RESEARCH HANDBOOK 2015

DEPARTMENT OF PHYSICS
The current Department of Physics can be traced back through a long and rich history: its earliest forerunner was founded in 1904 as Straits Settlements and Federated Malay States Government Medical School. It was renamed to Raffles College in 1929 and established as a proper university as University of Malaya in 1949. After a further renaming to University of Singapore in 1962 and a merger with Nanyang University in the year 1980, the National University of Singapore was established. It is worth mentioning that famous physicists visited the department, such as Paul A. M. Dirac – a picture of him during a lecture is on display still in the departmental meeting room.

Until around 1990, the department was essentially a teaching department with little research activities. At that time, NUS began to transform itself into a research university. Over these past two decades, tremendous efforts have been made in developing the research capabilities of our department, which is now classified as “research intensive”. Below we list the current major research directions.

» Physics of Nanoscience
» Condensed Matter and Advanced Materials
» Biological Physics
» Physics of Nonlinear and Complex Systems
» Atomic, Molecular Physics (including Nonlinear Optics)
» Computational and Theoretical Physics (including String Theory, Cosmology, Particle Physics, etc)
» Quantum Information
» Graphene and 2D Materials

There are several unique groups in our department, firstly the Centre for Quantum Technologies (CQT), which originated in the physics department and is now a separate research centre, the first Research Centre of Excellence (RCE) funded by the Singapore government. Recently the Centre for Advanced 2D Materials and Graphene Research Centre was set up to spearhead graphene and 2D materials research. The Centre for Ion Beam Application (CIBA) is a unique entity, dedicated to ion beam applications. Many of our faculty members have very active research programmes and have produced high impact research work. Some of them hold editorial positions at prestigious journals and are elite members of professional organizations (such as APS or IoP fellows).

The 2015 “QS world university ranking by subjects” has ranked NUS physics at the 23rd position in the physics and astronomy category. Over the years, the research output produced by the department has grown quite strongly, as shown in figure 1 below. The figure indicates the number of top journal publications indexed by the Web of Science with an author/coauthor from our department. Clearly, tremendous progress has been made.

This handbook will allow the reader to find out quickly who is doing what in our department. From the weblinks given, more in-depth information is then available (the department webpage is at http://www.physics.nus.edu.sg/).

Figure 1 - The number of top journal publications from the department as indexed by the Web of Science.
THE FACULTY
Head of Department
Professor Sow Chorng Haur

Deputy Heads of Department
Professor Wang Jian-Sheng
Associate Professor Phil Chan Aik Hui
Associate Professor Thomas Osipowicz
Professors
Baaquie, Belal E.
Breese, B. H. Mark
Castro-Neto, Antonio Helio (Distinguished Professor)
Chowdari, B. V. R.
Ekert, Artur Konrad (Lee Kong Chian Centennial Professor)
Englert, Berthold-Georg
Feng Yuan Ping
Gong Jiangbin
Ji Wei
Kuok Meng Hau
Kurtsiefer, Christian
Lai Choy Heng
Li Baowen
Lim Hock
Liu Xiang Yang
Özyilmaz, Barbaros
Scarani, Valerio (Provost’s Chair Professor)
Sow Chorng Haur (Head)
Tan Tiong Gie, Bernard
Venkatesan, Thirumalai Venky (Provost’s Chair Professor)
Vlatko Vedral
Wang Jian-Sheng (Provost’s Chair Professor)
Wee Thye Shen, Andrew (Provost’s Chair Professor)

Professorial Fellow
Oh Choo Hiap
Ong Chong Kim
Watt, Frank

Adjunct Professors
Lin Jianyi
Phua Kok Khoo

Associate Professors
Barrett, Murray Douglas
Bettiol, Andrew A.
Chan Aik Hui, Phil
Chen Wei
Chung Keng Yeow
Dieckmann, Kai
Ho, Peter (Dean’s Chair Professor)
van Kan, Jeroen Anton
Kaszlikowski, Dagomir
Lim Hock Siah, Paul
van der Maarel, Johan R. C.
Mahendiran, Ramanathan
Martin, Jens
Osipowicz, Thomas
Singh, Kuldip
Tan Meng Chwan
Tay Seng Chuan
Teo Ho Khoon, Edward
Tok Eng Soon
Wang Xuesen
Wang Zhisong
Yan Jie (Dean’s Chair Professor)
Yu Ting
Zhang Chun

Adjunct Associate Professors
Goh Kuan Eng, Johnson
Pan Jisheng
Teo Kien Boon
Wang Shijie
Yakovlev, Nikolai

Distinguished Visiting Professors
Geim, Andre (Nobel Laureate in Physics 2010)
Leggett, Anthony J. (Nobel Laureate in Physics 2003)

Visiting Professor
Hänggi, Peter

Visiting Research Professor
Miniatura, Christian

Visiting Associate Professor
Liu Ruchuan

Visiting Research Associate Professor
Gremaud, Benoit
Assistant Professors
Adam, Shaffique
Ariando
Chua Lay-Lay
Eda, Goki
Garaj, Slaven
Hessmo, Björn Gustaf
Li Wenhui
Lin Hsin
Ling Euk Jin, Alexander
Matsukevich, Dzmitry
Mirsaidov, Utkur Mirziyodovich
Mukherjee, Manas
Pereira, Vitor Manuel
Quek Su Ying
Rusydi, Andrivo
Tsang Mankei
Viana-Gomes, José Carlos
Wang Haifeng

Adjunct Assistant Professors
Lim Geok Kieng
Ng Chee Mang

Principal Research Scientist (CRISP)
Liew Soo Chin

Senior Lecturers
Ng Shao Chin, Cindy
Udalagama, Chammika N B
Wang Qinghai
Yeo Ye

Adjunct Senior Lecturer
Liu Lerwen

Lecturers
Chan Taw Kuei
Hong Chong Ming, Kenneth
Ng Wei Khim
Sharma, Nidhi
Yang Jiahui, Abel

Part-Time Lecturer
Ng Ser Choon

Instructors
Dewanto, Andreas
Lam Poh Fong, Lydia
Ng Siow Yee
Qiu Lei Ju

Teaching Assistants
Bomantara, Raditya Weda
Cheng Kok Cheong
Ching Chee Leong
Leong Qixiang
Lim Yen Kheng
Shu Sze Yi, Angeline
Tan Meng Ho
Shaffique Adam
Assistant Professor

**PhD, Cornell University, USA (2006)**

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Current Research

» Assistant Professor Adam’s background is in mesoscopic quantum condensed matter theory. He is currently interested in:

» theoretical studies on the effects of disorder and interactions in Dirac fermion systems such as graphene and topological insulators;

» exploring the effects of impurities and electronic screening on experimentally measurable quantities such as transport and scanning probe experiments;

» application of graphene for new electronic devices.

