Don E. Willcox / Curriculum Vitæ

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Recent Position:

Applied Mathematics and Computational Research Division

Lawrence Berkeley National Laboratory
1 Cyclotron Road Mailstop 50A3111
Berkeley, CA 94720

2022-2024 *Project Scientist*, Center for Computational Sciences & Engineering, Lawrence Berkeley National Laboratory

2018-2022 *Postdoctoral Researcher*, Center for Computational Sciences & Engineering, Lawrence Berkeley National Laboratory

Research Interests:

I am a computational physicist most recently employed as a project scientist in the Center for Computational Sciences and Engineering (CCSE) in the Applied Mathematics and Computational Research Division at Berkeley Lab.

At Stony Brook University, I used computation to research the nuclear and hydrodynamic physics that create thermonuclear supernova explosions. At LBNL, I collaborated with other researchers on a wider variety of computational science first as a postdoc and later as a project scientist. I developed efficient algorithms for implicit time integration to model nucleosynthesis in high-energy astrophysical events. I also accelerated these algorithms for modern, GPU-based supercomputers. Next, I collaborated with other LBNL scientists to study relativistic magnetic reconnection with our group's WarpX electromagnetic Particle-In-Cell (PIC) code. My WarpX experience enabled me to develop Emu, the first open, performance-portable PIC code for solving six-dimensional, three-flavor neutrino quantum kinetics. We then published the first detailed full-dimensional, three-flavor simulations of the theorized neutrino fast flavor instabilities critical to supernovae and neutron star merger nucleosynthesis. Most recently, I applied the computational techniques I learned from astrophysics to atmospheric science developing the ERF code for Energy Research and Forecasting. These and more applications all span a large range of scales and incorporate multiple physics phenomena. I am very interested in further developing adaptive, on-the-fly techniques for multiphysics phenomena to focus our computational intensity on the most critical terms in the equations we solve.

Another exciting research area is adapting our extensive forward simulation techniques to answer inverse scientific questions. Science always seeks to invert observations to uncover nature's principles, yet scientific principles often form partial differential equations impossible to solve analytically. To address these cases, I worked with other Berkeley Lab researchers to create accessible numerical solvers. We developed symbolic code-generation methods for translating partial differential equations into high-performance simulation code. We published our validated techniques for solving respectively the challenging equations of numerical general relativity and

neutrino quantum kinetics. However, sometimes we do not yet know what equations describe nature, so modern data science often searches for patterns using machine learning to assimilate large datasets. Thus, I also led a project at Berkeley Lab to construct machine learning surrogate models from simulated datasets, and we published efficient surrogate models for astrophysical flames. In addition to enabling faster computation, our work provides a starting point for future research analyzing trained models to discover unknown underlying equations. Next, I wish to collaborate with specialists in inverse modeling to optimally select simulations for the specific mathematics and data science of arbitrary science fields. Combining symbolic code generation with data-aware inverse optimization will enable us to widely accelerate scientific discovery.

Education:

- **Stony Brook University** – Stony Brook, NY, USA

  Ph.D., Physics, August 2018

- **LeTourneau University** – Longview, TX, USA

  B.S., Engineering Physics, May 2011
  B.S., Electrical Engineering, May 2011
  Minors: Mathematics, Applied Sciences

Fellowships / Awards:

2011-2018 Turner Fellow, Stony Brook University Center for Inclusive Education

2007-2011 Heritage Scholarship, LeTourneau University

Funding Proposals And Status:

2023 (Partially Funded) Principal Investigator, Berkeley Lab FY 2024 Multi-Area LDRD,
Co-Investigator: Hector Garcia Martin (LBNL, Biosciences Area),
Bioreactor digital twinning - Accelerating bioprocess scaling by combining computational fluid dynamics with metabolic modeling

2023 (Not Funded) Principal Investigator, DOE Wind Energy Technologies Office,
Co-Investigators: Adam Lavely (LBNL), Ganesh Vijayakumar (NREL),
Advancing AMR-Wind Turbine Simulations With Machine Learning

2023 (Not Funded) Principal Investigator, DOE Wind Energy Technologies Office,
Artificial Intelligence for Multiscale Wind Modeling with the ERF Simulation Code

Large Computer Time Allocations Awarded:

