

MARC CAHAY

PhD Electrical Engineering, Purdue University, December 1987

MS Physics, Purdue University, December 1986

BS Physics, University of Liege, Belgium, July 1981

EMPLOYMENT

Department Head, EECS Dept, University of Cincinnati, February 2017 – Present

Professor of ECECS, University of Cincinnati, Sep.'00 - Present

Adjunct Professor of Physics, University of Cincinnati, April 2012 - Present

Associate Professor of ECECS, University of Cincinnati, Sep.'95 - Aug.'00

Assistant Professor of ECECS, University of Cincinnati, Sep.'89 - Aug.'95

Research Scientist, Scientific Research Associates, CT, '87-'89

Graduate Research Assistant in EE, Purdue University, '84-'87

Summer Development Student, Amoco Research Center, IL, Summer '84

Teaching Assistant, Physics, Purdue University, Sep.'83 - June '84

Substitute Teacher in Physics (Belgium, Germany), Spring '83

Research Scientist in Nuclear Physics, University of Liege, Belgium, '81-'82

RESEARCH INTERESTS

Nanotechnology/Vacuum Nanoelectronics/Spintronics

AWARDS

Faculty Career Award, University of Cincinnati (2018)

Professor of the semester award, College of Engineering and Applied Science, Spring 2016

Fellow of the Academy of Teaching and Learning, University of Cincinnati (2014)

Wiley Prose Award, Guide to State-of-the-Art Electron Devices, J.N. Burghartz Ed. (2013)

Distinguished Teaching Professor Award, University of Cincinnati (2012)

Neil Wandmacher Award, College of Engineering, University of Cincinnati (2012)

Master Engineering Educator Award, College of Engineering, University of Cincinnati (2012)

W.H.Middendorf Research Excellence Award, School of Electronics and Computing Systems, University of Cincinnati (1991, 2005, 2008, 2011)

Etta Kappa Nu Outstanding Professor of the Year, ECECS Department (2003,2009)

Master Engineering Educator Award, College of Engineering, University of Cincinnati (2009)

Distinguished Researcher Award, College of Engineering, University of Cincinnati (2008)

W.E. Restemeyer Teaching Excellence Award, University of Cincinnati (2004)

Outstanding Professor of the Quarter Award, College of Engineering Tribunal, Fall 1997

Sigma Xi Young Investigator Research Award, University of Cincinnati (1995)

IBM certificate of Achievement Award, IBM supercomputing competition (1989)

Gold medal, Education Department, Government of Belgium (1977)

HONORS

Fellow of the American Society for the Advancement of Science, November 2015
Fellow of the American Physical Society, November 2012
Fellow of the Electrochemical Society, May 2007
IEEE Fellow, January 2007
IEEE Nanotechnology Council Distinguished Lecturer (2010-2012)
IEEE Electron Device Society (EDS) Distinguished Lecturer (May 2005 - Present)
Visiting Professor, Purdue University College of Engineering, June 15 - July 31, 2003
Fellow of the Graduate School, University of Cincinnati (2001)
Honor Roll Professor, College of Engineering, University of Cincinnati, Fall 1998 and 1999
Senior Member IEEE, elected December 1997
All-University Graduate Faculty Member, Elected March 1993

PROFESSIONAL ACTIVITIES

Reviewer for AIChE Journal, Applied Physics Letters, IEEE Potentials, IEEE Transactions on Education, IEEE Transactions on Electron Devices, Journal of Applied Physics, Nano Letters, Journal of Applied Superconductivity, Journal of Condensed Matter Physics, Journal of Electrochemical Society, Journal of Physics A: Mathematical and General, Journal of Vacuum Science and Technology B, Optics Communications, Physica B, Physical Review B, Physical Review Letters, Semiconductor Science and Technology, Solid State Communications, Solid State Electronics, and Superlattices and Microstructures.
Reviewer for Ohio Cray and University of Illinois Supercomputing Centers
Book Reviewer for Artech House, McGraw Hill, Prentice Hall
Reviewer and Solid State Microstructures
Division Panelist for National Science Foundation.
Member of Governing Body, Dielectric Science and Technology Division of Electrochemical Society, May 1992 - May 2004.
Membership Chairman on the Executive Committee of Dielectric Science and Technology Division of the Electrochemical Society, 1992-1998
Member of Publication Committee of the Electrochemical Society, May 1993-May 1996
Secretary of the Cincinnati chapter of Electrochemical Society, June 1994 - Present
Chairman, Cincinnati chapter of Electrochemical Society September 1993 - August 1997, September 1998 - August 1999, September 2001 - August 2002.
Member of Honors and Awards Committee of the Electrochemical Society, October 1996 – October 2000
Associate Editor, IEEE Potentials, April 1999 - May 2003.
Member of Sigma Xi, Eta Kappa Nu, Electrochemical Society, Materials Research Society, American Association for the Advancement of Science, American Vacuum Society
Member of IEEE Technical Committee on Spintronics, Nanomagnetism and Quantum Computing, 2002 - 2016.

Treasurer of the Cincinnati Chapter of Electrochemical Society, 2002-2003.
Member of Nominating Committee of the Electrochemical Society, May 2003 - May 2004.
IEEE Nanotechnology Council Newsletter Editor, 2006-2010.
Member of IEEE Technical Committee on Simulation and Modeling (TC-10), Fall 2006 - Present.
Member of review committee for IEEE Fellow nominations in nanotechnology area, March 2008 - Present.
Vice-President of Conference, IEEE Nanotechnology Council (2009-2010).
IEEE Nanotechnology Council Education Chair, 2012-2016.
Member of Editorial Board of the Journal of Nanoelectronics and Optoelectronics, May 2005 - present.
Member of Editorial Board of Advances in Microelectronic Engineering (2013-Present).
Member of Editorial Board of Proceedings of the Royal Society A, 1/1/2012-12/31/2017.
Member of Editorial Board of IEEE Transactions on Electron Devices, 11/1/2015-10/31/2018.
Member of Editorial Board of Scientific Reports, Electronics, Photonics, and Device Physics area, September 2016-Present.
Member of IEEE Nanotechnology Council Distinguished Lecturers Program Committee (2016-2018).

CONFERENCES CHAIRMANSHIP AND ORGANIZATION

Co-Chair, IVNC 2019 – IVESC 2019 Conference, Cincinnati, Ohio, July 22-26 (2019).

Member of International Advisory Committee, IEEE Nanotechnology Materials and Devices Conference (NMDC 2018), Portland, Oregon, October 14-17, 2018.

Member of Program Committee, International Workshop on Thin-Films for Electronics, Electro-Optics and Sensors, June 25-27, 2017, Dayton Ohio.

Member of Technical Committee on Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON 2016) and Computing and Communication Workshop and Conference (CCWC 2017).

Member of Advisory Committee EMN Meeting on Magnetic Materials 2016, Hawaii, USA March 21st-24th, 2016.

Session Chair, Session on Spintronics, IEEE Nano 2013, Beijing, China, August 5-8, 2013.

Member of International Advisory Committee CO-DIS 2012, Dec.28-29, Kolkata, India (2012).

Section Head, EIPBN 2012, May 29-June 1, 2012, Hawaii.

Co-chair, Session on Spintronics, IEEE Nano 2011, Portland, OR, August 14-19, 2011.

Member of Program Committee, American Liaison Committee Chair, IEEE-Nano 2011, Portland, Oregon, August 15-18, 2011.

Publicity Chair, IEEE-Nano 2010, Kintex, Seoul, Korea, August 17-20 (2010).

Member of Sub-Program Committee, Session on Spintronics and Nanomagnetism, IEEE-Nano 2010, Kintex, Seoul, Korea, August 17-20 (2010).

Member of Program Committee, Third International WUN Conference on Spintronics Materials and Devices, Urbana-Champaign, IL, June 21-23 (2010).

Chairman, Session on Spintronics and Nanomagnetism II, IEEE-Nano 2009, Genoa, Italy, July 26-29 (2009).

Technical Program Co-Chair, IEEE-Nano 2009, Genoa, Italy, July 26-29 (2009).

Member of Technical Program Committee
IEEE-NEMS 2006, Zhuhai, Guangdong, China, January 18-21 (2006).

Co-Chair, Member of Program Committee and Local Arrangement Chair
IEEE Nano2006 Conference, Cincinnati, July 16-20 (2006).

Member of Technical Program Committee, Session on Spintronics
IEEE Nano-2005, Nagoya, Japan, July 11-15 (2005).