Selected Publications


The electrons are still able to find their way to the buckled interface between insulating oxides LaAlO$_3$ and SrTiO$_3$ (110). This has led to an anisotropic conducting behavior with potential for anisotropic superconductivity and magnetism leading to possible new physics and applications.
Belal E. Baaquie
Professor

PhD in Theoretical Physics, Cornell University, USA (1976)

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Current Research

» Professor Baaquie’s main research is in study and application of the mathematical methods of quantum field theory.
» He has applied the methods and mathematical formalism of field theory to finance and has been a major contributor to the emerging field of quantum finance, having written two pioneering books on the subject.
» His future research is to develop the formalism of quantum finance and apply it to the pricing, portfolio theory and hedging of interest rate derivatives and to the study of equity, foreign exchange and commodities. He is also applying the methodology of statistical mechanics and quantum field theory to the study of micro and macroeconomics.

Selected Publications

Current Research

In cavity QED systems, when the atom-cavity coupling becomes large, the coherent dynamics dominates, and makes it possible for the cavity to operate as an interface between atoms and photons. This regime is of great practical interest and has many applications including novel cooling methods, frequency metrology, and as an information exchange between photons and atoms for quantum information. Currently his group is exploring the use of cavity QED with both neutral atoms and ions. In their neutral atom system they aim to combine the collective enhancement obtained when many atoms interact with the cavity together with cavity cooling methods to demonstrate direct ground state cooling of a many-body system. This would provide an important technique in the study of ultra-cold atoms and many body physics. In their ion trap system they hope to establish entanglement between remotely located atoms.

Selected Publications

Andrew A. Bettiol
Associate Professor
PhD, University of Melbourne, Australia (2000)

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Tel : (65) 6516 4138
Email : phybaa@nus.edu.sg

Current Research

Optics and Photonics
» Ion beam modification of materials for applications in micro/nanophotonics.
» Terahertz spectroscopy and optics - Application in metamaterials.
» Active plasmonics, loss mitigation in micro-optical systems, enhancement of light emission using plasmonics.
» Mid-IR optics, passive and active devices for biosensing.

Nuclear Microscopy and Radiobiology
» Proton induced fluorescence microscopy in biological systems - Super-resolution imaging.
» Radiation effects in single live cells - Applications in cancer treatment using particle therapy.
» Development of diamond based radiation hard particle detectors, delta-E detectors using thin membranes, radiation dosimetry.

Selected Publications
» Y. Yan, L.F. Ng, L.T. Ng, K.B. Choi, J. Gruber, A.A. Bettiol, and N.V. Thakor, “A continuous-flow C. elegans sorting system with integrated optical fiber detection and laminar flow switching”, Lab Chip 14, 4000 (2014).
B.H. Mark Breese
Professor
PhD, AEA Harwell and University of Manchester, UK (1990)

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Current Research

» Professor Breese’s ion beam research activities are centred around the use of focused high-energy beams of charged particles as a means of imaging the structure and crystallinity of materials and to modify their properties. This work includes areas such as porous silicon formation, electrochemistry, ion optics, and ion channelling, accelerator physics. Much of the current work is on the use of silicon micromachining to fabricate micro- and nanoscale components for silicon photonics.

» His Synchrotron research activities include X-ray lithography, X-ray optics, accelerator physics, soft X-ray scattering.

Selected Publications


Antonio Helio Castro-Neto
Distinguished Professor

PhD, University of Illinois at Urbana-Champaign, USA (1994)

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Current Research

Graphene: all aspects. Strongly correlated systems: spin and charge density wave, quantum magnetism, superconductivity. Disordered magnetic systems.

Selected Publications

Phil Chan Aik Hui
Associate Professor

PhD in High Energy Physics, National University of Singapore (1993)

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Current Research

» QCD soft-hadron multiplicity phenomenology,
» Neutrinos & Large scale structures of the Universe.
» CERN CMS Collab. EOI co-ordinator. Astronomy education

Selected Publications

Chan Taw Kuei
Lecturer
PhD, National University of Singapore (2009)

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Current Research

» High-resolution depth profiling of elements in advanced materials using methods of Ion Beams Analysis (IBA).
» Ion beam modifications of advanced materials in novel device and technology research.

Selected Publications


Chen Wei
Associate Professor
PhD, National University of Singapore (2004)

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Current Research

» Rational design of self-assembled molecular nanostructure arrays over macroscopic area with superior multi-functionalities for molecular nano-devices;
» Development of effective molecular-level interface engineering approaches for improved organic electronic devices, organic photovoltaic cells and nanostructured materials;
» Wafer-scale production of high quality graphene substrates and interface problems associated with graphene electronics;
» Interface-controlled nanocatalysis for energy and environmental research.

Selected Publications

B.V.R. Chowdari
Professor

PhD, Indian Institute of Technology, Kanpur, India (1968)

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Current Research

Professor Chowdari’s Research is aimed at finding novel materials for potential application in Lithium Ion Batteries. Several new materials are synthesized by variety of methods and characterized by a large number of modern techniques including electrochemical ones. Variations for the proven compounds are also aimed in order to improve their performance. Focus is on anode and cathode materials.

Selected Publications

» M.V. Reddy, G.V. Subba Rao, and B.V.R. Chowdari, “Nano-(V$_{1/2}$Sb$_{1/2}$Sn)$_4$: A high capacity, high rate anode material for Li-ion batteries”, J. Mater. Chem. 21, 10003 (2011).
Lay-Lay Chua
Assistant Professor

PhD, University of Cambridge, UK (2008)

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Current Research

» Functionalization and development of new applications for solution-processable graphenes.
» Transfer method and development of new applications for CVD graphenes.
» Energy-level engineering for organic solar cells and polymer heterostructure devices.
» Structure–morphology–property relations of pi-conjugated semiconducting materials.
» Materials development for high-performance organic electronic devices, such as photocrosslinkers.

