RALPH ETIENNE-CUMMINGS

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RESEARCH INTEREST

VLSI circuits, systems and algorithms for biologically inspired and low-power, parallel mixed-signal processing, with applications to sensory information process, biomorphic robotics, applied neuroscience, neural prosthetics, low-power instrumentation, acoustic signal processing MEMS and computer integrated surgical systems and technologies.

EDUCATION

University of Pennsylvania, Moore School of Electrical Engineering, Philadelphia, Pennsylvania
Ph.D. in Electrical Engineering, December 1994
Master in Electrical in Electrical Engineering, December 1990
Lincoln University, Department of Physics, Lincoln University, Pennsylvania
Bachelor of Science in Physics, May 1988, Summa Cum Laude, Valedictorian

EXPERIENCE

Faculty Positions:

Johns Hopkins University, Baltimore, MD, *Professor of ECE*, July 1st, 2008 – present
Johns Hopkins University, Baltimore, MD, *Associate Professor of ECE*, July 2002 – July 1st, 2008
Johns Hopkins University, Baltimore, MD, *Associate Director for Education and Outreach of the ERC on Computer Integrated Surgical Systems and Technology*, January 2004 – 2009
Johns Hopkins University, Baltimore, MD, *Secondary Appointment in CS*, November 2005 – present
University of Maryland, College Park, MD, *Adjunct Associate Professor*, July 2004 – Present
U. Western Sydney, Sydney, Australia, *Adjunct Professor*, March 2012 – Present
Institute of Neuromorphic Engineering, *Director*, July 2002 – July 2008
University of Cape Town, Cape Town, South Africa, *Visiting African Scholar*, June 2006 – February 2007
Johns Hopkins University, Baltimore, MD, *Director of CE*, July 2002 – July 2006
University of Maryland, College Park, MD, *Associate Professor*, January 2002 – January 2004
Johns Hopkins University, Baltimore, MD, *Assistant Professor*, July 1998 – July 2002
Southern Illinois University, Carbondale, IL, *Assistant Professor*, January 1995 – June 1998

Visiting Scientist Positions:

Lawrence Livermore National Laboratory, Livermore, CA, *Visiting Scientist*, May 1997 – August 1998

Consulting Activities:

Research In Motion Corporation, Ontario, Canada, *Expert Witness*, June 2012 – present
Kyocera Communications, Inc., San Diego, CA, *Expert Witness*, June 2012 – present
Apple Inc., Inc., Cupertino, CA, *Expert Witness*, June 2012 – present
Motorola Mobility LLC, Libertyville, IL, *Expert Witness*, June 2012 – present

Sony Mobile Communications (USA) Inc., Research Triangle Park, NC, *Expert Witness*, June 2012 – present

LG Electronics U.S.A., Inc., and LG Electronics MobileComm U.S.A., Inc., Englewood Cliffs, NJ, *Expert Witness*, June 2012 – present

Omnivision Technologies, Santa Clara, CA, *Expert Witness*, March 2011 – June 2012

Micron Technologies, Boise, ID, *Expert Witness*, July 2009 – March 2012

Aptina Imaging., Palo Alto, CA, *Expert Witness*, July 2009 – March 2012

Panasonic N. America & Corporation, Palo Alto, CA, *Consultant Engineer*, January 2009 – September 2010

Singular Computing, Baltimore, MD, *Consultant Engineer*, March 2007 – present

Adequate Energy, Cape Town, RSA, *Consultant Engineer*, October 2006 – September 2009

Innovative Wireless Technologies, Forest, VA, *Research Collaborator*, August 2005 – July 2009

Avago Inc, *Expert Witness*, August 2006 – November 2011

Agilent Technologies, *Expert Witness*, June 2004 – August 2006

Iguana Robotics Inc., Champagne, IL, *Consultant Engineer*, January 1999 – present

Nova Sensors Inc., Solvang, CA, *Consultant Engineer*, November 2000 – July 2009

AC Group, Ellicott City, MD, *Consultant Engineer*, June 2002 – June 2003

Boulder Nonlinear Systems Inc., Boulder, CO, *Consultant Engineer*, June 2000 – January 2002

I.E.Med Inc., Baltimore, MD, *Consultant Engineer*, November 2000 – July 2001

Corticon Incorporated, Philadelphia, PA, *Consultant Engineer*, May 1991 - January 1998

Imperium Incorporated, Rockville, MD, *Consultant Engineer*, August 1996 - August 1997

EDUCATIONAL LEADERSHIP

Mentor of Robotics Club, *JHU*, September 2009 - Present

Director of the Robotics Minor, *JHU*, September 2010 - Present

Member of the Robotics MSE Curriculum Committee, *JHU*, September 2010 - Present

Member of the ASE Continuous Review Committee, MD Higher Education Commission, Annapolis, MD, September 2009 - Present

Co-Organizer of MRCIIS Winter School, *JHU*, January 12^{th} – 16^{th}, 2009

Member of Johns Hopkins University Strategic Planning Committee, Co-Chair of People Working Group, *JHU*, April 2008 – September, 2008

Member of Engineering and Applied Science Programs for Professionals Curriculum Committee, Whiting School of Engineering, *JHU*, 2007 – Present

Leader of the ABET Committee for Computer Engineering, *JHU*, 2005/2006

Member of WSE Diversity Committee, Whiting School of Engineering, *JHU*, 2005 – 2008

Associate Director for Education and Outreach, ERC on CISST, *JHU*, 2004 – 2008

Co-Chair of Diversity Committee, ERC on CISST, *JHU*, 2004 – 2008

Director of Computer Engineering, *JHU*, 2002 – 2006

PI/Co-PI SITE REU Program & Supervised REU Students, ERC on CISST, *JHU*, 2000 – Present

Director, Research and Education Outreach, *Institute of Neuromorphic Engineering*, 2002 - 2008

Instructor, *NSF Sponsored Course on Telluride Neuromorphic Engineering*, 1996 - Present

Organization Committee, *NSF Sponsored Course on Telluride Neuromorphic Engineering*, 2002 –Present

Served on various committees to improve the education experience for undergraduate students, *SIUC, JHU*, 1995 – Present

Organized/Lead various tutorials, workshops and panels at international conferences, *ISCAS, NIPS, ISSCC, BioCAS*, 1997 - Present

Organized and Supervised Competition RoboCup Team, *JHU*, 2001 – 2005

Curriculum Development, Advising and ABET, *JHU, UMCP, SIUC*, 1995 – 2006

Designed/Developed New Computer Engineering Laboratory, *SIUC* 1996, *JHU* 1999

Supervised Various Research, Senior Design and Independent Studies, *SIUC, JHU, UMCP, UCT*, 1995 - Present

Developed New Course, 520.391/491, 520.738, 520.427, 520.661/662, 520.771/772, *JHU*, 1998 – Present

Developed New Course, CAD VLSI, Senior Thesis Topics, *UCT* , 2006

Developed New Course, CAD VLSI, Mixed Signal VLSI, *UMCP* , 2002

Developed New Course, CAD VLSI, Neuromorphic Engineering, *SIUC* , 1995 – 1998

AWARDS and HONORS

2012 IEEE-EMBS Outstanding Paper Award, *IEEE Trans. Neural System and Rehabilitation Engineering*, August 2012

ScienceMaker Scientist, *The History Makers*, February 2012

Appointed Eminent Visiting Scholar, *U. Western Sydney*, January 2012

Achieved IEEE Fellow Status, *IEEE*, January 2012

2011 Best Demonstration, *Biomedical Circuits and Systems Conference*, November 2011

Appointed Deputy Editor in Chief, *IEEE Trans. Biomedical Circuits and Systems*, January 2011

2011 Best Paper Award, *IEEE Trans. Biomedical Circuits and Systems*, May 2011

R. W. Hart Prize for Excellence in IR&D for Best Project, *JHU/APL*, November 2010

Appointed to the IEEE CAS Society Distinguish Lecturer Program, *IEEE*, January 2010

Achieved IEEE Senior Member Status, *IEEE*, December 2008

Best "Ph.D in a Nutshell," *IEEE BioCAS 2008 Conference*, Baltimore, MD, November 2008

Best Student Paper Finalist, *International Symposium of Circuits and Systems*, Seattle, WA, April 2008

Best Paper Honorable Mention, *North East BioEngineering Conference*, Providence, RI, April 2008

National Academies of Science Kavli Frontiers in Science Fellow, 2007

Science Spectrum Trailblazer Award for Top Minorities in Science, 2006

Fulbright Fellowship Award to South Africa, 2006/2007

Visiting African Fellowship Award, *University of Cape Town*, 2006/2007

Diversity Leadership Council Diversity Award, *JHU* 2006

2003 Best Paper Award, *EURASIP Journal of Applied Signal Processing*, 2004

Young Investigators Program Award, *Office of Naval Research, 2000-2004*

CAREER Award, *National Science Foundation, 1996-2000*

Harris Fellow, *University of Pennsylvania, 1992-1994*

Fountain Fellow, *University of Pennsylvania, 1988-1992*

Valedictorian, *Lincoln University, 1988*

Oakridge Fellow, *Lincoln University, 1986-1988*

PROFESSIONAL ACTIVITIES AND SERVICE

Appointed to the Committee on the NSF Workshop on the Science of Learning, September 2012 - Present

