CURRICULUM VITAE
Jerry A. Simmons

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Education:

Ph. D., Electrical Engineering, Princeton University 1990

Thesis: *"Resistance Fluctuations and Charge Measurements in Narrow AlGaAs/ GaAs Heterostructures in the Integral and Fractional Quantum Hall Regimes"*

Obtained first direct evidence for the existence of fractionally charged particles in the fractional quantum Hall effect.

Advisor: Prof. Dan C. Tsui, 1998 Nobel Laureate in Physics

M. A., Electrical Engineering, Princeton University 1986

B. A., Physics (Honors), New College of Florida 1982

B. A., Philosophy (Honors), New College of Florida requirements completed 1981

Professional Experience:

4/2004 – Present: Deputy Director/Senior Manager, 1100 Center for Physical, Chemical, and Nano Sciences, Sandia National Laboratories

Senior Manager overseeing three Center 1100 R&D Departments (comprising roughly 60 individuals), whose managers report to me. Departments include Dept. 1123, Semiconductor Material and Device Sciences; Dept. 1126, Advanced Materials Sciences; and Dept. 1128, Lasers, Optics, & Remote Sensing. As a Deputy Director, contribute to long range planning and strategic investment in emerging new science fields, including hiring of new staff, purchase of new capital equipment capabilities and facilities; and incubation of new partnerships with sponsors and other institutions. Participate in long-range planning for Sandia's Energy, Climate, and Infrastructure Security (ECIS) business unit.

Incubated new S&T and developed new programs in innovative new technology areas for a wide variety of customers, working in partnership with other Centers at Sandia. New S&T capabilities and new programs were developed in areas of photonic lattices, Terahertz sources and detectors, quantum computing, and metamaterials. This included participating in the development of major new innovations in THz device components such as a THz frequency quantum cascade laser with record long wavelength and high temperature operation; a novel plasmonic detector that acts as a spectrometer-on-a-chip; and progress towards the demonstration of a double quantum dot qubit in silicon.

Served as chair (FY2006, FY2007, FY2011) and member (since 2001) in the Nanoscience-To-Microsystems LDRD (Lab Directed R&D) Investment Area Team, which manages ~$20M/year in internal research funds devoted to fundamental materials science, semiconductor devices, and nanoscience & nanotechnology. Coordinated portfolio assessment, proposal calls, proposal evaluations, and funding decisions.

Served as founder and program manager for Sandia's Solid State Lighting (SSL) program since 2000. This included the initiation and management of the SSL Grand Challenge LDRD in 2000-2004; leadership in the establishment of a national R&D initiative by DOE; providing technical background information to congress; capturing of more than 12 new R&D projects through DOE's Office of Energy Efficiency and Renewable Energy; capturing 3 new SSL-related projects from DARPA; and promoting new SSL R&D activity within DOE's Office of Science. Worked extensively with industrial companies in solid state lighting to start collaborative R&D projects and develop national strategies to advance US technology, including Philips, GE, KLA-Tencor, Cree, Kodak, Veeco, Applied Materials, Dow Corning, etc.

4/2004 – Present: Lab Coordinator, DOE Office of Basic Energy Sciences/ Materials Programs, Sandia National Laboratories

Oversee all of Sandia's programs in the DOE Office Basic Energy Sciences' Division of Materials Sciences & Engineering (DMSE). This program consists of 7 large core program projects and participation in seven Energy Frontier Research Centers (one led by Sandia) with a total annual budget of ~$17M. Activities include managing the core projects, developing new science directions for new project incubation, and serving as the primary interface with BES/DMSE. The BES/DMSE portfolio has grown substantially in recent years with the addition of new core program projects and the new Energy Frontier Research Centers.

8/2009 – Present: Director, Energy Frontier Research Center (EFRC) for Solid State Lighting Science

Served as director of the DOE/Office of Science *Energy Frontier Research Center for Solid State Lighting Science*, established in 2009 and funded at $18M over five years. Jerry coordinated the proposal writing; oversees and coordinate the research activities and technical directions; establishes and maintains scientific standards; oversees interactions with research partners in industry and academia; and is responsible for interfacing with DOE/Office of Science and public outreach. (See http://ssls.sandia.gov.)