2023 Co-Investigator on an INCITE 2023 award, *Exascale Models of Astrophysical Thermonuclear Explosions* (Awarded: 400 k node-hours on Summit, 300 k node-hours on Frontier, 100 k node-hours on Polaris)

2022 Co-Investigator on an INCITE 2022 award at OLCF, *Approaching Exascale Models of Astrophysical Explosions* (Awarded: 590 k node-hours on Summit)

2021 Senior Investigator on a NERSC 2021 Allocation, *Three-dimensional studies of white dwarfs, massive stars, and neutron star systems* (Awarded: 30 M MPP hours)

2021 Senior Investigator on a NERSC 2021 Allocation, *Neutrino Flavor Transformation in Neutron Star Mergers* (Awarded: 18 M MPP hours)

2021 Senior Investigator on a NERSC 2021 Allocation, *Astrophysics of Supernova Progenitors* (Awarded: 13 M MPP hours)

2020 Senior Investigator on a NERSC 2020 Allocation, *Three-dimensional studies of white dwarfs, massive stars, and neutron star systems* (Awarded: 30 M MPP hours)

2019-2020 Co-Investigator on an INCITE 2019 award at OLCF, *Approaching Exascale Models of Astrophysical Explosions* (Awarded 2019: 1.5 M node-hours on Titan, 105 k node-hours on Summit; Awarded 2020: 300 k node-hours on Summit)

2018 Senior Investigator on a NERSC 2018 Allocation, *Three-dimensional studies of white dwarf and neutron star systems* (Awarded: 20.8 M MPP hours)

2018 Co-Investigator on an INCITE 2018 award at OLCF, *Approaching Exascale Models of Astrophysical Explosions* (Awarded: 40 Mh)

Scientific Software Projects:

ongoing Co-creator of the Emu simulation code for astrophysical neutrino quantum kinetics in 6-dimensional phase space. https://github.com/amrex-astro/Emu

ongoing Core developer of the Castro simulation code for astrophysical radiation-hydrodynamics on adaptive meshes, https://github.com/amrex-astro/Castro

ongoing Core developer of the StarKiller Microphysics code, a collection of publicly-available astrophysical microphysics routines and nuclear reaction network integrators, https://github.com/starkiller-astro/Microphysics

ongoing Co-developer of pynucastro, a publicly-available Python interface to the JINA Reaclib nuclear reaction rate database for rate visualization and ODE right hand side code generation in Python and C++, https://github.com/pynucastro/pynucastro

ongoing Co-creator of the StarSTRUQ github organization for publicly-available code implementing uncertainty quantification algorithms useful for stellar evolution calculations, https://github.com/StarSTRUQ

ongoing Core developer of the ERF simulation code for large-scale (ie. mesoscopic) weather modeling, https://github.com/erf-model/erf

Professional Mentoring:

2019–2021	*Co-mentor for LBNL intern - Eloise Yang*
2020–2021	*Associate mentor for Fall 2020 & Spring 2021 DOE SULI intern at LBNL - Nicole Ford*
Summer 2021	*Mentor for NSF MSGI intern at LBNL - Chris Degrendele*
Summer 2020	*Mentor for LBNL summer intern - Chris Degrendele*
Summer 2020	*Mentor for NSF MSGI intern at LBNL - Ty Frazier*
Summer 2019	*Co-mentor for LBNL summer interns - Chris Degrendele and Kiran Eiden*

Professional Service:

ongoing	Referee for the *Astrophysical Journal* and *Communications in Applied Mathematics and Computational Science*
2021	Organizer for SIAM CSE 2021 Minisymposium MS137, *Machine Learning Approaches in Computational Astrophysics and Cosmology*

Professional Development:

2019 Participated in GPU Hackathon organized by NERSC.

2018 Participated in GPU Hackathon at Brookhaven National Laboratory.

2018 Participated in GPU Hackathon at University of Colorado, Boulder.

2018 Achieved Software Carpentry instructor certification

2017 Participated in GPU Hackathon at Brookhaven National Laboratory.

2016 Participated in GPU Hackathon hosted by the Oak Ridge Leadership Computing Facility.

2015 Participated in GPU Hackathon hosted by the Oak Ridge Leadership Computing Facility.

2015 Studied at the Argonne Training Program on Extreme-Scale Computing.

2014 Studied at the MESA Summer School for simulating massive stars, accreting white dwarfs, stellar mixing processes and more at UC Santa Barbara.

