KATHOLIEKE UNIVERSITEIT
LEUVEN

Capita Selecta Lectures of Nanoscience and Nanotechnology H6L3 & H6N2

Prof.dr.ir. Jo De Boeck
K.U.Leuven, Belgium

Imec, Kapeldreef 75,
B-3001 Leuven, Belgium

Program and Abstracts

Academic Year 2014-2015

Introduction

How does so-called Nanoscience and Nanotechnology impact on modern society?
What are important scientific and technological nanotech fields at present?
What novel properties are created by precise manipulation of materials at atomic scale?
Can we construct novel building blocks with nano-scale precision and for what purpose?
What is the link between nanotech and life science?
What are there ethical or legal aspects we should know and care about?
What business opportunities arise in e.g. life-science, biotech, ICT or consumer products?

In the academic year 2014-2015, the 9th edition, Capita Selecta Lectures of Nanoscience and Nanotechnology[1], comprises of 13 lectures that will address a.o. the above questions. The lecturers are local and international experts on the selected topics, of which you can find the program details in this brochure. The topics are selected with input from the Erasmus Mundus program partners[2] and input from the students.

The topics, dates and location of the 2014-2015 lectures are as follows:

10-Feb	Patrick Wagner	KULeuven	The heat-transfer method HTM: a new concept for biosensors
17-Feb	Saroj Prasad Dash	Chalmers Univ.	Spintronics with two-dimensional crystals and heterostructures
24-Feb	Bart Soree	KULeuven	Spin wave computing : a possible route towards novel logic
03-Mar	Sebastian Haesler	KULeuven	Nanotechnology in Neuroscience or “How to hack a Brain”
10-Mar	Lyderic Bocquet	Univ. Grenoble	Nanofluidics
17-Mar	Korten Till	TUDresden	A tiny step for a protein, a giant leap for nanotechnology: Nanotechnological applications of biomolecular motors
24-Mar	David Cheyns	KULeuven	Thin-film optics: from theory to applications
31-Mar	Wilfried Vandervorst	KULeuven	Probing composition and conductivity in 3D-structures and confined volumes
21-Apr	Thilo Bauch	Chalmers Univ.	High critical temperature superconductor (HTS) nano devices: Quantum tools for probing the nature of HTSs
28-Apr	Xavier Blase	Univ. Grenoble	From earth sciences to photovoltaics: ab initio quantum simulations
05-May	Ghosh Ambarish	TUDresden	Artificial Nanoswimmers
12-May	Jesse Trekker	KULeuven	Start-up of a nanobiotech company
19-May	Inge Nelissen	KULeuven	Nanotechnology and health

[1]These lectures are organized in the frame of the Courses H6L3 “Capita Selecta of Nanoscience and Nanotechnology” within the Master of Nanoscience and Nanotechnology at the K.U.Leuven and H6N2 “Erasmus Mundus Lectures on Nanoscience and Nanotechnology”.
[2]K.U.Leuven, TU Dresden, Chalmers University and the Université Jean Fourrier Grenoble.

All lectures are broadcast live by the Audio-Visual department of the K.U. Leuven (AVNet) to all Erasmus Mundus partner universities using a Virtual Classroom concept. The lectures are open to everyone interested in the field and compulsory for the students in both Master programs[3]. All lectures are always followed by a discussion session involving the lecturers, the students and nanotechnology professionals.

We look forward to welcome you at the Capita Selecta Lectures.

Prof. Jo De Boeck, Coordinator H6L3/H6N2
December, 2014.

[3] Students have to follow at least 20 lectures in 2 consecutive years and to produce a report each year.

