ph.D. in Mechanical Engineering Massachusetts Institute of Technology, Cambridge, MA, 1998.
SM in Physics, Massachusetts Institute of Technology, 1998
MA in Engineering Cambridge University, U.K, 1997
SM in Mechanical Engineering, Massachusetts Institute of Technology,1995
BA in Engineering, Cambridge University, U.K., 1993

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TITLE: How Nanotechnology Research and Education Networks Promote Communications and Collaboration among Scientists and Engineers of Cyprus and the United States."

PRESENTER: Mr. W. Edward Johansen, Esq

California Nanotechnology Research and Education Network, CENIC

NANOTECHNOLOGY RESEARCH CENTER ¨HEPHAISTOS¨

University of Cyprus - School of Engineering

TITLE: Creating the Policy Framework to Realize the Promise of Nanotechnology

PRESENTER: Dr. Richard A. Johnson
Senior Counsel
Arnold & Porter

Abstract: Law, policy and regulation play a critical role in creating the framework for realizing the promise of nanotechnology -- in fundamental research, in translational research and applications, in commercialization, and in using nanotechnologies to address major societal challenges such as health, water, energy and the environment. This presentation briefly will review some of the key challenges and opportunities related to developing the global policy framework for nanotechnology research and applications, and the status of current efforts to address them.

About the Speaker: Rick Johnson currently has several roles, based in Washington, DC. He recently retired as Senior Partner in the law firm of Arnold & Porter LLP but continues an active practice as Senior Counsel. He specializes in: (1) legal and regulatory issues related to nanotechnology, biotechnology and the life sciences, and (2) international matters related to fundamental research, entrepreneurship and innovation. He also serves as the CEO of Global Helix LLC, a public policy and innovation strategy firm, that focuses on: (1) strategic policy issues related to open innovation, the globalization of R&D, intellectual property policy, technology standards, intellectual assets for value creation, and public-private partnerships; and (2) the internationalization of the research university and public-private research networks.

He formerly served as General Counsel for International Trade at the U.S. Commerce Department, where he was responsible for both U.S. trade policy and international technology issues. In addition to receiving his Juris Doctor degree from the Yale Law School where he was Editor of the *Yale Law Journal*, he received his M.S. from the Massachusetts Institute of Technology where he was a National Science Foundation National Fellow and his undergraduate degree with Highest Honors from Brown University.

He serves as the Chairman or Vice-Chairman of three OECD/BIAC Committees - Innovation, Biotechnology, and Nanotechnology -- and the OECD/BIAC globalization of higher education and research task force. Rick also is a member the MIT Corporation Visiting Committee, Brown's Advisory Council on Biology and Medicine, and several international organizations exploring new approaches to university-industry-government relationships, nanotechnology and innovation. He serves as Co-Chair of the National Academy of Science's new project on Synthetic Biology and technology convergence. He also participates on a number of advisory groups and panels at the National Academy of Sciences, the Business-University Forum, the National Cancer Institute and global philanthropic foundations.

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TITLE: Nanoscale Sceince and Engineering at NSF: Opportunities for Collaborative Work

PRESENTER: Dr. Geoffrey Prentice, Program Manager
Office of International Science and Engineering
National Science Foundation

Abstract: The National Nanotechnology Initiative (NNI) is a research-focused initiative encompassing many US federal agencies with a total funding request of $1.5 million in fiscal year 2009. About $400 million of federal funding for nanotechnology research has been allocated to the National Science Foundation (NSF). From the beginning, a policy of inclusion and partnerships has been incorporated in the NNI. Key investment strategies include a long-term perspective, workforce development, and broad humanitarian goals. Japan and Western Europe have made major investments in nanotechnology, and several partnerships have been established. Our ability to tailor novel materials at the molecular level will have profound consequences for industrial societies. The process for establishing international collaborations and some successful examples will be described.

About the Speaker: Geoffrey Prentice is a Program Manager in the Africa, Near East, and South Asia region in the Office of International Science and Engineering at the National Science Foundation. He is currently responsible for coordinating activities in countries in and around the western Middle East including Cyprus. At NSF he managed several Engineering Directorate programs including those dealing with chemical processes, catalysis, and separation processes. For one year he served as Acting Division Director for the Chemical and Transport Systems Division. After receiving an M.S. degree at Ohio State University, he held engineering positions in Sweden and Zaire. He received his Ph.D. in chemical engineering from the University of California, Berkeley and spent most of his academic career at Johns Hopkins University. At NSF he coordinated the group proposals for the Nanoscale Science and Engineering initiative. While in academia, he traveled to Mexico, China, and Russia to help foster student exchanges. At NSF he visited Japan on a JSPS fellowship, the Baltic States on a State Department Science and Technology Review, and Ukraine and Lithuania on Embassy Science Fellowships. In 2008 he served on a detail to the US Mission to UNESCO, where he focused on water issues as the Science Attaché.

