

## Protein Assisted Growth of Novel Biomaterials

NEW RESEARCH FROM PROFESSOR KUMTA'S GROUP

*Story on page 6*

# I·N·S·I·D·E



**3** MSE Diploma Ceremony

**4** Faculty and Student Awards



**7** Carnegie-Japan Dinner

**“The department is changing, continues to improve, and is a leader in the materials arena.”**

**A NOTE  
FROM THE  
DEPARTMENT  
HEAD**



This is an exciting time for the department! Our undergraduate and graduate numbers have increased steadily over the past two years and we have hired two new faculty members, Elias Towe and Robert Davis, who are both in the area of electronic materials. We have also decided to add faculty with an interest in “soft materials” to our staff and are currently in the process of interviewing. Our department is a diverse materials department and the addition of polymers focused materials faculty will ensure that all the major groups of materials will be given equal emphasis, especially at the undergraduate level. We are currently supporting university strategic initiatives in Biomedical Engineering and the Environment, and it is our strategy to add faculty specializing in polymers that have an interest in biomedical issues and/or nanotechnology to further support the Bio-Materials Initiative that already exists in MSE under the leadership of Professor Prashant Kumta, and to complement our ongoing efforts in nanotechnology.

Another major change to our department is our decision to add a major thrust area in the department on Materials for Energy Applications. This comes at a particularly appropriate time as the Steinbrenner Institute for Environmental Education and Research (SEER) has just been initiated and has chosen energy as one of its major thrusts. We will support this initiative strongly, which is appropriate since W. Lowell Steinbrenner, a university trustee and one of our alumni, has generously endowed this center.

The department has also become the center for materials research on campus and we have asked a number of faculty in other CIT and MCS departments, who conduct materials based research, to formally become affiliated with our department. These faculty were already working on joint projects with materials faculty or had a significant program in materials research. In the last year, 16 faculty have accepted affiliated positions within MSE. If you look at our web page ([www.materials.cmu.edu](http://www.materials.cmu.edu)), you will now find a complete listing of our 33 faculty and their interests and, in Figure 1, the research foci of our complete faculty are summarized. As you can see, we are strongly focused on the functional materials that support our college strength in electrical and computer engineering and leverage the facilities we have in George A. Roberts Engineering Hall.

The application of materials is a general issue in engineering and materials engineers can be found in all departments. Thus it is appropriate that our department should change with the times and recognize that materials engineers contribute generally to engineering and are the group that can link others together. This is not revolutionary as materials engineers have always served this function in industry. It is also why many of our alumni have become very successful.

As you can see from Figure 1, we have moved our emphasis significantly over time, and even though our roots were in metallurgy, we have now developed into a broad based materials department. The future will be to grow our polymers effort so that polymers research and teaching is based on faculty that are in our department and, who will interact with those in chemistry and chemical engineering.

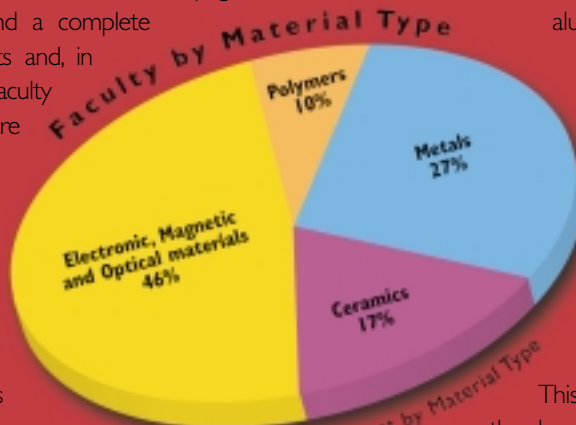


Figure 1: Research Interest by Material Type

As I mentioned earlier, we have hired two new faculty in the last couple of years—Elias Towe and Robert Davis. Professor Towe has just been named the A. and E. Grobstein Memorial Professor of Materials Science and Engineering and Professor Davis, our most recent hire, will hold the John and Claire Bertucci Distinguished Professorship in Engineering. This increases the number of chaired positions in the department to six.