Capita Selecta of Nanoscience and Nanotechnology

Program, Abstracts and CV's

Program

Tuesday, 10 February 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Prof. Patrick Wagner, K.U.Leuven, Belgium
The heat-transfer method HTM: a new concept for biosensors

Tuesday, 17 February 2015, 5-7pm (Broadcast from Chalmers)
Prof. Saroj Prasad Dash, Chalmers University, Sweden
Spintronics with two-dimensional crystals and heterostructures

Tuesday, 24 February 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Dr. Bart Soree, imec, Belgium
Spin wave computing: a possible route towards novel logic

Tuesday, 3 March 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Prof. Sebastian Haesler, NERF and K.U.Leuven, Belgium
Nanotechnology in Neuroscience or "How to hack a Brain"

Tuesday, 10 March 2015, 5-7pm *(Broadcast from Grenoble)*
Prof. Lyderic Bocquet, Ecole Normale Supérieure, France
Nanofluidics

Tuesday, 17 March 2015, 5-7pm (Broadcast from Dresden)
Dr. Till Korten, Group BioNanoTools, BCUBE-TU Dresden, Germany
A tiny step for a protein, a giant leap for nanotechnology: Nanotechnological applications of biomolecular motors

Tuesday, 24 March 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Dr. David Cheyns, Imec, Belgium
Thin-film optics: from theory to applications

Tuesday, 31 March 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Prof. Wilfried Vandervorst, Imec, Belgium
Probing composition and conductivity in 3D-structures and confined volumes

Tuesday, 21 April 2015, 5-7pm (Broadcast from Chalmers)
Prof. Thilo Bauch, Chalmers University, Sweden
High critical temperature superconductor (HTS) nano devices: Quantum tools for probing the nature of HTSs

Tuesday, 28 April 2015, 5-7pm (Broadcast from Grenoble)
Dr. Xavier Blase, CNRS, France
From earth sciences to photovoltaics: ab initio quantum simulations

Tuesday, 5 May 2015, 5-7pm (Broadcast from Dresden)
Prof. Ambarish Ghosh, Indian Institute of Science, India
Artificial Nanoswimmers

Tuesday, 12 May 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Dr. Jesse Trekker, Imec, Belgium
Start-up of a nanobiotech company

Tuesday, 19 May 2015, 5-7pm (Broadcast from Leuven, Aud. "De Molen")
Dr. Inge Nelissen, VITO, Belgium
Nanomaterials and health

Capita Selecta of Nanoscience and Nanotechnology

Abstracts & CV's

Tuesday, February 10, 2015, 5-7pm
Prof. Patrick Wagner, K.U.Leuven, Belgium

The heat-transfer method HTM: a new concept for biosensors

In this contribution we will report on the heat-transfer method (HTM), which was discovered in 2012 by serendipity during studies on the thermally induced denaturation of DNA brushes immobilized on synthetic diamond electrodes. By heating the chip from the backside, the heat-transfer resistance R_{th} of the solid-liquid interface shows an unexpected jump upon the conformational change from rigid ds-DNA to flexible ss-DNA. This way, the DNA-melting temperature can be identified thermometrically and this straightforward method is sufficiently sensitive to detect single-nucleotide polymorphisms. Interestingly enough, the heat-transfer method can also serve as a readout principle in a variety of other bioanalytical challenges including i) the identification of cancer cells by whole-cell receptors, ii) the detection of neurotransmitters, and iii) the monitoring of phase transitions in lipid vesicles. Although the heat-transfer effect is theoretically not yet understood, it appears to be related to a softening of molecular vibrations at the interphase between the sensor chip and the aqueous phase.