5/2007 – 10/2007: Acting Co-Director, Center for Integrated Nanotechnologies (CINT)

Served as acting Sandia Co-Director of CINT, a DOE Nanoscale Science Research Center with an annual operating budget of $18.5M, during the search for a permanent Co-Director. In conjunction with the Los Alamos Co-Director, set policy for user programs; helped CINT scientists establish their laboratories in a new $65M building with new equipment. Recruited new personnel to establish Nanophotonics as a research thrust. Strengthened crosslinking between CINT personnel located in Albuquerque and in Los Alamos.

5/2000 – 4/2004: Manager, Dept. 1123 Semiconductor Material and Device Sciences

Served as Manager of the Semiconductor Material and Device Sciences Department, consisting of approximately 25 researchers. Major activities in the department included AlInGaN materials growth for short wavelength optoelectonic devices and high power electronics for radar; design of novel blue and UV LEDs and vertical cavity surface emitting lasers (VCSELs); quantum transport theory and experiment, including double quantum wells, 1D wires, quantum dots, and the integer and fractional quantum Hall effect; exciton transport in alloys and disordered semiconductors; bandstructure of novel semiconductor alloys as a function of strain, temperature, pressure, and composition; ultra-high mobility AlGaAs/GaAs MBE materials growth; laser gain theory; nanoelectronic device physics.

Initiated, managed, and provided technical leadership of new multi-center programs in Solid State Lighting (30 people, $3.3M/yr); Solid State UV emitters for DARPA chem./bio detection (9 people, ~$1M/yr); nanoelectronics and nanophotonics (11 people, $1.5M/yr) and others. Total dept. budget of ~$5M/yr. Also, served as Thrust Leader for Nanoelectronics & Nanophotonics in the DOE Center for Integrated Nano-Technologies (CINT).

9/1990 – 5/2000: Principal Member of Technical Staff, Semiconductor Material and Device Sciences Dept., Sandia National Laboratories

Established Sandia's nanoelectronics research program in 1991, and served as lead principal investigator on the large majority of nanoelectronics physics research projects at Sandia. Areas included quantum tunneling transistors and other quantum tunneling devices, THz optical detectors based on photon-assisted tunneling, the integer and fractional quantum Hall effects, physics of 1D quantum wires and 0D quantum dots, composite fermions, skyrmions and other spin excitations, double layer and multi-layer (quasi-3D) electron systems, edge states of Luttinger liquids, and physics of 2D-2D-tunneling. Directly supervised the core nanoelectronics measurement group, consisting of a technician, two post-docs, and two graduate students. In addition, coordinated much of the nanoelectronics work of other senior staff members, including theorists, semiconductor crystal growers, electron-beam lithographers, and optical scientists. Responsible for setting research directions, conceiving new experiments, establishing collaborations in nanoelectronics with several universities and other government labs, pursuing and maintaining funding for nanoelectronic projects, and for coordinating and overseeing journal publications and conference presentations. In this position obtained and oversaw the utilization of ~$1M/year in research funding.

1998-2004, Adjunct Asst. Professor, Dept. of Physics, Univ. of New Mexico, Albuquerque. Dissertation co-advisor for doctoral candidate Mark Blount.

1992-1997, Adjunct Asst. Professor, Dept. of Electrical Eng., Oregon State Univ., Corvallis Was dissertation advisor for Nathan Harff, who took a postdoc position at the Max Planck Inst., Stuttgart, Germany. He is currently on staff at the Mayo Research Foundation.

1984-1990, Research and Teaching Assistant, Dept. of Electrical Engineering, Princeton Univ. Graduate student working in area of quantum electron transport and integer and fractional

quantum Hall effects, under Prof. Daniel Tsui.

1982-1984, Senior Technical Associate, Physics and Chemistry Research Division, Bell Laboratories, Murray Hill, New Jersey. Semiconductor physics technician, in department of Mort Panish.