Member of Program Committee, *Noise in Electronic Devices and Circuits*
SPIE 2005 Fluctuations and Noise Symposium (FN05) (2005).

Member of Program Committee, *The 10th International Workshop on Computational Electronics, IWCE-10*, October 25-27, 2004, Purdue University, West Lafayette, IN USA.

Member of Program Committee, *Quantum Optics and Advanced Spectroscopy Conference*,
Great Lakes Photonics Symposium, June 7-11, 2004 (Cleveland, Ohio).

Symposium co-organizer, *Symposium on Nanoscale Devices and Materials*, 206th Meeting of
The Electrochemical Society, Honolulu, October 3-8, 2004.

Chairman, Session on Spintronics and Nanomagnetism II, IEEE Nano2003,
Conference, Moscone Center, San Francisco, August 11-14, 2003.

Chairman, Session on Quantum 1/f noise, The Ninth Van der Ziel symposium on Quantum
1/f Noise and Other Fluctuations, School of Engineering at Virginia Commonwealth University,
Richmond, VA, August 2nd and 3rd, 2002.

Member of Organizing Committee, The Ninth Van der Ziel symposium on Quantum 1/f Noise and Other Fluctuations, School of Engineering at Virginia Commonwealth University, Richmond, VA, August 2nd and 3rd, 2002.

Chairman, Session on Physics and Chemistry in High Electric Fields, Joint Meeting of the 15th *International Vacuum Microelectronics (IVMC)* and *48th International Field Emission Symposium (IEFS)* 2002, Lyon (France), July 7-11, 2002.

Member of International Scientific Advisory Committee, Joint Meeting of the 15th *International Vacuum Microelectronics (IVMC)* and *48th International Field Emission Symposium (IEFS)* 2002, Lyon (France), July 7-11, 2002.

Symposium co-organizer, *Second International Symposium on Cold Cathodes*, 201st Meeting of The Electrochemical Society, Philadelphia, May 12-17, 2002.

Symposium co-organizer and session co-chairman, *Symposium on Advanced Luminescent Materials and Quantum Confinement*, 201st Meeting of The Electrochemical Society, Philadelphia, May 12-17, 2002.

Symposium co-organizer and chairman, *Symposium on Quantum Confinement*, 200th Meeting of The Electrochemical Society, San Francisco, September 2-7, 2001.

Co-organizer of Advanced Research Workshop on Semiconductor Nanostructures, Queenstown, February 5-9, 2001.

Symposium co-organizer, *First International Symposium on Cold Cathodes*, 198th Meeting of The Electrochemical Society, Phoenix, Arizona, October 17-22, 2000.

Member of Program Committee, *The International Symposium on Compound Semiconductors (ISCS 2000)*, October 2-5, 2000, Monterey, CA.

Symposium co-organizer and chairman, *Symposium on Mesoscale, Microscale and Nanoscale Technologies in Science and Engineering*, University of Cincinnati, May 13, 1999.

Symposium co-organizer and session co-chairman, *Symposium on Quantum Confinement: Nanostructures*, 196th Meeting of The Electrochemical Society, Honolulu, November 1999.

Symposium co-organizer and session co-chairman, *Symposium on Quantum Confinement: Nanostructures*, 194th Meeting of The Electrochemical Society, Boston, MA, November 1-6, 1998.

Chairman, Session on Transport in Nanostructures *Tenth International Conference on Superlattices, Microstructures and Microdevices*, Lincoln, Nebraska, July 10, 1997.

Member of Program Committee, *Tenth International Conference on Superlattices, Microstructures and Microdevices*, Lincoln, Nebraska, July 9-11, 1997.

Symposium co-organizer and session co-chairman, *Symposium on Quantum Confinement: Nanoscale Clusters, Devices, and Circuits*, 191st Meeting of The Electrochemical Society, Montreal, Quebec, Canada, May 4-9, 1997.

Member of Program Committee, *Ninth International Conference on Superlattices, Microstructures and Microdevices*, Liege, Belgium, July 14-19, 1996.

Conference co-organizer and session co-chairman, *Eighth International Conference on Superlattices, Microstructures and Microdevices*, Cincinnati, Ohio, August 21-25, 1995.

Symposium co-organizer and session co-chairman, *Symposium on Quantum Confinement: Physics and Applications*, 188th Meeting of The Electrochemical Society, Chicago, Illinois, October 8-13, 1995.

Symposium Organizer and Chairman, *Symposium on Quantum Confinement: Physics and Applications*, 185th Meeting of The Electrochemical Society, San Francisco, California, May 22-27, 1994.

Chairman, *Low Temperature Electronics and High Temperature Superconductivity, Superconducting Devices-Applications*, 183rd Meeting of The Electrochemical Society, Honolulu, Hawaii, May 16-21, 1993.

Chairman, Session B15, *Semiconductor Heterostructures, Tunneling I*, American Physical Society Meeting, Cincinnati, March 1991.

PUBLICATIONS/REFEREED JOURNALS

1. M. Cahay, G. Purdy, and D. Morris, “The quaternion representation of the spinor”, in preparation, to be submitted to *Phys. Rev. A*.
2. C. Duran, A. Mattson, and M. Cahay, “Sufficient condition for the existence of an excited state in a one-dimensional confining potential”, in preparation, to be submitted to **Physica E** (2018).
3. J. Ludwick, G. Tripathi, P Vempati, M. Cahay, S. Fairchild, P.T. Murray, and T. Back, “A New Fit to Secondary Electron Emission Yield in the Low Impact Voltage Regime: An Improvement of Vaughan’s expression”, to appear in **Journal of Vacuum Science and Technology B**

4. T. C. Back, S. B. Fairchild, J. Boeckl, M. Cahay, F. Derkink, G. Chen, A. K. Schmid, A. Sayir, "Work Function Characterization of the Directionally Solidified LaB₆-VB₂ Eutectic", **Ultramicroscopy** 183, 67 (2017).
5. P. P. Das, A. Jones, M. Cahay, S. Kalita, N. S. Sterin, T. R. Yadunath, M. Advaita, and S. T. Herbert, "Dependence of the $0.5x(2e^2/h)$ conductance plateau on the aspect ratio of InAs quantum point contacts with in-plane side gates", **Journal of Applied Physics** 121 (8), 083901 (2017).
6. D. Gortat, P.T. Murray, S.B. Fairchild, M. Sparkes, T.C. Back, G.J. Gruen, M.M. Cahay, and N.P. Lockwood, "Laser Surface of Stainless Steel Anodes for Reduced Hydrogen Outgassing", **Material Letters** (2017).
7. M. Cahay, W. Zhu, S. Fairchild, P.T. Murray, T.C. Back, and G. Gruen, "Multiscale Model of Heat Dissipation Mechanisms During Field Emission from Carbon Nanotube Fibers", **Applied Physics Letters** 108, 033110 (2016).
8. M. Pakmehr, A. Khaetskii, B. D. McCombe, N. Bhandari, M. Cahay, O. Chiatti, S. Fischer, C. Heyn and W. Hansen, "The g-factor of quasi-2D electrons in InAs/InGaAs/InAlAs inserted-channels", **Applied Physics Letters** 107, 082107 (2015).
9. S. Fairchild, T. Back, H. Koerner, J. Ferguson, J. Boeckl, K. Averett, B. Maruyama, N. Lockwood, P. T. Murray, M. Cahay, N. Behabtu, C. Young, M. Pasquali, "Morphology Dependent Field Emission of Acid-Spun Carbon Nanotube Fibers", **Nanotechnology** 26, 105706 (2015).
10. M. Cahay, "Prospect for An All-Electric Spin Field Effect Transistor With Semiconductors", News and Views, **Nature Nanotechnology** 10, pp.21-22 (2014).
11. M. Cahay, P.T. Murray, T.C. Back, S. Fairchild, J. Boeckl, J. Bulmer, K.K.K. Koziol, G. Gruen, M. Sparkes, F. Orozco, and W. O'Neill, "Hysteresis During Field Emission From Chemical Vapor Deposition Synthesized Carbon Nanotube Fibers", **Applied Physics Letters** 105, 173107 (2014).
12. M. Bosken, A. Steller, B. Waring, and M. Cahay, "Connection Between Bound state and Tunneling Problems", **Physica E** 64, pp.141-145 (2014).
13. M. Cahay, "Prospect for Immunity to Local Heating in Nanoscale Devices", News and Views, **Nature Nanotechnology** 9, pp. 97-98 (2014).