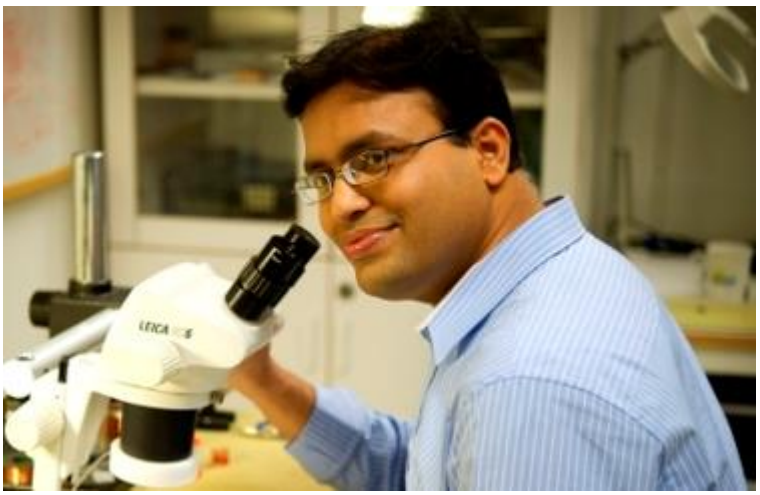
Prof. Patrick Wagner

Patrick Wagner *received his Ph.D. in physics in 1994 at the Technical University Darmstadt (Germany) and joined the Laboratory for Solid State Physics at the Catholic University Leuven (Belgium) in 1995 where he focused on the magneto-transport properties of mixed-valency magnetic oxides. In 2001 he was appointed as a professor of experimental physics at Hasselt University where he established a new research group on biosensors. In 2014 he moved back to KU Leuven as a full professor for bio- and soft-matter physics with a special focus on bio-functional surfaces. Patrick Wagner received several scientific distinctions including a Marie-Curie fellowship of the European Union (1996 – 1998) and a Methusalem grant of the Flemish Government (2008 – 2014).*

Tuesday, February 17, 2015, 5-7pm
Prof. Saroj Prasad Dash, Chalmers University, Sweden

Spintronics with semiconductors and two-dimensional atomic crystals

Spintronics is an alternative paradigm for information processing in which the state variable is the spin angular momentum of the electronic carriers. The large interest in silicon and graphene spintronics derives from the expected robustness and longevity of spin, because it has only a weak coupling to other degrees of freedom in the material. This lecture starts at a basic level of spintronics, and will cover the remarkable progress made in recent years with spins in semiconductors, graphene and heterostuctures of two-dimensional atomic crystals.



Prof. Saroj Prasad Dash

Saroj Prasad Dash an Associate Professor and leading a research team on Nanoelectronics and Spintronics at the Department of Microtechnology and Nanoscience, Chalmers University of Technology, Sweden. He received his PhD degree in Physics from Max Planck Institute, Stuttgart, Germany in 2007. After that he moved to Netherlands for three years of postdoc at University of Twente and University of Groningen. His research field is experimental condensed matter physics, in particular electron and spin transport in semiconductors, graphene, topological insulators and van der Waals heterostructures of two-dimensional atomic crystals.

Tuesday, February 24, 2015, 5-7pm
Dr. Bart Soree, Imec, Belgium

Spin wave computing: a possible route towards novel logic

The main idea behind wave computing is to make a paradigm shift in the way we design devices. Instead of making conventional devices that are part of a logic function, the goal is to make devices that already realize a logic function more functional than just an elementary switch.
Wave computing may realize this and is based on using the information carried by a wave such as amplitude, phase and frequency. The expectation is that one would need less interconnect as this is already part of the device (i.e. the realization of a complex logic function in one device removes the otherwise required local interconnect present in conventional CMOS logic).
Spin wave computing uses magnonic excitations which result in magnetization waves (coined spin waves in literature) propagating in ferromagnetic materials (spin wave bus). In order to excite, manipulate and detect spin waves different possibilities exist: magnetic tunnel junctions, microwave antenna or magnetoelectric elements. Spin wave computation uses interference and phase manipulation to obtain the desired computational outcome.
In this lecture, we start with a short introduction into the dynamics of magnetism in matter and the resulting spin wave theory and experimental verification thereof. In the second part of the lecture the application of spin waves for wave computing (logic) will be discussed and an overview of the current status of research and applications will be given.

Dr. Bart Sorée

Bart Sorée *received his Master Engineering Physics degree in 1998 and Master Theoretical Physics degree in 1999, both from University Ghent, and obtained his PhD in Theoretical Physics from the KULeuven in 2003. In 2004 he joined imec, Leuven as a staff member focussing on theoretical nano & quantum electronic devices & materials. He is currently member of the Physics, modelling and simulation group in imec investigating & developing novel beyond CMOS charge and non-charge based devices where he is involved in wave based computing devices and novel energy filtering devices. Since 2011 he is a part-time professor in the physics department at the University of Antwerp in the condensed matter theory group and since 2014 he is also appointed part-time professor at the KULeuven electrical engineering department.*
Bio : ***https://www.linkedin.com/in/bartsoree***

Tuesday, March 3, 2015, 5-7pm
Prof. Sebastian Haesler, NERF and KU Leuven

Nanotechnology in Neuroscience or "How to hack a Brain"