Appointed to the BME Awards Committee of the IEEE CAS Society, 2010 - Present

Appointed to the Nominations Committee of the CAS Society, August 2010

Appointed to the Journal of Low-Power Electronics and Applications Editorial Board, August 2010 - Present

Appointed to the Frontiers in Neuromorphic Engineering Editorial Board, July 2010 - Present

Appointed to the IEEE CAS Society Distinguish Lecturer Program, *IEEE*, January 2010 - 2012

Appointed Chair of WSE Tenure and Promotion Committee, JHU WSE, October 2009

Appointed Chair of the ECE Faculty Search Committee, ECE Department, December 2009

Member of the ASE Continuous Review Committee, MD Higher Education Commission , Annapolis, MD, September 2009

Appointed to Science of Learning Center Committee of Visitors, *National Science Foundation*, March 2009

Appointed Conference General Chair, *IEEE Biomedical Circuits and Systems 2008 Conference*, 2007 – 2008

Elected Chair of the Technical Committee on Neural Systems and Applications, *IEEE ISCAS*, 2003 – 2005

Elected to the Board of Governors, *IEEE CAS Society*, 2003-2005, 2005 – 2008

Elected Chairman of the Technical Committee on Sensors, *IEEE ISCAS*, 2001 – 2003

Elected Secretary of the Technical Committee on Neural Networks, *IEEE ISCAS*, 2001 – 2003

Appointed Assoc. Director for Education and Outreach, *ERC on CISST at Johns Hopkins University*, 2004 – 2009

Appointed to the Program Committee on Emerging Technology, *NIPS Society*, 2003 – 2004

Appointed Organizing Committee of the NSF Telluride Neuromorphic Engineering Workshop, 2003 – Present

Appointed Past-Chair of the Technical Committee on Sensors, *IEEE ISCAS*, 2003 – 2004

Appointed Director of the Computer Engineering Program, *Johns Hopkins University*, 2002 – 2006

Appointed Director of the Institute of Neuromorphic Engineering, 2002 – 2008 (an Institute "with-out walls")

Appointed Senior Associated Editor, *IEEE Sensors Journal*, 2002 – July 2008

Appointed Topic Area Editor, *IEEE Sensors Journal*, January 2013 – present

Appointed Senior Associated Editor, *IEEE Sensors Journal*, July 2008 – January 2013

Appointed Associated Editor, *IEEE Sensors Journal*, July 2004 – 2008

Appointed Associated Editor, *IEEE Trans. Biomedical Circuits and Systems*, 2006 – Present

Appointed Deputy Editor in Chief, *IEEE Trans. Biomedical Circuits and Systems*, 2010 – Present

Appointed to the Strategic Committee: IEEE CASS Board of Governors, 2003 – 2009

Appointed to the Regional Activities Committee: IEEE CASS Board of Governors, 2003 – 2008

Appointed to the Technical Activities Committee: IEEE CASS Board of Governors, 2003 – 2008

Appointed to the Journal Formation Committee Member: IEEE CASS, Trans. Biomedical Circuits and Systems, 2005 – 2006

Member of the Editorial Board: *INE The Neuromorphic Engineer*, 2002 – present

Guest Editor: *IEEE Sensors Journal*, Special Issue on Array Processing in VLSI, December 2002

Guest Editor: *Kluwer's AICSP Journal*, Special Issue on Smart Sensors, July 2004

Guest Editor: *IEEE Trans. Biomedical Circuits and Systems*, Special Issue on BioCAS 2007, February 2008

Member: Senior Member IEEE, Circuits and Systems, Solid-State Circuits, SPIE, Electron Devices

Member of Awards Committee: Westgate Scholars, JHU/WSE, 2004, 2006

Member of Program Committee: ISSCC, SPIE, BIS, ISCAS, NIPS, COSI, BioCAS

Member of Promotion and Tenure Committee: Served on one P & T committee at JHU, 2006

Chair of Promotion and Tenure Committee: Served on one P & T committee at JHU, 2009

Promotion and Tenure Referee: Associate Professor for 2 candidates, 2005

Promotion and Tenure Referee: Associate Professor for 1 candidate, 2007

Promotion and Tenure Referee: Associate Professor for 3 candidates, 2009

Promotion and Tenure Referee: Associate Professor for 3 candidates, 2010

Promotion and Tenure Referee: Professor for 2 candidates, 2009

Reviewer: IEEE SJ, IEEE TCAS II, IEEE TNN, IEEE TR, IEEE TBME, IEEE IJSSC, IJCV, NIPS, EWNS, ISCAS, Wiley, NSF, NIH

Senarathna, J., Murari, K., Etienne-Cummings, R., & Thakor, N. V. (2012). A Miniaturized Platform for Laser Speckle Contrast Imaging.

PUBLICATIONS

Journal Articles:

1. G. Orchard, J. G. Martin, R. J. Vogelstein, and R. Etienne-Cummings, "FPGA Implementation of HMAX Achieves 1000x Speedup Over CPU," *accepted by IEEE Transaction on Neural Network*, Spring 2013
2. F. Dong, S.-H. Ieng., X. Savatier, R. Etienne-Cumming and R. Benosman, "Plenoptic Cameras in Real-Time Robotics," *to appear in International Journal of Robotics Research*, Spring 2012.

3. J. Senarathna, K. Murari, R. Etienne-Cummings, N.V. Thakor, N., "A Miniaturized Platform for Laser Speckle Contrast Imaging," *to appear in IEEE Transactions on Biomedical Circuits and System*s, Fall 2012 (currently accessible on iEEExplore)
4. G. Orchard, J. Zhang, Y. Suo, M. Dao, D. T. Nguyen, S. Chin, C. Posch, T. D. Tran, and R. Etienne-Cummings, "Real Time Compressive Sensing Video Reconstruction In Hardware," *IEEE Journal of Emerging and Selected Topics in Circuits and Systems*, Vol. 2, No. 3, pp. 604 – 615, 2012
5. F. Folowosele, R. J. Vogelstein, R. Etienne-Cummings, "Spike Based Implementation of the HMAX Model of Object Recognition," *IEEE Journal of Emerging and Selected Topics in Circuits and Systems*, Vol. 1, No. 4, pp. 56-515, January 2012.
6. K. Mazurek, B. Holinski, D. Everaert, R. Stein, R. Etienne-Cummings, V. Mushahwar, "A Novel Control Algorithm with Feed Forward and Feedback Control for Over-Ground Locomotion in Anesthetized Cats," *Journal of Neural Engineering*, Vol. 9, No. 2, April 2012.
7. B. Asiyanbola, C. Cheng-Wu, J. S. Lewin and R. Etienne-Cummings, "Modified Map-Seeking Circuit: Use Of Computer-Aided Detection In Locating Postoperative Retained Foreign Bodies" *Journal of Surgical Research*, Vol. 175, No. 2, pp. e47-e52, June 2012.
8. A. Russell, K. Mazurek, S. Mihalas, E. Niebur and R. Etienne-Cummings, "Maximum Likelihood Optimization of Silicon Neurons," *IEEE Trans. Biomedical Circuits and Systems*, Vol. 6, No. 2, pp. 133-141, 2012.
9. F. Folowosele, T. Hamilton, R. Etienne-Cummings, "Silicon Modeling of the Milhanas-Niebur Neuron," *IEEE Transaction on Neural Networks*, Vol. 22, No. 12 (part 1), pp. 1915-1927, 2011.
10. G. Indiveri, R. Etienne-Cummings, F. Folowosele, *et al.*, "Neurons in Silicon," *Frontiers of Neuromorphic Engineering*, Vol. 5, No. 73, May 2011.
11. Y. Dong, S. Mihalas, A. Russell, R. Etienne-Cummings and E. Niebur, "Estimating Parameters Of Generalized Integrate-And-Fire Neurons From The Maximum Likelihood Of Spike Trains," *Neural Computation*, Vol. 23, No. 11, November 2011.
12. A. Harrison, L. Mullins and R. Etienne-Cummings, "Sensor and Display Human Factors Based Design Constraints for Head Mounted and Tele-operation Systems," *Sensors*, Vol. 11, No. 2, pp. 1598-1606, January 2011.
13. K. Murari, R. Etienne-Cummings, G. Cauwenberghs and N. Thakor, "A CMOS In-Pixel CTIA High Sensitivity Fluorescence Imager," *IEEE Trans. Biomedical Circuits and Systems*, Vol. 5, No. 5, pp. 449 – 458, October 2011.
14. G. Cauwenberghs, R. Etienne-Cummings, Untitled. *IEEE Transactions on Biomedical Circuits and Systems*, Vol. 5, No. 1, pp. 1-2, 2011. DOI:10.1109/TBCAS.2011.2105010.
15. B. Asiyanbola, C. Obasi, R. Etienne-Cummings, J. Lewin, "Sponges And Incorrect Sponge Count Are A Minor Contribution To The Problem Of Retained Foreign," *Journal of the American College of Surgeons*, Vol. 211, No. 3, 2010.
16. R. J. Vogelstein, S. Harshbarger, M. Mcloughlin, J. Beaty, S. Yantis, C. Connor, N. Thakor, C. Priebe, R. Etienne-Cummings, "Research Program in Applied Neuroscience," *Johns Hopkins Apl Technical Digest*, Vol. 28, No. 3, pp. 222-223, 2010.
17. G. Orchard and R. Etienne-Cummings, "Discriminating Multiple Nearby Targets Using a Single Ping Ultrasonic Mapping," *IEEE T. Circuits and Systems I*, Vol. 57, No. 11, pp. 2915-2924, Nov 2010.
18. A. Russell, G. Orchard, Y. Dong, S. Mihalas, E. Niebur, J. Tapson, R. Etienne-Cummings, "Optimization Methods For Spiking Neurons and Networks," IEEE Transactions on Neural Networks, Vol. 21, No. 12, pp. 1950-1962, Dec 2010.
19. V. Gruev, Z. Yang, R. Etienne-Cummings and J. Van der Spiegel, "Switchless Current Mode Active Pixel Sensor," accepted to *IEEE T. Circuits and Systems I*, Vol. 57, No. 6, pp. 1154 – 1165, June 2010.
20. K. Murari, R. Etienne-Cummings, G. Cauwenberghs, and N. Thakor, "Which Photodiode To Use: A Comparison of CMOS-Compatible Structures," *IEEE Sensors Journal*, Vol. 9, No. 7, pp. 752-761, 2009.
21. C. Obasi**,** A. Agwu**,** W. Akinpelu**,** R. Hammons**,** C. Clark**,** R. Etienne-Cummings**,** P. Hill**,** R. Rothman**,** S. Babalola**,** T. Ross**,** K. Carroll and B. Asiyanbola, "Contamination of Equipment in Emergency Settings: An Exploratory Study with a Targeted Automated Intervention," *Annals of Surgical Innovation and Research*, Vol. 3, No. 8, doi:10.1186/1750-1164-3-8, July 2009.
22. Y. M. Chi, R. Etienne-Cummings and G. Cauwenberghs, "Focal-Plane Change Triggered Video Compression for Low-Power Vision Sensor Systems," *Public Library of Science One*, Vol. 4, No. 7: e6384. doi:10.1371/journal.pone.0006384, 2009.