The department is changing, continues to improve, and is a leader in the materials arena. There are many other great developments within the department, but perhaps it is best to leave those to another newsletter.

I hope you will come and visit the department, either virtually or in person to see the great work that is being accomplished at Carnegie Mellon.

Alan W. Cramb





Chanjoon Paek ▶  
and son



## MSE Diploma Ceremony

The MSE diploma ceremony was held on Sunday, May 16th in Porter Hall and was followed by a reception in the Singleton Room and Seagate Atrium of George A. Roberts Engineering Hall. While many of the graduates are furthering their education at graduate schools such as the University of Michigan, UC Berkeley, Carnegie Mellon, and the University of Pennsylvania, others found employment at various companies including Medtronic Inc., Eastman Kodak, Samsung Electronics, and Los Alamos National Laboratory.



▲ Jason Wolf  
with Professor  
Alan Cramb

Some newly conferred Ph.D's obtained post-doctoral positions at Massachusetts Institute of Technology, National Institute of Standards and Technology, and the Max-Planck-Institute fuer Metallforschung.

During the ceremony, students and faculty were honored with a number of awards. **Julia Hess**, was selected as the recipient of the *William W. Mullins Undergraduate Award*, which is given to a graduating senior who best exemplifies the qualities associated with the late Professor Bill Mullins. **Autumn Wyda**, was awarded the *James W. Kirkpatrick and Jean Keelan Kirkpatrick Scholarship*, which is awarded to a graduating senior who has best supplemented his/her intellectual abilities with effort and work ethic. **Lane Martin**, was awarded the *William T. Lankford Jr. Memorial Scholarship*, which is 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. *The Krivobok-Brooks Metallography Award*, which is given each year to an undergraduate and graduate student who has displayed the greatest evidence of excellence in the art of metallography went to graduate students **Lisha Wang** and **Herbert Miller** while

**Eric Schmidt** received the undergraduate award. **Professor Sridhar Seetharaman** received the *2004 Philbrook Prize*, which is awarded to a faculty member who has made substantial, sustained contributions to excellence in education. **Professor Warren Garrison**, a past recipient of the Philbrook Prize, was recognized for his twenty years of service and dedication to research and education in the Department.

Another highlight of the ceremony was when MSE X-Ray facility supervisor **Jason Wolf**, received his M.S. degree. Jason has been with the department for almost fifteen years and worked toward his degree as a part-time student.

*Congratulations to the Class of 2004!*



▲ Materials Science and Engineering Faculty  
with the Class of 2004



◀ Emilie Baillet and  
Yan Wang

## FACULTY AWARDS



**Professor Emeritus Thaddeus B. Massalski** won the 2003 Luigi Losana Gold Medal of the Associazione Italiana di

Metallurgia. The award, which he received in Milan, is given to an international researcher for distinguished contributions to the advancement of metals science and technology.

**Professor Alan W. Cramb** received the Iron & Steel Society's 2003 Benjamin F. Fairless Award, which recognizes distinguished achievement in iron and steel production, and ferrous metallurgy. Professor Cramb also received the 2003 "Andrew Carnegie Lecture Award" from the Pittsburgh Chapter of ASM International. The Pittsburgh Chapter instituted the award in 1948 to honor a nationally prominent metallurgist or materials engineer.

**Professor Gregory S. Rohrer** has won the 2004 Richard M. Fulrath Award from the American Ceramic Society. This award is given to recognize outstanding academic and industrial ceramic engineers/scientists who are 45 years of age or younger.

Professor Rohrer and the late W.W. Mullins, university professor of applied science, emeritus, were also recently awarded the Ross Coffin Purdy Award of the American Ceramic Society for "the most valuable contribution to ceramic technical literature."