Selected Publications


Top: Schematic of top-gate bottom-contact field-effect transistors with transferred gate electrode. Photographs of transferred patterned graphene (bottom, right) and transferred Ag and Au metal films (bottom, left).
Chung Keng Yeow  
Associate Professor  
PhD, Stanford University, USA (2001)

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Current Research

» Use of laser-cooled atoms and Bose-Einstein condensates in ultra-high precision measurements
» Study the feasibility of using atom interferometers to detect effects of quantum gravity

Selected Publications

Kai Dieckmann
Associate Professor
PhD, University of Amsterdam, The Netherlands (2001)

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Current Research

» Experimental Atomic and Molecular Physics and Quantum Optics (AMOP)
» Many body quantum physics with degenerate Bose and Fermi gases and dipolar molecules
» Laser cooling and atom trapping
» Atom interferometry
» Laser spectroscopy and frequency combs

Selected Publications

Goki Eda
Assistant Professor

PhD, Rutgers University, New Jersey, USA (2009)

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Current Research

Assistant Professor Eda’s research aims to translate the unusual properties of novel materials into novel technology. He investigates the unique electronic and optoelectronic properties of two-dimensional materials such as graphene and MoS$_2$ with a focus on:

» Exciton dynamics and manipulation
» Charge transport and device implementation
» Intercalation chemistry and phase transformation
» Photoelectrochemistry and solar energy conversion
» Thin film growth and processing

Selected Publications


Artur Konrad Ekert
Lee Kong Chian Centennial Professor

DPhil, University of Oxford, UK (1991)

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Current Research

» Professor A Ekert is one of the world’s leading authorities in quantum information science, in particular in quantum cryptography. He is the founding Director of the Centre for Quantum Technologies (CQT) at NUS, established as Singapore’s first Research Centre of Excellence in December 2007. He had previously led the Quantum Information Technology group in NUS, which formed the core of the new centre. He has enriched the intellectual environment of the University, attracting outstanding physicists and computer scientists to collaborate with Singapore-based researchers and to join CQT. As of 2013, CQT has more than 200 staff and students.

» His research extends over most aspects of information processing in quantum-mechanical systems, with a focus on quantum cryptography and quantum computation. It is a cross-disciplinary field bringing together theoretical and experimental quantum physics, mathematics, logic, computer science and information theory. His work is mostly theoretical but its results also bear directly on issues of experimental implementation. One reason why it has attracted attention from industry and government agencies is that quantum cryptography can guarantee perfectly secure communication. Another is that projected quantum computers will be capable of efficiently solving some problems for which there is believed to be no efficient classical algorithm.

Selected Publications


Berthold-Georg Englert
Professor
Dr. rer. nat., University of Tübingen, Germany (1981)

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Current Research

» Ultracold fermionic atoms in two-dimensional traps
» Semiclassical theory of ultracold gases of neutral dipolar atoms
» Robust storage of quantum bits
» Quantum state estimation, quantum process estimation
» Mutually unbiased bases

Selected Publications

Spin-dependent transport in zigzag graphene nanoribbon. The spin-polarization and direction of electric current in the graphene nanoribbon can be controlled by magnetization of electrodes and bias voltage, allowing implementation of spin logic gates.

Selected Publications


Slaven Garaj
Assistant Professor

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Current Research

Assistant Professor Garaj is interested to investigate the interplay of nanostructures with molecules and liquids, and to study and control individual biomolecules. His research directions include:

» Graphene based sensors
» Nanopore physics and nanofluidics
» Single-molecule biophysics
» Electrical methods for DNA sequencing
» Bio-nanoscience

Selected Publications

Current Research

» Sir Andre Geim is the Regius and Royal Society Research Professor at the University of Manchester. He was awarded the 2010 Nobel Prize for his groundbreaking work on graphene, a one-atom-thick material made of carbon. He has also received numerous international awards and distinctions, including medals from the US National Academy of Sciences and the UK Royal Society, and holds honorary doctorates and professorships from many countries.

» Thomson-Reuters repeatedly named him among the world’s most active scientists and attributed to him three new research fronts – diamagnetic levitation, gecko tape and graphene. He was also awarded the IgNobel prize in 2000 for his work on levitation, becoming the first and only recipient of both Nobel and IgNobel Prizes. He has also received both Dutch and British knighthoods.

Selected Publications


Johnson Goh Kuan Eng
Adjunct Associate Professor
PhD, University of New South Wales, Sydney, Australia (2007)

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Current Research
» Additive Manufacturing
» Atomic Precision Manufacturing
» Nanofabrication by scanning probe microscopy and molecular beam epitaxy
» Quantum effects in low-dimensional systems
» High-K dielectrics
» Quantum computing

Selected Publications
Gong Jiangbin
Professor

PhD in Theoretical Chemical Physics, University of Toronto, Canada (2001)

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Current Research

Nonlinear Dynamics and Quantum Chaos; Quantum Dynamics Control and Quantum Simulation; Open Quantum Systems; Quantum-Classical Correspondence; Topological Aspects of Driven Quantum Systems.

Selected Publications

Benoit Gremaud  
Visiting Research Associate Professor  

PhD in Quantum Physics, Université Pierre et Marie Curie, Paris, France (1997)

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Current Research

Ultracold quantum gases, condensed matter, quantum Hall effects. Quantum transport and disorder: weak and strong localization.

Selected Publications


Peter Hänggi
Visiting Professor
PhD, University of Basel, Switzerland (1977)

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Current Research
Theoretical physics: time-dependent quantum dynamics and quantum control, decoherence and dissipation in quantum mechanics, quantum tunneling, classical and quantum information processing, molecular electronics, Brownian Motors, Stochastic Resonance, colored noise, theory of reaction rates, nonlinear dynamics in systems far from thermal equilibrium, stochastic processes, transport theory and instabilities, relativistic statistical physics and thermodynamics.

Selected Publications

Current Research

» Mesoscopic ensembles of ultra-cold atoms trapped with miniaturized atom traps. Using lithography to define atom traps allow us to realize both precise and complex trapping geometries for neutral atoms. The unique properties of these traps allow us to investigate small and tightly confined atom clouds located near a structured surface.

» Micro-optics and microstructures for atomic physics. This research involves both fabrication of high-performance devices, and to investigate the interaction between well-controlled quantum systems and surface-mounted devices.

» High-efficiency imaging. To detect individual atoms it is crucial to have good imaging systems that allow us to collect the signal from single atoms.

Selected Publications


Peter Ho
Dean's Chair Associate Professor
PhD, University of Cambridge, UK (2000)

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Current Research
Physics and technology of organic semiconductor devices
(light-emitting diodes, field-effect transistors and solar cells)

Selected Publications


"S. Sivaramakrishnan, P.J. Chia, Y.C. Yeo, L.L. Chua, and P.K.H. Ho, “Controlled insulator-to-metal transformation in printable polymer composites with nanometal clusters”, Nat. Mater. 6, 149 (2007)."
Kenneth Hong Chong Ming  
Lecturer  
PhD, National University of Singapore (2014)

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Tel: (65) 6516 2631  
Email: phyhcmk@nus.edu.sg

Current Research
Black holes in higher dimensions.

Selected Publications
Ji Wei
Professor
PhD, Heriot-Watt University, Edinburgh, UK (1986)

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Current Research

Professor Ji Wei’s research interests cover nonlinear optics, ultrafast nonlinear spectroscopy, and optical materials for optical limiting, optical switching and other photonics applications. He has co-authored over 200 research papers, and his h-index is 44 at December 2013. Recently, his research interests have been extended to optoelectronics with carbon and 2D materials.