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TITLE: NanoHeaters – Collaborative Research between Cyprus and US Universities

PRESENTER: Dr. Claus Rebholz , Assistant Professor
Department of Mechanical and Manufacturing Engineering
University of Cyprus

Abstract: NanoHeaters consist of nanoscale heterostructures of reactive multi-material systems, which upon controlled external ignition release instantaneous, locally singular exothermic heat to a substrate or surrounding material. This presentation overviews progress in fabrication of nanoheater systems (based on the exothermic reaction between aluminum and nickel) and their potential applications. The NanoHeaters project represents an active international collaboration between the University of Cyprus, University of Massachusetts Lowell, Northeastern University and Tufts University, with support by NSF and an EC Marie Curie Excellence Award.

About the Speaker: Claus Rebholz holds his Diploma in Materials & Surface Engineering from the University of Applied Sciences in Furtwangen/Germany (1993), his M.Sc. (1995) and Ph.D. from the University of Hull/UK (2000). He worked as a R&D Executive Management Trainee in the field of Advanced Materials & Surface Engineering at the Robert Bosch GmbH in several research centers in Germany, Japan and the US (1998-2001), before establishing and leading a multidisciplinary Research Profit Centre in the area of Laser Materials Processing in Stuttgart/Germany (2001-2004). His research interest at the University of Cyprus (since Nov. 2004) is mainly focused on Thin Film Materials Engineering.

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TITLE: Experimental Transport Phenomena of Mesoscopic Systems

PRESENTER: Dr. Alexandros Shailos, Technical Director
Center for Quantum Research (CQUARE)
California NanoSystems Institute (CNSI)
University of California Los Angeles

Abstract: Californian NanoSystems Institute is the leading research institutionfor nanotechnology in the southwest region of the United States. Within this short presentation (10min) I will discuss with you the number of different research activities that are currently undertaken within the different groups at CNSI in the area of nanoelectronics and photonics. More emphasis will be given to the Center for Quantum Research (CQUARE) by presenting the facility's research activities in fundamental transport phenomena of low-dimensional systems and spintronics as well as characterization of novel nanomaterials.

About the Speaker: Alexandros Shailos is the technical director of the Center for Quantum Research (CQUARE) laboratory at California Nanosystems Institute (CNSI), the research institution within the University of California at Los Angles (UCLA). www.cnsi.ucla.edu. Prior to this he obtained his B.Sc and M.S. and Ph.D. degrees in Electrical Engineering from the Arizona State University, in 1999, 2001 and 2004 respectively. He was a postdoctoral scholar for Laboratories of Solid State Physics (Paris, France) from 2005 to 2007 after which he joined the UCLA Department of Electrical Engineering where he served as a postdoctoral scientist until joining CNSI. His research interests involve fundamental transport phenomena of mesoscopic systems as well as characterization of novel nanomaterials.

TITLE: Funding opportunities for Nanotechnology Research in Cyprus

PRESENTER: Dr. Leda Skoufari-Themistou, Scientific Officer, Department of National Programmes Research Promotion Foundation, Cyprus

Abstract: Founded in 1996, the Research Promotion Foundation (RPF) has shown a track record of funding programmes and initiatives that promote the development of scientific and technological research in Cyprus. Along with its aim to identify appropriate thematic areas for conducting demand-driven research and taking into consideration the developmental needs of Cyprus, the Foundation has recently developed separate national funding tools for the funding of research projects in the area of Nanosciences and Nanotechnologies. Another important goal of RPF is the facilitation of networks between Cypriot and foreign scientists and this has led to the support of a number of coordination activities such as those of bilateral agreements and the funding of transnational joint funding programmes.

About the Speaker: Academic degrees B.Eng. honors degree in Mechanical Engineering and Ph.D. in Mechanical Engineering City University, UK.
Current position: Scientific Officer in charge of designing and managing the National Programme 'Technology', Department of National Programmes at Research Promotion Foundation. National Contact Point (FP7) for 'Nanosciences, nanotechnologies, materials and new production technologies.
Previous posts include: Honorary Visiting Research Fellow, City University, UK. Patent analyst, Derwent Scientific Information Ltd, UK.

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TITLE: Nanotechnology for Treating Damaged Tissues: Hype or Reality ?

