Carnegie Mellon
Engineering

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MSE news

MATERIALS SCIENCE AND ENGINEERING

Nematic Nanotube Gels

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MSE news

> "The entire MSE Department and I are grateful for the many generous gifts that we have received from alumni during the past year."

A Note From the Department Head

Professor Gregory S. Rohrer

Dear MSE Graduates:

A new year is upon us, bringing with it new opportunities. One very recent development is the founding of a Multifunctional Electronic Materials Center. The Center will allow study of the integration of metal oxides and traditional semiconductors for a wide range of devices that will be used for probe-based data storage, high-frequency signal conditioning, photonics, and sensing applications. **Professor Marek Skowronski** will lead this Center, joined by **Professors Paul Salvador, David Laughlin, Marc De Graef, Bob Davis,** and **Lisa Porter**. The Center will also include faculty from the Physics, Chemical Engineering, and Electrical and Computer Engineering Departments. You will be hearing more about this Center in the next newsletter.

We are also pleased to announce that the National Science Foundation (NSF) has renewed the Materials Research Science and Engineering Center (MRSEC) with a six-year, $6.5 million grant. This support will be used to further the Center's studies of polycrystalline materials. The main goals of the Center are to define structural metrics for polycrystals, to understand the origins of polycrystalline structure during materials processing, and to develop methods to predict the relationship between polycrystalline structure and materials properties. Undergraduate students, doctoral students, post-doctoral researchers, and faculty from the MSE Department all contribute to MRSEC's research and educational missions.

These advancements in research are coupled to new investments in the J. Earle and Mary Roberts Microstructural Characterization Laboratory to

provide state-of-the-art facilities for students and faculty in the Department. First, a multipurpose scanning probe microscope has been installed. Second, a dual-beam focused ion beam scanning electron microscope has been ordered, and will be installed in near future. Both of these instruments are important for nanomaterials research. For example, the focused ion beam is capable of shaping materials with nanometer-scale precision, and will be used for both the fabrication of nanostructures and three-dimensional microstructural studies.

I also have the pleasure of announcing a new award for our doctoral students. The *Paxton Award* will recognize the best doctoral thesis submitted in the 2005-2006 academic year. This award is made possible by a gift from **Ann and Harry Paxton** that will allow us to recognize and reward exemplary achievements by our graduate students. The entire MSE Department and I are grateful for this, as well as the many other generous gifts that we have received from alumni during the past year.

Finally, it is with great sadness that I announce the death of **Professor Hubert Aaronson.** Because of his long off-and-on association with our Department, from undergraduate student to University Professor Emeritus, he is well known to virtually all of the Carnegie Mellon MSE community. A tribute to Hub's life and works is included on pages 6 and 7.

MSE Softball Champions

Congratulations to the MSE softball team, "Alkaline Drives," who defeated Chemical Engineering to win the Summer 2005 championship. Throughout the season, the team—composed of many undergraduate students, graduate students, staff, and faculty—won 13 of its 14 games.

Standing (left to right): J. Wolf, J. Grim, A. Francis, L. McGregor, and H. MIller
Kneeling (left to right): C. Roberts, D. Berry, and P. Fisher

New Funding for MRSEC

The Materials Research Science and Engineering Center (MRSEC) will receive $6.5 million over the next six years from the National Science Foundation (NSF) to continue fundamental studies of polycrystalline materials important to many industry sectors.

"Our goals are to understand the origins of the quantifiable characteristics of polycrystals that arise during processing, to develop strategies for influencing these characteristics in predictable ways, and to define microstructural metrics that can be directly related to macroscopic properties and performance," says **Gregory S. Rohrer**, Head of both MRSEC and Carnegie Mellon's Materials Science and Engineering Department.

Since 1996, MRSEC researchers have been working to understand the complex nature of grain boundary networks in polycrystalline materials. These grain boundary networks occur in most of the metallic and ceramic materials used in aircraft and automobiles. The new grant provides Carnegie Mellon faculty and students with an opportunity to continue their groundbreaking studies of polycrystalline materials.

"Grain boundaries can be thought of as inherent points of weakness within the microstructure, and we are studying how the concentrations of various types of boundaries, and their connectivity, influence the performance and lifetime of polycrystalline materials," Rohrer notes.

The research planned by MRSEC researchers can benefit society by producing better, more reliable, longer-lasting polycrystalline materials used in critical engineered systems such as power plants, electrical circuits, communications devices, aircraft, and medical implants. To address these new challenges, MRSEC researchers will exploit computer-controlled experimental techniques for measuring, analyzing, and modeling grain boundary networks. As part of the new research, a dual-beam focused ion beam scanning electron microscope will be acquired to create three-dimensional orientation maps of polycrystals.

MRSEC also collaborates extensively with national laboratories, as well as important international organizations. An important feature of its educational program is a Partnership for Research and Education in Materials (PREM) with Florida A&M University. Carnegie Mellon's Center is one of 29 centers nationwide supported by the MRSEC program, with annual NSF support of $52.5 million.

Paxton Bids Farewell

Dr. Harold W. Paxton, US Steel University Professor Emeritus, called Carnegie Mellon and Pittsburgh home for over 50 years. During his tenure at Carnegie Mellon, his role evolved from student to faculty member and Department Head. Paxton officially retired from Carnegie Mellon in 1994, but remained a daily fixture at MSE until late August—when the Department wished him and his wife Ann farewell as they headed to the warm winters of Green Valley, Arizona.