Selected Publications


Jeroen Anton van Kan
Associate Professor
*PhD, Vrije Universiteit Amsterdam, The Netherlands (1996)*

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**Current Research**

- Micro and Nano fabrication using Proton Beam Writing (PBW), Nano Imprint Lithograph (NIL) and mold fabrication
- Micro & Nanofluidic lab on chip devices for single molecule detection and particle separation
- Nanowire fabrication and integration
- Ion source development

**Selected Publications**

Dagomir Kaszlikowski
Associate Professor
PhD, University of Gdansk, Poland (2000)
Office : S15-03-06
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Current Research

» It has been recently shown that large systems in thermal equilibrium can be in entangled states even for high temperatures. Associate Professor Kaszlikowski is interested in how entanglement, which is one of the most fundamental properties of quantum objects, can affect thermodynamic properties of such systems (magnetic susceptibility, heat capacity etc.).
» He currently investigates a connection between entanglement and phase transitions (Bose-Einstein condensation, quantum phase transitions etc.).
» He is also interested how to detect and quantify entanglement in quantum systems where the effects of Bose-Einstein and Fermi-Dirac statistics cannot be neglected (entanglement in Fock space).

Selected Publications

Kuok Meng Hau
Professor

PhD, University of Canterbury, NZ (1978)

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Current Research
Spin dynamics and acoustic dynamics of nanostructures; magphonic, magnonic, and phononic nanostructured crystals; magnonic and phononic waveguides; spin wave nonreciprocity; laser light scattering spectroscopy (Brillouin and Raman).

Selected Publications


Christian Kurtsiefer
Professor
PhD in Experimental Physics (Atom Optics/Interferometry),
Universität Konstanz, Germany (1997)

Office : S15-02-04
Tel : (65) 6516 1250
Email : phyck@nus.edu.sg

Current Research
» Experimental Quantum Information and Communication,
» Single Photon Technologies, Atom-Light interaction

Selected Publications
Lai Choy Heng  
Professor  
*PhD, University of Chicago, Chicago, Illinois, USA (1978)*

Office : S13-03-05  
Tel : (65) 6516 2981  
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**Current Research**

» Complex networks and applications  
» Quantum information science

**Selected Publications**


Anthony J. Leggett  
Distinguished Visiting Professor  
DPhil, University of Oxford, UK (1964)  

Email: aleggett@illinois.edu / phylaj@nus.edu.sg

Current Research

» Aspects of cuprate superconductivity
» Experimentally oriented studies of basic conceptual issues in the foundations of quantum mechanics
» Superfluidity and phase coherence in very degenerate atomic gases

Selected Publications

Li Baowen
Professor

Dr. rer. nat., Carl-von-Ossietzky Universitaet Oldenburg, Germany (1992)

Office : S13-02-01
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Current Research

» Phononics - the science and engineering of heat conduction
» Thermal metamaterial
» Thermoelectronics
» Energy conversion and transport in nanoscale
» Complex networks
» Non-equilibrium statistical mechanics
» Econophysics – study of financial market and economy by physics approaches
» Waves in random media

Selected Publications


» B Li, “Now you hear me, now you don’t”, Nat. Mat. **9**, 962 (2010).
Li Wenhui
Assistant Professor
PhD, University of Virginia, USA (2005)

Office : S15-02-08
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Current Research

» Experimental atomic and molecular physics, quantum gases, quantum many-body physics.
» Collective excitation to high-lying Rydberg states from a degenerate gas of ground-state atoms in optical lattices;
» Laser cooling and trapping;
» Many-body physics with atomic Fermi gases;
» Long-range interaction and strong correlation of Rydberg gases.

Selected Publications

Liew Soo Chin
Principal Research Scientist, CRISP

PhD, University of Arizona, Tucson, USA (1989)

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Current Research

» Atmospheric Correction of hyperspectral data
» Hyperspectral data analysis and applications in land cover classification
» Derivation of optical properties and water quality parameters of sea and inland waters from remote sensing reflectance data

Selected Publications

Lim Geok Kieng  
Adjunct Assistant Professor  

DSO National Laboratories  
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Current Research  
» Solution processible graphenes and related materials  
» Ceramic processing  
» Nanomaterials  

Selected Publications  

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Current Research

Prof Lim Hock is the founding Director of Temasek Laboratories at the National University of Singapore (TL@NUS). The research areas of TL@NUS include electromagnetics, aeronautics, control and guidance, information security, signal processing and nonlinear dynamics. His personal research interest are on the dynamics of atmosphere and ocean, image restoration, synthetic aperture radar imaging, and electromagnetic materials.

Selected Publications

Paul Lim Hock Siah  
Associate Professor  
DPhil, University of Oxford, UK (1997)  
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Tel: (65) 6516 2614  
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Current Research

Associate Professor Paul Lim’s current research is centered on the theoretical calculations of acoustic phonons and dipole-exchanged spin waves in periodic nanostructures.

Selected Publications


» J. Sun, Z.K. Wang, H.S. Lim, S.C. Ng, M.H. Kuok, T.T. Tran, and X. Lu, “Hypersonic vibrations of Ag@SiO₂ (Cubic Core) -shell nanospheres”, ACS Nano 4, 7692 (2010).


Silicene is a one-atom-thick 2D crystal of silicon with a hexagonal lattice structure that is related to that of graphene but with accessible spin-orbit coupling strength and with atomic bonds that are buckled rather than flat. These subtle differences could be exploited to build electrically-gated silicene devices that generate and control spin-polarized currents with near perfect efficiency. [See Nature Communications 4, 1500 (2013).]
Lin Jianyi
Adjunct Professor

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Current Research

» Heterogeneous Catalysis and Surface Science
» Molecular Physics
» Thin Film Growth and Characterisation

Selected Publications


Alexander Ling Euk Jin
Assistant Professor
PhD, National University of Singapore (2008)

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Tel: (65) 6516 2985
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Current Research

» Assistant Professor Ling’s research group works to leverage optical technology for building compact, rugged & effective optical entanglement systems.

» He is currently working on a project called SPEQS (Small Photon-Entangling Quantum Systems) which is designed to incorporate photon-pair sources and detectors into a single package of 300 mililitres, capable of running off a single CR1220 battery for 3 hours.

Selected Publications


Dr Liu Lerwen is an Asia-based expert specializing in nanotechnology policy and business strategy, internationalization, project management, business development and education. Since 1999 she has been actively building nanotechnology networks with government agencies, R & D institutions and industries around the world, promoting nanotechnology policy, innovation, commercialization and international collaboration, especially in the Asia Pacific region.