14. S. Fairchild, J. Bulmer, M. Sparkes, J. Boeckl, M. Cahay, T. Back, P.T. Murray, G. Gruen, M. Lange, N. P. Lockwood, F. Orozco, W. O'Neill, C. Paukner, and K.K.K. Koziol, "Field Emission From Laser Cut CNT Fibers and Films", **J. Mater. Res.** 29, pp.392-402 (2014).
15. T.C. Back, S. Fairchild, K. Averett, B. Maruyama, N. Pierce, M. Cahay, and P.T. Murray, "Pulsed Laser Deposited Transition Metal Carbides for Field Emission Cathode Coatings", **ACS Applied Materials and Interfaces** (2013).
16. T. Murray, T. Back, M. Cahay, S. Fairchild, B. Maruyama, N.P. Lockwood, and M. Pasquali, "Evidence for Adsorbate-Enhanced Field Emission from Carbon Nanotube Fibers", **Applied Physics Letters** 103, 053113 (2013).
17. N. Bhandari, M. Dutta, J. Charles, M. Cahay, and R.S. Newrock, "Hysteresis in the Conductance of Asymmetrically Biased Quantum Point Contacts with In-Plane Side Gates", **J. Appl. Physics** 114, 033702 (2013).
18. J. Charles, M. Cahay, and R.S. Newrock, "Intrinsic Bistability in Quantum Point Contacts in the Presence of Lateral Spin-Orbit Coupling", **Applied Physics Letters** 102, 112413 (2013).
19. J. Charles, N. Bhandari, J. Wan, M. Cahay, and R.S. Newrock, "Tunable All-Electric Spin Polarizer", **Applied Physics Letters** 102, 062419 (2013).
20. R.S. Newrock, N. Bhandari, M. Cahay, and S. T. Herbert, "Steps toward an all-electric spin valve using side-gated Quantum Point Contacts with Lateral Spin Orbit Coupling", **Advances in Natural Sciences: Nanoscience and Nanotechnology** 4, 013002 (2013).
21. N. Bhandari, P.P. Das, M. Cahay, R.S. Newrock, and S.T. Herbert, "Spin polarization in a side gated GaAs Quantum Point Contact", **Applied Physics Letters** 101, 102401 (2012).
22. S. Fairchild, M. Cahay, J.W. Fraser, D.J. Lockwood, P.T. Murray, and T.C. Back, "Grain Size, Texture, and Crystallinity in Lanthanum Monosulfide Thin Films Grown by Pulsed Laser Deposition", **Thin Solid Films** 524, 166 (2012).
23. P.P. Das, N. Bhandari, J. Wan, J. Charles, M. Cahay, K. Chetry, R.S. Newrock, and S.T. Herbert, "Influence of surface scattering on the anomalous plateaus in an asymmetrically biased InAs/InAlAs quantum point contact", **Nanotechnology** 23, 215201 (2012).
24. P.P. Das, K. Chetry, N. Bhandari, J. Wan, M. Cahay, R.S. Newrock, and S.T. Herbert, "Evolution of the anomalous conductance plateau in an asymmetrically biased InAs/InAlAs quantum point contact", **Applied Physics Letters** 99, 122105 (2011).

25. M. Cahay, S. Fairchild, L. Grazulis, P.T. Murray, T. Back, D. Poitras, D. Lockwood, F. Wu, V. Kuppa, "Rare-Earth Monosulfides: a review", **Journal of Vacuum Science and Technology B** 29, 06F602 (2011).
26. J. Wan, M. Cahay, P. Debray, and R.S. Newrock, "Spin texture of conductance anomalies in quantum point contacts", **Journal of Nanoelectronics and Optoelectronics** 6, 95 (2011).
27. S. Fairchild, T. Back, P.T.Murray, M. Cahay, and D.A. Shiffler, "Low work function CsI coatings for enhanced field emission properties", **Journal of Vacuum Science and Technology A** 29, 031402 (2011).
28. S.H. Mohan, K. Garre, N. Bhandari, and M. Cahay, "Improving the efficiency of organic light emitting diodes by use of a diluted light-emitting layer", **Journal of Nanoelectronics and Optoelectronics** 6, 152 (2011).
29. J. Wan, W. Liu, M. Cahay, V. Gasparian, and S. Bandyopadhyay, "The effective spin concept to analyze coherent charge transport in mesoscopic systems", **American Journal of Physics** 79, 164 (2011).
30. V. Gasparian, M. Cahay, and E. Jodar, "Localization length in quasi one-dimensional disordered system in the presence of an electric field", **J. Phys. Cond. Matter** 23, 045301 (2011).
31. S. Bandyopadhyay and M. Cahay, **Invited paper**, "Does organic spintronics have a role in quantum information processing?", special issue on "Novel Biochemical and Physical Information Processing Systems", **Journal of Computational and Theoretical Nanoscience** 8, 464 (2011).
32. Vu Thien Binh, R. Mouton, Ch. Adessi, V. Semet, M. Cahay, and S. Fairchild, "Nano-patchwork cathodes: the role of patch-field in field emission", **Journal of Applied Physics**, 108, 044311 (2010).
33. W. Liu, J. Wan, M. Cahay, V. Gasparian, and S. Bandyopadhyay, "Properties of the Shannon Entropy of Arrays of Elastic Scatterers", **Physica E** 42, 1520 (2010).
34. S. Patibandla, B. Kanchibotla, S. Pramanik, S. Bandyopadhyay, and M. Cahay "Spin relaxation mechanisms in the organic semiconductor Alq_3 ", **International Journal of Nanotechnology and Molecular Computation** 1, 20 (2009).

35. J. Wan, M. Cahay, P. Debray, and R.S. Newrock, "On the physical origin of the 0.5 plateau in the conductance of quantum point contacts", (arXiv:cond-mat/0903.3734), **Physical Review B** 80, 155440 (2009).
36. S. Bandyopadhyay and M. Cahay, "Spin Based Boolean Logic Devices and Architectures", **Nanotechnology** 20, 412001 (2009).
37. P. Debray, J. Wan, S.M. Rahman, R.S. Newrock, M. Cahay, A.T. Ngo, S.E. Ulloa, S.T. Herbert, M. Muhammad, and M. Johnson, "All-Electrical Quantum Point Contact Spin Valves", (arXiv:cond-mat/0901.2197), **Nature-Nanotechnology** 4, 759 (2009).
38. B. Kanchibotla, S. Pramanik, S. Pramanik, S. Bandyopadhyay, and M. Cahay "Transverse spin relaxation and spin decoherence in organic molecules", **Physical Review B** 78, 193306 (2008).
39. S. Pramanik, S. Bandyopadhyay, and M. Cahay "Spin relaxation in time versus space: The difference between charge and spin diffusion constant", **Journal of Applied Physics** 104, 0014304 (2008).
40. J. Wan, M. Cahay, and S. Bandyopadhyay, "Proposal for a dual-gate SpinFET with a large ON to OFF ratio", **Physica E** 40, 2659 (2008).
41. A.R. Trivedi, S. Bandyopadhyay, and M. Cahay "Switching voltage, dynamic power dissipation and on-to-off conductance ratio of a Spin Field Effect Transistor", **IEE Proceedings Circuits, Devices and Systems** 1, 395 (2008).
42. S. Fairchild, M. Cahay, L. Grazulis, K. Garre, J.W. Fraser, D.J. Lockwood, V. Semet, Vu Thien Binh, S. Bandyopadhyay, and B. Kanchibotla, "Field emission properties of lanthanum monosulfide thin film grown on (001) MgO substrates", **Journal of Vacuum Science and Technology B** 26, 891 (2008).
43. V. Semet, M. Cahay, Vu Thien Binh, K. Garre, J.W. Fraser, D.J. Lockwood, S. Bandyopadhyay, S. Pramanik, B. Kanchibotla, S. Fairchild, and L. Grazulis, "Field emission properties of self-assembled arrays of lanthanum monosulfide nanodomes", **Journal of Nanomaterials**, 682920 (2008).
44. M. Cahay, K. Garre, J.W. Fraser, D.J. Lockwood, V. Semet, Vu Thien Binh, S. Bandyopadhyay, and B. Kanchibotla, and L. Grazulis, "Field emission properties of nanoscale field emitters self-assembled on alumina templates", **Journal of Vacuum Science and Technology B** 26, 885 (2008).