Professor Mohammad F. Islam Joins MSE

On August 1st, **Professor Mohammad F. Islam** joined Carnegie Mellon as the first faculty member jointly appointed in both the Materials Science and Engineering and Chemical Engineering Departments.

Professor Islam's research interests lie in the area of soft condensed matter.

After receiving his Ph.D. in Physics from Lehigh University (2000), Islam was a Postdoctoral Associate in the Department of Physics at the University of Pennsylvania.

Islam's research interests lie in the area of soft condensed matter. Soft materials are diverse—ranging from suspensions of nano- to micron-size particles, to solutions of semi-flexible and flexible polymers, to mixtures of macromolecules of varying shapes and rigidity.

Islam's research studies the influence of interparticle interactions in complex fluids on their self-assembly and collective properties. Experimental tools such as light-scattering, optical spectroscopy and microscopy, rheometry, and laser tweezers are used to gain insight into the structure and dynamics of the resultant materials. In the long term, the resulting understanding of soft materials will be used to create new and technologically important structures with tailored optical, electrical, thermal, and mechanical properties.

ALUMNI NEWS

Saltminers Dinner Held at Carnegie Mellon

Since Pittsburgh was chosen as the venue for the 2005 MS&T meeting, the Department had the opportunity to host the annual Saltminers Dinner on Carnegie Mellon's campus. The dinner, held in the Singleton Room of George A. Roberts Engineering Hall, was well attended. It offered alums the opportunity to see old friends, as well as tour MSE's state-of-the-art J. Earle and Mary Roberts Microstructural Characterization Laboratory.

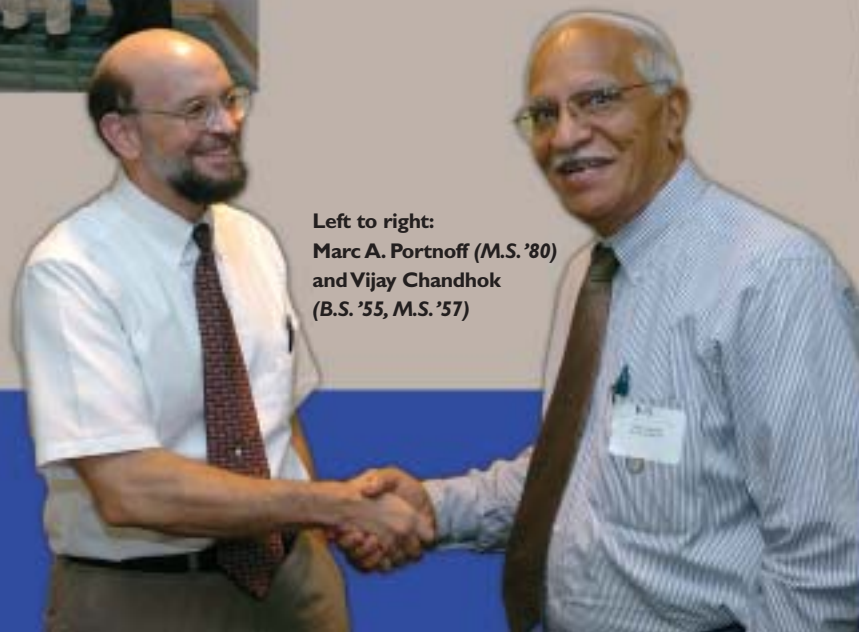
For those of you who might not be familiar with the tradition, all MSE alums are welcome to attend the annual Saltminers Dinner. This past year's dinner included graduates ranging from the class of 1944 to 2005. The term "saltminers" originated more than 50 years ago and, according to **Hub Aaronson** *('48, '54)*, refers to the similarity of the working conditions of metallurgy graduate students at Carnegie Tech and the unfortunates who, in ancient times, were subjected to punitive labor in the salt mines. Even though the working conditions of our graduate students have greatly improved, the event's name has been preserved.

Edgar Landerman *(B.S. '44)*

2005 Saltminers Dinner attendees

Kenneth Russell *(Ph.D. '64)*

George E. Dieter, Jr. *(Ph.D. '58)*



Left to right: Marc A. Portnoff *(M.S. '80)* and Vijay Chandhok *(B.S. '55, M.S. '57)*

MSE's 27-100 "Engineering the Materials of the Future" course (aka "Intro to Materials") Makes Campus Top 10 List

To see the complete list and some other favorite categories, log on to: http://my.cmu.edu/site/admission/page.cut/challenge.html

George A. Roberts and Gregory S. Rohrer

George A. Roberts
(B.S. '39, M.S. '41, Ph.D. '42)

ALUMNI UPDATES

Rebecca Berngartt *(B.S. '01)* was admitted to Michigan State University and was awarded its highest fellowship—the *University Distinguished Fellowship*—which includes tuition and a stipend for five years.

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Robert Boni *(M.S. '54, Ph.D. '54)* visited his alma mater in Fall 2005 and gave a lecture in the MSE undergraduate Professional Development class. Dr. Boni provided examples of ethical dilemmas he encountered during his career as a materials engineer and business leader that the students could reflect on—leading to many interesting discussions.

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Robert F. Buck *(M.E. '90, Ph.D. '94)* received two new US patents in May 2005 for novel martensitic stainless steels designed for use as production tubing in the oil and gas exploration and production industry. His company, Advanced Steel Technology, LLC, recently licensed the rights to these new steels to Hydril, a Houston-based company that engineers, designs, and markets premium products for the global oil and gas industry. Patents were also filed in 13 foreign countries on five continents.