2014 Studied at the JINA TALENT Course on Nuclear Theory for Astrophysics at Michigan State University.

Community Outreach:

10/20/2020	Panelist at CAUSE Career Panel, University of Minnesota
06/18/2019	Public talk at the Berkeley Public Library, Claremont, *How to Simulate a Thermonuclear Supernova*
01/2019	Judge for Chambliss poster competition at the 233rd Meeting of the American Astronomical Society.
02/21/2018	Public talk at the Astronomical Society of Long Island, Vanderbilt Museum & Planetarium, *Saturn in 13 Years: the Cassini-Huygens Mission*
11/03/2017	Public talk in the Astronomy Open Night Series, Stony Brook University, *Saturn in 13 Years: the Cassini-Huygens Mission*

Teaching Experience:

LBNL

2019,2020,2021	*ATPESC Lecturer Support Staff* Designed and presented hands-on exercises for the AMReX code at the Argonne Training Program on Extreme-Scale Computing.

Stony Brook University

Spring 2017	*WISE Computational Astrophysics* Co-instructor for a computational astrophysics course for the Women In Science and Engineering program.
Summer 2015	*IACS Computes!* Teaching assistant for a Python programming workshop for high school students by the Institute for Advanced Computational Sciences.
Spring 2014	*Astronomy* Teaching assistant for an undergraduate astronomy course.
Spring 2013	*Modern Physics* Instructor for an undergraduate laboratory on relativity and quantum mechanics.
Summer 2012	*Introduction to Calculus II* Instructor for a 3-week course on integral calculus for incoming freshman students.
2012	*Introductory Physics* Instructor for undergraduate laboratory on electricity and magnetism.

LeTourneau University

Fall, 2008-2010 *Electricity and Magnetism*

Recitation instructor for undergraduates taking the physics course on electricity and magnetism.

Spring 2010 *Classical Mechanics*

Recitation instructor for undergraduates taking the physics course on classical mechanics.

Don E. Willcox / Publications and Talks

Refereed Publications:

26. *ERF: Energy Research and Forecasting Model*

    A. Lattanzi, A. Almgren, E. Quon, M. Natarajan, B. Kosovic, J. Mirocha, B. Perry, D. Wiersema, D. Willcox, X. Yuan, W. Zhang

    2024, arXiv:2412.04395

    doi.org/10.48550/arXiv.2412.04395

25. *Code Generation for AMReX with Applications to Numerical Relativity*

    A. J. Peterson, D. Willcox, and P. Moesta

    2023, Classical and Quantum Gravity, 40, 245013

    doi.org/10.1088/1361-6382/ad0b37

24. *Dimming the Lights: 2D Simulations of Deflagrations of Hybrid C/O/Ne White Dwarfs using FLASH*

    C. Feldman, N. Gutierrez, E. Eisenberg, D. E. Willcox, D. M. Townsley, A. C. Calder

    2023, Astrophysical Journal, 959, 112

    doi.org/10.3847/1538-4357/acf658

23. *ERF: Energy Research and Forecasting*

    A. Almgren, A. Lattanzi, R. Haque, P. Jha, B. Kosovic, J. Mirocha, B. Perry, E. Quon, M. Sanders, D. Wiersema, D. Willcox, X. Yuan, W. Zhang

    2023, Journal of Open Source Software, 8, 87

    doi.org/10.21105/joss.05202

22. *Particle-in-Cell Simulations of Relativistic Magnetic Reconnection with Advanced Maxwell Solver Algorithms*