Professor Rohrer has also been appointed a Fellow of the American Ceramics Society, which is the highest honor given to a member of the society.



**Professor Paul A. Salvador** received the 2003 Philbrook Prize which is awarded annually to a faculty member in the MSE

department who has made substantial, sustained contributions to excellence in education, or to the application of materials science to important problems. The award was created in order to preserve the memory of Professor Philbrook's many contributions to the teaching of metallurgy and to his successful application of metallurgical principles to practical problems.

**Professor Richard J. Fruehan** has been named the 2004 J. Keith Brimacombe Memorial Lecturer. This Lectureship was established in 1999 by the Process Technology Division to honor Dr. Brimacombe's outstanding accomplishments in the area of process metallurgy; his dedication to the steel industry, and his profound effect on people in the industry. The Lectureship also strives to acquaint members, students, and engineers with the many exciting opportunities that exist in the area of process metallurgy and to inspire them to pursue careers in this field. Please note that there will be a special reception in Dr. Fruehan's honor during the AIST Conference in September.

Professor Fruehan is also this year's recipient of the American Iron and Steel Institute Medal. The Medal is awarded for a technical paper that has special merit and importance

in connection with the iron and steel industry and was published in the last 12 months. It is the major technical award of the AISI.

Dr. Fruehan will also be awarded the Bessemer Gold Medal for 2004 from The Institute of Materials, Minerals & Mining. This award is given for outstanding service to the industry, including contributions to the development of the industry and its importance to the economy both nationally and internationally.



**Professor Sridhar Seetharaman** received a five-year \$600,000 National Science Foundation CAREER grant entitled "In-Situ

Visualization of Metallurgical Processes." The award "recognizes and supports the early career-development activities of those teachers who are most likely to become the academic leaders of the 21st century." Professor Seetharaman has also been elected the recipient of a Friedrich Wilhelm Bessel Research Award. This award from the Alexander von Humboldt Stiftung Foundation was granted to him in recognition of his past accomplishments in research and teaching.

**Professor Elias D. Towe** was elected an IEEE Fellow for contributions to nanostructure optoelectronic technology and was also elected a Fellow of the Optical Society of America.

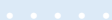
Dr. Towe has also been elected a Fellow of the American Physical Society which is limited to no more than one half of one percent of the membership. Dr. Towe was cited "for pioneering contributions to the application of quantum-dot nanostructures in optoelectronic devices, and for the innovative use of phenomena in the design of novel optical devices."



**Professor Prashant N. Kumta** and Co-PI, Dr. Charles Sfeir have received a four year \$1,020,00 grant from the National Institutes of

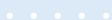
Health for their research project "Nanosized Carriers for Non-Viral Dental Gene Therapy." This is the first NIH funded grant in the department.

Professor Kumta was also recently appointed editor of Material Science and Engineering B, a leading journal in electronic materials.

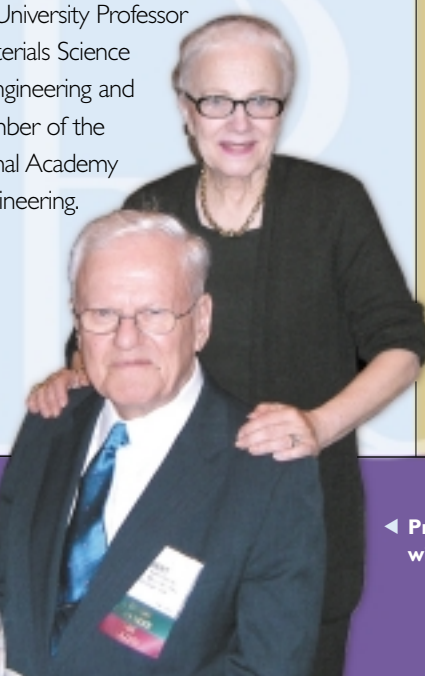


**Professor Marc De Graef** completed his book, "Introduction to Conventional Transmission Electron Microscopy,"

The 700 page manuscript was published by Cambridge University Press.