Together with a number of nanotechnology leaders in Asia, she co-founded Asia Nano Forum (www.asia-anf.org, a nanotechnology society linking 15 Asia Pacific economies) and has been serving as the Secretary since 2004. She is passionate about promoting sustainability by: changing the minds of people through education and empowering people with knowledge, innovation and entrepreneurship to minimize carbon footprint.

With her extensive global network, knowledge and experience in green technologies, she is actively involved in creating strategic partnerships to accelerate the adoption of solutions (including innovative technologies and systems) towards sustainability. She focuses on the areas of energy and environment related innovations through global collaborations in form of infrastructure sharing, manpower exchange, collaborative research, technology transfer and joint ventures.

Selected Publications


Dr Liu Ruchuan's current research work is focused on exploring protein folding/refolding and protein-protein interactions at the molecular level using cutting-edge bio- and nano-technologies, such as AFM, magnetic tweezers, scanning confocal microscope, and TIRFM. With these techniques of single-molecule manipulation and detection, protein systems and processes usually complicated from ensemble views are targeted. Currently, single-molecule approaches are used to study mechanical, electronic and fluorescent properties of proteins and to unveil the mystery of intra-and extra-cellular signaling processes.

Selected Publications


Liu Xiang Yang
Professor

PhD (with cum laude title), University of Nijmegen, The Netherlands (1993)

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Current Research

» Biological Materials and Physics: Biomacro-molecule crystallization, self-assembly and aggregation in the bulk and at the surface; Antifreeze mechanism; Biomineralization; Silk formation mechanism; Biomimicking of structural colors, lotus leaves, etc.

» Micro/Nano Materials and Soft Materials Formation and Engineering: Supramolecular self-assembly and micro/nano architecture; Micro/nano particle self assembly; Controlled self assembly of colloidal spheres, etc.

» Crystallization, Molecular Assembly and Hybrid materials: Colloidal, biomolecule crystallization; Surface roughening; Morphologies (shapes) of crystals; Nucleation and crystals growth; Crystal network (and aggregation) formation, etc.

Selected Publications


Johan R.C. van der Maarel
Associate Professor

PhD, Leiden University, The Netherlands (1987)

Office: S13-02-03
Tel: (65) 6516 4396
Email: phyjrcvd@nus.edu.sg

Current Research

Associate Professor van der Maarel’s main interest is the dynamic assembly, complexity and emergence of complex fluids with a relevance for biology and/or nanobiotechnology. His methodology includes molecular and microbiology, nanofluidics, microrheology, light, neutron and x-ray scattering, nuclear magnetic resonance, optical, fluorescence, scanning probe and electron microscopy, and computer simulation.

Selected Publications

Ramanathan Mahendiran
Associate Professor

PhD in Experimental Physics, Indian Institute of Science, Bangalore, India (1997)

Office : S12-02-10
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Email : phyrm@nus.edu.sg

Current Research

» Oxide Spintronics : Materials, physics and devices
» Magnetic and Resistive Non-volatile Memories
» Electron correlation effects in oxides
» Magnetocalorics, Thermoelectrics and Spincaloritronics
» Multiferroics and Relaxor Ferroelectrics
» High frequency magnetotransport
» Magnetization dynamics in nanostructures
» Magnetic Shape Memory alloys
» Giant Magnetostrictive materials
» Ordered magnetic nanostructures
» Energy harvesting

Selected Publications

» S.K. Barik and R. Mahendiran, “Anomalous alternating current magnetoresistance in La_{0.5}Ca_{0.5}MnO_{1-x}NiO_x (x = 0.04)”, J. Appl. Phys. 109, 07D724 (2011).
» V.B. Naik, M.C. Lam, and R. Mahendiran, “Radio-frequency detection of structural transition and magnetoimpedance in La_{0.7}Ba_{0.1}Ca_{0.2}MnO_3”, J. Appl. Phys. 107, 09D720 (2010).
» A. Rebello and R. Mahendiran, “Current-driven discontinuous insulator-metal transition and low-field colossal magnetoresistance in Sm_{0.6}Sr_{0.4}MnO_3”, Appl. Phys. Lett. 96, 152504 (2010).
» A. Rebello, V.B. Naik, and R. Mahendiran, “Huge ac magnetoresistance of La_{0.7}Sr_{0.3}MnO_3 in sub-kilo gauss magnetic fields”, J. Appl. Phys. 106, 073905 (2009).
Jens Martin
Associate Professor
Dr. rer. nat., University of Tuebingen, Germany (1998)

Office : S13-02-01
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Email : phyjm@nus.edu.sg

Current Research

» Electronic systems in low dimensions have been intensively investigated for many years because of the novel physical phenomena emerging when the phase space of electrons is restricted. A famous example is the quantum Hall effect in 2-dim electronic systems. Moreover, the role of electron interactions is enhanced in low dimensional systems resulting in even more surprising effects, for example the appearance of fractional charge.

» Recently, the discovery of graphene introduced a new and exciting material system which enables us to investigate a truly 2-dim electronic system with relativistic electrons.

» In his research he will focus on the experimental investigation of electronic properties in graphene and other 2-dimensional systems, employing a combination of electronic transport and unconventional scanning probe techniques. In particular, he is interested in: Novel quantum Hall and topological states in mono- and bilayer graphene, Electro-mechanical interaction and artificial gauge fields, Local modification of graphene using scanning probe techniques.

Selected Publications


Current Research

Due to rich level structure, long trapping time and good isolation from environment, molecular ions confined in a Paul trap are attractive candidates for spectroscopy, precision measurements and quantum information processing. However lack of suitable transitions makes laser cooling and state detection of the molecules difficult. His group currently explores application of “quantum logic” techniques initially developed for the ion trap quantum computations, for preparation, manipulation, and detection of internal states of molecular ions.

Selected Publications

Christian Miniatura
Visiting Research Professor
PhD, Laser Physics Laboratory, University Paris 13, France (1990)

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Current Research

» Quantum Transport and Disorder
» Quantum Degenerate Gases
» Strongly Interacting Systems
» Multiple Scattering of Light

Selected Publications

Mirsaidov Utkur Mirziyodovich
Assistant Professor

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Email : phyumm@nus.edu.sg / mirsaidov@gmail.com

Current Research

» Phase transitions at *Nanoscale*
» New pathways in material synthesis
» Interfacial Liquids
» *Nanoscale* Dynamics in biological and soft matter systems
» Development of new in situ Electron Microscopy techniques.

Selected Publications

Manas Mukherjee
Assistant Professor

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Current Research
A single or few ions trapped in a linear radiofrequency ion trap and laser cooled to low temperatures provide a simple and clean quantum system. A linear chain of such ions is equivalent to a chain of quantum oscillators. He prepares such systems for different kind of studies including emulating condensed matter systems, understanding the inherent geometry of a quantum system and tests of fundamental physics. He is also interested in using trapped ions for quantum information processing and metrology. In parallel he is also developing surface based ion trap chips.