23. J. Tapson, C. Jin, A. van Schaik and R. Etienne-Cummings, "A First-Order Non-Homogeneous Markov Model for Integrate-and-Fire Neurons Stimulated by Small Phase-Continuous Signals," *Neural Computation*, Vol. 21, No. 6, pp. 1554-1588, 2009.
24. F. Tenore, A. Ramos Murguialday, A. Fahmy, R. Etienne-Cummings, and N. V. Thakor, "Towards Real-Time Control of Individuated Finger Movements using Surface Myoelectric Signals," *IEEE T. Biomedical Engineering*, Vol. 56, No. 5, pp. 1427, 2009.
25. R. Jacob Vogelstein, Lisa Stirling, Francesco Tenore, Vivian K. Mushahwar, and Ralph Etienne-Cummings. "A Silicon Central Pattern Generator Controls Locomotion in vivo," *IEEE T. Biomedical Circuits and Systems*, Vol. 2, No. 3, pp 212 – 222, Sept. 2008. **Best Paper Award 2011**
26. A. Acharya, F. Tenore, V. Aggarwal, R. Etienne-Cummings, M. H. Schieber, and N. V. Thakor, "Decoding Finger Movements Using Volume-Constrained Neuronal Ensembles," *IEEE Trans. Neural Systems and Rehabilitation Engineering*, Vol. 16, No. 1, pp. 15-23, 2008.
27. V. Aggarwal, S. Acharya, F. Tenore, R. Etienne-Cummings, M. H. Schieber, and N. V. Thakor, "Asynchronous Decoding of Dexterous Finger Movements using M1 Neurons," *IEEE Trans. Neural Systems and Rehabilitation Engineering*, Vol. 16, No. 1, pp. 3-14, 2008. **IEEE-EMBS Most Outstanding Paper Award 2012**
28. N. Ekekwe, P. Kazanzides and R. Etienne-Cummings, "A Wide Speed Range and High Precision Position and Velocity Measurements Chip with Serial Peripheral Interface," *Elsevier Integration, the VLSI Journal*, Vol. 41, No. 2, pp. 297 – 305, Feb 2008.
29. R. Philipp, V. Gruev, D. Orr, J. Van der Spiegel and R. Etienne-Cummings, "A Linear and Low-Noise Current Domain Imager," *IEEE J. Solid-State Circuits*, Vol. 42, No. 11, Nov. 2007.
30. M. Chi, U. Mallik, E. Choi, M. Clapp, G. Cauwenberghs and R. Etienne-Cummings, "CMOS Pixel-Level ADC with Change Detection," *IEEE J. Solid-State Circuits*, Vol. 42, No. 10, pp. 2187-2196, Oct. 2007.
31. J. Vogelstein, U. Mallick, G. Cauwenberghs and R. Etienne-Cummings, "Real-Time Image Processing using a Spiking Imager and an Integrate-and-Fire Array Transceiver System," *Neural Computation*, Vol. 19, pp. 2281-2300, 2007.
32. J. Vogelstein, F. Tenore, R. Etienne-Cummings, M. A. Lewis, N. Thakor and A. Cohen, "Control of Locomotion After Injury or Amputation," *Biological Cybernetics*, Vol. 95, No. 6, pp. 555 – 566, December 2006.
33. J. Vogelstein, R. Etienne-Cummings, N. Thakor and A. Cohen, "Phase-Dependent Effects of Stimulation of the Spinal Central Pattern Generator for Locomotion," *IEEE Trans. Neural Systems and Rehabilitation Engineering*, Vol. 14, No. 3, pp. 257 – 265, September 2006.
34. N. Ekekwe and R. Etienne-Cummings, "Power Dissipation Sources and Possible Control Techniques in Ultra Deep Submicron CMOS Technologies," *Elsevier Journal of Microelectronics*, Vol. 37, No. 9, pp. 851-860 September 2006
35. M. Clapp and R. Etienne-Cummings, "Bearing Angle Estimation for Sonar Micro-Array Using Analog VLSI Spatiotemporal Processing," *IEEE Trans. Circuits and Systems-I*, Vol. 53, No. 4, pp. 769 – 783, 2006.
36. S. Mehta and R. Etienne-Cummings, "A Simplified Normal Optical Flow CMOS Camera," *IEEE Trans. Circuits and Systems-I*, Vol. 53, No. 6, pp. 1223 – 1234, June 2006
37. S. Mehta and R. Etienne-Cummings, "Normal Optical Flow CMOS APS Imager," *IEE Electronics Letters*, Vol. 41, No. 13, pp. 732 – 733, June 2005.
38. T. Horiuch and R. Etienne-Cummings, "A Time-Series Processor for Sonar Mapping and Novelty Detection," *Int. J. Robots and Automation*, Vol. 19, No. 4, pp. 171 – 177, 2004.
39. M. Clapp and R. Etienne-Cummings, "Sensing Signal Input Bearing to a Sensor Array Using Velocity-Sensitive Spatiotemporal Filters," *IEE Electronics Letters*, Vol. 40, No. 3, pp. 211-212, February 2004.
40. V. Gruev and R. Etienne-Cummings, "A Pipelined Temporal Difference Imager," *IEEE J. Solid-State Circuits*, Vol. 39, No. 3, pp. 538 – 543, March 2004.
41. R. Philipp and R. Etienne-Cummings, "A Single Chip Stereo Vision System," *Analog Integrated Circuits and Signal Processing Journal*, Vol. 7, pp. 703-712, July 2004.
42. E. Culurciello, R. Etienne-Cummings, and K. Boahen, "An Address Event Digital Imager," *IEEE J. Solid-State Circuits*, Vol. 38, No. 2, pp. 281 – 294, February 2003.