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Penny K. Iwamasa *(M.S. '92, Ph.D. '95)* is currently a Staff Engineer at Fab 20 at Intel (Hillsboro, Oregon). Fab 20 is one of Intel's many high-volume semiconductor manufacturing factories. Iwamasa is working in the area of photolithography and is responsible for initiating improvements in equipment performance, output capability, quality performance, and safety—as well as reducing defect density, improving product yields, monitoring process performance, and improving process capability.

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John J. Lewandowski *(B.S. '79, M.E. '80, Ph.D. '84)* has been reappointed as the Leonard Case Jr. Professor of Engineering for a second five-year term at Case Western Reserve University. Professor Lewandowski joined the University as an Assistant Professor in 1986, and has been a full Professor in its Department of Materials Science and Engineering since 1994.

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Lisa (Fedoris) Roudabush *(B.S. '82)* spoke to all freshman engineers as part of the CIT First-Year Seminar Series on September 27th, 2005. The title of her presentation was "Commercialization of High-Strength Steel for Automotive Applications." Roudabush is General Manager of Processed Products for US Steel.

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David M. Saylor *(B.S. '97, M.S. '97, Ph.D. '01)*, who is currently a Materials Scientist with the Food and Drug Administration, was awarded the *2005 Henry Marion Howe Medal* along with Joseph Friday, Senior Staff Computer Scientist, Alcoa Technical Center; **Anthony D. Rollett**, Professor, Carnegie Mellon; and **Kee Young Jung** and **Bassem S. El-Dasher** (former graduate students). Their paper, entitled "Statistically Representative Three-Dimensional Microstructures Based on Orthogonal Observation Sections," was published in the July 2004 issue of *Metallurgical and Materials Transactions A.*

The *Henry Marion Howe Medal* was established in 1923 to recognize the author(s) whose paper was selected as the best of those published in a specific volume of *Metallurgical and Materials Transactions.*

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Jessamine Winer *(B.S. '05)* won a *Microscopy Society of America Presidential Student Fellowship* and travel grant to attend the 2005 MSA Conference in Honolulu, Hawaii. Winer is the co-author of a paper entitled "Lorentz TEM Characterization of Al-Cu-Ge-Mn Alloys." Other authors are N.T. Nuhfer, **M.E. McHenry**, and **M. De Graef**.

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We love hearing from our graduates!
If you would like to be included in the next issue of MSE News, simply send your update to ***sb3n@andrew.cmu.edu,*** *or mail it directly to the Department c/o Alumni Updates.*

Remembering Hubert I. Aaronson

R.F. Mehl University Professor Emeritus

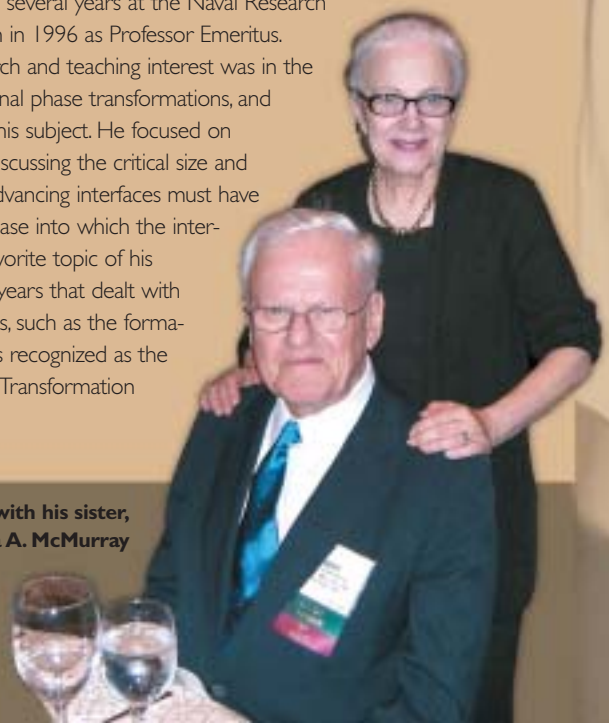
1924-2005

Hubert I. "Hub" Aaronson received his B.S., M.S., and Ph.D. degrees from Carnegie Tech in 1948 and 1954. World War II interrupted the pace of his undergraduate career, as he opted to join the Army Air Corps. He was commissioned a lieutenant and sent to bombardiers school. According to long-time friend and colleague, **Professor Ken Russell** *(Ph.D., '64)*, this was all fine, except the school was for B-24 Liberator bombers. As Hub put it, "Those things had no interest in flying; they just wanted to blow up in mid-air." Hub was a patriot, but wanted at least a fighting chance of coming home alive. So he found a school for B-17 bombardiers that started a few weeks before his B-24 school, and simply showed up. His arrival took everyone totally by surprise, as no one had ever before done such a thing. The confused bureaucrats accepted Hub, and he flew many combat missions over Europe in the workhorse B-17. He never received even a scratch. Hub had marched to his own drummer and come out a winner.

After returning to Tech, Hub completed his M.S. and Ph.D. degrees and took a position as a member of the staff of the Metals Research Laboratory at C.I.T. (1953 to 1957). Hub then joined the staff of the Metallurgy Department of the Scientific Laboratory of Ford Motor Company, later becoming Supervisor of the Phase Transformations Section. He left Ford in the early 1970s and joined Michigan Tech as a Professor, where he quickly assembled a superb research program that attracted a clutch of top-quality graduate students and post-docs. Hub also brought in as visiting professors just about anyone who was anyone, and a bunch of others who weren't. This crew produced a flood of scientific manuscripts that required a forest's worth of paper pulp to publish. Hub's literary prolificacy was the stuff of legend.