PRESENTER: Dr. Thomas J. Webster, Associate Professor
Divisions of Engineering and Orthopaedics
Brown University

Abstract: Nanotechnology is being used to mimic structural components of tissues in synthetic materials intended for various implant applications. Recent studies have highlighted that when compared to flat or micron rough surfaces, surfaces with nanofeatures promote optimal initial protein interactions necessary to mediate cell adhesion and subsequent tissue regrowth. This has been demonstrated for a wide range of implant chemistries (from ceramics to metals to polymers) and for a wide range of tissues (including bone, vascular, cartilage, bladder, skin, and the central and peripheral nervous system). Importantly, these results have been seen at the in vitro and in vivo level. This talk will cover some of the more significant advancements in creating better vascular, cardiovascular, and orthopedic implants through nanotechnology efforts. It will also cover recent in vitro and in vivo studies which highlight better tissue regeneration. This talk will also address recent concerns of nanoparticle toxicity.

About the Speaker: Thomas J. Webster is an associate professor for the Divisions of Engineering and Orthopaedics at Brown University. His degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995) and in biomedical engineering from Rensselaer Polytechnic Institute (M.S., 1997; Ph.D., 2000). Prof. Webster's research addresses the design, synthesis, and evaluation of nanophase (that is, materials with fundamental length scales less than 100 nm) materials as more effective biomedical implants. Prof. Webster is the current director of the Nanomedicine Laboratory (28 members) and has completed extensive studies on the use of nanophase materials to regenerate tissues. To date, his lab group has generated 5 textbooks, 29 book chapters, 121 invited presentations, 232 peer-reviewed literature articles and/or conference proceedings, 306 conference presentations, and 17 provisional or full patents. Some of these patents led to the formation of NanoVis, Inc. (Lafayette, IN) and NanoRose, Inc. (Providence, RI) in which he serves as the Director of the Advisory Board. His research on nanophase materials has received attention in numerous recent media publications such as MSNBC (October 10, 2005); NBC Nightly News (May 14, 2007), and *Time Magazine* (to appear this Spring). His work has been on display at the London and Boston Science Museums. He is the founding editor-in-chief of the *International Journal of Nanomedicine* (the first international journal in nanomedicine). Other honors include: 2002, Biomedical Engineering Society Rita Schaffer Young Investigator Award; 2003, Outstanding Young Investigator Award Purdue University College of Engineering; 2005, American Association of Nanomedicine Young Investigator Award Finalist; 2005, Coulter Foundation Young Investigator Award; and 2006, Fellow, American Association of Nanomedicine.

PRESENTER: Dr. Stavros A. Zenios, Rector
Professor of Finance and Management Scientist
University of Cyprus

About the Speaker: Dr. Zenios is known internationally for his work in computational finance and financial services, high-performance and parallel computations, and operations research. In his career he authored two books, edited twelve books and journal issues, and (co)authored over 130 scholarly articles in some of the premier journals in the field. He holds two US patents on financial engineering methods. His book with Yair Censor Parallel Optimization received the 1999 ICS prize of the Institute of Operations Research and the Management Sciences. His article with A. Soteriou in Management Science on banking services received a Best Paper Award from the Decision Sciences Institute at the 1999 International Meeting. In 2000 he was a Marie Curie Fellow of the European Commission.

He is currently the Director of the HERMES Center on Computational Finance & Economics, which has been selected by the European Commission as a European Center of Excellence. The Center develops mathematical models and novel computational techniques for planning financial operations. Its products have been used for fixed-income and asset/liability management by institutions in Switzerland, the United States and Europe. Dr Zenios serves as consultant for several financial institutions, and he consulted with supercomputing manufacturers such as CRAY Research and Thinking Machines Corporation. He lectured extensively in North America, Europe and the Far East, and gave seminars to more than fifty Universities worldwide. He serves on the editorial board of six journals and is editor for the Handbook on Asset and Liability Management in Elsevier's series Handbooks of Finance.

He received a BSc degree in Mathematics from London University in 1980, a BEng degree in Electrical Engineering from Council of Engineering Institutions in 1982, MA and PhD degrees in Engineering-Management Systems from Princeton University in 1986, and an Honorary MA from University of Pennsylvania in 1992. Prior to joining the University of Cyprus to serve as the first Dean of the School of Economics and Management he was a tenured faculty member of the Wharton School, University of Pennsylvania. He also held visiting academic appointments at the Sloan School of the Massachusetts Institute of Technology (MIT), University of Haifa (Israel), University of Vienna, and the Universities of Bergamo, Milano and Urbino.