    H. Klion, R. Jambunathan, M. E. Rowan, E. Yang, D. Willcox, J. L. Vay, R. Lehe, A. Myers, A. Huebl, W. Zhang

    2023, Astrophysical Journal, 952, 8

    doi.org/10.3847/1538-4357/acd75b

21. *pynucastro: A Python Library for Nuclear Astrophysics*

    A. Smith Clark, E. T. Johnson, Z. Chen, K. Eiden, D. E. Willcox, B. Boyd, L. Cao, C. J. DeGrendele, M. Zingale

    2023, Astrophysical Journal, 947, 65

    doi.org/10.3847/1538-4357/acbaff

20. *Neural Networks for Nuclear Reactions in MAESTROeX*

    D. Fan, D. E. Willcox, C. DeGrendele, M. Zingale, A. Nonaka

    2022, Astrophysical Journal, 940, 134

    doi.org/10.3847/1538-4357/ac9a4b

19. *Dark Matter from Axion Strings with Adaptive Mesh Refinement*

    M. Buschmann, J. W. Foster, A. Hook, A. Peterson, D. E. Willcox, W. Zhang, B. R. Safdi

    2022, Nature Communications, 13, 1

    doi.org/10.1038/s41467-022-28669-y

18. *Neutrino Fast Flavor Instability in Three Dimensions*

    S. Richers, D. E. Willcox, N. M. Ford

    2021, Physical Review D, 104, 103023

    doi.org/10.1103/PhysRevD.104.103023

17. *Practical Effects of Integrating Temperature with Strang Split Reactions*

    M. Zingale, M. P. Katz, D. E. Willcox, A. Harpole

    2021, Research Notes of the AAS, 5, 71

    doi.org/10.3847/2515-5172/abf3cb

16. *Dynamics of Laterally Propagating Flames in X-Ray Bursts. II. Realistic Burning and Rotation*

    A. Harpole, N. M. Ford, K. Eiden, M. Zingale, D. E. Willcox, Y. Cavecchi, M. P. Katz

    2021, Astrophysical Journal, 912, 36

    doi.org/10.3847/1538-4357/abee87

15. *Particle-in-cell Simulation of the Neutrino Fast Flavor Instability*

    S. Richers, D. E. Willcox, N. M. Ford, A. Myers

    2021, Physical Review D, 103, 083013

    doi.org/10.1103/PhysRevD.103.083013

14. *Preparing Nuclear Astrophysics for Exascale*

    M. Katz, A. Almgren, M. Barrios Sazo, K. Eiden, K. Gott, A. Harpole, J. Sexton, D. Willcox, W. Zhang, M. Zingale

    2020, Supercomputing 20 (SC20)

    doi.org/10.1109/SC41405.2020.00095

13. *CASTRO: A Massively Parallel Compressible Astrophysics Simulation Code*

    A. Almgren, M. Barrios Sazo, J. Bell, A. Harpole, M. Katz, J. Sexton, D. Willcox, W. Zhang, M. Zingale

    2020, Journal of Open Source Software, 5, 54, 2513

    doi.org/10.21105/joss.02513

12. *Dynamics of Laterally Propagating Flames in X-Ray Bursts. I. Burning Front Structure*
    K. Eiden, M. Zingale, A. Harpole, D. Willcox, Y. Cavecchi, M. P. Katz
    2020, Astrophysical Journal, 894, 6
    doi.org/10.3847/1538-4357/ab80bc

11. *The Castro AMR Simulation Code: Current and Future Developments*
    M. Zingale, A. S. Almgren, M. Barrios Sazo, J. B. Bell, K. Eiden, A. Harpole, M. P. Katz, A. J. Nonaka, D. E. Willcox, W. Zhang
    2020, Journal of Physics: Conference Series, 1623, 012021
    doi.org/10.1088/1742-6596/1623/1/012021

10. *Modelling low Mach number stellar hydrodynamics with MAESTROeX*
    A. Harpole, D. Fan, M. P. Katz, A. J. Nonaka, D. E. Willcox, M. Zingale
    2020, Journal of Physics: Conference Series, 1623, 012015
    doi.org/10.1088/1742-6596/1623/1/012015

9. *MAESTROeX: A Massively Parallel Low Mach Number Astrophysical Solver*
    D. Fan, A. Nonaka, A. Almgren, D. Willcox, A. Harpole, M. Zingale
    2019, Journal of Open Source Software, 4, 43, 1757
    doi.org/10.21105/joss.01757

8. *SN Ia Explosions from Hybrid Carbon-Oxygen-Neon White Dwarf Progenitors That Have Mixed During Cooling*
    C. N. Augustine, D. E. Willcox, J. Brooks, D. M. Townsley, A. C. Calder
    2019, Astrophysical Journal, 887, 188
    doi.org/10.3847/1538-4357/ab511a

7. *Toward Resolved Simulations of Burning Fronts in Thermonuclear X-ray Bursts*
    M. Zingale, K. Eiden, Y. Cavecchi, A. Harpole, J. B. Bell, M. Chang, I. Hawke, M. P. Katz, C. M. Malone, A. J. Nonaka, D. E. Willcox, W. Zhang
    2019, Journal of Physics: Conference Series, 1225, 012005
    doi.org/10.1088/1742-6596/1225/1/012005

