Madison Section NEWSLETTER

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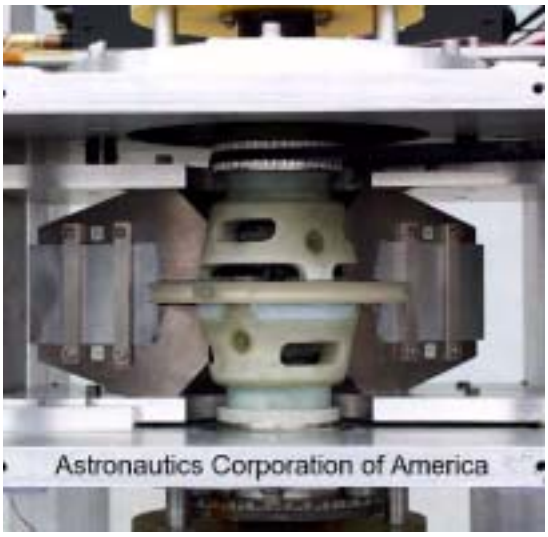
Magnetic Refrigeration



Date/Time: Thursday, September 19, 2002, 11:45 AM - 1:00 PM
Speaker: Jeremy Chell, Astronautics Corporation
Location: UW Space Place, 1605 S. Park Street, Madison, Tel: 262-4779 (see map below)
Menu: Pizza and soft drinks (cost $10.00, free for student members)
RSVP: by September 16th to Tom Yager via email (tyager@biocentric-solutions.com) or call 608.821.0821 ext. 342

Non-member guests are always welcome!

Magnetic refrigeration is an emerging technology which offers the benefits of high efficiency, environmentally benign, low-noise operation at both large and small scales. The core principle behind its operation is the magnetocaloric effect, which utilizes the entropy change produced in a ferromagnetic material when subjected to a change in magnetic field. When a magnetocaloric material, such as the rare earth metal gadolinium, is magnetized, its atomic spins align, rejecting entropy in the form of heat. When demagnetized, the atomic spins randomize again causing the material to absorb heat in a highly reversible and efficient process. Recent advances in materials science and theoretical research have made it possible for Astronautics Technology Center of Madison, WI to demonstrate the first permanent-magnet based near-room temperature magnetic refrigerator. This technology has potential applications where vapor-compression or thermoelectric devices are currently being used, especially those involving chilled water as a heat transfer medium.The Space Astronomy Laboratory (SAL) is a unit of the Astronomy Department at the The University of Wisconsin. SAL designs and builds instruments for the Department of Astronomy. These instruments help the Astronomy Department's faculty to do research in both space-based and ground-based astronomy. Research in space is performed using rockets, balloons, the Space Shuttle, and free-flying satellites. Ground-based research is performed primarily at the Astronomy Department's two research telescopes, the 3.5 meter WIYN telescope in Arizona and the 0.9 meter telescope at Pine Bluff Observatory in Wisconsin.

Jeremy Chell graduated in May 2000 with a Bachelor's in Mechanical Engineering from UW-Madison and a Bachelor's in Physics from Beloit College. He has worked on magnetic refrigeration as a mechanical engineer with Astronautics Corporation since June 2000.

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Madison IEEE Entrepreneurs' Network

A new Madison IEEE Entrepreneurs' Network Chapter is being formed. For more information contact:

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About Working Together… or Not

by Donald Christiansen

I first thought of calling this column "The lone wolf: endangered or extinct?" That was based on the common belief that engineers who practiced before the middle of the 20th century (up until World War II, say) did their best work as individuals, not in teams. They liked to work alone, and even disliked working with others. And that with the technological watershed stemming from wartime developments and the subsequent complexity of systems, team engineering became the necessity and the norm. Can we possibly imagine today's extraordinary computer and communications systems being developed in any other way?

Yet most historians of technology subscribe to the notion that engineers are, or at least were, individualistic and independent, and proud and protective of their own accomplishments. They cite pioneers such as Tesla, Armstrong and Farnsworth, who seemed to do their best work in isolation and did not work especially well in the corporate environment. In those days, it seemed easier to determine who deserved credit for a particular invention. Admittedly,

there were contests concerning who was first when engineers working independently developed essentially similar inventions, but ultimately the engineering community, if not always the legal community, was able to determine who did what and when.

Contrast that with today's situation. One seasoned engineer, serving as a judge for a major award to an engineer for outstanding technical accomplishment, told me recently that it is more and more difficult to single out one person for the award, or even judge the merit of a nominee's contribution. For one thing, he said, the supporting papers are likely to list multiple authors and, likewise, the supporting patents list multiple inventors. It would be embarrassing, he said, to have to ask the nominee, "How much of this work is yours?"

Engineers don't always relish working in teams, despite the need to do so. They embrace the idea of autonomy, and they don't expect the boss or even colleagues to have to tell them how to do their job. They respect originality, and thus neither favor nor enjoy copying the competition. Often they are even skeptical of ideas offered by members of their own project team, particularly if adopting those ideas means scuttling an idea of their own. They may go to great lengths to prove why a colleague's idea is unworkable — or at least how their own is better.

In part because of today's team approach to engineering, the EC2000 curricula accreditation requires that some undergraduate projects (e.g., research or design projects) be done by student teams. Aside from the technical and procedural knowledge gained thereby, students are exposed to both the advantages and hazards of team dynamics. A student project may fail or be poorly done in spite of technically competent team members. A strong leader may suppress the role of other team members, permitting little or no collaborative effort. The mere presence of a female on an otherwise male team may encourage stereotyping. She may assume the role of data taker or some other non-leadership role, or even become the subject of minor harassment (someone will write me that no harassment is minor, and they may be right). The solution here may be close monitoring of student interaction, or, as happened in one case, tape recording of the sessions for later analysis by the professor and team participants. In any event, these projects provide a preview of what the student may find in his or her first encounter with team engineering in industry.

Is there a serious downside to team engineering? Too many meetings? Too much time spent selling your ideas? Too little time for creative engineering? A lack of psychic reward for one's own contributions?

When social scientist and management consultant Michael Maccoby interviewed engineers in major U.S. electronics companies in the 1970s, many said they were nagged by thoughts of being merely part of a huge machine. For many, Maccoby concluded, the ideals of individualism persisted within engineers even in the contemporary corporate environment.

My senior colleagues and I ("old-timers," if you prefer) marvel at the amount and diversity of technical knowledge today's active engineers require and can assimilate, and the amount of time they must spend communicating via e-mail, technical conferences, and face-to-face meetings. How do they find time to think? Junichi Nishizawa, inventor of the semiconductor injection laser, demanded quiet and solitude while working. Prolific inventor Jacob Rabinow said that inspiration came to him in solitary moments — while shaving or driving, for example.

Could it be that there remains a bit of the lone wolf in each of us that we should nurture? Do we need to set aside some time for engineering meditation? Is there such a thing?

RESOURCES

For more about the working habits of engineers, see:

Ingram, S. and Parker, A., "The Influence of Gender on Collaborative Projects in an Engineering Classroom," IEEE Transactions on Professional Communication, March 2002, pp. 7-20.

Kidder, T., The Soul of a New Machine, Little, Brown, 1981, Avon, 1982.

Maccoby, M., "The Innovative Mind at Work," IEEE Spectrum, December 1991, pp. 23-25.

Vincenti, W.G., What Engineers Know and How They Know It, The Johns Hopkins University Press, 1990.

Donald Christiansen is the former editor and publisher of IEEE Spectrum and an independent publishing consultant. He can be contacted at donchristiansen@ieee.org.

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