

• Upcoming Events

◦ January Section Meeting "Magnetic Nanowires"



- Speaker: Dr. Bethanie Stadler
- Topic: Magnetic Nanowires: Revolutionizing Hard Drives, RAM, and Cancer Treatment
- Tuesday, January 17th, 11:45-1:00 PM
- Social/Professional Meeting

Meeting

- Fee:\$5/10/FREE for Members/Non/Students

▪ Location:

Promega Biotechnology Center
Room 226/227
5445 E Cheryl Pkwy
Fitchburg, Wisconsin

United States 53711

- Pizza and Drinks (Fee)
- Please Register at the IEEE-Madison [event page](#).
- Non-member guests are always welcome.

Talk: Magnetic nanowires can have many names: bits, sensors, heads, artificial cilia, sensors, and nano-bots. These applications require nanometer control of dimensions, while incorporating various metals and alloys. To realize this control, our 7- to 200-nm diameter nanowires are synthesized within insulating matrices by direct electrochemistry, which negates sidewall damage such as that caused by lithographical patterning of vacuum-deposited structures. Our nanowires can easily have lengths 10,000x their diameters, and they are often layered with magnetic (Co, Fe, FeGa, FeNi, Ni) and non-magnetic (Ag, Cu, Au) metals as required by each application. This talk will reveal synthesis secrets for nm-control of layer thicknesses, even for difficult alloys, which has enabled studies of magnetization reversal, magneto-elasticity, giant magnetoresistance (GMR), and spin transfer torque (STT) switching. In addition, this lithography-free synthesis yields 10-nm diameter nanowires that have resistivities of only 5.4 $\mu\Omega$.cm (nearly that of bulk copper) due to negligible sidewall roughness. Therefore, these nanowires will mitigate the ITRS Roadmap's "Size Effect" Grand Challenge which identifies the high resistivities in small interconnects as a barrier to continued progress along Moore's Law (or better). Ten-nm diameter trilayers of [Co(15nm)/Cu(5nm)/Co(10nm)] have also met or surpassed all of the criterion for the world's smallest read heads with 30 Ω resistance and 19% magnetoresistance. High magnetoresistance is also possible in other multilayered nanowires that exhibit excellent properties for mult-level nonvolatile random access memory (RAM) using STT switching at very low current densities (100kA/cm²). If the insulating growth matrix is etched away, the nanowires resemble a magnetic bed of nano-seaweed which enables microfluidic flow sensors and vibration sensors. Finally, we have incubated various nanowires with several healthy and cancerous cell lines, and find that they are readily internalized by all cell types thus far. Careful magnetic design of these "nano-bots" enables external steering, nano-barcode identification, and several modes of therapy. In short, by the end of this talk, I hope you will be convinced that magnetic nanowires can and will revolutionize hard drives, RAM, and cancer treatment.

Speaker Bio: Dr. Bethanie Stadler works on the integration of nanomagnetic and photonic materials with a variety of platforms to allow the development of practical devices and systems. This includes magnetic nanowires for magnetoelectronics (including hard drive heads), microfluidic flow sensors and actuators, acoustic/vibration sensor applications, and cellular biomarkers. In photonics, Stadler works

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on the integration of magnets, magneto-optical garnets waveguides, and nanostructures for magnetophotonic crystals with semiconductor platforms for isolator and sensor applications.

Stadler received her PhD from MIT in 1994 and her B.S. from Case Western Reserve University in 1990, both in Materials Science and Engineering. She held a NRC postdoctoral fellowship at the Air Force Rome Laboratory before joining Electrical and Computer Engineering at the University of Minnesota, where she is also on the Graduate Faculty of Chemical Engineering and Materials Science. She has been awarded the NSF CAREER award and a McKnight Presidential Fellowship. Stadler has served both as Director and Secretary of the Materials Research Society, and has been asked to teach for the IEEE Magnetic Summer School in Chennai India and in Assis Italy.

◦ January LMAG Meeting " Stellarator Talk and Tour"



- Speaker: Dr. David Anderson, UW-Madison ECE Department
- Topic: Optimized Stellarators in the Path toward Fusion Energy
- Tour: HSX Plasma Laboratory
- **Date/Time:** Tuesday, January 31, from 5:30 PM until 7:00 PM
- Fee: None
- Location:
 - University of Wisconsin
 - 1415 Engineering Drive, Madison, Wisconsin
 - Engineering Hall
 - Room: TBD
- RSVP: Please Register at the IEEE Madison Section [event page](#). Non-member guests are always welcome.

Talk: Controlled thermonuclear fusion presents the possibility of virtually limitless energy with no greenhouse gas emissions. The challenges to making this a reality are daunting. Never-the-less, over 20 MW of fusion power has been released in laboratory experiments and an international effort (ITER) is underway to produce 500 MW of fusion power for periods up to ½ hour to study “burning plasmas” (predominantly self-heated). ITER is based upon the tokamak concept, which has achieved the highest plasma parameters to date. An alternative concept to the tokamak, the stellarator, possesses significant engineering advantages when considered as a power-producing reactor, and recent work in “optimized” stellarators shows great promise. HSX (the Helical Symmetric Experiment) is the first of this new generation of optimized stellarators. This talk will focus on the present state of fusion research and the role of the stellarator in addressing open issues, and HSX contributions to the program. We will conclude with a tour of the HSX facility in Engineering Hall.