In 1979, Hub returned to Carnegie Mellon as the R.F. Mehl Professor in the Department of Metallurgy and Materials Science. Retiring in 1991, he spent several years at the Naval Research Laboratory before returning to Carnegie Mellon in 1996 as Professor Emeritus.

Throughout his career, Hub's primary research and teaching interest was in the morphology, kinetics, and mechanisms of diffusional phase transformations, and nearly all his more than 300 papers dealt with this subject. He focused on solid-state nucleation and wrote many papers discussing the critical size and shape of nucleating phases. Hub believed that advancing interfaces must have low energy orientation relationships with the phase into which the interface moved. Growth ledges were therefore a favorite topic of his research. He chaired several symposia over the years that dealt with these matters in specific types of transformations, such as the formation of Pearlite or Massive transformations. He is recognized as the founder of the very successful Solid-Solid Phase Transformation



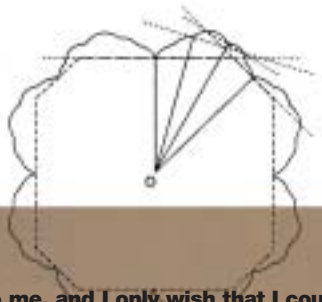
Professor Aaronson with his sister, Mrs. Barbara A. McMurray

"I stayed with Hub for my Ph.D. study from 1978 to 1982 at Michigan Technological University in Upper Michigan, as well as Carnegie Mellon University in Pittsburgh. I was very much impressed by his enthusiasm for research and education. When I saw his thesis in the library (two thick volumes), I stared in astonishment. He took unsparing care of all of us, irrespective of nationality, even after we returned to our own countries. We pray for his soul, a great scientist and leader in physical metallurgy."
Professor Enomoto
(Ibarki University)

"As a mentor or a teacher, Hub had a natural knack of inculcating hard work, curiosity, and humbleness in his students. Hub also never stopped providing continuous encouragement and esteem to his people. To make them grow and flourish, Hub fought hard, often sacrificing his own pride. I am lucky and gratified to have had Hub, a very humane and decent person, as my mentor over 30 years ago, and wish that my sons develop into the kind of professor that he was.

Hub lived a full life, carrying and nurturing the field of solid-to-solid phase transformations. His outstanding contributions have enriched the minds of many materials scientists and engineers."
Professor Jong K. Lee
(Michigan Tech)

"Hub's unwavering and unselfish support, his friendship, and his example over the years have meant a great deal. I relish the memories of the great conversations and elaborate meals that myself and his other students shared with him over the years. But probably the largest impact he had on me was the example he set of an honest, caring, self-confident man. Wanting to become a better parent to my daughter Rachael, I once read in a parenting book a line that I have never forgotten: "When it comes to parenting, much more is 'caught' than is 'taught.'" As a result of just observing (over the last 24 years) how Hub operated, worked, and treated other people, I "caught" much more than I could ever have imagined—he definitely led by example. Hub truly was a second father



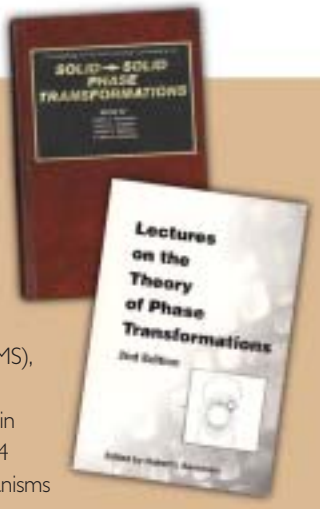
to me, and I only wish that I could find a way to better express all that he has meant to me. I miss him greatly."
Dr. George Spanos
(Naval Research Laboratory)

"I had the pleasure of hiring Hub Aaronson as the first R.F. Mehl Professor. Ever after, he referred to me as RF II. I was never quite sure if that was a compliment or a complaint, but we got along well. I arrived in the office many mornings to find "hubcaps" (nocturnal notes written by HIA) under my door, informing, instructing, or pleading. Over the years, he more than fulfilled my expectations that he would play a leading role in the area of solid-solid phase transformations. As Chairman of the Department Seminar Committee, Hub frequently and lavishly entertained guest speakers from his own funds, long after the budgeted Departmental funds ran out. And he ran the Saltminers Dinners as if they were invitations to his own table. He was tirelessly devoted to his research and to his students, and very unselfishly promoted many colleagues for recognition and awards. He contributed mightily to his research field and to Carnegie Mellon, and will be sincerely missed."
Professor Robert F. Sekerka
(Carnegie Mellon)

"The dinners and parties were delightful, but it was Hub's encouragement, vision, and optimism that had the most profound impact on my professional and personal development. He encouraged me to think big. And his support and encouragement—when changing jobs, discussing problems, and contemplating career changes—was unwavering since our first conversation 29 years ago.

On occasion we didn't see eye-to-eye, and Hub was neither hesitant nor bashful about letting me know when I had strayed from orthodoxy. I (almost) always appreciated the candor and honesty of our discussions, even when Hub was telling me that my proposed course of action was not simply misguided, but wrong; I knew that Hub had my best interests at heart. In the end, I was confident that Hub would always forgive me my metallurgical transgressions."
Professor William Johnson
(University of VA)

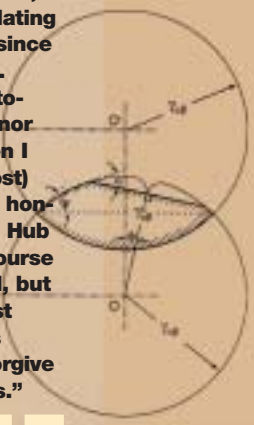
For more memories of Hub, please see page 9.



