Mark A. Novotny - biography

Mark A. Novotny is honored to be the Fulbright Distinguished Chair at Charles University in the Matematicko-fyzikální fakulta for the 2016-2017 academic year. Prof. Novotny was born in the US, and earned his B.S. degree in physics in 1973 from North Dakota State University and his Ph.D. in physics from Leland Stanford Junior University in 1978. He is currently a Giles Distinguished Professor in the Department of Physics and Astronomy at Mississippi State University (MSU), and has served as Head of the Department since 2001. He was the founding Director of the MSU High Performance Computing Collaboratory (HPC^2) Center of Computational Sciences (CCS). Prior to joining MSU he was employed at the US institutions of the University of Georgia, Northeastern University, and Florida State University, as well as the IBM Scientific Centre in Bergen, Norway,

Prof. Novotny has published more than 200 articles in refereed journals. He is co-inventor of a US patent entitled 'Fully Scalable Computer Architecture' and is the inventor of US provisional patents related to quantum nanodevices and to quantum computers. He has mentored in research eighteen graduate students, seventeen undergraduate students and sixteen postdoctoral associates. He has received external funding from the National Science Foundation, the US Department of Energy, the US Army, and the US Air Force. He has delivered over one hundred presentations at national and international meetings and institutions in the last decade, including over thirty invited presentations.

His past research areas are in computational materials physics, including algorithm development for bridging disparate time scales. He has studied extensively nucleation and growth phenomena in magnetic thin films and nanomaterials. Better understanding of the time scales involved in the dynamics of nanomagnets affects virtually everyone in today's technological society. Your data is primarily stored on magnetic nanoparticles, and the time scales extend from an inverse phonon frequency (about 10^{-13} sec) to the time to write a data bit (10^{-9}sec) to how long you want your data to remain stored (10^{9} sec). Nanomagnets also enable measurement of the last magnetic field reversal of the Earth, (about 10^{13} sec). The time spanned by algorithms of Prof. Novotny for nanoparticle dynamics is as many decades in time as the number of decades between the volume of a raindrop and all the water on Earth.

The current research of Prof. Novotny centers on three areas regarding the utilization of quantum mechanics in future enhanced technologies. One research area is electron transport through nanodevices, where he discovered ‘quantum dragons’ wherein electrons of all energies can have complete transmission through the nanodevice even for arbitrarily strong scattering [1]. Another research area concerns advancement and use of quantum computers, in particular adiabatic quantum computers [2]. A third research area is how quantum statistical mechanics is approximated by classical statistical mechanics for finite closed quantum systems [3], with potential applications to quantum computing.

Prof. Novotny became a Fellow of the American Physical Society (APS), nominated by the Division of Computational Physics (DCOMP), in 2000 "For original algorithm development and applications of computational statistical mechanics to equilibrium and non-equilibrium problems in condensed-matter physics and materials science". He received the Faculty Research Award from the College of Arts & Sciences in 2006. In 2011 he was named 'Outstanding Referee' by the APS. In 2012 he received a 'Dynasty Foundation Visiting Scientist' award to spend a fortnight in Russia. He became a Fellow of the American Association for the Advancement of Science (AAAS) from the Section on Physics in 2012. He became a Giles Distinguished Professor at MSU in 2013, the top honor bestowed on a faculty member at MSU.

Recent Select References

[1] M.A. Novotny, "Energy-independent total quantum transmission of electrons through nanodevices with correlated disorder", Physical Review B **90**, 165103 [14 pages] (2014).

[2] M.A. Novotny, Q.L. Hobl, J.S. Hall, and K. Michielsen, "Spanning tree calculations on D-Wave 2 machines", from "International conference on computer simulation in physics and beyond 2015" held in Moscow, Russia, Journal of Physics: Conference Proceedings **681**, 012005 [13 pages] (2016).

[3] M.A. Novotny, F. Jin, S. Yuan, S. Miyashita, H. De Raedt, and K. Michielsen, "Quantum decoherence and thermalization at finite temperature within the canonical thermal state ensemble", Physical Review A **93**, 032110 [46 pages] (2016).