Selected Publications
Ng Chee Mang
Adjunct Assistant Professor

Email: phyncm@nus.edu.sg

Current Research
» Structural and electronic studies of strained silicon
» Advanced materials for next-generation interconnect
» Fabrication of silicon based nanowire transistors

Selected Publications
Ng Ser Choon
Part-Time Lecturer
PhD, McMaster University, Canada (1967)

Office : S12-03-10
Tel : (65) 6516 2610
Email : phyngsc@nus.edu.sg

Current Research

» Quantization of spin waves and acoustic waves in nanostructures.
» Spin waves in ferromagnetic nanowires and thin films.
» Elastic properties of nanostructured materials.
» Velocity angular dispersion of surface acoustic waves on semiconductors (e.g. Si, InSb, GaAs) and other materials (e.g. SAW-device substrates LiTaO3 and LiNbO3).
» Surface and bulk acoustic modes in passivated porous silicon.
» Ferroelectric and ferroelastic phase transitions.

Selected Publications

Cindy Ng Shao Chin  
Senior Lecturer  
*PhD, University of Adelaide, Australia (2002)*

Office : S13-02-06  
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Email : phynsc@nus.edu.sg

**Current Research**

Cosmology, dark energy, modified gravity theories

**Selected Publications**


Ng Wei Khim
Lecturer
PhD, National University of Singapore (2010)

Office : S13-02-07
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Email : phynwk@nus.edu.sg

Current Research

» Theoretical and phenomenological high energy physics:
  Neutrino physics & Matter and Anti-matter asymmetry.
» Nonlinear quantum theory: Formalism and phenomenological
  applications.
» Quantum Theory: Foundations and symmetries &
  Generalised Uncertainty Principles.

Selected Publications

» C.L. Ching, and W.K. Ng, “Generalized Relativistic Wave
  Equations with Intrinsic Maximum Momentum”, Mod.
» C.L. Ching, and W.K. Ng, “Generalized Coherent States
  under Deformed Quantum Mechanics with Maximum
» W.K. Ng, and R.R. Parwani, “Information and Particle
» W.K. Ng, and R.R. Parwani, “Probing Quantum
  Nonlinearities through Neutrino Oscillations”, Mod. Phys.
» W.K. Ng, “Nonlinear Dirac Equations with Applications to
» W.K. Ng, and R.R. Parwani, “Nonlinear Dirac Equations,
  SIGMA”, 5, 023 (2009).
Oh Choo Hiap
Professorial Fellow
PhD, University of Otago, New Zealand (1972)

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Email : phyohch@nus.edu.sg

Current Research

» Quantum information including quantum cryptography, entanglement, topological quantum computation, quantum simulation, cold atoms and quantum memory.

Selected Publications

Microwave imaging device. The lens sits in a brass dish that serves both as circular mirror and ground plate. The Maxwell Fish-eye profile is produced by a microwave metamaterial made of patterned circuit board. The inset shows the theoretical curve of $\varepsilon = n^2$ versus the simulation results for the metamaterial layers.

Ong Chong Kim  
Professorial Fellow  
*PhD, University of Manitoba, Winnipeg, Manitoba, Canada (1973)*

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Email : phyongck@nus.edu.sg

Current Research

» Superconductivity, magnetism and ferroelectricity  
» Microwave measurements and materials characterization  
» Electromagnetic materials and photonics  
» Electronics and nanostructures of oxide thin films  
» Microwave electronics

Selected Publications


Thomas Osipowicz
Associate Professor

PhD, University of Gottingen, Germany (1990)

Office : S12-03-09
Tel : (65) 6516 6745
Email : phyto@nus.edu.sg

Current Research

» Application of ion beam based techniques to a wide range of problems in materials science and solid state physics.
» Development of Nuclear Microscopy and the various analytical and lithographic techniques associated with it, eg ERDA, IBIC, RBS, Proton Beam Writing.
» Proton beam writing, a true 3D micromachining process that was invented and developed at the Centre for Ion Beam Applications (CIBA) at the physics department, NUS.
» Development and applications of high resolution (magnet spectrometer) RBS and ERD, a quantitative technique for the analysis of ultrathin film systems.

Selected Publications

Barbaros Özyilmaz  
Professor  
*PhD, New York University, USA (2004)*

Office : S13-02-10  
Tel : (65) 6516 4395  
Email : phyob@nus.edu.sg / barbaros.oezyilmaz@gmail.com

**Current Research**

» Fundamental studies of spin, charge and phonon transport in graphene nanostructures and their applications.  
» Semiconductor device application of graphene and its derivatives, e.g. Ferroelectric-graphene transistors and non-volatile memory.  
» Graphene based biomedical applications: cellular force sensing, stem cell differentiation and growth.  
» Device applications of graphene and its derivatives, e.g. graphene transistors and nonvolatile memory.

**Selected Publications**


Pan Jisheng
Adjunct Associate Professor
PhD, National University of Singapore (1998)

Tel : (65) 6874 8118
Email : phypj / js-pan@nus.edu.sg

Current Research

» Surface nanostructure formation
» Synthesis and characterization of thin film for microelectronic device fabrication
» Ion beam modification and patterning of surfaces
» Gas surface absorption
» Ion implantation and sputtering
» Industry surface analysis and consulting service

Selected Publications

Strain-engineering can be a new route for tailored graphene devices, such as confining or tunnelling barriers, as the one depicted above.

Selected Publications

Phua Kok Khoo
Adjunct Professor
PhD in Mathematical Physics, University of Birmingham, UK (1970)
Email : kkphua@wspc.com.sg

Biodata

Professor Phua Kok Khoo is the Founding Director of the Institute of Advanced Studies at Nanyang Technological University (NTU), Adjunct Professor of Department of Physics at National University of Singapore (NUS) and Chairman and Editor-in-Chief of World Scientific Publishing Co Pte Ltd.

He obtained his BSc DIC from Imperial College, London University and Ph.D. in Mathematical Physics from Birmingham University, United Kingdom and as a theoretical high energy physicist he did some interesting and useful work in particle physics, particularly in the field of phenomenology in high energy collisions.

Professor Phua is the Founding President of the South East Asia Theoretical Physics Association (SEATPA). Together with Nobel Laureate Professor C. N. Yang and other senior physicist, he is one of the founding council members of the Association of Asia-Pacific Physical Society (AAPPS).