**Professor Emeritus Hubert Aaronson** received the William Hume-Rothery Award presented by The Minerals, Metals & Materials Society (TMS) at the March 2004 TMS Annual Meeting in Charlotte, N. C. The award is presented annually to an outstanding scientific leader for exceptional scholarly contributions to the science of alloys. Hub is the Robert F. Mehl University Professor of Materials Science and Engineering and a member of the National Academy of Engineering.



## STUDENT AWARDS



**Jennifer Singelyn**, a MSE Junior was selected as the recipient of the *Boeing Scholarship for Academic Leadership* because she possesses the values that Boeing strives for in candidates: leadership, teamwork and academic excellence.



**Neill McDonald**, a materials science and engineering doctoral student won second prize in The Minerals, Metals and Materials Society Graduate Student Outstanding Paper contest for his paper "Peritectic Reaction and Mechanical Equilibrium in Iron-Nickel Alloys." The prize was \$250 in cash and an additional \$250 for travel expenses to the 2004 annual conference in Charlotte, N.C. Neill, a graduate student of Professor Sridhar Seetharaman has also been awarded the Willy Korf Award for Young Excellence for his work on peritectic reactions. The award, includes 2,500 euros and travel expenses.



Materials Science and Engineering students won big at the Pittsburgh Golden Triangle

Chapter of ASM International's Young Members Night which was held on February 19th. Doctoral student, **Neill McDonald** won first prize in the Graduate Student Poster Contest, while senior, **Clarissa Yablinsky** took second place in the Undergraduate Poster Contest. Sophomore, **Eric Vanderson** received the Past Chairpersons Scholarship and senior **Julia Hess** was awarded the Outstanding Senior Award.



Graduate student **Mitra Taheri** was awarded the Silver Prize in the Graduate Student Competition at the Spring MRS Meeting in San Francisco. The award is given to graduate students who authored or co-authored symposium papers which exemplified significant and timely research.



Graduate students **Yan Wang** and **Martin Valdez** with their advisor, **Professor Sridhar Seetharaman** were awarded the 2003 Marcus Grossmann Young Author Award by the American Society for Metals (ASM). This award was for the best paper published in a given year in *Metallurgical Transactions* by authors under the age of 40.

## CIT AWARDS

At the annual spring CIT faculty awards dinner, **Professor David Laughlin** and **Professor David Lambeth** were co-recipients of *The Outstanding Research Award*, which is made to a faculty member within the Carnegie Institute of Technology in recognition of an exceptional research contribution that has enhanced the reputation of the college in a global or national context. **Professor Richard J. Fruehan** was also honored when he received the *Distinguished Professor of Engineering Award*, which is given to a faculty member within the Carnegie Institute of Technology in recognition of exceptional achievements that have enhanced the reputation of the college.



**Former CIT Dean, John Anderson and Professor Richard Fruehan**



**Professor David Laughlin and Professor David Lambeth**

◀ **Professor Hubert I. Aaronson with his sister, Barbara A. McMurray**



**FACULTY NEWS**

**Wynblatt Retires**

**A**fter more than twenty-two years of dedicated service to education and research at Carnegie Mellon University, Professor Paul Wynblatt began his new role as Professor Emeritus in July 2004. Paul received his B.Sc.Tech with honors, in metallurgy from the University of Manchester in 1956, his M.S. in metallurgy from the



Technion-Israel Institute of Technology in 1958, and his Ph.D. in engineering (major in materials science, minors in chemistry and ceramics) from the University of California, Berkeley in 1966. Prior to joining CMU, Professor Wynblatt was employed as a research metallurgist for the Israel Atomic Energy Commission and as a staff scientist who headed the Technology Assessment/Forecasting Activity division of Ford Motor Company.