Professional Honors and Awards:

Fellow, American Association for the Advancement of Science, *"For outstanding accomplishments in semiconductor science and technology through personal research and leadership of group efforts, particularly in low dimensional physics and solid state lighting*," (2008)

Fellow, American Physical Society, *"For outstanding contributions to the physics of tunneling in two-dimensional electronic materials, including fractional quantum Hall and double quantum well systems,"* (2002)

Sandia Employee Recognition Award, *"For exceptional leadership of Sandia's Basic Energy Sciences (BES) Materials Science and Solid-State Lighting (SSL) programs,"* (2010)

Sandia National Security Leadership Development Program Level II (2010 – 2011)

Merit Award, Lockheed Martin Basic Employee Stock Option Program, (for Solid State Lighting leadership, 2004)

Sandia Employee Recognition Award, Solid State Lighting Team (J.A. Simmons, team lead), "For pioneering contributions to, and for service as our nation's leading public resource in, solid-state lighting (SSL) science and technology," (2003)

Sandia's National Security Leadership Program (2001-2002)

Lockheed Martin Institute for Leadership Excellence Program (2001-2002)

Industry Week magazine's Technology of the Year Award (1998)

Sandia Award for Excellence for the Quantum Tunneling Transistor (1997)

New Jersey Garden State Graduate Fellowship (1984-1988)

NSF Graduate Fellowship Hon. Mention (1984)

American Physical Society Industrial Intern, Xerox Webster Research Ctr. (1982)

Best Student Paper of the Year, Florida Philosophical Association (1981)

NSF Summer Intern, James Frank Inst., Univ. of Chicago (1981)

National Merit Semifinalist, 1976

Selected Service Activities:

Member, Solid State Sciences Committee, National Academy of Sciences, 2010-present

Panel Member, Solid State Lighting Panel, DOE/BES Workshop on Science for Energy Technology, 2010

Member, Independent Review Panel, Chemical and Biological Defense (CBD) S&T Program, under Jean Reed, Special Assistant to Secretary of Defense, DOD, 2009

Panel Member, International Energy Agency (IEA) Experts Group on Science for Energy, 2009 -

present
Member, Nanophotonics Assessment Committee, National Academy of Sciences, 2006-2007
Co-Chair, LED Panel, DOE/BES Basic Research Needs for SSL Workshop, 2006
Conference Chair, 16th Int. Conference on the Electronic Properties of 2D Systems (EP2DS-16), Albuquerque, NM, July 10-15, 2005

Publications:

[1] "Quantum Interference Effects In High-Mobility Mesoscopic GaAs/AlGaAs Heterostructures," J. A. Simmons, D. C. Tsui, and G. Weimann, Surf. Sci. 196, 81 (1988).

[2] "Resistance Fluctuations In Narrow GaAs/AlGaAs Heterostructures: Direct Evidence Of Fractional Charge In The Fractional Quantum Hall Effect," J. A. Simmons, H. P. Wei, L. W. Engel, D. C. Tsui, and M. Shayegan, Phys. Rev. Lett. 63, 1731 (1989).

[3] "Electron Waveguide Junctions: Scattering From A Microfabrication-Imposed Potential," M. L. Roukes, T. J. Thornton, A. Scherer, J. A. Simmons, B. P. Van der Gaag, and E. D. Beebe, in Science and Engineering of 1D and 0D Semiconductors, ed. by S. P. Beaumont and C. M. Sotomayor-Torres (Plenum, 1989).

[4] "Low-Frequency Noise In Transport Through Quantum Point Contacts," Y. P. Li, D. C. Tsui, J. J. Heremans, J. A. Simmons, and G. W. Weimann, Appl. Phys. Lett. 57, 774 (1990).

[5] "Resistance Fluctuations In The Integral- And Fractional-Quantum-Hall-Effect Regimes," J. A. Simmons, S. W. Hwang, D. C. Tsui, H. P. Wei, L. W. Engel, and M. Shayegan, Phys. Rev. B 44, 12933 (1991).

[6] "Quantum Interference In Two Independently Tunable Parallel Point Contacts," S. W. Hwang, J. A. Simmons, D. C. Tsui, M. Shayegan, Phys. Rev. B 44, 13497 (1991).