43. M. Anthony Lewis, R. Etienne-Cummings, M. H. Hartmann, A. H. Cohen, and Z. R. Xu, "An *In Silico* Central Pattern Generator: Silicon Oscillator, Coupling, Entrainment, Physical Computation & Biped Mechanism Control," *Biological Cybernetics*, Vol. 88, No. 2, pp 137-151, February 2003.
44. R. Etienne-Cummings, P. Pouliquen and M. A. Lewis, "A Vision Chip for Color Segmentation and Object Recognition," *EURASIP J. Applied Signal Processing*, Vol. 2003, No. 7, pp. 703-712, June 2003. **Best Paper Award 2003**
45. M. Clapp and R. Etienne-Cummings, "Dual Pixel Array for Imaging, Motion Detection and Centroid Tracking," *IEEE Sensors Journal*, Vol. 2, No. 6, pp. 529 – 548, December 2002.
46. V. Gruev and R. Etienne-Cummings, "A Pipe-Lined Differencing Imager," *IEE Electronics Letter*, Vol. 38, No. 7, pp. 315-317, March 2002.
47. R. Etienne-Cummings, P. Pouliquen and M. A. Lewis, "Single Chip for Imaging, Color Segmentation, Histogramming and Template Matching," *IEE Electronic Letters*, Vol. 38, No. 4, pp. 172 –174, February 2002.
48. V. Gruev and R. Etienne-Cummings, "Implementation Of Steerable Spatiotemporal Image Filters on the Focal Plane," *IEEE Trans. Circuits and Systems-II*, Vol. 49, No. 4, pp. 233-244, April 2002.
49. E. Culurciello, R. Etienne-Cummings, and K. Boahen, "An Address Event Digital Imager," *IEE Electronic Letters*, Vol. 37, No. 24, pp. 1443-1445, November, 2001.
50. R. Etienne-Cummings, V. Gruev and M. Clapp, "High Performance Biomorphic Image Processing Under Tight Space and Power Constraints," *Autonomous Robots*, Vol. 11, No. 3, pp. 227-232, November 2001.
51. R. Etienne-Cummings, "Neuromorphic Visual Motion Detection in VLSI," *Int. J. Computer Vision*, Vol. 44, No. 3, pp. 175-198, September 2001.
52. M. A. Lewis, M. Hartmann, R. Etienne-Cummings, and A. Cohen, "Biomorphic Control of a Running Robot Leg using a Custom aVLSI CPG Chip," *Neurocomputing*, Vol. 38-40, pp. 1409-1421, June 2001.
53. V. Gruev and R. Etienne-Cummings, "Programmable Spatial Processing Imager Chip," *Electronic Letters*, Vol. 37, No. 11, pp. 688 – 690, May, 2001.
54. R. Etienne-Cummings, Z. Kalayijan and D. Cai, "A Programmable Focal-Plane MIMD Image Processor Chip" *IEEE J. Solid-State Circuits*, Vol. 36, No. 1, pp 64 – 73, January 2001.
55. R. Etienne-Cummings, J. Van der Spiegel and P. Mueller, "A Foveated Silicon Retina for Two-Dimensional Tracking," *IEEE Trans. Circuits and System II*, Vol. 47, No. 6, pp. 504 – 527, June 2000.
56. R. Etienne-Cummings, "Intelligent Robot Vision Sensors in VLSI," *Autonomous Robots*, Vol. 7, No. 3 pp. 225-237, 1999.
57. R. Etienne-Cummings, J. Van der Spiegel and P. Mueller, "Hardware Implementation of a Visual Motion Pixel using Oriented Spatiotemporal Neural Filters," *IEEE Trans. Circuits and System II*, Vol. 46, No. 9, pp. 1121 – 1136, 1999.
58. R. Etienne-Cummings, J. Van der Spiegel and P. Mueller, "A Focal Plane Visual Motion Measurement Sensor," *IEEE Trans. Circuits and System I*, Vol. 44, No. 1, pp. 55 – 66, 1997.
59. R. Etienne-Cummings and J. Van der Spiegel, "Neuromorphic Vision Sensors," *Sensors and Actuators: A*, Vol. SNA056, pp. 19 – 29, 1996.
60. R. Etienne-Cummings, R. Hathaway and J. Van der Spiegel, "An Accurate and Simple CMOS 'One-Over' Circuit," *Electronic Letters*, Vol. 29-18, pp. 1618 – 1620, Sept. 1993.
61. J. Van der Spiegel, D. Blackman, P. Chance, C. Donham, R. Etienne-Cummings and P. Kinget, "An Analog Neural Network with Modular Architecture for Real-Time Dynamic Computations," *IEEE J. Solid-State Circuits*, Vol. 27, pp. 82 – 92, 1992.
62. P. Mueller, J. Van der Spiegel, D. Blackman, P. Chance, C. Donham, R. Etienne-Cummings, J., J. Kim, M. Massa and S. Samarasekera, "Design and Performance of a Prototype General Purpose Analog Neural Computer," *Neurocomputing*, Vol. 4, pp. 311 – 324, 1992.

Journal Articles (In Review):

1. C. Clark, C. White and R. Etienne-Cummings, "Design and Optimization of Tissue Specific Ultrasonic Systems," submitted to *IEEE Sensors Journal*, Fall 2009.

2. C. Obasi, C. Cheng-Wu, C. Sciortini, R. Etienne-Cummings, J. S. Lewin and B. Asiyanbola, "Sponges And Incorrect Sponge Count: Limited Contribution To The Current Process Of Detecting Retained Foreign Bodies," *submitted to Annals Of The Royal College Of Surgeons Of England***,** Fall 2010
3. A. Russell, S. Mihalas, Y. Dong, P.A. Iglesias, E. Niebur and R. Etienne-Cummings, "The Maximum Likelihood estimator for the Mihalas-Niebur Neuron is Log-concave," *under revision for Neural Computation*, June 2011
4. L. Mullins, A. Harrison, R. Etienne-Cummings, "Tone Mapping to Enhance Target Identification", *submitted to Military Psychology*, Summer 2011.
5. A. Russell, S. Mihalas, E. Niebur and R. Etienne-Cummings, "A Proto-Object Based Visual Saliency Model," submitted to *Vision Research*, Spring 2013.
6. A. Harrison, G. Qulock-Knopp and R. Etienne-Cummings, "An Entropy-Based Model of Visual Saliency," submitted to *Journal of Vision*, revised, Spring 2013.
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2. R. Etienne-Cummings, "How Do We Make Neural Prosthetic Devices of the Future Speak The Same Language as the Nervous System?" *Proc. IEEE Technology Time Machine*, Hong Kong, June 2011. (Keynote with extended abstract)
3. R. Etienne-Cummings and R. Philipp, "Single Chip Stereo Imager," *ISSCC Forum on 3D Imaging*, Feb. 2011.

4. R. Etienne-Cummings, "Current Mode Active Pixel Imagers Make Focal-Plane Processing Easier," *CMOS Emerging Technology*, Vancouver, Canada, Aug 2008.
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2. G. Koklu, S. Carrara, and R. Etienne-Cummings, "Are CMOS Cameras Reliable for Biological
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4. C. Rhoades, Advani, T., Mazurek, K., & Etienne-Cummings, R., "Live Demo: Spiking ratSLAM: Rat hippocampus cells in spiking neural hardware," *2012 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 92-92, November 2012.
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2. K.A. Mazurek, B.J. Holinski, D.G. Everaert, P. Troyk, R. Etienne-Cummings, R.B. Stein, V.K. Mushahwar, "Producing Sustainable Over-ground Walking Using Intraspinal Microstimulation," Society for Neuroscience Annual Conference, New Orleans, LA, October 2012
3. G. Orchard, J. Zhang, and C. Posch and R. Etienne-Cummings, "Real-Time Compressive Sensing Using an Asynchronous Time-domain Image Sensor and a Virtex-6 FPGA " *Proc. IEEE Biomedical Circuits and Systems Conference*, San Diego, November 2011.
4. R. Etienne-Cummings, "How Do We Make Neural Prosthetic Devices of the Future Speak The Same Language as the Nervous System?" *Proc. IEEE Technology Time Machine*, Hong Kong, June 2011. (extended abstract)
5. C. Ashby and R. Etienne-Cummings, "A Novel 3D Display Using Multi-Hyperstereo Image Stitching" Proc. Conf. Information Science and Systems, Baltimore, MD, pp. 1-6, March, 2011. (extended abstract)
6. V. Aggarwal, S. Acharya, F. Tenore, R. Etienne-Cummings, M. H. Schieber, N. V. Thakor, "Real-time Neuronal Decoding for Individuated and Combined Finger Movements of a Robotic Hand," accepted for *2007 BMES Annual Meeting*, Summer 2007 (extended abstract)
7. F. Folowesele, R. Etienne-Cummings, J. Tapson, "Wireless Address Event Representation System For Biological Sensor Network," Proc. SPIE (Bioengineered and Bioinspired Systems), May 2007
8. C. Clark, J. Whitney and R. Etienne-Cummings, "Design of an Ultrasonic Micro-Array for Near Field Sensing during Retinal Microsurgery," *Proc. EMBS*, New York, NY, August 2006.
9. R. Vogelstein, N. Thakor, R. Etienne-Cummings, and A. Cohen, "Electrical Stimulation of a Spinal Central Pattern Generator for Locomotion," Proc. 2nd International IEEE EMBS Conference on Neural Engineering. Arlington, VA, March 2005.
10. S. Mehta and R. Etienne-Cummings, "An Optical Flow Camera," *Proc. SPIE*, Orlando, FL, April 2004.
11. L. Beresnev, M. Vorontsov, V. Gruev and R. Etienne-Cummings, "Differential Zernike Filter Based on Ferroelectric Liquid Crystal OASLM," *Proc. SPIE*, Orlando, FL, April 2002.
12. D. Tomlin, A. Thakral, J. Wallace, R. Etienne-Cummings, and N. Thakor, "Precision Minimally Invasive Surgery By Adaptive Organ Motion Tracking And Compensation," *Annals of Biomedical Engineering*, Vol. 28, SUPPL. 1, 2000.
13. M. A. Lewis, R. Etienne-Cummings, M. Hartmann, and A. H. Cohen, "Sensorimotor Integration in Lampreys and Robots II: CPG Hardware Circuit for Controlling a Running Robot Leg," (Abstract), *International Symposium on Adaptive Motion of Animals and Machines*, Motreal, Canada, Aug 8-12, 2000.
14. Ralph Etienne-Cummings, M. Anthony Lewis, Mitra Hartmann and Avis H. Cohen, "CPU-Less Robotics: Distributed Control of Biomorphs," *Proceedings of the SPIE*, Vol. 4109, San Diego, CA, August, 2000.
15. M. Anthony Lewis, Ralph Etienne-Cummings, Mitra Hartmann, and Avis H. Cohen, "Biomorphic Control of a Running Robot Leg using a Custom aVLSI CPG Chip," (Abstract), *4th International Conference on Cognitive and Neural Systems*, Boston, 2000.
16. M. Anthony Lewis, Ralph Etienne-Cummings, Mitra Hartmann, and Avis Cohen, "Control of a Robot Leg with an Adaptive aVLSI CPG Chip," *Computational Neuroscience Meeting 2000 (CNS*2000)*, Brugge, Belgium, July 16-20, 2000.
17. R. Etienne-Cummings and T. Lewis, "CPU-Less Sensory-Motor Control of Real-Time Behaving Systems," *SPIE Conference on Critical Technologies for the Future of Computing*, San Diego, California, August, 2000.
18. R. Tumbar, V. Gruev, M. R. Fetterman, R. Etienne-Cummings, and D. Brady, "Focal-Plane Processing for Interferometric Imaging," OSA*99, Santa Clara, CA, 1999.
19. R. Etienne-Cummings, Viktor Gruev and Donghui Cai, "A High Density Focal-Plane Image Processing Array," *33rd. Conf. Information Sciences and Systems*, pp. 866-870, March, 1999.