Brain disorders pose an enormous burden on affected individuals and health care systems throughout Europe and the world. In order to find new ways to treat, prevent, and cure disease like Alzheimer's, schizophrenia, autism, epilepsy, and traumatic brain injury, a better understanding of the brain is urgently needed. One approach which is essential for basic and translational research as well as for therapeutic intervention, involves physical interfacing with the brain *in vivo*. Here, novel nanoelectronic technologies can make a difference, in that ever smaller devices can be created which interface with the brain in intelligent ways for both sensing and manipulation. Silicon-based neural probes have already played a key role in measuring the response properties of neurons in the brain of awake behaving animals. More recently developed technologies such as optogenetics, now also enable controlling neural activity with unprecedented temporal and spatial precision. In my presentation, I will provide an overview of current methods for measuring and manipulating neural activity *in vivo,* highlight current technological challenges and discuss possible nanoelectronic solutions.

Prof. Sebastian Haesler

Sebastian Haesler *did his PhD work at the Max-Planck-Institute for Molecular Genetics in Berlin, Germany. With support from a long-term postdoctoral fellowship from the Human Frontier Science Program he then moved to the Center for Brain Science at Harvard University to join the lab of Prof. Naoshige Uchida. In 2013, he joined Neuroelectronics Research Flanders (NERF) in Leuven, Belgium to start his own laboratory. Founded by KU Leuven, VIB and IMEC, NERF is a young interdisciplinary, academic initiative focused on using and developing novel neurotechnologies. The long-term goal of the Haesler laboratory is to understand how activity in neuronal circuits gives rise to mental function and behavior. Current experimental work is focused on the question of how the brain detects and processes novel stimuli, a fundamental problem of information processing in intelligent systems.*

Tuesday, March 10, 2015, 5-7pm
Prof. Lyderic Bocquet, Ecole Normale Supérieure, Paris

Nanofluidics

« *There is plenty of room at the bottom* ». This visionary foresight of R. Feynman, introduced during a lecture at Caltech in 1959, was at the root of numerous scientific and technological developments, taking benefit of the "strange phenomena" occurring at the smallest scales. There remains however a lot to explore, in particular in the context of fluids at the nanoscales and their specific transport properties. Superfast flows in carbon nanotubes, hydrodynamic slippage, nanobubble superstability, … are the most striking phenomena that have been unveiled over the last few years and some of them are still awaiting an explanation. Furthermore the great efficiency of biological nanopores, such as aquaporins, in terms of permeability or selectivity is definitely a great motivation to foster research in this direction. How to reach such efficiency in artificial nano-systems, and build new devices taking benefit of the strange transport behavior of fluids at nanoscales is still an open question.
This lecture will introduce the various phenomena which enters fluid dynamics in nanoscale pores. This involves interfacial dynamics, slippage effects, the limits of validity of continuum transport, electro-hydrodynamics and osmotic transport, fluctuations, etc.… In particular I will discuss several examples of theoretical and experimental studies of transport inside nanochannels, showing how nanoscales can be harnessed to obtain new transport properties and the case of flows inside nanotubes will be specifically discussed.

Prof. Lydéric Bocquet

http://ilm-perso.univ-lyon1.fr/~lbocquet
Lydéric Bocquet *is director of research at CNRS and professor in physics at the Ecole Normale Supérieure in Paris. His research interests are mainly curiosity driven and extend to domains at the interface between soft condensed matter, fluid dynamics and nanoscience. He combines experiments theory, and simulations to explore the intimate mechanisms of fluid interfaces from the macroscopic down to the molecular level, with applications in the fields of material science, micro- and nano-fluidics, complex fluids, etc. His scientific objective is to harvest the unexpected fluid transport behaviors occurring at the nanoscales in order to propose new routes for energy harvesting and desalination. Beyond academically oriented topics, he has also a strong interest in every-day life science.*
He received several awards including an Advanced Grant of the European Research Council in 2010, the Friedrich Wilhelm Bessel prize of the von Humboldt foundation in 2007, as well as the Ancell condensed matter prize of the Société Française de Physique in 2011, and the Jean Protas scientific prize of the french Academy of Sciences in 2008. His scientific production consists of 133 publications in peer-reviewed journals and 70+ invited talks in international conferences.

