

# spinlab Overview

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# Welcome to WPI



# WPI ECE Department



# WPI ECE Labs & Centers

The screenshot shows a web browser window displaying the WPI website. The address bar shows the URL <http://www.wpi.edu/academics/ece/labs-centers.html>. The page header includes navigation links for myWPI, News, Calendars, Employment, Library, Offices & Services, and Directories. The WPI logo and name are prominently displayed, along with a search bar and links for STUDENTS, ALUMNI, PARENTS, MEDIA, and CORPORATIONS. A red navigation bar contains links for ACADEMICS, RESEARCH, ADMISSIONS, CAMPUS LIFE, ATHLETICS, ABOUT WPI, and GIVE TO WPI. The left sidebar lists categories under ACADEMICS, with 'Electrical & Computer Engineering' selected. The main content area shows the breadcrumb trail: Home > Academics > Departments & Programs > Electrical & Computer Engineering > Research & Facilities > Labs & Centers. The page title is 'Labs & Centers', and the featured section is the 'Cryptography and Information Security (CRIS) Laboratory' by Berk Sunar. The mission statement is: 'Address security and reliability related problems at various levels by developing new security technologies to ensure the safety of all facets of the communication infrastructure.'

# About spinlab

Signal Processing and Information Networking Laboratory  
spinlab.wpi.edu

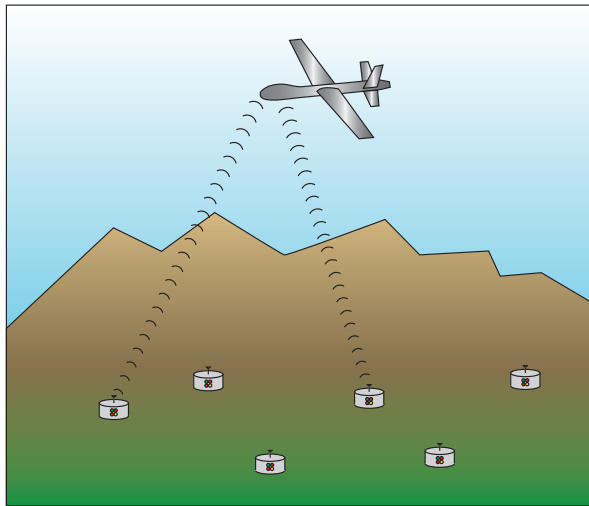
Current research topics:

- ▶ Cooperative communication systems
- ▶ Resource allocation
- ▶ Energy efficient communication
- ▶ Fundamental limits on communication
- ▶ Game theoretic analysis of networks
- ▶ Distributed MIMO, e.g. distributed transmit beamforming

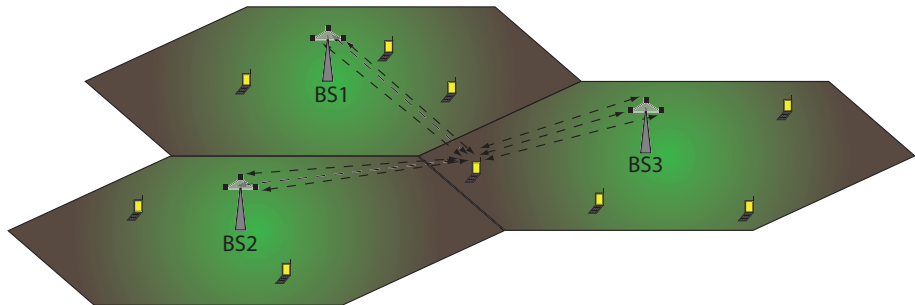
Current graduate students:

- ▶ Min Ni (PhD)
- ▶ Joshua Bacon (PhD)

# Application: Sensor Network Reachback



# Application: Multi-Basestation Cellular



# Application: Precision Electronic Warfare





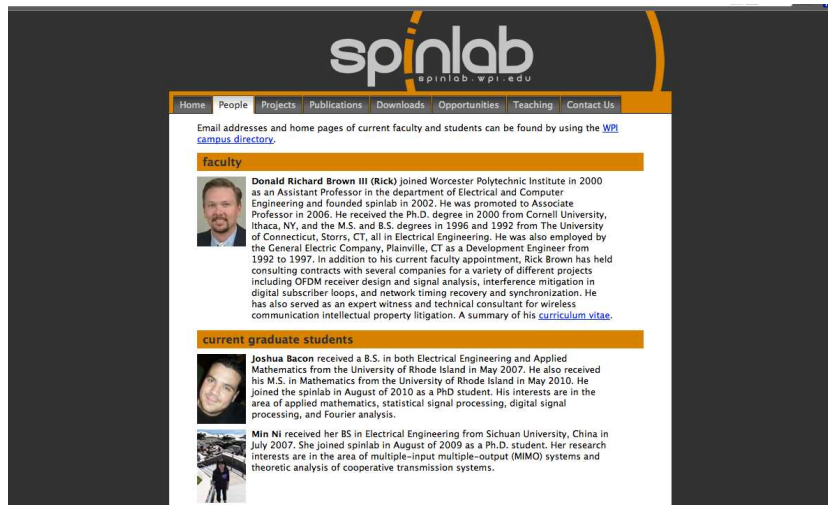
# Some Recent spinlab graduates

Yizheng Liao: MS May 2011.

- ▶ Master's Thesis: "Phase and Frequency Estimation: High-Accuracy and Low-Complexity Techniques", April 2011
- ▶ D.R. Brown III, Y. Liao, and N. Fox. Fast Single-Tone Phase and Frequency Estimation via Zero-Crossing Detection. Submitted to EURASIP Journal on Advances in Signal Processing. Currently in review.

Jie Yang: PhD July 2009.