20. R. Etienne-Cummings, F. Pourboghrat, H. Maruboyina and S. Dhali, "Architecture for Distributed Actuation and Sensing Using Smart Piezoelectric Elements," *Proceedings of SPIE Smart Structure and Integrated Systems 98*, San Diego, CA, March 1998.
21. R. Etienne-Cummings, P. Longo, J. Van der Spiegel and P. Mueller, "Real Time Visual Target Tracking: Two Implementations of Velocity-Based Smooth Pursuit," Pro*ceedings of SPIE AeroSense 95*, Vol. 2486, Orlando, FL., April 1995.
22. R. Etienne-Cummings, S. Fernando, J. Van der Spiegel and P. Mueller, "VLSI Implementation of a Focal Plane Motion Sensor," *Proc. SENSOR EXPO*, Philadelphia, Oct. 26-28 1993.
23. P. Mueller, J. Van der Spiegel, D. Blackman, C. Donham and R. Etienne-Cummings, "Real Time Decomposition of Acoustical Patterns with an Analog Neural Computer," *SPIE Conf. on Applications of Artificial Neural Networks III*, Vol. 1709, pp. 758-769, 1992.
24. P. Mueller, J. Van der Spiegel, V. Agami, D. Black-man, P. Chance, C. Donham, R. Etienne-Cummings, J. Flinn, J. Kim, M. Massa, S. Samarasekera, "Design and Performance of a Prototype General Purpose Analog Neural Computer," *Proc. 2nd Intl. Conf. Microelectronics for Neural Networks*, pp. 347-357, Munich, Germany, Oct. 16-18 1991.
25. P. Mueller, J. Van der Spiegel, V. Agami, D. Blackman, P. Chance, C. Donham, R. Etienne-Cummings, J. Flinn, J. Kim, M. Massa, S. Samarasekera, "Design and Performance of a Prototype General Purpose Analog Neural Network," *Proc. 2nd Government Neural Network Application Workshop*, Huntsville, AL, 10-12, Sept. 1991.
26. J. Van der Spiegel, P. Mueller, V. Agami, P. Aziz, D. Blackman, P. Chance, A. Choudhury, C. Donham, R. Etienne-Cummings, L. Jones, P. Kinget, M. Massa, W. von Koch, J. Xin, "A Multi-Chip Analog Neural Network," *Proc. 1991 Intl. Symp. on VLSI Tech., Systems and Applications*, pp. 64-68, Taipei, Taiwan, May 22-24 1991.
27. J. Van der Spiegel, P. Mueller, D. Blackman, C. Donham, R. Etienne-Cummings, P. Aziz, A. Choudhury, L. Jones and J. Xin, "Artificial Neural Networks: Principles and VLSI Implementation," *Proc. SPIE of Vth Congress of the Brazilian Society of Microelectronics SPIE*, Vol. 1405, pp. 184-197, Campinas, Brazil, July 1990.

Patents:

1. E. Boctor, X. Guo and R. Etienne-Cummings, "High Quality Closed Loop Ultrasound System," Report of Invention, JHTT, Fall 2012
2. B. Asiyanbola, C. Cheng-Wu, J. Levin, R. Etienne-Cummings, Roger Hammons, "A New System For The Detection Of Post Operative Retained Foreign Bodies," JHTT Ref.: C10417_P10417-02; Venable Ref.: 2240-294739.
3. B. Asiyanbola, W. Akinpelu, R. Etienne-Cummings, R. Hammons, "Decontamination Apparatus," PTC International Application, P10418-03 for U.S. Application 61/174261 and 61/293031, May 2010.
4. F. Tenore, F. Folowosele, J. Tapson and R. Etienne-Cummings, "A Neuromorphic Cross-Correlation Engine" Utility Patent Filed, May 2009.
5. M. Massie, R. Etienne-Cummings, S. Baxter, J.P. Curzan, "Variable Acuity Imager with Pitch, Yaw and Roll Measurement," Patent #7,808,528, September 2010.
6. N. Ekekwe, R. Etienne-Cummings, P. Kazanzides, "Adaptive and Reconfigurable Chip for DC Motor Control," Utility Patent Filed, USPTO Publication # 2008/0247735 A1, October 2008.
7. R. Etienne-Cummings, M. A. Lewis, V. Gruev, "ColorStick," Patent #7,251,031, December 2006.
8. R. Etienne-Cummings, M. A. Lewis and P. Pouliquen, "Color Segmentation, Histogramming and Object Recognition System," Patent #6,897,426, May 2005.
9. R. Etienne-Cummings and M. A. Lewis, "A Biomorphic Rhythmic Movement Controller," Patent #7,164,967, September 2006.

Workshops/Conferences/Panels/Invited Talks:

Participant: Computational Sensors Workshop, Grasp Lab, U. of Pennsylvania, Philadelphia, PA, 1993.

Participant: International CMOS Camera Workshop, AT&T Laboratories, Holmdel, NJ, 1994.

Participant: NSF Workshop on Neuromorphic Engineering, Telluride, CO, 1996-1999.
Participant: NIPS Workshops, Snowmass, CO, 1996.
Participant: DARPA RP2009 Phase II Kick-Off Meeting, St. Michaels, MD, April 2008.
Instructor: NSF Workshop on Neuromorphic Engineering, Telluride, CO, 1997.
Session Chairman: Conference on Information Sciences and Systems, Baltimore, MD, 1999.
Session Chairman: International Solid-State Circuits Conference, San Francisco, CA, 2000, 2003, 2004.
Session Chairman: International Symposium on Circuits and Systems, 2001-2009
Panel Moderator: IEEE ISSCC, San Francisco, CA, 2002.
Panel Moderator: NSF ERC Annual Meeting, 2004.
Co-chairman: Workshop on Understanding the Brain and Engineering Models, Sydney, Australia, 1999.
Co-Chairman: Neural Information Processing Systems Workshop, December 1997, 1998, 2002, 2003.
Program Co-Chair: IEEE BioCAS Conference, Montreal, Fall 2007
General Co-Chair and Organizer: IEEE BioCAS Conference, Baltimore, Fall 2008
Invited Speaker: 1st European Workshop on Neuromorphic Systems, Stirling, Scotland, 1997.
Invited Speaker: IROS Workshop on Biomorphic Robots, Victoria, Canada, 1998.
Invited Participant/Speaker: Evolvable Distributed Sensors and Systems, Bozeman, MT, 1999.
Invited Participant: Workshop on Biomorphic Robots, Pasadena, CA, 2000.
Invited Participant: ARO Workshop on Personnel Detection, Columbus, OH, 2002.
Invited Participant: DARPA Workshop on Intelligent Arthropods, Arlington, VA, 2003.
Invited Speaker: SPIE Conference, Orlando, FL, 2001, 2005
Invited Speaker: Post IJCNN Neuromorphic Workshop, Montreal, Canada, 2005
Invited Speaker: Carnegie Mellon University, Pittsburgh, PA, 2001.
Invited Speaker: ETH-Zurich, Switzerland, 2001.
Invited Speaker: IEEE Low-Power Electronics Workshop, Arlington, VA, 2001.
Invited Speaker: OIDA Workshop, Washington, DC, 2002.
Invited Speaker: Bio-Technology Review Day, College Park, MD, 2002.
Invited Speaker: ISCAS 2003, Special Session, Bangkok, Thailand, May 2003
Invited Speaker: NSF Telluride Workshop on Neuromorphic Engineering, CO, 2000, 2001, 2002, 2003, 2004.
Invited Speaker: LPS Seminar Series, University of Maryland, College Park, MD, 2003.
Invited Speaker: Neuroscience and Cognitive Sciences, University of Maryland, College Park, MD, 2003, 2004.
Invited Speaker: SRC Review, Seattle, WA, 2003.
Invited Speaker: Cornell University, Ithaca, NY, 2004.
Invited Speaker: University of Sydney, Sydney, Australia, 2004.
Invited Speaker: Edith Cowen University, Perth, Australia, 2004.
Invited Speaker: University of Queensland, Brisbane, Australia, 2004.
Invited Speaker: Johns Hopkins University, Baltimore, MD, 2004.
Invited Speaker: Mitre Corporation, McClean, VA, 2004.
Invited Speaker: NRO, Chantilly, VA, 2005.
Invited Speaker: Agilent Corp., Palo Alto, CA, 2005.
Invited Speaker: SPIE Conference, Orlando FL, 2005.
Invited Speaker: NSF Grantees Meeting, Washington, DC, 2005.
Invited Speaker: Columbia University, NY, 2005.
Invited Speaker: NASA, Goddard, MD, 2005.
Invited Speaker: Workshop on Neuromorphic Systems, IJCNN'05, Montreal, Canada, 2005.
Invited Speaker: ETHZ-INI/INE Workshop, Zurich, Switzerland, 2005.
Invited Speaker: National Society of Black Engineers, Greenbelt, MD, 2005.