45. K.L. Jensen, J.J. Petillo, E.J. .Montgomery, Z. Pan, D.W. Feldman, P.G. O'Shea, N.A.Moody,M. Cahay, J.E. Yater, and J.L. Shaw, "Application of a general electron emission equation to surface non-uniformity and current density variation", **Journal of Vacuum Science and Technology B** 26, 831 (2008).
46. P. Upadhyay, S. Pramanik, S. Bandyopadhyay, and M. Cahay "Magnetic field effects on spin texturing in a quantum wire with Rashba spin orbit interaction", **Physical Review B** 77, 045306 (2008).
47. J. Wan, M. Cahay, and S. Bandyopadhyay, "Spin Injection Efficiency at the Source/Channel Interface of Spin Transistors", **IEEE Transactions on Nanotechnology** 7, 34 (2008).
48. S. Pramanik, S. Bandyopadhyay, and M. Cahay, "Energy dispersion relations of spin-split subbands in quasi-one-dimensional systems and gate control of spin polarization", **Physical Review B** 76, 155325 (2007).
49. J. Wan, M. Cahay and S. Bandyopadhyay, "A Digital Switch and Femto-Tesla Magnetic Field Sensor Based on Fano Resonance in a Spin Field Effect Transistor", **J. Appl. Phys.** 102, 034301 (2007).
50. S. Pramanik, C.-G. Stefanita, S. Bandyopadhyay, N. Harth, K. Garre, and M. Cahay "Spin relaxation in organic spin valves", **Nature-Nanotechnology** 1, 216 (2007).
51. M. Cahay, K. Garre, V. Semet, and Vu Thien Binh, J.W. Fraser, D.J. Lockwood, S. Bandyopadhyay, S. Pramanik, B. Kanchibotla, S. Fairchild, and L. Grazulis, "Characterization and field emission properties of lanthanum monosulfide nanoscale emitter arrays deposited by pulsed laser deposition on self-assembled nanoporous alumina templates", **Journal of Vacuum Science and Technology B** 25, 594 (2007).
52. S. Pramanik, S. Bandyopadhyay, K. Garre and M. Cahay "Normal and inverse spin valve effect in organic semiconductor nanowires and the background monotonic magnetoresistance", **Physical Review B** 74, 235329 (2006).
53. M. Samiee, K. Garre, M. Cahay, P.B. Kosel, and S. Fairchild, "A New Cold Cathode Using Pulsed Laser Deposition of Lanthanum Monosulfide Thin Films", **Journal of Vacuum Science and Technology** 26, 764 (2008).

54. V. Semet, M. Cahay, Vu Thien Binh, S. Fairchild, X. Wu and D.J. Lockwood, "Patchwork Field Emission Properties of Lanthanum Sulfide Thin Films", **Journal of Vacuum Science and Technology B** 24, 2412 (2006).
55. S. Pramanik, S. Bandyopadhyay, and M. Cahay "Spin relaxation of upstream electrons in a quantum wire: Failure of the drift diffusion model", **Physics Review B** 73, 125309 (2006).
56. K.L. Jensen and M. Cahay, "A General Thermal Field Emission Equation", **Applied Physics Letters** 88, 154105 (2006).
57. M. Cahay, K. Garre, X. Wu, D. Poitras, D.J. Lockwood, and S. Fairchild, "Physical properties of lanthanum sulfide thin films grown on (100) silicon", **Journal of Applied Physics** 99, 123502 (2006).
58. J. Wan, M. Cahay, and S. Bandyopadhyay, "Can a Non-Ideal Ferromagnet Inject Spin Into a Semiconductor With 100 % Efficiency Without a Tunnel Barrier?", **Journal of Nanoelectronics and Optoelectronics** 1, 62 (2006).
59. S. Bandyopadhyay and M. Cahay, "Are spin injection transistors useful for signal processing?", **Applied Physics Letters** 86, 133502 (2005).
60. S. Fairchild, J. Jones, M. Cahay, K. Garre, P. Draviam, P. Boolchand, X.Wu and D.J.Lockwood, "Pulsed laser deposition of lanthanumsulfide on Si substrate", **J.Vac.Sci. and Tech. B** 23, 318 (2005).
61. K. Rangaswamy, M. Cahay, and K.L. Jensen, "Shot Noise Power Spectrum of Planar Field Emitters", **Journal of Vacuum Science and Technology B** 23, 380 (2005).
62. S. Bandyopadhyay and M. Cahay, "Proposal for a spintronic femto-Tesla magnetic field sensor", **Physica E** 27, 98 (2005).
63. K. Rangaswamy, M. Cahay, and K.L. Jensen, "Influence of image force potential on the shot noise properties of field emitters", **Applied Physics Letters** 85, 3763 (2004).
64. S. Bandyopadhyay and M. Cahay, "Re-examination of some of spintronic field effect device concepts", (arXiv:cond-mat/0404339), **Applied Physics Letters** 85, 1433 (2004).
65. S. Bandyopadhyay and M. Cahay, "Alternate spintronic analog of the electro-optic modulator",(arXiv:cond-mat/0404337), **Applied Physics Letters** 85, 1814 (2004).

66. S. Bandyopadhyay and M. Cahay, "A spin field effect transistor with low leakage current", **Physica E** 25, 399 (2005).
67. S. Pramanik, S. Bandyopadhyay and M. Cahay, "Issues pertaining to D'yakonov-Perel' spin relaxation in a quantum wire" **IEEE Transactions on Nanotechnology** 4, 1 (2005).
68. R. Krishnan and M. Cahay, "Electron Beam Prebunching in Planar Cold Cathodes With Surface Current Carrying Thin Films", **Journal of Vacuum Science and Technology B** 22, 231 (2004).
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 140. M. Cahay and L. Daemen, “Proximity Effect at Superconductor-Semiconductor Contacts”, American Physical Society Meeting, Indianapolis, Indiana, March 16-20 (1992).
 141. T. Singh, G. Qian and M. Cahay, “Electron Wave Directional Couplers”, American Physical Society Meeting, Indianapolis, Indiana, March 16-20 (1992).
 142. T. Singh and M. Cahay, “Wavepacket Switching Between Parallel Quantum Wells in the Presence of An External Magnetic Field”, Proceedings of SPIE’s 1992 on Compound Semiconductor Physics and Devices, Sommerset, New-Jersey, March 1992.
 143. M. Cahay, T. Dichiaro, P. Thanikasalam and R. Venkat, “Quantum-Mechanical Tunneling Time and its Relation to the Tsu-Esaki Formula”, Proceedings of SPIE’s 1992 on Compound Semiconductor Physics and Devices, Sommerset, New-Jersey, March 1992.
 144. S. Chaudhuri, S. Bandyopadhyay and M. Cahay, “Effect of a Magnetic Field on Quantum Transport Through an Array of Elastic Scatterers”, Second Inter’l. Conference on Nanostructure Physics and Fabrication, Santa Fe, New Mexico, May 1991.
 145. T. Singh and M. Cahay, “Wavepacket Switching Between Parallel Quantum Wells”, Second Inter’l. Conference on Nanostructure Physics and Fabrication, Santa Fe, New Mexico, May 1991.
 146. M. Cahay, T. Dichiaro, R. Venkat and A. F. Anwar, “A New Quantum-Mechanical Tunneling Time Expression”, Second Inter’l. Conference on Nanostructure Physics and Fabrication, Santa Fe, New Mexico, May 1991.

147. M. Cahay, T. Dichiaro and A. F. Anwar, "Tunneling Time Through One-Dimensional Disordered Systems", Second Inter'l. Conference on Nanostructure Physics and Fabrication, Santa Fe, New Mexico, May 1991.
148. S. Bandyopadhyay and M. Cahay, "Mode Quenching and Space Charge Effects in Mesoscopic Systems", American Physical Society Meeting, Cincinnati, Ohio, March 1991.
149. M. Cahay, "Polarizability of the Free and Bound Polaron", American Physical Society Meeting, Cincinnati, Ohio, March 1991.
150. T. Dichiaro, M. Cahay and A. F. Anwar, "Quantum-Mechanical Tunneling Time", American Physical Society Meeting, Cincinnati, Ohio, March 1991.
151. H. Lai, T. Singh and M. Cahay, "Modeling of Three-terminal Hybrid Superconducting Devices", American Physical Society Meeting, Cincinnati, Ohio, March 1991.
152. A. F.M. Anwar, R. B. Lacombe and M. Cahay, "Influence of Impurity Scattering on the Tunneling Time and Current-Voltage Characteristics of Resonant Tunneling Structures", Fifth International Conference on Superlattices and Microstructures, Berlin, August 13-17 (1990).
153. M. Cahay, S. Dalton, G. S. Fisher and A. F. M. Anwar, "Tunneling Time Through Resonant Tunneling Devices and Quantum-Mechanical Bistability", Fifth International Conference on Superlattices and Microstructures, Berlin, August 13-17 (1990).
154. S. Bandyopadhyay, M. Cahay, D. Berman and B. Nayfeh, "Influence of Evanescent States on Quantum Transport in Mesoscopic Semiconductor Structures", Fifth International Conference on Superlattices and Microstructures, Berlin, August 13-17 (1990).
155. M. Cahay, S. Bandyopadhyay and R. Frohne, "Scattering-Matrix Analysis of Electron transport in Aharonov-Bohm Interferometer and Quantum point contacts", 34th Inter'l. Symposium on Electron, Ion and Photon Beams, San Antonio, Texas, May 29-June 1 (1990).
156. M. Cahay, P. Marzolf and S. Bandyopadhyay, "Numerical Study of the Higher Order Cumulants in the Conductance Fluctuations of Mesoscopic Structures", workshop on Computational Electronics, Urbana-Champaign, Illinois, May 21-22 (1990).