- ▶ PhD Dissertation: "Energy Efficient Cooperative Communication", May 2009
- ▶ Jie Yang, Andrew G. Klein, and D.R. Brown III. Natural Cooperation in Wireless Networks: When Can Selfish Nodes Cooperate Without Extrinsic Incentive Mechanisms? IEEE Signal Processing Magazine, 26(5):98:106, September 2009
- ▶ K. Zeng, W. Lou, J. Yang and D.R. Brown III, On Throughput Efficiency of Geographic Opportunistic Routing in Multihop Wireless Networks. Mobile Networks and Applications, 12(5):347-357, December 2007.
- ▶ J. Yang, D. Gunduz, D.R. Brown III, and E. Erkip. Resource Allocation for Cooperative Relaying. Proceedings of the Conference of Information Sciences and Systems (CISS 2008), pages 848-853, Princeton, NJ, March 19-21, 2008
- ▶ J. Yang and D.R. Brown III. Energy Efficient Relaying Games in Cooperative Wireless Transmission Systems. Proceedings of the 41st Asilomar Conference on Signals, Systems, and Computers, pages 835-839, Pacific Grove, CA, November 4-7, 2007.
- ▶ K. Zeng, W. Lou, J. Yang and D.R. Brown III, On Throughput Efficiency of Geographic Opportunistic Routing in Multihop Wireless Networks. Proceedings of the International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine), August 14-17, 2007.
- ▶ K. Zeng, W. Lou, J. Yang and D.R. Brown III, On Geographic Collaborative Forwarding in Wireless Ad Hoc and Sensor Networks. Proceedings of the International Conference on Wireless Algorithms, Systems and Applications (WASA 2007), pages 11 - 18, Chicago, IL, August 2007.
- ▶ J. Yang and D.R. Brown III. The effect of receiver diversity combining on optimum energy allocation and energy efficiency of cooperative wireless transmission systems. ICASSP 2007. Honolulu, HI, April 15-20, 2007. Poster 1, poster 2, and poster 3.
- ▶ J. Yang and D.R. Brown III. The Effect of Channel State Information on Optimum Energy Allocation and Energy Efficiency of Cooperative Wireless Transmission Systems, Proceedings of the Conference of Information Sciences and Systems (CISS 2006), pages 1044-1049, Princeton, NJ, March 22-24, 2006. Presentation slides.




The screenshot shows the spinlab website with a navigation menu and a faculty list. The spinlab logo is at the top, followed by a navigation bar with links: Home, People, Projects, Publications, Downloads, Opportunities, Teaching, and Contact Us. Below the navigation bar, a text block states that email addresses and home pages of current faculty and students can be found by using the WPI campus directory. The 'faculty' section is highlighted in orange and contains a profile for Donald Richard Brown III (Rick). Below this, the 'current graduate students' section is also highlighted in orange and contains profiles for Joshua Bacon and Min Ni.

**spinlab**  
spinlab.wpi.edu


Home People Projects Publications Downloads Opportunities Teaching Contact Us


Email addresses and home pages of current faculty and students can be found by using the [WPI campus directory](#).

**faculty**

 **Donald Richard Brown III (Rick)** joined Worcester Polytechnic Institute in 2000 as an Assistant Professor in the department of Electrical and Computer Engineering and founded spinlab in 2002. He was promoted to Associate Professor in 2006. He received the Ph.D. degree in 2000 from Cornell University, Ithaca, NY, and the M.S. and B.S. degrees in 1996 and 1992 from The University of Connecticut, Storrs, CT, all in Electrical Engineering. He was also employed by the General Electric Company, Plainville, CT as a Development Engineer from 1992 to 1997. In addition to his current faculty appointment, Rick Brown has held consulting contracts with several companies for a variety of different projects including OFDM receiver design and signal analysis, interference mitigation in digital subscriber loops, and network timing recovery and synchronization. He has also served as an expert witness and technical consultant for wireless communication intellectual property litigation. A summary of his [curriculum vitae](#).

**current graduate students**

 **Joshua Bacon** received a B.S. in both Electrical Engineering and Applied Mathematics from the University of Rhode Island in May 2007. He also received his M.S. in Mathematics from the University of Rhode Island in May 2010. He joined the spinlab in August of 2010 as a PhD student. His interests are in the area of applied mathematics, statistical signal processing, digital signal processing, and Fourier analysis.

 **Min Ni** received her BS in Electrical Engineering from Sichuan University, China in July 2007. She joined spinlab in August of 2009 as a Ph.D. student. Her research interests are in the area of multiple-input multiple-output (MIMO) systems and theoretic analysis of cooperative transmission systems.

# Some good courses for students interested in this research

- ▶ ECE502: Analysis of probabilistic signals and systems
- ▶ ECE503: Digital signal processing
- ▶ ECE504: Analysis of deterministic signals and systems
- ▶ ECE531: Detection and estimation
- ▶ ECE5311: Information theory and coding
- ▶ ECE5312: Modern Digital Communication Systems
- ▶ ECE581/CS533: Modeling and performance evaluation of networks
- ▶ ECE539: Selected topics in comm theory and signal processing
- ▶ ECE630: Advanced topics in signal processing
- ▶ MA501: Engineering mathematics
- ▶ MA503: Lebesgue Measure and Integration
- ▶ MA524: Convex Analysis and Optimization
- ▶ MA542: Regression Analysis

# Interested in spinlab?

Visit <http://spinlab.wpi.edu/publications.html>

Read some of our work. Learn about what we are doing. Is this interesting to you?

Take a course with me:

- ▶ ECE4703: Real-time DSP (B-term 2011)
- ▶ ECE503: Digital signal processing (Spring 2012)
- ▶ ECE598: Directed research.

If you are interested, motivated, and do well in my course, I would be happy to talk with you about research opportunities in spinlab.