Invited Speaker: Yale University, CT, 2006.
Invited Speaker: University of Alberta, Canada, 2006.
Invited Speaker: IEEE CICC '06, Signal and Data Processing, San Jose, CA, 2006.
Invited Speaker: University of Cape Town, IEEE Chapter, 2006.
Invited Speaker: Arizona State University, Catalyst Symposium, Mar 2007
Invited Speaker: Institute of Neuromorphic Engineering, Sardinia Meeting, Apr 2007
Invited Speaker: Keynote Address, Center for Talent Youths, Baltimore, MD, June 2007.
Invited Speaker: European Optical Society, Munich, Germany, June 2007.
Invited Speaker: NASA Goddard, Laurel, MD, July 2007.
Invited Speaker: University of Cape Town, South Africa, Sept 2007.
Invited Speaker: Cornell University, Oct 2007.
Invited Speaker: Army Research Lab – Aberdeen Proving Grounds, Nov 2007.
Invited Speaker: National Academy of Science, Kavli Frontiers in Science, Irvine, CA, Nov 2007.
Invited Speaker: Biomedical Circuits and Systems Conference, Tutorial, Montreal, CA, Nov 2007.
Invited Speaker: DARPA DRSC Electronic StemCell Workshop, DC, Jan 2008.
Invited Speaker: University of Pennsylvania, Feb 2008.
Invited Speaker: Institute for Neuro Informatics, ETHZ, Zurich, Switzerland, October, 2008.
Invited Speaker: Intelligent Sensors, Sensor Networks and Information Processing, Sydney, Australia, December, 2008 (Keynote Address).
Invited Speaker: Hong Kong University of Science and Technology, Hong Kong, P.R. China, May 2009.
Invited Speaker: JHU Applied Physics Laboratory, Laurel, MD, August 2009.
Invited Speaker: Center for Research in Minority Institutions, U. Hawaii - Manoa, HI, October 2009.
Invited Speaker: Bodian Lecture, Mind-Brain Institute, JHU, Baltimore, MD, November 2009.
Invited Speaker: Morgan State University, Baltimore, MD, November 2009.
Invited Speaker: Applied Physics Lab, Laurel, MD, April 2010.
Invited Speaker: Mitre Corporation, Mclean, VA, April 2010.
Invited Speaker: CNS Conference, Boston University, Boston, MA, May 2010.
Invited Speaker: CAARMS Conference, Baltimore, MD, June 2010.
Invited Speaker: University of Seychelles Open Lecture Series, January 2011
Invited Speaker: IEEE Solid State Circuits Conference, Forum on 3D Image Sensors, February 2011
Invited Speaker: IEEE Technology Time Machine (Keynote), June 2011
Invited Speaker: Hong Kong University of Science and Technology, June 2011
Invited Speaker: 9th System on a Chip Conference (Keynote), November 2011
Invited Speaker: Washington International School (K – 12 Outreach), November 2011
Invited Speaker: 5th Australian Workshop on computational Neuroscience, December 2011
Invited Speaker: Capo Caccia Cognitive Neuromorphic Engineering Workshop, Italy, April 2012
Invited Speaker: TSRC Telluride Town Talks Series, Colorado, July 2012
Invited Speaker: Macquarrie University, Australia, August 2012
Invited Speaker: IFESS 2012, Banff, Canada, September 2012
Invited Speaker: National University of Singapore, Singapore, November 2012
Invited Speaker: National Chiao Tung University, Taiwan, November 2012
Review Panel: NIH SBIR Panel, Washington, DC, Nov. 2002, Mar. 2004, Nov. 2004, Nov 2005.
Review Panel: NSF ECS Panel, Arlington, VA, Jan., Oct. 2003.
Review Panel: DoE Retina Prosthesis Project, Rockville, MD, Sept 2007.
Review Site Visitor: NSF-SLC CELEST, Boston U., MA, March 25-27, 2007.
Review Committee of Visitors: NSF SLC Programs, Arlington, VA, February, 2009.

Review Site Visitor: NSF-ERC QOLT, Carnegie Mellon U., Pittsburgh, PA, March, 2009.
Review of Faculty Member: Tufts University, Medford, MA, November, 2009.
Organizer: CMOS Imagers Tutorial, ISCAS 2003, May 2003; ISCAS 2004, May 2004, ICECS Dec 2004.
Organizer: NSF Telluride Neuromorphic Engineering Workshop, Telluride, CO, 2003 – Present.
Organizer: Topical Meeting on Time Domain Neural Signal Processing, Zurich, Switzerland, 2005.
Organizer: ISCAS 2004, Special Sessions on Spiking Neural Systems, Vancouver, Canada, May 2004.
Organizer: ISCAS 2005, Special Sessions on Sensory Systems for Biological Applications, Kobe, Japan, May 2005.
Organizer: ISCAS 2005, Demonstration Sessions on Sensory Systems, Kobe, Japan, May 2005.
Organizer: ISCAS 2006, Special Sessions on Sensory Systems for Biological Applications, Kos, Greece, May 2006.
Organizer: ISCAS 2006, Demonstration Sessions on Sensory Systems, Kos, Greece, May 2006.
Organizer: IEEE BioCAS Conference, Baltimore, MD, November 2008 (General Chair).
Tutorial Presenter: IEEE BioCAS Conference, Baltimore, MD, November 2008.
Tutorial Presenter: IEEE BioCAS Conference, Beijing, P.R. China, November 2009.

TEACHING

JHU:

CAD Digital VLSI Design, 520.491/391: Fall 1998-2012, Enrollment: F2012 (14)
Electronic Design Laboratory, 520.448/738: Spring 1999-2013, Enrollment: S2012 (36)
Senior Design Project, 520.498: 1998-2013, Enrollment S/F2012 (0)
Independent Study/Research, 520.502/504/800/801/802: 1998-2013, Enrollment S/F2012 (13)
Advanced Integrated Circuits, 520.671/672/771/772: 2007-2013, Enrollment S/F2012 (8)
Product Design Laboratory, 520.427: Fall 2007-20012, Enrollment F2012 (13)
Seminar in Computational Sensing and Robotics, 500.745: Fall 2004 – 2012, Enrollment F2012 (50)

UCT:

CAD Digital VLSI Design: Fall 2006, Enrollment: 7
Senior Thesis Advisor: Fall 2006, Enrollment: 11

UMCP:

CAD Digital VLSI Design, ENEE408B: Spring 2002, Enrollment: 9
Advanced Mixed Signal VLSI Design, ENEE719C: Fall 2002, Enrollment: 20 (+ ~5 sit-ins)

SIUC:

Introduction to Digital Systems, Fall 1995-1997
Computer Architecture, Spring 1996, 1998
CAD Digital VLSI Design, Fall 1995-1997
Advanced Computer Design, Spring 1995, 1997
Advanced Mixed Signal VLSI Design, Spring 1995-1998
Senior Design Project, 1996, 1997, 1998

GRADUATE STUDENTS

Masters

1. Per Stomhagen, MSEE 1996 (SIU), Intel Corp.
2. Dinakaran Chidambaram, MSEE 1996(SIU), Thompson Electronics
3. Donghui Cai, MSEE 1997 (SIU), Intel Corp.
4. Eunsung Huh, MSEE 1997 (SIU), IC Works