157. S. Bandyopadhyay and M. Cahay, "A Quantum Transport Formalism to model electron transport in the presence of elastic scattering", workshop on Computational Electronics, Urbana-Champaign, Illinois, May 21-22 (1990).
158. M. A. Osman and M. Cahay, "Effect of Hot Phonons on the Ultrafast Relaxation of Holes in GaAs", SPIE March Meeting, San Diego, March 18-23 (1990).
159. M. Cahay and S. Bandyopadhyay, "Influence of Evanescent States on Transport in Disordered Mesoscopic Systems", American Physical Society, Anaheim, March 1990.
160. M. Cahay, J. P. Kreskovsky and H.L. Grubin, "Electron Diffraction Through a Narrow Splitgate", Sixth International Conference on Hot Carriers in Semiconductors, Scottsdale, Arizona, July 23-28 (1989).
161. 159. M. A. Osman, M. Cahay and H.L. Grubin, "Effect of Valence Band Anisotropy on the Ultrafast Relaxation of Photoexcited Carriers in GaAs", Sixth International Conference on Hot Carriers in Semiconductors, Scottsdale, Arizona, July 23-28 (1989).
162. M. Cahay, S. Bandyopadhyay, M. A. Osman and H.L. Grubin, "Influence of Evanescent Modes on Quantum Transport Through an Array of Elastic Scatterers", MMS4 conference, Ann Harbor, Michigan, July 1989.
163. M. Cahay, S. Bandyopadhyay and H.L. Grubin, "Electrostatic Aharonov-Bohm Effect in One-Dimensional Ring Structures", Poster presented at the first Inter'l. Symp. on Nanostructure Physics and Fabrication, College Station, Texas, March 13-15 (1989).
164. M. Cahay, M. McLennan, M. A. Osman and H.L. Grubin, "Comparison of the Importance of Space-charge Effects in Compositional and Effective-Mass Superlattices", Poster presented at the first Inter'l. Symp. on Nanostructure Physics and Fabrication, College Station, Texas, March 13-15 (1989).
165. M. Cahay, S. Bandyopadhyay and H.L. Grubin, "New Conductance Minima in Electrostatic Aharonov-Bohm Interferometers", American Physical Society Meeting, St Louis, March 1989.
166. M. Cahay, H. L. Grubin and S. Datta, "Influence of Correlated versus Uncorrelated Scattering on the size of the Conductance Modulation of Aharonov-Bohm Devices", American Physical Society Meeting, New Orleans, March 1988.

167. H. L. Grubin and M. Cahay, "Properties of the Landauer Resistance of a finite, repeated structure", American Physical Society Meeting, New Orleans, March 1988.
168. M. Cahay, M. McLennan and S. Datta, "Analysis of Electron Propagation Through Narrow GaAs Wires", poster presented at the third International Conference on Superlattices, Microstructures and Microdevices, Chicago, August 17-20 (1987).
169. M. Cahay, M. McLennan and S. Datta, "Analysis of Electron Propagation Through a Two-Dimensional Random Array of Scatterers", American Physical Society Meeting, New York, March 1987.
170. M. Cahay, M.J. McLennan, S. Datta and M. S. Lundstrom, "Self consistent I-V Characteristic of Ultra Small Devices", Numos I Conference, Los Angeles, Dec. 11-12 (1986).
171. M. Cahay, S. Bandyopadhyay, M. J. McLennan, S. Datta and M. S. Lundstrom, "Quantum Transport in Ultra-Small Structures", American Physical Society Meeting, Las Vegas, April 1986.
172. S. Bandyopadhyay, M. Cahay, S. Datta and M. R. Melloch, "Electron Transport in Ultra-small Devices; Quantum-Mechanical Effect", 2nd Inter'l. Conference on Modulated Semiconductor Structures, Kyoto, Japan, Sept. 1985.
173. M. Cahay, J. Cugnon and J. Vandermeulen, "Pion Production in Relativistic Nuclear Collisions", 7th High Energy Heavy Ion Study, Darmstadt (FRG), Oct. 8-12 (1984).
174. M. Cahay, J. Cugnon, P. Jasselette and J. Vandermeulen, "Antiproton Annihilation Inside Nuclei", poster presented at the annual meeting of the Belgian Society of Physics, MONS, June 1983.

INVITED TALKS, SEMINARS AND SHORT COURSES

1. M. Cahay, "The use of quantum point contacts for spintronics applications", talk given at the Spintronics and Nanomagnetic Computing Devices tutorial, IEEE Nano 2017, July 25-28, 2017, Pittsburgh, PA.
2. M. Cahay, "A platform to optimize the field emission properties of carbon-nanotube-based fibers", CETRASE seminar given at University of Dayton, October 4, 2016.

3. M.Cahay, K. L. Jensen, R. G. Forbes, S. B. Fairchild, T. C. Back, G. Gruen, P. T. Murray, J. R. Harris, and D. A. Shiffler, "A platform to optimize the field emission properties of carbon-nanotube-based fibers", IVNC 2016, 29th International Vacuum Nanoelectronics Conference, 11-15 July, 2016, Vancouver, Canada.
4. M.Cahay, W. Zhu, N. Perarulan, R. G. Forbes, S. B. Fairchild, T. C. Back, "Progress in the development of a multiscale model of the field emission properties of carbon-nanotube-based fibers", IVNC 2016, 29th International Vacuum Nanoelectronics Conference, 11-15 July, 2016, Vancouver, Canada.
5. "Space charge and thermal effects of CNT fiber field emission cathodes", Talk given at Materials and Applications for Microplasmas, Wright Brothers Institute Innovation and Collaboration Center, Dayton, September 25, 2014.
6. M. Cahay, "All electrical spintronics using quantum point contacts", Talk given in the Physics Department, University of Linköping, Sweden, May 21, 2014.
7. M. Cahay, "Field Emission from Carbon Nanotube Fibers", Talk given in the Physics Department, University of Linköping, Sweden, June 18, 2014.
8. M. Cahay, "All electrical spintronics using quantum point contacts", Talk given in the Physics Department, University of SUNY-Buffalo, May 2, 2014.
9. M. Cahay, N. Bhandari, M. Dutta, R. S. Newrock, and S. T. Herbert, "Spin polarization in gated single and dual quantum point contacts with lateral spin orbit coupling", Superlattice Workshop, Development of Man made Electronic Materials and Devices: Past and Future, **Invited Talk**, University of North Carolina-Charlotte, May 5-7, 2013.
10. M. Cahay, "All electrical spintronics using quantum point contacts", Talk given in the Department of Electrical Engineering, Washington University, Seattle, May 9, 2012.
11. M. Cahay, "Spintronics highlights", Talk given at Wright-State University, January 23, 2012.
12. M. Cahay, "Towards the realization of an all electrical spin valve using quantum point contacts", colloquium given in the Physics Department, University of Cincinnati, October 20, 2011.
13. M. Cahay, "Spintronics: A bird's eye view", talk at University of Dayton, November 2011.