Conferences, which are held approximately every five years (first one at Carnegie Mellon in 1982, 1987 at Cambridge, 1994 at Nemacolin Woodlands Resort, 2001 in Kyoto, and 2005 in Phoenix).

Hub's accolades include Member of the National Academy of Engineering, Fellow of ASM and TMS, *C.H. Mathewson Gold Medal* (TMS), *Albert Sauveur Achievement Award* (ASM), *NSF Creativity Extension Award*, Institute of Metals Lecture and *R.F. Mehl Medal* (TMS), *Educator Award* (TMS), Fellow of the Japan Society for the Promotion of Science, and Honorary Membership in the Japan Institute of Metals. At the Winter TMS Meeting in March 2004, Hub received the *Hume-Rothery Award* and chaired the 2004 Hume-Rothery Symposium on "Structure and Diffusional Growth Mechanisms of Irrational Interphase Boundaries."

Dr. John Cahn, Professor Hub Aaronson, and Professor Mats Hillert at the May 2005 Solid-Solid Phase Transformations in Organic Materials Conference



Hub's contributions to the Carnegie Mellon MSE Department included his strong interest in keeping the standards high and making sure that graduate students were working "in the salt mines." His courses (Phase Transformations and Physical Metallurgy) were legendary for their depth (and length!), as were his homework problems and examinations. In fact, several homework problems found their way into the literature as notes to *Scripta Met.* Once they were properly solved! Hub will be missed by all who knew him.

Hub Aaronson Memorial Fund Created

At the request of Hub's sister, **Barbara McMurray**, the Department has established "The Hub Aaronson Memorial Fund." Using the funds received, an award in Hub's name will be presented to a deserving undergraduate metallurgy student at the graduation ceremony each May. If you would like to participate in this tribute to Hub, please send your contribution to:

The Hub Aaronson Memorial Fund
Materials Science and Engineering Department
3323 Wean Hall
Carnegie Mellon University
Pittsburgh, PA 15213

Remembering Hub

MSE will be hosting a tribute to Hub on Monday, May 15th, at 10:00 a.m. in the Singleton Room of George A. Roberts Engineering Hall on Carnegie Mellon's campus. To confirm your attendance, or for additional information, please contact **Suzanne Smith** at 412-268-5936 or sb3n@andrew.cmu.edu.

FACULTY NEWS

A paper from **Professor Marek Skowronski's** research group was selected by *Thomson ISI Essential Science Indicators* as a representative of a "fast-moving front" in materials science. ISI identifies these papers by a surge in recent citations. The paper has recently been cited 52 times in subsequent publications. The paper is titled "Structure of Recombination-Induced Stacking Faults in High-Voltage SiC p-n Junctions," by J.Q. Liu, M. Skowronski, C. Hallin, R. Soderholm, and H. Lendenmann, *Appl. Phys. Left*, 80 (5): 749-751, Feb. 4, 2002. The interview with Professor Skowronski can be found at: http://esi-topics.com/fmf/2005/november05-MarekSkowronski.html

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Professor Mohammad Islam's paper was featured on the cover of *Science Magazine* (vol. 309, issue 5738, 1207-1210, 19 August 2005). The paper, entitled "Premelting at Defects Within Bulk Colloidal Crystals," by Alsayed, Islam, Zhang, Collings, and Yodh, accounts some of the work Islam did while at Penn.

Another Islam paper—"High Weight Fraction Surfactant Solubilization of Single-Wall Carbon Nanotubes in Water," by M.F. Islam, E. Rojas, D.M. Bergey, A.T. Johnson, and A.G. Yodh, *Nano Lett.* 2003, 3(2), pp. 269-273. DOI: 10.1021/nl025924u—is one of the most highly downloaded from the *Journal of Nano Letters*.

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A paper by **Professor Robert F. Davis** with R.I. Barabash, G. E. Ice, W. Liu, S. Einfeldt, D. Hommel, A.M. Roskowski, and R.F. Davis—"White X-Ray Microbeam Analysis of Strain and Crystallographic Tilt in GaN Layers Grown by Maskless Pendeoepitaxy," *Physical Status Solidi* (a) 202, 732-738 (2005)—was selected by the management of the Advance Photon Source as an "outstanding" result from that facility. This award acknowledges excellence in collaborative research between Davis' student team of scholars (Einfeldt and Roskowski) and those at Oak Ridge National Laboratory (Barabash, Ice, and Liu) as well as the University of Bremen (Einfeldt and Hommel).

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Professor Marc De Graef's paper—"Demagnetization Factors for Elliptic Cylinders," by M. Beleggia, M. De Graef, Y.T. Millev, D.A. Goode, and G. Rowlands, *J. Phys. D: Appl. Phys.* 38 (2005) 3333-334—was selected by the editors of the *Journal of Physics D* for "institute of physics select status" as one of the best papers of the month.

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Professor Michael McHenry is serving his second term as the Publication Chair for the Magnetism and Magnetic Materials Conference.

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Professor Paul Salvador was one of nine contributing authors to the Fourth Edition of *Inorganic Chemistry* by Shriver & Atkins.