6. *Thermonuclear (Type Ia) Supernovae and Progenitor Evolution*
    A. C. Calder, D. E. Willcox, C. J. DeGrendele, D. Shangase, M. Zingale, D. M. Townsley
    2019, Journal of Physics: Conference Series, 1225, 012002
    doi.org/10.1088/1742-6596/1225/1/012002

5. *Quantification of Incertitude in Black Box Simulation Codes*
    A. C. Calder, M. M. Hoffman, D. E. Willcox, M. P. Katz, F. D. Swesty, S. Ferson
    2018, Journal of Physics: Conference Series, 1031, 012016
    doi.org/10.1088/1742-6596/1031/1/012016

4. *pynucastro: an interface to nuclear reaction rates and code generator for reaction network equations*

   D. E. Willcox, M. Zingale

   2018, Journal of Open Source Software, 3(23), 588

   doi.org/10.21105/joss.00588

3. *Meeting the Challenges of Modeling Astrophysical Thermonuclear Explosions: Castro, Maestro, and the AMReX Astrophysics Suite*

   M. Zingale, A. S. Almgren, M. G. Barrios Sazo, V. E. Beckner, J. B. Bell, B. Friesen, A. M. Jacobs, M. P. Katz, C. M. Malone, A. J. Nonaka, D. E. Willcox, W. Zhang

   2018, Journal of Physics: Conference Series, 1031, 012024

   doi.org/10.1088/1742-6596/1031/1/012024

2. *Cosmic Chandlery with Thermonuclear Supernovae*

   A. C. Calder, B. K. Krueger, A. P. Jackson, D. E. Willcox, B. J. Miles, D. M. Townsley

   2017, Journal of Physics: Conference Series, 837, 012005

   doi.org/10.1088/1742-6596/837/1/012005

1. *Type Ia Supernova Explosions From Hybrid Carbon-Oxygen-Neon White Dwarf Progenitors*

   D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, F. Herwig

   2016, Astrophysical Journal, 832, 13

   doi.org/10.3847/0004-637X/832/1/13

Meeting Talks / Invited Talks / Seminars:

07/15/2021	Seminar for the CS Summer Student Seminar Series, Computing Sciences, Lawrence Berkeley National Laboratory, *Supercomputing For Nuclear Astrophysics*
04/19/2021	Invited Speaker in APS April Meeting 2021 Session T05, *Neutrino Flavor Transformations with Emu: A New Particle-in-Cell Code for Quantum Kinetics*
03/02/2021	Speaker in SIAM CSE 2021 Minisymposium MS137, *Towards Surrogate Models for Nuclear Reactions in Astrophysics*
07/09/2020	Seminar for the CS Summer Student Seminar Series, Computing Sciences, Lawrence Berkeley National Laboratory, *Simulating Supernovae with Supercomputers*
01/31/2020	Talk at the 1st Annual CS Area Postdoc Symposium, Computing Sciences, Lawrence Berkeley National Laboratory, *Towards ExaScale Supernovae Simulations*
11/15/2017	Seminar for the Student Seminar Series, Institute for Advanced Computational Sciences, Stony Brook University, *Stellar Explosion Mechanics: Properties and Physical Processes in White Dwarf Interiors*
10/05/2017	Talk at the Interdisciplinary Theoretical and Computational Physical Science meeting, Tokyo Institute of Technology, Japan, *The Dynamics and Origins of Thermonuclear (Type Ia) Supernovae*

09/29/2017 Talk at NY Area Computational Hydro Workshop, Flatiron Institute/CCA, *A Brief Tour of the AMReX Astrophysics Suite of Codes*

06/28/2017 Seminar for the Research Café Series, Center for Inclusive Education, Stony Brook University, *White Dwarfs as Type Ia Supernovae Progenitors*

06/16/2017 Invited talk at Current Challenges in the Physics of White Dwarf Stars, Santa Fe, NM, *Simulations of Various White Dwarf Progenitor Models for Type Ia Supernovae*

06/14/2017 Invited astrophysics seminar at Los Alamos National Laboratory, NM, *Status of Recent Work for Type Ia Supernovae Progenitors: Hybrid C-O-Ne White Dwarfs, the Convective Urca Process, and Accelerated Reaction Networks*