14. M. Cahay, "Cold Cathodes of LEA and NEA thin films and nanoclusters ", **Invited Talk**, 55th International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication (EIPBN2011), May 31- June 3 2011.
15. M. Cahay, "Possible origin of anomalous plateaus in quantum point contacts", **Invited Talk**, Symposium on Spintronics and Nanomagnetism, IEEE-Nano2010, Kintex, Seoul, Korea, August 17-20, 2010.
16. M. Cahay, "All-Electric Quantum Point Contact Spin Polarizer: From Spin Physics to Spin Electronics", Ball State University, Muncie, IN, April 15, 2010.
17. M. Cahay, "Towards the creation of an all-electric spin valve using quantum point contacts: from spin physics to spin electronics", talk given in the Materials and Manufacture Directorate, WPAFB, Dayton (OH), Feb.26 (2010).
18. M. Cahay, "All electrical control of spin injection, detection, and manipulation using quantum point contacts", feasible? ", Physics Department, Ohio University, May 2009.
19. M. Cahay, K. Garre, S. Fairchild, L. Grazulis, J.W. Fraser, D.J. Lockwood, S. Pramanik, B. Kanchibotla, S. Bandyopadhyay, V. Semet, and V.T. Binh, "Are materials with reliable work function as low as 1 eV feasible? ", **Invited Talk**, NAECON 2008 meeting, July 16-18, Dayton, Ohio.
20. M. Cahay, "Tri-modal self assembly on nanoporous templates and its potential for vacuum nanoelectronics and optoelectronics applications", Graduate Materials Engineering Seminar Series, Materials Engineering Department, University of Dayton, October 18, 2007.
21. S. Bandyopadhyay and M. Cahay "Magnetometers based on Spin Orbit Interaction", **Invited talk** given at CNRS Thematic School for High Sensitivity Magnetometry, Bainville-sur-Mer (France), September 24-28 (2007).
22. M. Cahay, K. Garre, J.W. Fraser, D.J. Lockwood, S. Bandyopadhyay, S. Pramanik, B. Kanchibotla, S. Fairchild, and L. Grazulis, V. Semet, and Vu Thien Binh, "Multi-modal and multi-level self assembly of nanostructures using nanoporous substrates", **Invited Talk** given at 2007 Virtual Conference on Nanoscale Science and Technology (VC-NST-2007), Fayetteville, Arkansas, October 21-25 (2007).
23. M. Cahay, K. Garre, J.W. Fraser, D.J. Lockwood, S. Bandyopadhyay, S. Pramanik, B. Kanchibotla, V. Semet, Vu Thien Binh, S. Fairchild, and L. Grazulis, "Tri modal self assembly on nanoporous templates and its potential for vacuum nanoelectronics and

optoelectronics applications”, **Invited Talk** given at SPIE Optics East conference, September 9-12, 2007, Boston, MA.

24. S. Pramanik, B. Kanchibotla, K. Garre, M. Cahay, and S. Bandyopadhyay, ”Organic Spintronics”, **Invited Talk** given at IEEE nano2007, Hong-Kong, August 2-5 (2007).
25. M. Cahay, ”Three-mode self assembly of rare-earth sulfide nanodome, nanodot, and nanowire arrays and their applications as cold cathode emitters”, talk given in the Materials Engineering Department, University of Cincinnati, September 21, 2006.
26. M. Cahay, ”Three-mode self assembly of rare-earth sulfide nanodome, nanodot, and nanowire arrays and their field emission properties”, talk given in the Department of Physics, Clarkson University, Potsdam, NY, September 15, 2006.
27. M. Cahay and S. Bandyopadhyay, ”Can the interface between a non-ideal ferromagnet and a semiconductor quantum wire act as a ideal spin filter?”, **Invited Talk**, IEEE Nano 2005, July 11-15, 2005.
28. M. Cahay, ”Spin injection from ferromagnetic contacts into semiconductors: from bulk samples to quantum wires”, **Invited Talk**, NDSI2005-Second Conference on Nanoscale Devices and System Integration, April 4-6, 2005, Houston (Texas).
29. M. Cahay, ”Rare-Earth Sulfides: From Bulk Samples to Nanowires”, Electrical Engineering Department, University of Lexington, KY, April 15, 2005.
30. M. Cahay, ”Potential Applications of Spintronics”, ECECS Department, University of Cincinnati, Cincinnati, Ohio 45221, February 4, 2005.
31. M. Cahay, ”Field Emission Properties of Rare-Earth Sulfide Thin Films”, Colloquium in Physics Department, Miami University, Oxford, Ohio, October 20, 2004.
32. M. Cahay, ”Spin transport on semiconductor nanostructures”, **Invited Talk**, The fifth international conference on Low Dimensional Structures and Devices, Cancun, Mexico, December 12-17, 2004.
33. M. Cahay, ”Spin Transistors”, **Invited Talk**, ITRS Emerging Research Devices Group (ERD) meeting, Leuven (Belgium), September 24, 2004.
34. M. Cahay and S. Bandyopadhyay, Shortcourse on ”Fundamentals of Spintronics and Quantum Computing”, short course given at TI-Dallas, June 25, 2004.

35. M. Cahay, "Spin transport in semiconducting nanowires", Condensed Matter Seminar, Physics Department, University of Cincinnati, May 19, 2004.
36. M. Cahay and S. Bandyopadhyay, Shortcourse on "Fundamentals of Spintronics and Quantum Computing", short course given at Intel (Portland, Oregon), February 9, 2004.
37. M. Cahay and S. Bandyopadhyay, "Spintronics and Quantum information processing", short course given at IEEE Nano2003, August 11, 2003, San Francisco.
38. M. Cahay, "The Quest for the Elusive Spin Field Effect Transistor", talk given in the Department of Physics, Clarkson University, Potsdam, NY, September 26, 2003.
39. M. Cahay, "From Spintronics to Quantum Computing", talk given ECECS Dept., University of Cincinnati, April 18, 2003.
40. M. Cahay, "From Spintronics to Quantum Computing", talk given at meeting of IEEE Students Chapter, University of Dayton, March 12, 2003.
41. M. Cahay, "Spintronics: the good, the bad, and the ugly", talk given in ECECS Dept., University of Cincinnati, February 14, 2003.
42. M. Cahay, "Quantum Devices and Quantum Computing", talk given at IEEE Students/UC Local Section, Cincinnati (OH), October 23, 2002.
43. M. Cahay and R. Krishnan, "Transition from Sub-Poissonian to Super-Poissonian Shot Noise in Planar Cold Cathodes" **Invited Talk**, The Ninth Van der Ziel Symposium on quantum 1/f fluctuations and low frequency noise, School of Engineering, Virginia Commonwealth University, Richmond, VA August 2-3, 2002.
44. M. Cahay, "The Quest for Negative Electron Affinity Surfaces", talk given in the Department of Electrical Engineering, University of West Virginia, Morgantown, February 18, 2002.
45. S. Bandyopadhyay, M. Cahay, and A. Svizhenko, "Noise and 1/f Fluctuations in Nanoscale Devices", **Plenary Lecture**, 16th International Conference on Noise in Physical Systems and 1/f Fluctuations, October 22-25, 2001, Gainesville, FL.
46. M. Cahay, "Tunneling Properties of Holes Across Semiconductor Heterostructures with Wurtzite Symmetry", **Invited Talk** at the Advanced Research Workshop on Semiconductor Nanostructures, Queenstown, New Zealand, February 5-9, 2001.

47. M. Cahay, "Quantum Effects in Submicron Devices", Talk given in the Department of Electrical and Computer Engineering, University of Florida, Gainesville, September 27, 2000.
48. M. Cahay, "How do we run an Engineering Department in the 21st century?" Talk given in the Department of Electrical Engineering, University of Nebraska at Lincoln, Lincoln, Nebraska, February 10, 2000.
49. M. Cahay, "Current Self-Quenching Effects in a InP/CdS/LaS Cold Cathode", Physikalisches Institut, Universitat Bayreuth, D-95440 Bayreuth, Germany, September 17, 1999.
50. M. Cahay, "Localization of Rayleigh Waves", Applied Physics Department, Delft Institute of Technology, Delft, August 30, 1999.
51. M. Cahay, "Efficiency of Hole Conversion in Heterostructures", Applied Physics Department, Delft Institute of Technology, Delft, May 27, 1998.
52. M. Cahay, "Cold Cathodes Are Getting Hotter and Hotter", Department of Electrical Engineering, Delft Institute of Technology, Delft, May 20, 1998.
53. M. Cahay, "Hole Tunneling Through heterostructures", Department of Physics, Frij University, Amsterdam, April 29, 1998.
54. M. Cahay, "Proposal for a new InP/CdS/LaS Cold Cathode", Department of Electrical Engineering, Purdue University, March 4, 1998.
55. M. Cahay and R. Kothari, "Superconducting Wheatstone Bridges as Neural Cells for Q-state Associative Memories", Talk given at the Indiana University of Pennsylvania, March 25, 1994.
56. M. Cahay and R. Kothari, "Radio Frequency Properties of Superconducting Wheatstone Bridges", Talk given at the State University of New York at Buffalo, March 14, 1994.
57. R. Kothari and M. Cahay "Issues in Reliable Storage and Retrieval of Q-state Patterns: Algorithm and Implementation", Talk given to Special Interest Group on Artificial Intelligence (SIGART), March 10, 1994, Dayton, Ohio.
58. M. Cahay, "Superconducting Field Effect Transistor Arrays for Microwave Applications", Talk given at Wright-Patterson Air Force Base, August 24, 1993