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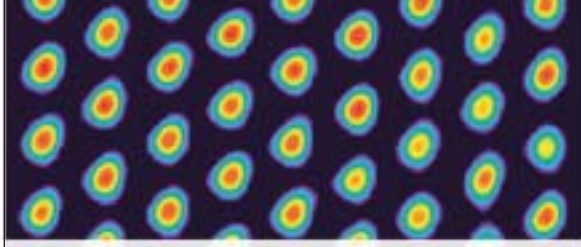
Professor Elias Towe has been elected to the rank of AAAS Fellow (American Association for the Advancement of Science). Each year, the Association elects members "whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." Towe is being honored for his pioneering research in semiconductor laser development in the area of quantum structures and devices, and for contributions to nanostructure optoelectronic technology.

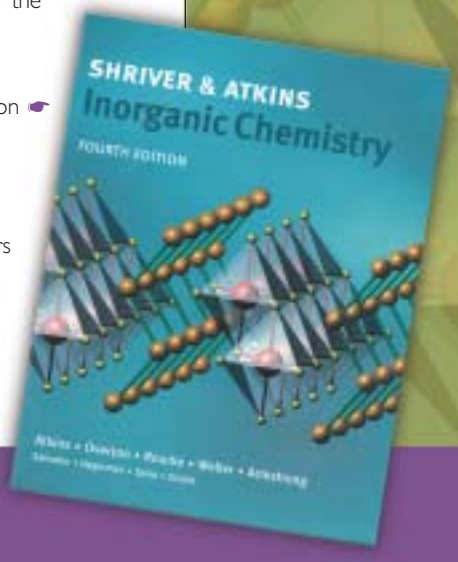


COVER PHOTO

Nematic Nanotube Gels

This edition's cover features carbon nanotube gels created by **Professor Mohammad Islam** and others—and detailed recently in *Physical Review Letters*.

Composites of aligned single-wall carbon nanotubes are among the most sought-after materials in nanotube science. Carbon nanotube gels are the first example of a liquid crystalline material consisting of large domains of oriented nanotubes. The gels were created by mixing nanotubes with polymers which form a cross-linking network among the tubes, and then inducing a temperature-dependent volume-compression transition of the polymer matrix. The gel exhibits hallmark properties of a nematic liquid crystal (in which rod-shaped molecules are aligned), including optical anisotropy and topological defects. The anisotropic characteristics and the sensitivity of the gels to changes in solvent quality might make them candidates for novel applications. They could be useful, for example, as an osmotic or an electrical actuator in which changes in salt concentration or electrical field produce volume and shape changes.



Thank You, MSE Alumni and Friends!

In fiscal year 2005, 460 MSE alumni and friends of the MSE Department contributed to Carnegie Mellon University. One hundred and ten of these contributors, listed below, donated more than $62,000 directly to MSE. These generous donations directed toward MSE make it possible for us to fund scholarships and fellowships, upgrade laboratories, and improve the quality of student life. Your generosity toward your alma mater is greatly appreciated!

Aaronson, Hubert I.
Albert, Robert L.
Allison, John E.
Andersen, Thomas Brooke
Baumert, Beth Ann
Beck, Carl L.
Bilaniuk, Miroslawa Lidia
Bilaniuk, Nykolai
Bloch, Richard J.
Boni, Janet
Boni, Robert E.
Bytnar, James Henry
Bytnar, Linda
Caldwell, Sally H.
Cameron, Joseph A.
Cerreta, Ellen
Clum, James A.
Connelly, Anita
Connelly, James B.
Cortes, F. Richard
Cox, Thomas B.
Crosbie, Gary M.
Dieter Jr., George E.
Ellinger, Linda F.
Ellinger, Richard K.
Emerick, Harold B.
Ewanco, Eric James
Fidelity Investments
Finney, Kevin R.
Flessner, Conrad J.
Fluharty, Amy E.
Fox, Arthur V.
Gangopadhyay, Utpal
Gibala, Ronald
Gilbert, Jeremy L.
Glaws, Peter C.
Goldman, Kenneth M.
Goodwald, Jerry A.
Grace, Richard E.
Guerry Jr., John B.
Hart III, Joseph H.
Hartfield-Wunsch, Susan E.
Heckel, Richard W.
Hirth, John Price
Horne, Gerald T.
Horvath, J. Paul
Houska, Catherine M.
Hresko III, George C.
Huebschman, Jennifer Rebecca
Hunt Jr., Warren H.
Jaffe, Donald
Kashar, Lawrence J.
Kelly, Paul C.
Kimmel, Albert F.
Lambert, William N.
LaSalvia, Robyn L.
Lee, Hyun K.
Levinstein, Moses A.
Lu, Weier Larry
Lucas, Eugene F.
Lutz, Carl F.
Lynn, Lawrence H.
Magee, Christopher L.
Malenock, Phillip R.
Marinis Jr., Thomas F.
Masteller, Millard Scott
Maxton, Robert C.
McInteer, William A.
McTiernan, Brian J.
Miller, Herbert M.
Miller, Reed A.
Minton Jr., Hugh C.
Mitchell, Conrad
Moongkhamklang, Pimsiree
Mullins, Garrick R.
Murray Jr., Allan D.
Park, Yong-Jin
Paxton, Harold W.
Pearce Jr., Charles R.
Perepezko, John H.
Pisula, Scott E.
Porter, Lisa M.
Rabinowitz, Jesse S.
Reiley III, Don C.
Reynolds Jr., James R.
Reynolds, William T.
Rimnac, Clare M.
Robinson, George H.
Russell, Kenneth C.
Salvadore, Eugene A.
Schorr, Heather L.
Schulte, Arthur J.
Schulte, Patricia Conner
Schweitzer, Irene
Shoff, Jon C.
Siebert, William R.
Snee, David J.
Spahr, Gary L.
Squire, Frederick J.
Steyer, Todd E.
Stolfi, Michael A.
Sutch, Dan A.
Tarby, Stephen K.
Taylor, Jerry M.
Thornburg, Donald R.
Vensel, David A.
Warner Jr., Raymond F.
Werrin M.D., Ronald J.
Williams, Robert K.
Wolfe, Richard A.
Zschack, Paul R.