Tuesday, March 17, 2015, 5-7pm
Dr. Till Korten, Group BioNanoTools, BCUBE-TU Dresden, Germany

A tiny step for a protein, a giant leap for nanotechnology: Nanotechnological applications of biomolecular motors

Proteins have been optimized by evolution for billions of years to work on a nanometerscale. Therefore, they are extremely promising for nanotechnological applications. In particular, cytoskeletal motor proteins are ideally suited for nano-

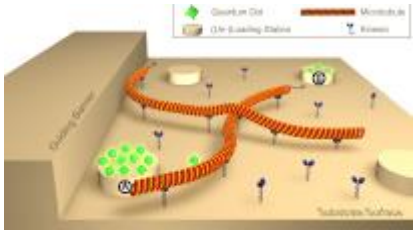


Figure 1: Microtubes transporting cargo on a kinesin-1 coated surface.

technological devices, because they perform mechanical work using the chemical energy of ATP-hydrolysis. This lecture will give an overview of important advances in the field of nanotechnological applications of biomolecularmotors. Key technologies necessary to make full use of molecular motors in artificial environments include (i) spatial guiding allowing directional control, (ii) molecular switches that allow temporal control, and (iii) versatile methods of molecular attachment allowing loading and unloading of cargo. With these technologies, it was possible to develop more and more complex devices such as molecular sorters, molecular concentrators, detectors and biocomputation devices.

Dr.Till Korten

Till Korten *received his biochemistry degree in 2004 from the University of Tübingen, Germany. He attended the Dresden International Graduate School for Biomedicine and Bioengineering and was awarded his PhD in Biophysics in 2009 from the TUDresden. From 2009 to 2012 he did a Postdoc at the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden and since 2012 he is a Postdoc at the BCUBE, center for innovation competence at the TUDresden, Germany.*

Tuesday, March 24, 2015, 5-7pm
Dr. David Cheyns, Imec, Belgium

Thin-film optics: from theory to applications

Light-matter interactions become more complicated once the sub-micrometer region is reached. For these dimensions, the wavelength of the light has the same magnitude as the used layer thickness. As a consequence, light that is reflected at any interface will (constructive or destructive) interfere with the incoming light, and create a complex interference pattern. A fairly simple matrix approach can be used to calculate the light propagation in flat, thin-layered stacks. We will show how this approach is used in optical thickness measurements (ellipsometry), as well as for the optimization of thin-film electro-optical components such as photovoltaics or light-emitting diodes.

Dr. David Cheyns

David Cheyns *received a master and Ph.D. in electrical engineering in 2003 and 2008, respectively, from the Katholieke Universiteit Leuven. His thesis was on planar heterojunction organic solar cells, carried out in the Polymer and Molecular Electronics group at IMEC. Presently he is working on different thin-film opto-electronic components as a principal scientist in the thin-film PV group. He is actively involved in several European projects, and is the daily supervisor of 6 PhD students.*

Tuesday, March 31, 2015, 5-7pm
Prof. Wilfried Vandervorst, Imec, Belgium

Probing composition and conductivity in 3D-structures and confined volumes

Developing and implementing next technology nodes is a complex task involving innovation in materials engineering, process development and device design. Metrology is now recognized as an important enabler within the development paths of novel technologies and also a crucial component for their manufacturing implementation. The down scaling of devices into non-planar structures has led to physical phenomena which can only been seen in 3D-structures and confined volumes such that the metrology is now pushed into dealing with analysis on a scale commensurate with device dimensions (finfets, FETS, filaments in RRAM, epi growth by ART,....).
Concepts like Atomprobe tomography with its inherent 3D-resolution are obviously a potential solution although its routine application is still hampered by localization problems, reconstruction artifacts due to inhomogeneous evaporation, sensitivity due to the limited statistics, poor tip yield, etc.
Although on the other hand concepts like scanning probe microscopy are inherently 2D, extensions towards 3D appear possible either by the design of dedicated tests structures or by novel approaches such as mechanical scalping. For instance recent applications of Scalpel SPM towards novel non-volatile memory devices have unraveled the filament formation in RRAM-devices and highlighted the conduction paths in NAND devices. Nevertheless probing confined volumes embedded in insulators does represent some challenges in terms of localization.
Despite the apparent 1D-nature of Secondary Ion Mass Spectrometry, novel concepts like Self-focusing SIMS enable to probe layer composition within trenches as narrow as 20 nm. Similarly Ion channeling as a tool for in-depth defect analysis was been demonstrated on similar structures.
The application of these methods to 3D-structures and confined volumes, has highlighted that the changing surface/volume ratios in confined devices versus blanket films lead to phenomena (dopant deactivation, enhanced diffusion,..) which cannot be observed in blanket experiments. Hence more emphasis should be placed on the analysis of device and structures with the relevant dimensions relative to the exploration of blanket experiments.