5. Timothy McKinney, MSEE 1997 (SIU), Ph.D. Candidate, Texas A&M
6. Tom Burke, MSEE 1998 (SIU), Northrop Grumman
7. How-Yue Chen, MSEE 1999 (SIU), Intel Corp.
8. Clarence Keith, MSEE 1999 (SIU), Northrop Grumman
9. Mohamed Abdel Ghani, MSEE 1999 (SIU), IBM
10. Francesco Tenore, MSEE (JHU), Trieste U., Italy
11. Mark Nesky, MSEE 2001 (JHU), EVI
12. Zi Rong Xu, MSEE 2001 (JHU), Temple University Med. School
13. Bharath Reddy, MSEE 2001 (JHU), Analog Devices Inc.
14. Katherine Tsai, MSEE 2005 (JHU), Stanford University, CA
15. Vikram Shirgur, MSEE 2005 (JHU)
16. Ndubuisi Ekekwe, MSEE 2005 (JHU)
17. Fopefolu Folowosele, MSEE 2007 (JHU)
18. Andre Harrison, MSEE 2008 (JHU)
19. Alexander Russell, MSEE 2009 (JHU)
20. Garrick Orchard, MSEE 2009 (JHU)
21. Kevin Mazurek, MSEE 2010 (JHU)
22. Amit Bhatia, MSEE 2010 (JHU)
23. Corey Ashby, MSEE 2011 (JHU)
24. Luwei Huang, MSEE 2011 (JHU)
25. Xiaoyu Guo, MSEE 2008 (JHU)
26. Kerron Duncan, MSEE 2011 (JHU)
27. Aaron Lampley, MSEE 2011 (JHU)
28. Shinjan Li, MSEE 2013 (JHU)
29. Siwei Liu, MSEE 2013 (JHU)
30. Meng Wang, MSEE 2013 (JHU)
31. Chen Zhao, MSEE 2013 (JHU)

Ph.D.

Viktor Gruev, Ph.D.2004 (ECE/JHU), "Implementation of Steerable Spatiotemporal Filters and Adaptive Image Processing on the Focal-Plane," Currently a Post-Doc at U. Pennsylvania, PA

Mathew Clapp, Ph.D. 2005 (ECE/JHU), "3-D Sensing Using Smart Sensors: Compact Efficient Sensor Processing," Currently Technical Staff of LSI Logic, CA

Swati Metha, Ph.D. 2006, "Compact, Low-Power and High Resolution Optical Flow Camera," Currently Technical Staff of Canesta, CA

Jacob Vogelstein, Ph.D. 2007 (BME/JHU), "Towards a Spinal Neural Prosthesis Device," Currently Technical Staff of The Johns Hopkins U. Applied Physics Lab

Francesco Tenore, Ph.D. 2008 (ECE/JHU), "Biomorphic Robotic Systems: Silicon Spinal Networks for Robotic Limb Control," Currently a Post Doctoral Fellow at The Johns Hopkins U. Applied Physics Lab

Clyde Clark, Ph.D. 2008 (MSU/EE), "Design and Optimization of Tissue Specific Ultrasonic Arrays," JHU/SOM Department of Radiology for a Post Doctoral Fellowship

Ralf Phillip, Ph.D. 2008 (ECE/JHU), "VLSI Systems for 3D Vision," Looking for a Faculty Position

Ndubuisi Ekekwe, Ph.D. 2009 (ECE/JHU), "Reconfigurable, Application Specific Control Systems on a Chip," Analog Devices Inc., Boston, MA

Fopefolu Folowosele, Ph.D. 2010 (ECE/JHU) "Spike Based Object Recognition," McKenzie Consulting, NY

Alexander Russell, Ph.D. 2012 (ECE/JHU) "Biofidelic Models of Visual Attention", Start Up, Johannesburg, RSA

Garrick Orchard, Ph.D. 2012 (ECE/JHU) "Neuromorphic Visual Information Processing in Hardware", National University of Singapore

Andre Harrison, Ph.D. 2012 (ECE/JHU) "Information Content Models of Human Vision", Fall 2012

Kevin Mazurek, ECE Ph.D. Candidate, Graduation Expected, Summer 2012, JHU (Passed Qualifier, GBO and Seminar)

Xiaoyu Guo, ECE Ph.D., Started Fall 2009 (Passed Qualifier and GBO)

Kerron Duncan, ECE Ph.D., Started Spring 2010 (Passed Qualifier and GBO)

Jie Zhang, ECE Ph.D., Started Fall 2010 (Passed Qualifers)

Jamal Molin, ECE Ph.D., Started Fall 2011 (Passed Qualifier)

Helene Nguewou-Hyouse, ECE Ph.D, Started Fall 2011

GRANTS

FUNDED

Title: Material Technology Center: Distributed Smart Ultrasonic Sensors Networks

Agency: Southern Illinois University at Carbondale

PI: Shirshak Dhali (EE/SIUC)

Amount: $46K ***Portion:*** 100% ***Duration:*** 1997 – 1999

Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: CAREER: VLSI Implementation of Computational Sensors

Agency: National Science Foundation

PI: Ralph Etienne-Cummings (ECE/JHU)

Amount: $200K ***Portion:*** 100% ***Duration:*** 1996 – 2000

Role: PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: ERC: Computer Integrated Surgical Systems and Technology

Agency: National Science Foundation

PD: Russel Taylor (CS/JHU)

Amount: $30M ***Portion:*** 2% ***Duration:*** 1998 – 2008

Role: PI, Task Leader ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Amount: $30M ***Portion:*** 15% ***Duration:*** 2004 – 2008

Role: PI, Assoc. Director for Education/Outreach ***Funding Type:*** Personnel Salaries, Programs, Equipment

Title: International Collaboration Grant: Computation with Spikes

Agency: Australian Research Council

PI: Marwan Jabri (EE/U. Sydney)

Amount: A$8.6K ***Portion:*** 100% ***Duration:*** 1998 – 1999

Role: Co-PI ***Funding Type:*** Personnel Salaries, Travel, Equipment

Title: Legged Locomotion: Central Pattern Generators for Elegant Stepping

Agency: Office of Naval Research

PI: Ralph Etienne-Cummings (ECE/JHU)

Amount: $300K ***Portion:*** 100% ***Duration:*** 1999 – 2000

Role: PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Young Investigator Program: Computational Microsystems for Autonomous Distributed Sensory Information Processing

Agency: Office of Naval Research

PI: Ralph Etienne-Cummings (ECE/JHU)

Amount: $300K ***Portion:*** 100% ***Duration:*** 2000 – 2003
Role: PI ***Funding Type:*** Personnel Salary, Graduate Students, Equipment

Title: SBIR Phase I & II: Focal-Plane Color-Based Object Recognition
Agency: National Science Foundation
PI: M. Anthony Lewis (Iguana Robotics, Inc.)
Amount: $590K ***Portion:*** 11% ***Duration:*** 2000 – 2003
Role: Senior Personnel ***Funding Type:*** Personnel Salaries, Equipment

Title: Wavefront Detection for Adaptive Optics Systems
Agency: Army Research Lab
PI: Ralph Etienne-Cummings (ECE/JHU)
Amount: $50K ***Portion:*** 100% ***Duration:*** 2000 – 2001
Role: PI ***Funding Type:*** Graduate Student, Equipment

Title: MIATI Information Technology Grant: Development of the JHU RoboCup Team
Agency: JHU
PI: Ralph Etienne-Cummings (ECE/JHU)
Amount: $40K ***Portion:*** 100% ***Duration:*** 2000 – 2000
Role: PI ***Funding Type:*** Equipment

Title: SBIR Phase I: Wavefront Correction for Adaptive Optics Systems
Agency: Army Research Office
PI: Teresa Ewing (Bolder Non-Linear Systems, Inc.)
Amount: $90K ***Portion:*** 16% ***Duration:*** 2001 – 2001
Role: Senior Personnel ***Funding Type:*** Personnel Salaries, Equipment

Title: Air-Coupled Acoustic Microsensor Technologies
Agency: DARPA
PI: Shihab Shamma (ECE/UMCP)
Amount: $2.5M ***Portion:*** 8% ***Duration:*** 2000 – 2004
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: XYZ on a Chip: Microscale Adaptive Optical Wavefront Correction
Agency: National Science Foundation
PI: Gert Cauwenberghs (ECE/JHU)
Amount: $589K ***Portion:*** 16% ***Duration:*** 2001 – 2004
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Integrative Systems: Computation with Inter-Pulse-Interval
Agency: National Science Foundation/Silicon Research Council
PI: Daniel Hammerstrom (ECE/OHSU)
Amount: $375K ***Portion:*** 38% ***Duration:*** 2001 – 2004
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Collaborative Technical Alliance: Sensor Networks using Free-Air Laser Communication

Agency: Army Research Office/Telcordia Technologies
PI: Ralph Etienne-Cummings (ECE/UMCP)
Amount: $140K ***Portion:*** 60% ***Duration:*** 2002 – 2002
Role: PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Site REU: Maryland Engineering Research Internship Teams (MERIT)
Agency: National Science Foundation
PI: Steve Marcus (ECE/UMCP)
Amount: $1M ***Portion:*** - ***Duration:*** 2002 – 2007
Role: Faculty Participant ***Funding Type:*** Undergraduate Student Stipend, Equipment