[7] "Quantum Interference In Two Independently Tunable Parallel Quantum Point Contacts, J. A. Simmons," S. W. Hwang, D. C. Tsui, M. Shayegan, Superlattices and Microstructures 11, 223 (1992).

[8] "Quasiparticle Charge Of 1/3 Fractional Quantum Hall Liquid From Resistance Fluctuation Measurements," S. W. Hwang, J. A. Simmons, D. C. Tsui, M. Shayegan, Surface Science 263, 72 (1992).

[9] "Linear Response Theory Of Inter-Quantum-Well Tunneling In A Double-Well Structure With In-Plane Magnetic Fields," S. K. Lyo and J. A. Simmons, *J. Phys.: Condens. Matter* **5**, L299 (1993).

[10] "Submicrometer Control Of Two-Dimensional -- Two-Dimensional Magneto-Tunneling In Double Well Heterostructures," J. A. Simmons, S. K. Lyo, J. F. Klem, M. E. Sherwin, and J. R. Wendt, *Phys. Rev. B* **47**, 15741 (1993).

[11] "A Frequency To Voltage Converter Based On Bloch Oscillations In A Capacitively Coupled Gaas-Gaalas Quantum Well," D. H. Dunlap, V. Kovanis, R. V. Duncan, and J. Simmons, *Phys Rev. B* **48**, 7975 (1993).

[12] "Hybrid Shubnikov-De Haas--Photoluminescence Analysis Of Two Dimensional Electron Density In P-HEMT Structures With Heavily-Doped Contact Layers," M. L. Lovejoy, J. A. Simmons, P. Ho, and P. A. Martin, *Appl. Phys. Lett.* **64**, 3634 (1994).

[13] "Conductance Modulation In Double Quantum Wells Due To Magnetic Field--Induced Anticrossing," J. A. Simmons, S. K. Lyo, N. E. Harff, and J. F. Klem, *Phys. Rev. Lett.* **73**, 2256 (1994).

[14] "Parallel Quantum Point Contacts Fabricated With Independently Biased Gates And A Sub-Micrometer Air-Bridge Post," M. E. Sherwin, J. A. Simmons, T. M. Eiles, N. E. Harff, and J. F. Klem, *Appl. Phys. Lett.* **65**, 2326 (1994).

[15] "Observation Of Extreme Field-Induced Mass Deviations In Double Quantum Wells," J. A. Simmons, N. E. Harff, and J. F. Klem, *Phys. Rev. B* **51**, 11156 (1995).

[16] "Magnetic Field Induced Minigap In Double Quantum Wells," J. A. Simmons, N. E. Harff, S. K. Lyo, and J. F. Klem, in *Proceedings of the 11th International Conference on the Application of High Magnetic Fields in Semiconductor Physics*, ed. by D. Heiman, (World Scientific, 1995)

[17] "Field-Induced Minigap And Transport With In-Plane Magnetic Fields In Double Quantum Wells," S. K. Lyo, J. A. Simmons, and N. E. Harff, in *Proceedings of the 22nd International Conference on the Physics of Semiconductors*, ed. by D.J. Lockwood (World Scientific, 1995).

[18] "Giant Effective Mass Deviations Near The Magnetic Field-Induced Minigap In Double Quantum Wells," N. E. Harff, J. A. Simmons, S. K. Lyo, J. E. Schirber, J. F. Klem, and S. M. Goodnick, in *Proceedings of the 22nd International Conference on the Physics of Semiconductors,* ed. by D.J. Lockwood (World Scientific, 1995).

[19] "High Quality Single And Double Two-Dimensional Electron Gases Grown By Metalorganic Vapor Phase Epitaxy," H. C. Chui, B. E. Hammons, J. A. Simmons, N. E. Harff, and M. E. Sherwin, *Appl. Phys. Lett.* **67**, 1911 (1995).

[20] "Magnetic Focusing In Parallel Quantum Point Contacts," T. M. Eiles, J. A. Simmons, M. E. Sherwin, and J. F. Klem, *Phys. Rev. B* **52**, 10756 (1995).