Bio: David Anderson received his Ph.D. degree from the University of Wisconsin-Madison in 1984 with a major in Electrical Engineering. He was employed as a scientist there from 1980-1999, and has been a professor in the Department of Electrical and Computer Engineering since that time, currently holding the Jim and Anne Sorden professorship. He also holds an affiliate appointment as a professor in the Physics Department. His main interests are in experimental plasma physics research focused on controlled thermonuclear fusion and teaches predominantly in this area and electromagnetics. He has served on numerous advisory and review committees for national laboratories and international programs and is the Director of the HSX Plasma Laboratory.

◦ February ECN Meeting "Elevator Speech and Discussion"

Entrepreneurs and
Consultants Network



- Topic: Your Activities
- Thursday, February 2nd, 11:45-1:00 PM
- Social/Professional Meeting
- Fee: Free
- Location:
 - Sector67
 - 2100 Winnebago Street
 - Madison, WI
- Snacks and Drinks are available at Sector67
- Please Register at the IEEE-Madison [event page](#).
- Non-member guests are always welcome.



Talk: Be prepared to give a brief introduction to what you do ("Elevator Speech"). This is your opportunity to discuss your company, or your consulting expertise.

• Section News

◦ Upcoming Meetings

January Section Meeting: Is scheduled for Tuesday, January 17th at noon at Promega Biotechnology Center in Fitchburg and will be a talk by Bethanie Stadler who works on the integration of nanomagnetic and photonic materials with a variety of platforms to allow the development of practical devices and systems. This includes magnetic nanowires for magnetoelectronics (including hard drive heads), microfluidic flow sensors and actuators, acoustic/vibration sensor applications, and cellular biomarkers.

January Life Member Affinity Group Meeting and Tour: The LMAG group has arranged a talk about the UW-Madison Stellarator Project and a tour of the HSX Laboratory for the evening of January 31st. Dr. David Anderson will give the talk. HSX is a modular coil stellarator optimized for quasi-helically symmetry located in the Electrical and Computer Engineering department at the University of Wisconsin-Madison. Plasma physics research goals include investigation of transport, turbulence, and confinement in a quasi-helically symmetric magnetic field. Please check the event listing [here](#) for details about parking and the talk room location. At the time of the Newsletter, those details were not available.

IEEE/Badger Amateur Radio Society Joint February (Tentative) Meeting: Many of our members got our start in Electrical Engineering as a hobbyist, or a Ham. The UW-Madison Badger Amateur Radio Society is in danger of being de-listed as a student club. The ARRL has announced a program called "Ivy + Amateur Radio" — to boost college and university Amateur Radio club interest, membership, and activity. There will be a local joint meeting of the Madison IEEE Section including the UW-Madison Student Branch and BARS with the express intent of rekindling interest in BARS. For more information see the [ARRL Announcement](#) and the Badger Amateur Radio Society [W9YT link](#).

February Section Meeting (Tentative) -- Dr. Thomas Jahns will be giving a talk on the electric grid, distributed energy and micro grids. It will be held Thursday, February 16th starting with a social time at 5 pm and a 5:30 presentation. somewhere on the UW-Madison campus. Check the IEEE-Madison Section [event link](#) later for details.

◦ **Madison Section Elections**

Madison Section Officers are finished. Thanks for voting! This year, 7% of the Membership voted (48 votes) and the new elected officers are:

Chair: Tom Kaminski (48 votes), Vice Chair: Scott Olsen (46 votes), Secretary: Steve Shultheis (48 votes), Treasurer: Charles Gervasi (46 votes), Member(s) at Large: Clark Johnson (45 votes), Craig Heilman (47 votes), Dennis Bahr (46 votes) and San Rotter (47 votes).

◦ **Sector67 Announces a New Permanent Home**

The IEEE-Madison Entrepreneur and Consultants Network holds regular meetings at Sector67. Sector67 is working hard to move to a permanent location on the near east side. They have identified a site at 56 Corry St just a few minutes away from their existing location and have announced a capital campaign to purchase the building. So far, Sector67 has raised \$450,000, 75% of the \$600,000 capital campaign goal and over halfway to the \$750,000 stretch goal. If you or your company are interested in donating, please visit their [Donation Page](#). The donation page has a link to a great video starring John Wiley.

◦ **IEEE-Madison Facebook Page**

Thanks to volunteer, Nate Toth, the IEEE-Madison Section recently launched a Facebook page. It is located at [IEEE-Madison Facebook link](#). Feel free to "like" and/or "follow" this page, as it is a great place to share information on the happenings of IEEE Madison. Events will be posted there, as well as some interesting things that folks are working on. So, if you are working on interesting projects, conducting research, or doing anything else that is related to the activities of IEEE, please post.