Title: Visually Guided Legged Locomotion
Agency: Office of Naval Research
PI: M. Anthony Lewis (Iguana Robotics, Inc.)
Amount: $511K ***Portion:*** 21% ***Duration:*** 2000 – 2003
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Planning Grant on Multidisciplinary Capstone Courses Program
Agency: National Science Foundation
PI: Neil Goldman (ECE/UMCP)
Amount: $100K ***Portion:*** 5% ***Duration:*** 2002 – 2002
Role: Co-PI ***Funding Type:*** Personnel Salaries

Title: Biologically Inspired Visual Motion Sensors for Unmanned Aerial Vehicles
Agency: Air Force Research Labs - Eglin
PI: Ralph Etienne-Cummings (ECE/JHU)
Amount: $147K ***Portion:*** 100% ***Duration:*** 2004 – 2006
Role: PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Conference: Telluride Neuromorphic Engineering Workshop
Agency: National Science Foundation
PI: Ralph Etienne-Cummings (ECE/UMCP)
Amount: $400K ***Portion:*** - ***Duration:*** 2004 – 2009
Role: PI ***Funding Type:*** Housing, Participants Cost, Travel

Title: SST: Minimally Attended Smart Sensor Networks
Agency: National Science Foundation
PI: Ralph Etienne-Cummings (ECE/UMCP)
Amount: $412K ***Portion:*** 60% ***Duration:*** 2004 – 2008
Role: PI ***Funding Type:*** Personnel Salaries, Graduate/REU Students, Equipment

Title: ERC: Computer Integrated Surgical Systems and Technology (Funding Supplements)
Agency: National Science Foundation
PD: Russel Taylor (CS/JHU)
Amount: $165K (REU) ***Portion:*** - ***Duration:*** 2004 – 2007
Role: PI, Assoc. Director for Education/Outreach ***Funding Type:*** Undergraduate Student Stipend, Equipment

Amount: $150K (REU) ***Portion:*** - ***Duration:*** 2005 – 2008
Role: PI, Assoc. Director for Education/Outreach ***Funding Type:*** Undergraduate Student Stipend, Equipment
Amount: $57K (ROLE) ***Portion:*** - ***Duration:*** 2004 – 2005
Role: PI, Assoc. Director for Education/Outreach ***Funding Type:*** Visiting Scholar Salary

Title: Telluride Neuromorphic Engineering Workshop
Agency: WowWee Toys
PI: Ralph Etienne-Cummings (INE)
Amount: $10K ***Portion:*** - ***Duration:*** 2005 – 2005
Role: PI ***Funding Type:*** Housing, Participants Cost, Travel

Title: GK - 12: BIGSTEP Training Grant for Pre-doctoral Students
Agency: National Science Foundation
PI: Leigh Abts (CEO/JHU)
Amount: $1.98M ***Portion:*** - ***Duration:*** 2004 – 2007
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students

Title: STTR: ELASTIC Program for Low-Power, Compact *ad-hoc* Networked Video Motes
Agency: DARPA
PI: Raymond Coussa (Nova Sensors)
Amount: $100K ***Portion:*** 20% ***Duration:*** 2005 – 2006
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: Telluride Neuromorphic Engineering Workshop
Agency: IEEE CAS Society
PI: Ralph Etienne-Cummings (INE)
Amount: $5K ***Portion:*** - ***Duration:*** 2006 – 2006
Role: PI ***Funding Type:*** Housing, Participants Cost, Travel

Title: Revolutionary Prosthetic Limbs: Upper Extremity Prosthetics Phase I
Agency: DARPA
PD: Stuart Harshbarger (APL/JHU)
Amount: $30M ***Portion:*** 1.1% ($433K) ***Duration:*** 2006 – 2008
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment

Title: SITE REU: Research Experience for Undergraduates in Computer Integrated Surgery
Agency: National Science Foundation
PI: Jerry Prince (ECE/JHU)
Amount: $325K ***Portion:*** - ***Duration:*** 2007 – 2010
Role: Co-PI ***Funding Type:*** Housing, Participants Cost, Travel

Title: Conference: Telluride Neuromorphic Cognition Engineering Workshop
Agency: National Science Foundation
PI: Timothy Horiuchi (ECE/UMCP)
Amount: $500K ***Portion:*** - ***Duration:*** 2007 – 2012
Role: Co-PI ***Funding Type:*** Housing, Participants Cost, Travel

Title: Instraspinal Microstimulation for Restoring Limb Movement
Agency: National Institute of Health
PI: Vivian Mushahwar (BME/UA)
Amount: ~$1.8M ***Portion:*** - ***Duration:*** 2007 – 2012
Role: Co-PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material, Travel

Title: Revolutionary Prosthetic Limbs: Upper Extremity Prosthetics Phase II
Agency: DARPA
PD: Stuart Harshbarger (APL/JHU)
Amount: ~$40M ***Portion:*** ~2% ($773K) ***Duration:*** 2008 – 2010
Role: Co-PI ***Funding Type:*** Personnel Salaries, Graduate Students, Equipment, Travel

Title: Human Factors Defined Visual Sensors and Displays
Agency: Army Research Labs
PI: Ralph Etienne-Cummings
Amount: ~$158K ***Portion:*** 100% ***Duration:*** 2008 – 2010
Role: PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material, Travel

Title: North American School of Medical Robotics
Agency: NSF
PI: Ralph Etienne-Cummings
Amount: $50K ***Portion:*** - ***Duration:*** 2008 – 2010
Role: PI ***Funding Type:*** Participants Cost, Programs

Title: Small Acoustic Sensor Array for Small UAVs
Agency: JHU/Applied Physics Lab
PI: Ralph Etienne-Cummings
Amount: $14.4K ***Portion:*** 100% ***Duration:*** 2008 – 2008
Role: PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material

Title: Biologically Inspired Battlefield Situation Awareness
Agency: Army Research labs
PI: Ralph Etienne-Cummings
Amount: $13K ***Portion:*** 100% ***Duration:*** 2008 – 2008
Role: PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material

Title: MURI – Figure-Ground Processing, Saliency and Guided Attention for Analysis of Large Natural Scenes
Agency: Office of Naval Research
PI: Ernst Neibur
Amount: $7.5M ***Portion:*** 3% ***Duration:*** 2009 – 2014
Role: Co-PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material, Travel

Title: NeuroVision II
Agency: DARPA
PD: Khosla Role: JHU-PI

Amount: $530K (8.4% Effort) ***Portion***: 100% ***Duration***: 2010 – 2014

Title: Research Program in Applied Neuroscience (RPAN)
Agency: DoD
PD: Vogelstein Role: Collaborator
Amount: $1.25M (5% Effort) ***Portion***: 5% ***Duration***: 2008 – 2013

Title: SBIR Phase II - Development and Implementation of Ultrasound Therapy Technologies
Agency: National Institute of Health
PI: Baudette
Amount: $750K ***Portion:*** 10% ***Duration:*** 2010 – 2012
Role: Senior Personnel ***Funding Type:*** Personnel Salaries, Tuition, Research Material, Travel

Title: SITE REU: Summer Undergraduate Research Program in Computational Sensing and Medical Robotics (PI)
Agency: NSF
PI: Etienne-Cummings Role: PI
Amount: $328K (0% Effort) ***Portion***: 100% ***Duration***: 2010 – 2013

Title: EAGER: Object Recognition Using Cortical Tactile Feedback (PI)
Agency: NSF
PI: Etienne-Cummings ***Role***: PI
Amount: $200K (4.2% Effort) ***Portion***: 100% ***Duration***: 2011 – 2012

Title: R21: Functional Neuroimaging in Awake, Behaving Rats (Co-I)
Agency: NIH (R21EB012829)
PI: Etienne-Cummings ***Role***: PI
Amount: $275K (4.2% Effort) ***Portion***: 5% ***Duration***: 2011 – 2013

PENDING and PLANNED

Title: PIRE – International Collaboration and Research in Medical Robotics (Planned Spring 2011)
Agency: National Science Foundation
PI: Greg Hager
Amount: $2.5M ***Portion:*** 25% ***Duration:*** 2009 – 2014
Role: Co-PI ***Funding Type:*** Personnel Salaries, Participants Cost, Travel

Title: Towards a Silicon Spinal Neuro-prosthetic Device (Planned Submission)
Agency: Nation Science Foundation
PI: Ralph Etienne-Cummings
Amount: $750K ***Portion:*** - ***Duration:*** 2011 – 2014
Role: PI ***Funding Type:*** Personnel Salaries, Tuition, Research Material, Travel

Title: CRCN: Object Recognition Using Cortical Tactile Feedback for Upper Limb Prosthetics (PI) (Planned Resubmit)
Agency: NSF
PI: Etienne-Cummings ***Role***: PI
Amount: $750K (8.4% Effort) ***Portion***: 100% ***Duration***: 2010 – 2013

Title: Bio-Robotics Navigation: From Rats to Robot (Pending)
Agency: Keck Foundation
PI: Cowan ***Role***: Co-PI
Amount: $1M (8.4% Effort) ***Portion***: 25% ***Duration***: 2011 – 2015