Prof.dr.ir. W. Vandervorst

Prof.dr.ir. W. Vandervorst received the M.Sc. degree (electronic engineering) in 1977 from the Katholieke Universiteit Leuven. Belgium and in 1983 the Ph.D degree in Applied Physics from the same University. In 1983-1984 he worked at Bell Northern Research, Ottawa, Canada as a consultant in the field of materials characterization. In 1984 he joined Imec where he became director of the department dealing with materials characterization. Since 1990 he is also holding an appointment as a Professor at the Katholieke Universiteit Leuven where he is teaching a course on materials characterization. In 2001, after an international peer review, he was elected as an Imec Fellow for his outstanding scientific achievements related to semiconductor metrology and in 2013 as Senior Imec Fellow. He is engaged in advanced research on metrology and material (interactions) for semiconductor technology.

Tuesday, April 21, 2015, 5-7pm
Prof. Thilo Bauch, Chalmers University, Sweden

High critical temperature superconductor (HTS) nano devices: Quantum tools for probing the nature of HTSs

The nature of High critical Temperature Superconductivity is one of the main unresolved problems in solid-state physics. Superconductive devices at the nanoscale can have a fundamental role in shedding light into the mechanism leading to High critical Temperature Superconductivity. Indeed, our recent achievements in nano-patterning of HTS devices such as a single electron transistor (SET) allow us to explore the superconducting state in regimes never accessed before. Indeed, we univocally show via the measurement of the parity effect in a YBa2Cu3O7-x SET that the superconducting order parameter breaks time reversal symmetry in contrast to a pure d-wave symmetry. This is of fundamental importance for the development of any new theoretical HTS modeling. Moreover, our nano-patterning process allows for new exciting developments towards quantum-limited sensors such as single photon detectors and nano Superconducting Quantum Interference Devices (nanoSQUIDs) with unprecedented magnetic flux sensitivity.

Associate Prof. Thilo Bauch

Thilo Bauch received his physics degree (Diplom) in 1995 from the University of Tübingen and his PhD degree in 2000 from the University of Cologne. His main research interests are devoted to the search for the mechanism leading to the fascinating phenomenon of superconductivity in High critical Temperature Superconductors using quantum nano devices. Since 2011 he is associate professor at the department of Microtechnology and Nanoscience at Chalmers University of Technology.

Tuesday, April 28, 2015, 5-7pm
Dr. Xavier Blase, CNRS, France

From earth sciences to photovoltaics: ab initio quantum simulations

Quantum mechanics describe the behavior of condensed matter systems at the electronic level from which a wealth of properties (structural, electronic, magnetic, etc.) can be in principle deduced. However, even though known for more than a century, the Schrödinger equation does not admit analytic solutions for systems more complicated than the hydrogen atom. Further, exact numerical solutions are extremely difficult to acquire due to an exponentially growing complexity with system size. Still, simple approximations, from mean-field to many-body theories, allow obtaining an "accurate enough" description of a growing number of properties for complex realistic systems. From the understanding of systems unattainable to experiments, such as earth deep interior or remote planets surface, to the prediction of novel materials of interest for applications in nanoelectronics or energy relevant applications, a glimpse at the potentialities of quantum simulations will be presented.