59. M. Cahay, "Superconducting Three-Terminal Devices: Is There Hope?", Talk given at Purdue University, EE Department, West Lafayette, Indiana 47906, September 23, 1992.
60. S. Bandyopadhyay, S. Chaudhuri, B. Das, and M. Cahay, **Invited Talk**, "Features of Quantum Magnetotransport and Electromigration in Mesoscopic Systems", Sixth International Conference on Superlattices, Microstructures and Microdevices, Xi'an, China, August 4-7, 1992.
61. M. Cahay, "Modeling of Josephson Field Effect Transistors Study of Proximity Effect at Contacts", Talk given at the University of Cincinnati, Physics Department, Cincinnati, Ohio 45221, April 22, 1992.
62. M. Cahay, "Electrical and Optical Properties of Quantum Confined Geometries", Talk given at Miami University, Department of Physics, Oxford, Ohio, January 22, 1992.
63. M. Cahay, "Phase Coherent Electron Transport in Disordered Semiconductor Microstructures", Talk given at Wright-Patterson Air Force Base, September 27, 1990.
64. M. Cahay, "Quantum-Mechanical Analysis of Ultra-Small Devices", presented at the University of Cincinnati, Electrical and Computer Engineering Department, Cincinnati, Ohio, May 31, 1989.
65. M. Cahay, "Quantum Transport in Semiconductor Nanostructures", Invited seminar at Scientific Research Associates, Inc., Glastonbury, CT, May 1987.
66. M. Cahay, "Quantum-Mechanical Analysis of Ultra-Small Devices", talk presented at the University of Notre Dame, South Bend, IN, October 5, 1987.

FUNDED RESEARCH PROPOSALS

Total research funding, as of June 22, 2016: \$ 2,911,994

1. M. Cahay, **\$ 60,000**

Research Initiation Grant-NSF, Contract : ECS-9108932,

"RIA: Analysis of Electrical and Optical Properties of Quantum Confined Structures Using an Alternating Direction Implicit Algorithm", Sept. 1, 1991 - August 31, 1993.

2. M. Cahay, **\$ 7,000**

University Research Council, University of Cincinnati,
Winter '91, "Quantum Phase Based Devices"

3. CO-PI (with Ken Roenker), **\$ 30,000**

Ohio Aerospace Institute, July 1, 1993 - June 30, 1994,
"Complementary InAlAs/InGaAs/InP Heterojunction Bipolar Transistors for MMIC's".

4. M. Cahay, K. Roenker, and F. M. Gerner, **\$ 50,000**

"Simulation and Development of InP-Based Heterojunction
Bipolar Transistors for Microwave Integrated Circuits",
Research Challenge Award/University of Cincinnati, 9/1/94 - 12/31/95

5. M. Cahay, **\$ 7,400**

"Monte Carlo Simulation of Carrier Transport in GaN Cold Cathodes",
Research Associate, AFOSR Summer Research Program,
Wright Patterson Air Force Base, Dayton OH 45433, Summer 95

6. M. Cahay, **\$ 4,000**

University Research Council, University of Cincinnati,
Spring '95, "Self-Heating Effects in PNP Heterojunction Bipolar Transistors"

7. M. Cahay, **\$ 24,998**

"Modeling and Design of New Cold Cathode Emitters and Photocathodes"
Air Force Office of Scientific Research, 1996 Summer Research Extension Program, Contract
F49620-93-C-0063

8. M. Cahay, **\$ 9,240**

"Transport Processes in New Solid State Cold Cathodes",
Research Associate, AFOSR Summer Research Program,

Wright Patterson Air Force Base, Dayton OH 45433, Summer 96.

9. M. Cahay and K. P. Roenker, **\$ 189,559**, Award ECS-9525942

”Theoretical and Experimental Investigation of PNP InP-based Heterojunction Bipolar Transistors”, National Science Foundation, June 1, 1996 - May 31, 1998.

10. M. Cahay and K. P. Roenker, **\$ 10,000**, REU Supplement to Award ECS-9525942,

”Improved Modeling of InP-based Heterojunction Bipolar Transistors”, National Science Foundation, August 1, 1997 - May 31, 1998.

11. M. Cahay, **\$ 2,000**

”Design of Superconducting Neural Cells and Circuits”,
Summer Faculty Research Fellowship, University of Cincinnati, Summer 1997.

12. K. Roenker and M. Cahay, **\$ 20,000**, ”Ka-band Low Phase Noise Active resonator oscillator MMICs fabricated from InP/InGaAs/InP DHBT production epitaxy”, Phase I proposal with SVT Associates, Bloomington, MN, June 1, 1997 - December 1, 1997.

13. K. Roenker and M. Cahay, **\$ 5,000**, ”Modeling of Collector Junction Grading for InP-based Double Heterojunction Bipolar Transistors”, Phase II proposal with SVT Associates, Bloomington, MN, July 1, 1997 - May 1, 1998.

14. M. Cahay, **\$ 12,500**, ”Improved Modeling of Space-Charge Effects in a New Cold Cathode”, Air Force Office of Scientific Research, Summer Research Extension Program, Contract F49620-93- C-0063 July 1, 1997 - December 31, 1997.

15. M. Cahay, **\$ 64,441**, ”Simulation of New Solid State Cold Cathode Emitters Using Current Carrying Thin Films”, National Science Foundation, Award ECS-9632511, July 1, 1997 - June 30, 1999.

16. M. Cahay and P. Boolchand, total: **\$ 525,000**

"Growth and Characterization of a New Cold Cathode Emitter Using a InP/CdS/LaS multilayered structure", funded by Wright-Patterson Air Force Base, Jan. 1, 1998 - June 30, 2002.

17. M. Cahay and G. E. W. Bauer, "Study of Surface Roughness Scattering in Mesoscopic Systems", **\$ 3,500** (7,000 guilders), funded by NWO (Nederlandse Organisatie voor Wetenschappelijk Onderzoek), April 1 - May 30, 1998.

18. M. Cahay and P. Boolchand, **\$ 226,429**, The Use of Sulfides of Rare-Earth Elements to Achieve Durable Negative Electron Affinity Cold Cathodes, Photocathodes, and Polarized Electron Sources, National Science Foundation, Award ECS-9906053, July 1, 1999 - June 30, 2002.

19. M. Cahay and K. Roenker, **\$ 20,999**, "Design of Wideband Microwave Amplifiers Based on a Combination of Heterojunction Bipolar Transistors, Cold Cathode Emitters, and Coplanar Waveguide Technology", Systran Federal Cooperation, Dayton, Ohio.

20. M. Cahay and P. Boolchand, total: **\$ 48,500**
"Growth of Rare-Earth Sulfides for use in cold cathodes", Wright-Patterson Air Force Base, September 2001

21. M. Cahay, total: **\$ 4,630**
"Fabrication of Lanthanum Sulfide Targets", Wright-Patterson Air Force Base, April 1, 2003 - August 31, 2003

22. P. Boolchand, M. Cahay, and P. Smirniotis, **\$ 120,000**,
"Acquisition of an FTIR and Raman Spectrometer System to Probe Intermediate Phases in Disordered Systems", National Science Foundation, July 1, 2003 - June 30, 2004.