He is an Advisory Board Member of Singapore-China Association for Advanced Science & Technology. He was elected as a Fellow of the American Physical Society (APS) for his contributions to research and education in physics in 2009 and was also awarded the IPS President’s Award by the institute of Physics Singapore (IPS) Council, for his outstanding contributions to physics research and education in Singapore in 2006. He is an Honorary Professor at Nankai University and also holding a number of honorary professorships in China.
Quek Su Ying
Assistant Professor
PhD in Applied Physics, Harvard University, USA (2006)

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Current Research

Assistant Professor Quek’s group use first principles approaches to make predictions on the electronic structure and transport properties of materials. The uniqueness of the approach is that they can combine many-electron theories with mean-field theories into a practical and predictive tool to predict transport properties in nanoscale systems. They also work closely with experimentalists to understand experimental observations and guide experiments. In particular, they have recently focused on research involving emerging 2D materials.

Selected Publications


Andrivo Rusydi
Assistant Professor

PhD, University of Groningen, The Netherlands (2006)

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Current Research

» Study of interplay of spin, charge, orbital and lattice degrees of freedom at interface and surface of novel complex systems and nanostructured strongly correlated electron systems, such magnetic materials, high temperature superconductors, organic semiconductors, and molecular electronics materials.

» Develop in-situ synchrotron-based characterizations including resonant soft X-ray magnetic scattering, spectral generalized magneto-optical spectroscopic ellipsometry (from mid-infrared to vacuum-ultraviolet) and angular resolved photoemission spectroscopy, and in-situ (ultra) film growth (atomically layer-by-layer molecular beam epitaxy) at Singapore Synchrotron Light Source.

Selected Publications


Valerio Scarani
Provost’s Chair Professor
PhD, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland (2000)

Office: S15-03-14B
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Email: physv@nus.edu.sg

Current Research

» Device-independent certification of quantum randomness.
» Complex quantum states.
» Foundations of quantum physics, in particular Bell nonlocality.
» Description of light-matter interactions (atoms, nanomechanical systems), in collaboration with experimental groups.

Selected Publications


Nidhi Sharma
Lecturer
PhD, National University of Singapore (2006)

Office : S12-02-11
Tel : (65) 6516 2959
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Current Research

» Materials synthesis and characterization
» Sol-gel method: Nano materials
» Li-ion batteries

Selected Publications

Kuldip Singh
Associate Professor
PhD, National University of Singapore (1995)

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Current Research

» Geometrical Methods in Physics
» Quantum Algebras
» Quantum Theory

Selected Publications

Sow Chorng Haur
Professor
*PhD, University of Chicago, USA (1998)*

Office : S12-02-19
Tel : (65) 6516 2957
Email : physowch@nus.edu.sg

**Current Research**

» Studies of hybrid nanostructured functional materials and their unique electrical, optical and mechanical properties.

» Investigation of potential applications of these nanostructured materials as field emitter, photo-sensor, transistor, etc.

**Selected Publications**


Tan Meng Chwan
Associate Professor
PhD, National University of Singapore (2007)

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Tel: (65) 6516 5376
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Current Research

» M-theory, string theory, quantum field theory, and their deep implications for contemporary mathematics.
» Emergent spacetime in quantum theories of gravity.

Selected Publications

 Bernard Tan Tiong Gie
Professor
DPhil in Electronics, University of Oxford, UK (1968)

Office: S12-02-13
Tel: (65) 6516 2615
Email: phytanb@nus.edu.sg

Current Research

» Microwave applications of semiconductors and dielectrics.
» Digital musical sound analysis and synthesis.
» Psychoacoustics of time-delayed multiple sound sources.

Selected Publications

Tay Seng Chuan
Associate Professor
PhD, National University of Singapore (1999)

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Tel : (65) 6516 8752
Email : pvotaysc@nus.edu.sg

Current Research

» Discrete-Event Systems
» Parallel Simulation
» Information Technology and Applications in Education

Selected Publications

Edward Teo Ho Khoon
Associate Professor
PhD, University of Cambridge, UK (1994)

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Email : phyteoe@nus.edu.sg

Current Research
Associate Professor Edward Teo’s research lies in the areas of General Relativity and Gravitation. He is very interested in exact solutions of general relativity, particularly those describing black holes. More recently, he has been focusing on black holes and black rings in higher dimensions.

Selected Publications

Teo Kien Boon  
Adjunct Associate Professor  
*PhD, Massachusetts Institute of Technology, USA (1994)*

DSO National Laboratories  
Tel: (65) 6796 8345  
Email: phytkb@nus.edu.sg

**Current Research**

» Quantum information and communications.  
» Quantum field theory.  
» Applied chaos.  
» Other applied physics topics for defence and national security applications.

**Selected Publications**

Tok Eng Soon  
Associate Professor  
*PhD, Imperial College, London, UK (1998)*  

Office : S13-03-06  
Tel : (65) 6516 1192  
Email : phytkes@nus.edu.sg

Current Research

Associate Professor Tok Eng Soon's research group aim to understand the fundamental relationship between surface chemistry and physics with growth and material properties of low dimensional structures (wells, wires, dots and clusters) at the atomic scale. Research emphasis is placed on elucidating surface structure, reaction kinetics and energetics, surface and interface analysis, scaling phenomena and growth processes (adsorption, desorption, nucleation and self-assembly) occurring on surfaces and interfaces of semiconducting materials.

Selected Publications

» H. Johll, M.D.K. Lee, S.P.N. Ng, H.C. Kang, and E.S. Tok,  


» W.J. Ong, and E.S. Tok, “Real time dynamics of Si magic clusters mediating phase transformation: Si(111)-(1x1) to (7x7) reconstruction revisited”, *Surf. Sci.* 606, 1037 (2012).


Mankei Tsang
Assistant Professor
PhD, California Institute of Technology, USA (2006)

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Email : phytmk / eletmk@nus.edu.sg

Current Research

» Quantum Measurement and Control Theory
» Quantum Optics
» Nano-Optics
» Nonlinear Optics

Selected Publications

The image is of an event-by-event Monte Carlo simulation of MeV protons (i.e. with millions of electron-volts of energy) plunging into a material. The protons lead to secondary electron (delta-ray) cascades (seen as fiery streaks) that are the predominant mode of energy deposition.
Vlatko Vedral
Professor
PhD, Imperial College, London, UK (1998)
Office : S15-03-08
Tel : (65) 6516 5874
Email : phyvv@nus.edu.sg

Current Research

» Many body entanglement
» Geometrical phases and quantum computation
» Generalised entropies in information theory and physics
» Cluster state quantum computation

Selected Publications

Thirumalai Venky Venkatesan  
Provost's Chair Professor  

PhD, University of New York and Bell Laboratories, USA

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Tel : (65) 6516 5187  
Email : venky@nus.edu.sg

Current Research

» Nanoscience
» Nanotechnology

Selected Publications


José Carlos Viana-Gomes
Assistant Professor

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Email : phyvjc@nus.edu.sg

Current Research


Selected Publications
Wang Haifeng  
Assistant Professor  
*PhD, Purdue University, the School of Electrical and Computer Engineering.*  
*West Lafayette, Indiana, USA (2003)*

Office : S13-M-01  
Tel : (65) 6516 6977  
Email : phywh@nus.edu.sg

**Current Research**

» Coherent Raman microscopy (CARS or SRS) and their applications  
» Nonlinear Optics

**Selected Publications**

Wang Jian-Sheng
Provost's Chair Professor

PhD, Carnegie-Mellon University, Pittsburgh, USA (1987)

Office : S12-02-17
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Email : phywjs@nus.edu.sg

Current Research

» Professor Wang’s research focus is on the problems of quantum thermal transport in nanostructures and the development of nonequilibrium Green’s function (NEGF) method for such problems. Most recently, he studies full counting statistics of heat transport in junctions. Other topics of current interests include molecular dynamics simulation with quantum baths, transport in oxides, quantum master equation approach to heat transport, Joule heating and electron-phonon interaction.