Memories of Hub Aaronson

(continued from page 7)

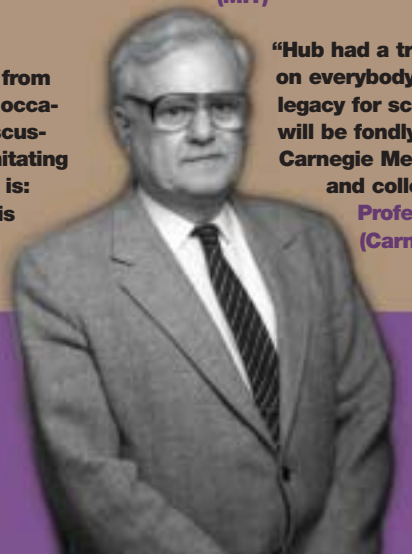
"I co-taught a graduate Phase Transformations course with Hub for 10 years. Our approaches to the subject matter and our styles of teaching were very different, but we always managed to "properly educate" the students. Hub's dedication to graduate education (courses, exams, and research) is something we all should emulate."
Professor David E. Laughlin
(Carnegie Mellon)

"I knew Hub as a fellow student at Carnegie Tech in the 1949-50 school year. Basically he had not changed since then, except perhaps to become more famous. His intensity of scholarship, his time commitment, his devotion to quantitative scientific understanding, and his true love of teaching at all levels made Hub a member of a very small and select class of professors. How many people can be recognized by a short nickname anywhere in the world? Hub is on a par with Cher, Bono, etc. and maybe, in my view, more deserving (I am not a celebrity fan!). He was at several institutions (Ford, MTU, NRL) as well as Carnegie Mellon, and has left a major impression and acolytes at each place. He held his own in long-standing differences of opinion conducted in print and in personal debate."
Professor Harry Paxton
(Carnegie Mellon)

"One of my favorite quotes from Hub that he would express occasionally during research discussions in a gravelly voice, imitating his Ph.D. advisor R.F. Mehl, is: "The question, gentlemen, is not whether it should or shouldn't, but whether it does." Being an experimentalist at heart, I think Hub lived by this expression, and it is one that will always be useful in science."
Professor Jim Howe
(University of VA)

"Hub was an unforgettable mentor, friend, and colleague to dozens of young scholars over many years. He made the world a better place."
Professor Kenneth C. Russell
(MIT)

"Hub had a tremendous positive impact on everybody in the Department. His legacy for scholarship and education will be fondly remembered both at Carnegie Mellon and by his students and colleagues around the world."
Professor Greg Rohrer
(Carnegie Mellon)



STUDENT NEWS

Junior **Jessica Woods** won an *Intel First Year Research Experience (IFYRE)* fellowship for her poster "Thermodynamics and Kinetics of Chemical Decomposition of NiZn-Ferrite Nanoparticles" which was presented at the 2005 Carnegie Mellon Meeting of the Minds Poster Competition. Woods was also included on a presentation at the 50th Magnetism and Magnetic Materials (MMM) conference in San Jose, CA, entitled "Sintering Behavior and Magnetic Properties of NiZn-Ferrite Nanoparticles Interpreted in a Microstructural Evolution Model." Co-authors of the presentation were **R. Swaminathan** (M.S. '01, Ph.D. '05), **J. Woods**, S. Calvin, J. Huth, and **M.E. McHenry**.

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Senior **Yuranan Hanlumyuang** was first author on a paper which was presented at the 50th Magnetism and Magnetic Materials conference San Jose, CA, entitled "Bragg-Williams Model of Fe-Co Order-Disorder Phase Transformations in a Strong Magnetic Field." Co-authors are **Y. Hanlumyuang**, **P. Ohodnicki** (doctoral student), and **M.E. McHenry**.

Hanlumyuang also gave a presentation titled "Investigation of Basal Plane Dislocations in 4H-SiC Epilayers" at the International Conference on Silicon Carbide and Related Materials 2005, held in Pittsburgh. The authors are S. Ha, Y. Hanlumyuang, C.H. Chou, V. Rodriguez, X. Zhang, and **M. Skowronski** from Carnegie Mellon, and J. J. Sumakeris and M. J. O'Loughlin from Cree Inc.

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Junior **Nicole Hayward** had her paper on a walking tour of Pittsburgh materials sites published in the *Materials Research Bulletin*, September 2005. "Pittsburgh: A Meal of Steel and a Taste of Aluminum. A Walking Tour" was authored by **Nicole Hayward, Michael McHenry**, and **Harold Paxton**.

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Junior **Nichole Cates** was the recipient of the *Meredith Thomas Memorial Scholarship*. This scholarship, awarded by the Society of Women Engineers (SWE), is open to all undergraduate women in CIT. Nichole received $2000 and a one-year membership in SWE.

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Senior **Jackie Milhans** is first author on a paper with Soon Gi Lee and A.M. Gokhale of Georgia Institute of Technology, titled "Reconstruction, Visualization, and Characterization of Three-Dimensional Microstructure of High-Pressure Die-Cast AE44 Magnesium Alloy." The paper has been accepted for presentation at the 2006 TMS annual meeting in San Antonio.