[21] "2 x 10^6 cm^2/Vs Electron Mobility By Metalorganic Chemical Vapor Deposition With Tertiarybutylarsine," H. C. Chui, B. E. Hammons, N. E. Harff, J. A. Simmons, and M. E. Sherwin, *Appl. Phys. Lett.* **68**, 208 (1996).

[22] "Magnetic-Field-Induced Tunneling And Minigap Transport In Double Quantum Wells," S. K. Lyo, J. A. Simmons, N. E. Harff, T. M. Eiles, and J. F. Klem, Compound Semiconductors 1995, Y.S. Woo. Bristol, IOP Publishing Ltd., *Institute of Physics Conference Series* **145**, 845 (1996).

[23] "Extreme Field-Induced Cyclotron Mass Variations In Coupled Double Quantum Wells," N. E. Harff, J. A. Simmons, and J. F. Klem, Solid State Electronics **40**, 29 (1996).

[24] "Tuning a Double Quantum Well Fermi Surface with In-Plane Magnetic Fields," J.A. Simmons, N. E. Harff, T.M. Eiles, S.K. Lyo, and J.F. Klem, *Surface Science* **362**, 138 (1996).

[25] "Novel Magnetic-Field-Induced Minigap And Transport In Coupled Double Quantum Wells," S. K. Lyo, J. A. Simmons, N. E. Harff, and J. F. Klem, in *35 Years of Condensed Matter Physics:Proceedings of the Raymond L. Orbach Symposium*, ed. By D. W. Hone (World Scientific, 1996), pp. 1-12.

[26] "Advanced Fabrication Technologies For Nano-Electronics," J. A. Simmons, M. E. Sherwin, M. Weckwerth, N. E. Harff, T. M. Eiles, W. E. Baca, H. Q. Hou, and B. E. Hammons, *Proceedings of the 24th State-Of-The-Art Program on Compound Semiconductors*, ed. by F. Ren et al., (Electrochemical Society Proceedings Vol. 96-2, Pennington, New Jersey, 1996) pp. 186-202.

[27] "Quantum Effect Device Research At Sandia National Laboratories," R. V. Duncan and J. A. Simmons, *Proceedings of the International Conference on Integrated Micro-Nanotechnology for Space Applications,* Houston, TX 10/30-11/3/95.

[28] "Epoxy Bond And Stop-Etch (Ebase) Technique Enabling Backside Processing Of (Al)Gaas Heterostructures," M. V. Weckwerth, J. A. Simmons, N. E. Harff, M. E. Sherwin, M. A. Blount, W. E. Baca, and H. C. Chui, Superlattices and Microstructures **20**, 561 (1996).

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[32] "Magnetic Breakdown in Double Quantum Wells," N. E. Harff, J. A. Simmons, G. S. Boebinger, J. F. Klem, L. N. Pfeiffer, and K. W. West, in Proceedings of the 23rd International Conference on the Physics of Semiconductors, ed. by D.J. Lockwood (World Scientific, 1996), p. 2199.

[33] "Magnetic Breakdown and Landau Level Spectra of a Tunable Double-Quantum-Well Fermi surface," N.E. Harff, J.A. Simmons, S. K. Lyo, J.F. Klem, G.S. Boebinger, L. N. Pfeiffer, and K. W. West, Phys. Rev. B 55, R13405 (1997).

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[36] "Landau-Level Formation and Magnetic Breakdown in Coupled Double Quantum Wells," N. E. Harff, J. A. Simmons, S. K. Lyo, J. F. Klem, G. S. Boebinger, L. N. Pfeiffer, and K. W. West, Physica E 1, 185 (1997).

[37] "Unipolar Complementary Bistable Memories Using Gate-Controlled Negative Differential Resistance In A 2D-2D Quantum Tunneling Transistor, " J. A. Simmons, M. A. Blount, J. S. Moon, W. E. Baca and M. J. Hafich, Proceedings of the 1997 International Electron Devices Meeting, Washington DC, p. 755 (1998).

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[39] "Gate-Controlled Double-Electron Layer Tunneling Transistor and Singe Transistor Digital Logic Applications," J. S. Moon, J. A. Simmons, M. A. Blount, W. E. Baca, J. L. Reno, and M. J. Hafich, Elect. Lett. **34**, 921 (1998).