» His earlier research has been in Monte Carlo method and cluster algorithms for efficient computer simulations in statistical physics.

Selected Publications


Real parts of the eigenvalues as functions of the coupling constant $g$ with the imaginary Hénon-Heiles potential $V(x,y) = ig(xy^2 - \frac{1}{3}x^3)$. 

Selected Publications

Wang Shijie
Adjunct Associate Professor
PhD, National University of Singapore (2002)

Tel : (65) 6874 8184
Email : phywangs@nus.edu.sg

Current Research

» Nanoelectronics and nanophotonics
» Surface and interface physics: high-resolution transmission electron microscopy, in-situ x-ray photoemission spectroscopy and first-principles calculations.
» Functional oxide growth: Pulsed laser deposition and ultra-high vacuum sputtering.

Selected Publications

Green Gold: Gold nanoparticles covered with PTCDA molecules. Their height and lateral size are about 2 nm and 3-5 nm, respectively. Their plasmonic resonance is strongly blue-shifted so they may appear green instead of golden. Additionally, they are effective catalyst for CO conversion to CO2.
Wang Zhisong
Associate Professor
Dr. rer. nat., University of Tuebingen, Germany (1998)

Office : S12-03-18
Tel : (65) 6516 2606
Email : phywangz@nus.edu.sg

Current Research
Unified frontier of biological & nano-machine physics
Bioinspired artificial nanomotors motor protein biophysics

Selected Publications
A MeV transmission ion image of a lung fibroblast cell.

This novel technology, developed in the department of Physics, represents a new way of imaging whole biological cells at nm resolutions without the need for sectioning: A beam of MeV helium ions, focused to 25 nm, passes through the cell without loss of spatial resolution. The image, which shows structural details from inside the cell, is formed by measuring the energy loss of each ion as they pass through the cell.

Centre for Ion Beam Applications, Dept of Physics, NUS.
Andrew Wee Thye Shen  
Provost's Chair Professor  
*DPhil, University of Oxford, UK (1990)*

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Tel : (65) 6516 6362  
Email : phyweets@nus.edu.sg

**Current Research**

Professor Wee’s research interests are in the field of surface and interface science, and include scanning tunneling microscopy (STM) and synchrotron radiation studies of the molecule-substrate interface, organic-organic heterojunctions, graphene and 2D materials and devices.

**Selected Publications**


**Scanning tunneling microscopy/spectroscopy (STM/STS) data showing a single-layer (SL), bilayer (BL) and trilayer (TL) molybdenum disulfide (MoS2) [Nature Comm. (2015)]**
Nikolai Yakovlev  
Adjunct Associate Professor  

**PhD, Ioffe Physico-Technical Institute, St.Petersburg, Russia (1987)**  
Email : niko-y@imre.a-star.edu.sg

Current Research

- Technology in ultra high vacuum, deposition of thin films, study of their properties using electron and X-ray diffraction, optical spectroscopy, scanning probe microscopy, precision ellipsometry.
- Study of structural and magnetic properties of epitaxial films and atomic arrangement on surfaces and interfaces.
- Study of composition of surfaces and multilayer structures using secondary ion mass spectrometry.

Selected Publications

Schematic representation of a magnetic tweezers setup to stretch short DNA molecules or proteins. (A) The DNA or protein is tethered between a paramagnetic bead and a coverslip surface. Force is applied to the bead by a pair of permanent magnets above the sample, and changing the distance between the magnets and the bead controls the magnitude of the force over a range from 0.1 pN to 200 pN. A bead stuck on the surface is used as a reference to eliminate drift in three dimensions. (B) Schematic representation of the application of the instrument to study interaction between a short DNA and a DNA bending protein. Association and disassociation of the protein lead to change in DNA extension which is monitored by the change in the height of the bead at a sub-nanometer resolution in real time.

Yan Jie
Dean's Chair Associate Professor

PhD in experimental biophysics, University of Illinois, Chicago, USA (2005)
PhD, Institute of Theoretical Physics of CAS, China (1998)

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Tel : (65) 6516 2620
Email : phyyj@nus.edu.sg

Current Research
Micromechanics of various DNA structures, their transitions and functions; Micromechanics of cytoskeleton proteins and their roles in mechanosensing process of cells; Major nucleoid associated proteins in E. Coli and their roles in DNA packaging and gene regulations; Single-stranded DNA binding proteins and their roles in DNA damage repairing.

Selected Publications
Abel Yang Jiahui  
Lecturer  
PhD, University of Virginia, USA (2012)  
Office : S13-02-08  
Tel : (65) 6516 1246  
Email : phyyja@nus.edu.sg  

**Current Research**  
Galaxy clustering, cosmology, large scale structure of the universe, dark matter and astronomy education.

**Selected Publications**

Yeo Ye
Senior Lecturer
PhD, University of Cambridge, UK (2004)

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Email: phyy / sciyeoy@nu.edu.sg

Current Research

Dr. Yeo’s current research interest is in quantum entanglement associated with many parties. It lies at the heart of quantum information processing. Entanglement is one of the most striking features of quantum mechanics, but it is also one of its most counterintuitive consequences of which we still have rather incomplete knowledge. Although the concentrated effort during the past decade has produced impressive progress, there is no general qualitative and quantitative theory of entanglement. It is hoped that we would be able to gain more understanding about the nature of multipartite entanglement by analyzing the roles of multipartite entangled states in various quantum information processes.

Selected Publications

Yu Ting
Associate Professor
PhD, National University of Singapore (2003)
Email: phyyut@nus.edu.sg or yuting@ntu.edu.sg

Current Research
Nanoscience and Nanotechnology

Selected Publications


Dr. Zhang Chun’s research is focused on the theoretical modeling and simulation of materials at nanoscale, such as molecules, nanowires and thin films. Related interests are nano electronics/spintronics and nanocatalysis.

Selected Publications


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