23. P. Boolchand, M. Cahay, and P. Smirniotis, **\$ 63,000**,
"Acquisition of an FT-IR and Raman Spectrometer System to Probe Intermediate Phases in Disordered Systems", Ohio Board of Regents Award, August 15, 2003 - July 31, 2006
24. M. Cahay, A. Kogan, M. Jarrell, and L. Smith, **\$ 25,000**,
"Towards Single-Electron Spin Optical Devices", Institute for Nanoscale Science and Technology, University of Cincinnati, Feb.1, 2005 - January 31, 2006.
25. M. Cahay, **\$ 16,000**
"Self-assembled arrays of rare-earth sulfide nanowires",
Air Force Summer Faculty Fellowship Program Wright Patterson Air Force Base, Dayton OH 45433, Summer 2005.
26. M. Cahay, **\$ 119,983**
Collaborative NSF-GOALI proposal ECS-0524166
"Self-assembled arrays of rare-earth sulfide nanowires for traveling wave tube applications"
August 1, 2005 - July 31, 2009.
27. M. Cahay, **\$ 99,999**
NSF-NER ECS-0608854, "Nanoscale Organic Spintronics"
July 1, 2006 - June 30, 2007.
28. M. Cahay and P. Boolchand, **\$ 2,500**,
"Lanthanum Sulfide Filaments for Halogen Lamps", Osram Sylvania, Fall 2006
29. M. Cahay, **\$ 16,500**
"Hybrid rare-earth monosulfide/carbon nanoparticle arrays on flexible substrates and their potential applications, Air Force Summer Faculty Fellowship Program, Wright Patterson Air Force Base, Dayton OH 45433, Summer 2007.
30. P. Debray, S. Newrock, and M. Cahay, **\$ 300,000**

NSF ECCS-0725404, "All electrical Datta-Das SpinFET"
National Science Foundation, August 1, 2007 - July 31, 2010.

31. M. Cahay, **\$ 16,500**

"Experimental and Theoretical Investigation of New Carbon Nanopetal Arrays as Stable and Reliable Cold Cathodes", Air Force Summer Faculty Fellowship Program, Wright Patterson Air Force Base, Dayton OH 45433, Summer 2008.

32. M. Cahay, **\$ 17,070**

"Pulsed laser deposition, work function measurements of field emission characteristics of low work function materials for traveling wave tube applications", Universal Technology Corporation, Dayton OH 45433, Summer 2009.

33. M. Cahay, **\$ 23,000**

"Pulsed laser deposition, work function measurements of field emission characteristics of low work function materials", Universal Technology Corporation, Dayton OH 45433, Summer 2010.

34. M. Cahay, **\$ 23,000**

"Field emission characteristics of carbon nanofibers", Universal Technology Corporation, Dayton OH 45433, Summer 2011.

35. P. Debray, S. Newrock, and M. Cahay, **\$ 24,000**

NSF ECCS-0725404 supplement - equipment grant, "All electrical Datta-Das SpinFET".

36. V. Kuppa and M. Cahay, **\$ 25,000**

"Nanopatterned organic-inorganic solar cells: efficient hybrids that transcend the bulk heterojunction paradigm", University Research Council Interdisciplinary Grant, University of Cincinnati (2010).

37. P. Debray, S. Newrock, and M. Cahay, **\$ 345,000**

NSF ECCS-1028483, "All-Electric Semiconductor Spin Valve"

National Science Foundation, September 1, 2010 - August 31, 2013.

REU Supplement award to NSF ECCS-1028423, COEUS 007081: **\$6,000.**

38. M. Cahay, **\$ 18,486**

"Characterization of Carbon Nanotube Fibers", Universal Technology Corporation, Dayton OH 45433, Summer 2013.

39. M. Cahay, **\$53,304**, "Spin Blockaded Transport and Onset of Wigner Crystallization in All Electric Spin Valves", NSF IIA-1341789, September 15, 2013 - August 31, 2014.

"CNIC: U.S.-Swedish Engineering Research on Spin Blockaded Transport and Onset of Wigner Crystallization in All Electric Spin Valves".

40. M. Cahay, **\$20,600**

"Multiscale Modeling of Carbon Nanotube Fibers", Universal Energy Systems, Dayton OH 45433, May 4 – June 15, 2015.

41. M. Cahay, **\$17,280**

"Multiscale Modeling of Carbon Nanotube Fibers", Universal Energy Systems, Dayton OH 45433, August 1 – Sept 15, 2015.

42. M. Cahay, **\$26,927**

"Self-heating effects during field emission from a pair of carbon nanotube fibers", Universal Energy Systems, Dayton OH 45433, June 9 – August 12, 2016.

43. M. Schulz, John Yin, M. Cahay, and W.K. Kim, **\$40,000**, "Carbon Nanotube Hybrid Wire", UC technology commercialization accelerator, University of Cincinnati, Dec.1, 2016-Nov.30, 2017.

44. M. Cahay, **\$45,990**, Hybrid Materials for Advanced Pulsed Power Devices, DAGSI grant, April 1, 2017-March 31, 2018.

45. M. Cahay, **\$52,259**, Hybrid Materials for Advanced Pulsed Power Devices, DAGSI grant, April 1, 2018-March 31, 2019.

46. M. Schulz, Yoo Kyun Kim, and M. Cahay, Carbon Hybrid Materials for Personal Protective Equipment, University of Cincinnati Technology Accelerator for Commercialization. **\$70,000**, April 1, 2018 – March 31, 2019.

FUNDED NON-RESEARCH PROPOSALS

Total research funding, as of June 22, 2016: \$ 71,250

1. M. Cahay, **\$ 8,200**

Symposium on Quantum Confinement: Physics and Applications,
ECS meeting, San Francisco, May 22-27, 1994,

Sponsored by the Electro Chemical Society, \$ 1,200

the U.S.Army Research Office, \$ 2,000

the National Science Foundation (ECS 9409978), \$ 3,000

and the International Science Foundation : Travel grant (1351-3) for Dr. Savel'ev from Ioffe Physical Technical Institute Russian Academy of Sciences, St. Petersburg, Russia, \$2,000

2. M. Cahay, **\$10,000**

Third International Symposium on Quantum Confinement: Physics and Applications
188th ECS meeting, Chicago, October 8-13, 1995.

Sponsored by the Electro Chemical Society, \$ 1,500

the U.S.Army Research Office, \$ 4,000.

and the National Science Foundation (ECS-9527543), \$ 4,500.

3. M. Cahay, **\$8,500**

Fourth International Symposium on Quantum Confinement: Physics and Applications
191st ECS meeting, Montreal, Quebec, Canada, May 4-9, 1997.

Sponsored by the Electro Chemical Society, \$ 1,500

the National Science Foundation (ECS-9705093), \$ 4,000

and the U.S.Army Research Office, \$ 3,000.

4. M. Cahay, **\$5,000**

Fifth International Symposium on Quantum Confinement: Physics and Applications

194th ECS meeting, Boston, MA, November 1-6, 1998

Sponsored by the Electro Chemical Society, \$ 1,500

and the U.S.Army Research Office, \$ 3,500.

5. M. Cahay, **\$10,000**

First International Symposium on Advanced Luminescent Displays and Quantum Confinement:
Physics and Applications

196th ECS meeting, Honolulu, Hawaii, October 1-6, 1999

Sponsored by the Electro Chemical Society, \$ 2,500

the National Science Foundation (ECS-9907465), \$ 3,000

and the U.S.Army Research Office, \$ 4,500

6. M. Cahay, **\$3,100**

First International Symposium on Cold Cathodes

198th Meeting of The Electrochemical Society

Phoenix, Arizona, October 17-22, 2000.

Sponsored by the Electro Chemical Society, \$ 2,100

the National Science Foundation (ECS-0002801), \$ 1,000

7. M. Cahay, **\$4,400**

Sixth International Symposium on Quantum Confinement: Nanostructured Materials and
Devices, 200th ECS meeting, San Francisco, CA, September 5-6, 2001

Sponsored by the Electro Chemical Society, \$ 2,400

and the U.S.Army Research Far East Office, \$ 2,000.

8. M. Cahay, **\$2,400**

Second International Symposium on Advanced Luminescent Materials and Quantum Confinement, ECS Centennial Meeting, Philadelphia, PA, May 12-17, 2002

Sponsored by the Electro Chemical Society, \$ 2,400.

9. M. Cahay, **\$2,200**

Second International Symposium on Cold Cathodes

ECS Centennial Meeting, Philadelphia, PA, May 12-17, 2002

Sponsored by the Electro Chemical Society, \$ 2,200.

10. M. Cahay, **\$1,950**

International Symposium on Nanoscale Devices and Materials

206th ECS meeting, Honolulu, Hawaii, October 3-8, 2004

Sponsored by the Electro Chemical Society, \$ 1,950.

11. M. Cahay, **\$20,500**

IEEE Nano2006 International Conference

Cincinnati, Ohio, July 16-20, 2006

Sponsored by the Electro Chemical Society, \$ 500.

the University of Cincinnati, \$ 19,500

and the Nanoscale Science and Engineering Institute (UC), \$ 500.