02/05/2017 Talk at JINA-CEE Frontiers in Nuclear Astrophysics: Junior Researchers Workshop, Michigan State University, *Elucidating the Convective Urca Process in Pre-Supernova White Dwarfs Using Three-Dimensional Simulations*

Conference Posters:

13. *SedonaEx: A Monte Carlo Radiation Transfer Code for Astrophysical Events,*

    D. E. Willcox, A. S. Almgren, D. Kasen, A. Myers, & W. Zhang

    SIAM CSE 2019 Meeting, Spokane, WA (Best Poster Prize)

12. *Visualizing Nuclear Reaction Rates and Constructing Networks with pynucastro*

    D. E. Willcox, A. Jacobs, X. Li, & M. Zingale

    2019, American Astronomical Society Meeting 233, 457.05

11. *Computational Astrophysics and Cosmology*

    D. Fan, J. Sexton, & D. Willcox

    2019, Computational Research Division Capability Review, Lawrence Berkeley National Laboratory

10. *pynucastro: Code Generation and Visualization for Nuclear Reaction Networks,*

    D. E. Willcox, A. Jacobs, X. Li, & M. Zingale

    Bay Area Scientific Computing Day 2018, Sandia National Laboratories, Livermore, CA, December 7, 2018.

9. *Three Dimensional Simulations of the Convective Urca Process in White Dwarf Progenitors of Type Ia Supernovae,*

    D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

    2017, Current Challenges in the Physics of White Dwarf Stars, Santa Fe, NM, June 12-16, 2017.

8. *Elucidating the Convective Urca Process in Pre-Supernova White Dwarfs Using Three-Dimensional Simulations,*

    D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

    2017, JINA-CEE Frontiers in Nuclear Astrophysics Meeting, February 7-9, 2017.

7. *Three-Dimensional Simulations of the Convective Urca Process in Pre-Supernova White Dwarfs,*

   D. E. Willcox, D. M. Townsley, M. Zingale, & A. C. Calder

   2017, American Astronomical Society Meeting 229, 244.05

6. *On the Quantification of Incertitude in Astrophysical Simulation Codes,*

   M. M. Hoffman, M. P. Katz, D. E. Willcox, S. Ferson, F. D. Swesty, & A. C. Calder

   2017, American Astronomical Society Meeting 229, 154.27

5. *Thermonuclear Supernova Explosions From Hybrid White Dwarf Progenitors,*

   D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, & F. Herwig

   2016, American Astronomical Society Meeting 227, 237.17

4. *A Comparison of Type Ia Supernovae with C-O and Hybrid C-O-Ne White Dwarf Progenitors,*

   D. E. Willcox, D. M. Townsley, A. C. Calder, P. Denissenkov, & F. Herwig

   2015, F.O.E. Fifty-One Erg International Workshop, North Carolina State University, NC.

3. *A Study of Steady-State Detonation Structures for Hybrid C, O, Ne White Dwarf Models,*

   D. E. Willcox, D. M. Townsley, & A. C. Calder

   2014, International Conference: "Type Ia Supernovae: Progenitors, Explosions, and Cosmology," University of Chicago, IL.

2. *Imaging Molecular Structure With High Harmonics,*

   D. E. Willcox, M. A. Reber, Y. Chen, K. Halder, & T. Allison

   2013, Chemistry Research Day, Stony Brook University, NY.

1. *Cavity-Enhanced Transient Absorption Spectroscopy,*

   M. A. Reber, Y. Chen, D. E. Willcox, & T. Allison

   2013, Chemistry Research Day, Stony Brook University, NY.

Non-Refereed Conference Proceedings:

3. *Implementation of Digital Radio Mondiale receiver - Part II,*

   D. E. Willcox, J. Kim, & J. Wineman

   2011, IEEE 43rd Southeastern Symposium on System Theory, Auburn, AL, March 2011.

2. *Implementation of Digital Radio Mondiale Receiver - Part I,*

   D. E. Willcox, J. Kim, C. Loewen, & J. Wineman

   2010, IEEE 42nd Southeastern Symposium on System Theory, Tyler, TX, March 2010.

1. *Diversity Receiver for Digital Radio Mondiale - a multi-year design project,*

   P. Leiffer, J. Kim, R. W. Graff, & D. E. Willcox

   2010, ASEE 2010 Annual Conference & Exposition, Louisville, KY, June 2010.