Dr. Xavier Blase

Xavier Blase *performed his undergraduate studies at the Ecole Normale Supérieure in Lyon before moving to the physics department at UC Berkeley for a PhD in theoretical physics. After a postdoctoral stay at EPFL, Lausanne, he joined the French CNRS in Lyon. He is today director of research at Institut Néel in Grenoble. His activity aims at understanding the properties of various systems, from nanotubes to graphene, superconducting diamond to DNA nucleobasis, using the methodology of ab initio quantum simulations, namely "in silico" study of real materials based on the basic principles of quantum mechanics. Much emphasis is given to contributing to the development of novel approaches, in particular in the so-called field of many-body perturbation theory, to progress in the computer-aided description of materials, in terms of accuracy, complexity of the systems and of the "physical observables" that can be calculated. Current applications focus mainly on methodology for the study of organic and hybrid photovoltaic systems for "green" energy generation. Xavier Blase received the 2008 CNRS silver medal for his achievements in developing quantum simulations in France.*

Tuesday, May 5, 2015, 5-7pm
Prof. Ambarish Ghosh

Artificial nanoswimmers

The idea of tiny vessels roaming around in human blood vessels working as surgical nanorobots was first proposed by Richard Feynman, a vision that has triggered imagination in scientists and non-scientists alike. With current advances in nanotechnology, there have been several strategies to realize this dream of a "nanovoyager", aiming to maneuver artificial nanostructures in biological media for diagnostic and therapeutic applications. We will provide a review of the various approaches that have been used to move artificial nanostructures remotely in fluidic environments in a controllable fashion, with special emphasis on manipulation techniques that rely on small, spatially homogenous magnetic fields.

Prof. Ambarish Ghosh

Ambarish Ghosh *received his undergraduate degree in Physics from the Indian Institute of Technology, Kharagpur, India. Subsequently, he did his PhD in Physics from Brown University in 2004, and worked at Harvard University from 2005-2009 as a postdoctoral fellow. In 2009, he joined Indian Institute of Science, Bangalore, India as an Assistant Professor, where he is currently a faculty member at the Centre for Nano Science and Engineering, and associate faculty at the Departments of Physics and Electrical Communication Engineering. His research interests include the study of quantum fluids, plasmonics, driven colloidal particles and their applications in biotechnology.*

Tuesday, May 12, 2015, 5-7pm
Dr. Jesse Trekker, Imec, Belgium

Start-up of a nanobiotech company

Entrepreneurship is the buzzword of today. Everybody wants to be an entrepreneur. Even as a university student you can obtain a special status as student-entrepreneur. Great! We need more companies who create value and who drive our economy. But how do you organize your idea or research into a business plan? In this lecture I will give an overview of new businesses emerging in the nanobio field. Hereby, I will share my experience with setting up a nanobiotech company (still in progress!) and highlight the tools that have helped me structure my approach!

Dr. Jesse Trekker

Jesse Trekker *received his masters in biomedical sciences in 2006 at the KU Leuven. He was next granted an IWT fellowship to pursue a PhD in nanobiotechnology at imec and the KU Leuven. He graduated in 2013 as doctor in biomedical sciences. His PhD had a strong economic valorization direction and therefore he is currently pushing his research into a business solution, stretching the boundaries between nanotechnology and regenerative medicine. To achieve this goal he was granted an IWT innovation mandate in 2014.*

Tuesday, May 19, 2015, 5-7pm
Dr. Inge Nelissen, VITO, Belgium

Nanomaterials and health

Nanomaterials are recognized as one of the enabling technologies to innovation. Nanoscale objects interact with living organisms in a fundamentally new manner. In a biological environment molecular interactions may occur at their surface, leading to the formation of a biomolecule corona. They are also able to enter living cells and interfere with cellular processes. In this lecture possible implications for human health and application fields in which these nano-bio interactions are exploited to stimulate innovation will be discussed.

Dr. Inge Nelissen

Inge Nelissen *is trained as bio-engineer (1998) and obtained her PhD degree in 2003 from the Catholic University of Leuven. Since 2004 she joined VITO (Flemish Institute for Technological Research, Mol, Belgium) where she started as a researcher in the development and validation of in vitro cell-based assays for chemical and nanomaterials safety assessment. In 2011 she became project manager leading the research programme on nano-bio interactions in the Applied Bio&molecular Systems group. She is partner in several EU framework projects in the field of nanosafety, and expert member of working groups of the OECD Working Party on Manufactured Nanomaterials, EU NanoSafetyCluster, and ETP-Nanomedicine. She is co-author of 39 peer-reviewed scientific papers.*