[40] "In-Plane Magnetoresistance Studies of an Extremely Coupled Double Quantum Well," M. A. Blount, J. A. Simmons, S. K. Lyo, Phys. Rev. B **57**, 14882 (1998).

[41] "Bandgap renormalization: GaAs/AlGaAs quantum wells," E.D. Jones, M.A. Blount, W. Chow, H. Hou, and J.A. Simmons. Physics and Simulation of Optoelectronic Devices VI, Pts 1 and 2. A. Osinski. Bellingham, SPIE-Int. Soc Optical Engineering, 3283: 350-356.

[42] "Dirac II Series in 800 T Fields: Reflectivity Measurements on Low-Dimensional, Low Electron-Density Materials," J. S. Brooks, L. E. Engel, J. Cothern, J. A. Simmons, M. J. Hafich, W. Lewis, S. Gallegos, D. Devore, B. Marshall, M. Grover, G. Leach, C. H. Mielke, Physica B **246**, 50 (1998).

[43] "Bandgap Renormalization Studies Of n-Type GaAs/AlGaAs Single Quantum Well," E. D. Jones, M. Blount, W. Chow, H. Hou, and J. A. Simmons, Compound Semiconductors 1997: Institute of Physics Conference Series **156**, 187 (1998).

[44] "Magnetoresistance And Cyclotron Mass In Strongly-Coupled Double Quantum Wells Under In-Plane Magnetic Fields," M. A. Blount, J. A. Simmons, S. K. Lyo, N. E. Harff, and M. V. Weckwerth, Institute of Physics Conference Series 156, 275 (1998).

[45] "Magnetic Breakdown and Landau Level Spectra of a Tunable Double-Quantum-Well Fermi surface," N.E. Harff, J.A. Simmons, S. K. Lyo, G.S. Boebinger, J. F. Klem, L. N. Pfeiffer, and K. W. West, Physica B 251, 845 (1998).

[46] "Magneto-Quantum-Resistance Oscillations in Tunnel-Coupled Double Quantum Wells in Tilted Magnetic Fields: Variable Landau Biladders," S. K. Lyo, N. E. Harff, and J. A. Simmons, Phys. Rev. B 58, 1572 (1998).

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[51] "Quantization and Chiral Edge State Properties in Nearly 3D Quantum Well Structures," B. Zhang, J. S. Brooks, Z. Wang, J. A. A. J. Perenboom, J. Simmons, J. Reno, N. Lumpkin, J. O'Brien, R. Clark, Physica B 258, 279 (1998).

[52] "Unipolar Complementary Circuits Using Double Electron Layer Tunneling Transistors," J. S. Moon, J. A. Simmons, M. A. Blount, J. L. Reno, and M. J. Hafich, Appl. Phys. Letts. 74, 314 (1999).

[53] "Effect of the Nuclear Hyperfine Field on the 2D Electron Conductivity in the Quantum Hall Regime," S. A. Vitkalov, C. R. Bowers, J. A. Simmons, and J. L. Reno, JETP Letters 69, 64 (1999).

[54] "Photoluminescence Detected Doublet Structure in the Integer and Fractional Quantum Hall Regimes," F. M. Munteanu, Y. Kim, C. H. Perry, D. G. Rickel, J. A. Simmons, and J. L. Reno, Solid State Comm. 111, 665 (1999).

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[56] "Nuclear Spin-Orientation Dependence of Magnetoconductance: a New Method for Measuring the Spin of Charged Excitations in the Quantum Hall Effect," S. A. Vitkalov, C. R. Bowers, J. A. Simmons, and J. L. Reno, Journ. Of Phys.-Cond. Matt. 11, L407 (1999).

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Patents:

"Resonant Tunneling Device with Two-Dimensional Quantum Well Emitter and Base Layers," Jerry A. Simmons, Marc E. Sherwin, Timothy J. Drummond, and Mark V. Weckwerth, U. S. Patent No. 5,825,049.

"Epoxy Bond and Stop Etch Fabrication Method," Jerry A. Simmons, Mark V. Weckwerth, and Wes E. Baca, U. S. Patent No. 6,110,393.

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Avaliable upon request.