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Senior **Mary Wilson** was awarded the *J. Earl Frazier Memorial Scholarship* from the American Ceramic Society. This $3000 scholarship is awarded annually to a member of a junior class at one of the colleges providing an accredited undergraduate ceramic science and/or engineering curriculum, whose home residence is within the geographical confines of the Pittsburgh Section.

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Senior **Eric Vanderson** has been awarded the *Fiore-Chinque-Scinto-Glasso Scholarship*. This scholarship is made available to MSE students through an endowed fund established by **Dr. Nicholas F. Fiore** *(B.S. '60, M.S. '63, Ph.D. '64)*.

• • • • •

MSE doctoral student **Balasubramaniam R. Kavaipatti** is the recipient of the *Gjostein Legacy Fellowship*. This fellowship was established through the generosity of **Dr. Norman A. Gjostein** *(Ph.D. '58)*.

Recent Ph.D. Theses

Mohammed Alvi
"Recrystallization Kinetics and Microstructural Evolution in Warm Rolled Aluminum Alloys"
ADVISOR: Anthony D. Rollett

Daiwon Choi
"Synthesis, Structure, and Electrochemical Characterization of Transition Metal Nitride Supercapacitors Derived by a Two-Step Transition Metal Halide Approach"
ADVISOR: Prashant Kumta

Andrew J. Francis
"Heteroepitaxial Growth of Chiral and Achiral Metal Thin Films on Ceramic Substrates"
ADVISOR: Paul A. Salvador

Qiang Li
"The Influence of Stoichiometry on Electrical Properties of Silicon Carbide in Physical Vapor Transport Process"
ADVISOR: Marek Skowronski

Feroz A. Mohammad
"Study of Morphology, Mechanisms, and Interlayers in Ohmic Contacts to Silicon Carbide"
ADVISOR: Lisa M. Porter

Ying Pang
"Relation Between Grain Boundary Segregation and Plane Orientation in Nb-Doped TiO_2"
ADVISOR: Paul Wynblatt

Tomoko Sano
"Interface Anisotropy and Its Effect on Microstructural Evolution During Coarsening"
ADVISOR: Gregory S. Rohrer

Il Sohn
"The Role of Volatiles in the Reduction of Iron Oxides"
ADVISOR: Richard J. Fruehan

Rajasekaran Swaminathan
"Influence of Surface Structure on the Magnetic Properties of RF Plasma Synthesized NiZn Ferrite Nanoparticles"
ADVISOR: Michael E. McHenry

Mitra Taheri
"In-Situ Quantification of the Effect of Solute on the Mobility, Character, and Driving Pressure of Grain Boundaries During Recrystallization in Al Alloys"
ADVISOR: Anthony D. Rollett

Ph.D. recipient Mitra Taheri

Commencement | Class of 2005

The MSE diploma ceremony was held on Sunday, May 15, 2005. During the ceremony, students were honored with a number of awards. **Jessamine Winer** was selected as the recipient of the *William W. Mullins Undergraduate Award*, given to a graduating senior who best exemplifies the qualities associated with the late **Professor Bill Mullins**. **Jessica Mastalski** was awarded the *James W. Kirkpatrick & Jean Keelan Kirkpatrick Award,* given to a graduating senior who best supplements his/her intellectual abilities with effort and work ethic. **Jennifer Singelyn** was awarded the *William T. Lankford Jr. Memorial Scholarship*, presented to a graduating senior who exemplifies the attributes associated with **Bill Lankford**—true scholarship, high standards, great potential, and the willingness to help others unselfishly.

Professor Katy Barmak and M.S. recipient David Berry

Left to right: Justin Samuels (B.S.), Zhaohui Fan (Ph.D.), Wayne Archibald (Ph.D.), and Laura Cerully (B.S.)

Left to right: Xuan Zhang (M.S.), Wanlin Wang (M.S.), and Kai Shen (M.S.)

Golden Anniversary | Class of 1955

The class of 1955 celebrated its 50-year anniversary during the 2005 Homecoming weekend. As you can see, MSE was well represented by 10 members of that graduating class!

Class of 1955 members, from left to right: Vijay Chandhok, George Konoval, Charles Luchok, Richard Cortes, Theodore Reuther, Samuel Hitchings, Edmund Cipro, Howard Bellin, Lowell Steinbrenner, and Richard Heckel

MSE news

Department of Materials Science and Engineering
Carnegie Mellon University
Pittsburgh, PA 15213-3890

Carnegie Mellon
ENGINEERING

Department Head
Gregory S. Rohrer

Editor
Suzanne B. Smith

Photographers
Ken Andreyo
Glenn Brookes

Designer
Dan Hart

Educational Objectives and Programs Outcomes

In accordance with our curriculum assessment plan, we publish our Program Educational Objectives and Program Outcomes, so that our alumni may provide feedback. These objectives and outcomes can be found at:
http://materials.cmu.edu/degraef/PEOPO.html

We invite comments from you on all or any of these statements. Please send your comments to **Professor Marc De Graef**, Chair of the Undergraduate Program Assessment and Review Committee. He can be reached at degraef@cmu.edu or 412-268-8527.

Feedback on Our Objectives for Education of Undergraduates

We have written to our B.S. graduates (2000-2005) to request input on our Objectives (formally, Program Educational Objectives). We are seeking this input as part of our evaluation process which, in turn, is a part of how we maintain an accredited program with ABET.

If you have already returned your form to us, thank you! If not, we hope that you can take a few minutes, answer the few questions, get your supervisor to do the same, and send it back to us as soon as possible.

Your help is most appreciated!