◦ **Volunteers Needed**

Micro Volunteers: Do you have some time to spare to help IEEE-Madison Section? Perhaps you have a meeting topic that you would like to see us host and could find a speaker. Maybe you have time to call a few members who might have forgotten to renew their membership.

• **Regular Meetings**

◦ **Section Meetings**

The third Thursday of January through May, and September through December is reserved for a meeting to provide recent research, developments, trends and/or innovations in one of our membership's technical areas.

◦ **Life Member Affinity Group**

The first Thursday of January, March, May, September and November is reserved for a meeting on a topic selected from a broad range including such areas as technology, science, history, culture and leisure.

◦ **IEEE-MSN-ECN Networking Meetings**

- Purpose: Presentations, Discussions, networking
- Date: First Thursday of even-numbered months
- Time: 11:45 AM to 1:00 PM
- Location: Sector67, 2100 Winnebago Street (East Side of Madison)

- Parking: Park in lot or on Winnebago Street.
- Process: Members are encouraged to make introductions, describe endeavors, and make request for: contacts in target companies, needs, resources.

• Membership Upgrades

Those interested in upgrading their IEEE membership level should send their resumes or other information showing five years of significant performance in an IEEE-designated field to Charles J Gervasi via email at [cj\(at\)cgervasi.com](mailto:cj(at)cgervasi.com). Madison Section Board will attempt to find Senior IEEE members knowledgeable in the applicant's area of practice who may be able to provide references. You are invited to attend the informal networking portion of the monthly Section meetings (starting at 11:30am) to meet the Section Board members and discuss intentions.

• About IEEE



The Institute of Electrical and Electronics Engineers or IEEE (read Eye-Triple-E) is an international non-profit, professional organization dedicated to advancing technology innovation and excellence for the betterment of humanity. IEEE and its members inspire a global community through IEEE's highly cited publications, conferences, technology standards, and professional and educational activities. It has the most members of any technical professional organization in the world, with more than 300,000 members in around 150 countries. The IEEE consists of 38 societies, organized around specialized technical fields, with more than 300 local organizations that hold regular meetings. Discover what IEEE Member Discounts can offer you. The Member Discounts portfolio consists of insurance products and programs for the home, office and travel, all at excellent group rates and reduced pricing. Visit IEEE Member Discounts to see what's available in your location and enjoy the savings. For more information, please visit: IEEE.ORG.

• Madison IEEE Section

The IEEE-Madison Section of the IEEE is a section in Region 4 of the IEEE-USA organized to serve IEEE members in the Madison, WI area with over 600 members. The 2016 Officers and Board Members are Tom Kaminski - Chair, Scott Olsen - Vice Chair, Charles Gervasi - Treasurer, Steve Schultheis - Secretary, Timothy Chapman - Webmaster, Tom Kaminski - ECN Chair, Dennis Bahr - Engineering in Medicine and Biology Chapter Chair, Charles Cowie - Life Member Affinity Group Chair, Chuck Kime - Life Member Affinity Group Vice Chair, Members at Large: Clark Johnson, Craig Heilman, Dennis Bahr, Sandy Rotter.

• Job Openings

Check out WIEES.com for electrical engineering jobs in Madison and the surrounding region. This site is maintained as a service for electrical engineers. Jobs are displayed starting with the most recent postings first. You can filter results by location and job type. If you are hiring an electrical engineer in our area, for full-time or contract work, you can post the job in the *Contact Us* section on the WIEES.com site. Here is a sampling of the new job listings:

- Electronics Engineer, Four Lakes Technology – Madison
- Optical Design Engineer, Electronic Theater Controls, Middleton

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The Madison Science Museum focuses on Wisconsin's unique history and continuous success as an innovative center of science, engineering, and biotechnology. The museum is located at 211 N. Carroll St. on the 6th floor, and shares its space with the downtown Madison College.

Come and explore our exhibits!

Admission is free. Donations are gladly accepted.

Parking is available across the street from the museum at the Carroll Street Capitol Parking Garage, 214 N. Carroll Street, Madison WI

Our regular hours are Wednesday & Friday 12pm-5pm, Thursday 2pm-7pm, and Saturday 9am-3pm.

We are closed Sunday-Tuesday.

Volunteer

Welcome Desk – Docents – Event Planning
Development – Fundraising – Outreach
Communications – Marketing – Membership
Exhibit and Graphic Design – Exhibit Fabrication
Collections Management

Donate

Please help us to sustain your Madison Science Museum and develop new exhibits. The museum is seeking both financial and in-kind donations including possible exhibit items and documents. Contact the museum for details.

The Madison Science Museum is a non-profit, tax-exempt, 501(c)(3) organization and a member of the Wisconsin Federation of Museums.

• Contact Us

The IEEE-Madison Section has a number of volunteer positions open if you are interested in helping out. Please direct any questions or comments to Tom Kaminski (Newsletter Editor) via email to [tjkaminski\(at\)ieee.org](mailto:tjkaminski(at)ieee.org).

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