Paul joined the materials science and engineering department in 1981 and during his tenure was director of the Center for the Study of Materials, associate dean of Carnegie Institute of Technology, and department head of MSE.

Paul's work has focused on compositional phenomena at surfaces and interfaces, structure of interphase boundaries, thermal stability of thin films, capillarity driven processes, 2-dimensional phase transitions, wetting phenomena, and computer simulation. He is a member of TMS-AIME, ASM, AVS and MRS.

**Davis Joins MSE**

**R**obert F. Davis, The John and Clair Bertucci Distinguished Professor in Engineering, joined the faculty of the materials science and engineering department in 2004 after a celebrated career at North Carolina State University, where he was the Kobe Steel Ltd. Distinguished University Professor of Materials Science and Engineering. He is one of the most respected researchers in the field of electronic materials, specifically in the growth and characterization of semiconductors, ceramic thin films and ceramic coatings, and in the kinetics and mechanisms of creep in ceramic materials. He is a member of the National Academy of Engineering, a fellow of the American Ceramics Society and a member of the Materials Research Society. He has graduated 52 Ph.D. students and 18 master's students.

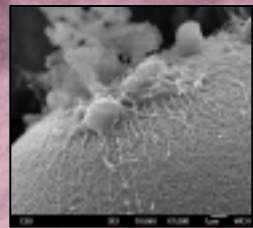
An accomplished author, Davis has five books, 341 journal publications, 246 book chapters, and publications in conference proceedings to his credit. He has given over 300 invited presentations over the course of his career. Davis has been widely recognized for his skill in education and research, with awards including the ALCOA Distinguished Research Award, the ORNL Excellence in Publications Award, the Richard M. Fulrath Memorial Award from the American Ceramic Society, and the Alexander Holladay Medal for Excellence in Teaching, Research, and Outreach. He also received the National Collegiate Inventor of the Year award for 1999.

**COVER STORY**

**Protein Assisted Growth of Novel Biomaterials**

PROFESSOR PRASHANT KUMTA  
PROFESSOR CHARLES SFEIR

**Extracellular matrix (ECM) proteins play an important role in cell function and regulation. A genetically engineered ECM protein motif found in normal mineralized structures has been observed to interact with calcium phosphate aquagels, synthesized by a novel chemical approach under physiological conditions. This interaction has resulted in the growth of new spherical shaped nanoporous mineralized structures that have a unique interaction with mesenchymal stem cells**



Micrograph



**of human origin (h-msc). As shown in the micrograph, the genetically engineered protein provides a signaling pathway that triggers the h-msc to attach and proliferate on the aquagel surface. The protein assisted new surface formed on the calcium phosphate aquagel appears to provide a unique platform for growth of these cells as seen by the intense mass of cellular processes emerging from the newly formed stem cells attempting to proliferate on the mineralized surface.**



◀ **X-ray pole figure from a rolled titanium aluminide alloy**

Davis received his Ph.D. in ceramic engineering from the University of California, Berkeley in 1970, his M.S. in ceramic engineering from Pennsylvania State University in 1966, and his B.S. in ceramic engineering from North Carolina State University in 1964.

### **Towe Joins MSE**

**D**r. Elias Towe, The A. and E. Grobstein Memorial Professor of Materials Science and Engineering, received his S.B., S.M. (both 1981) and Ph.D. (1987) from the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, where he was a Vinton Hayes fellow. He holds a joint appointment in Materials Science and Engineering and Electrical and Computer Engineering. Before coming to Carnegie Mellon, he was on the faculty at the University of Virginia and also served as program manager for DARPA in the Microsystems Technology Office. His research has led to a number of breakthroughs in semiconductor laser development in the area of quantum structures (quantum dots) and devices. The latter development was recognized as a major national research and development priority in 1999. Elias has been active in developing the national research strategy in electronics and optoelectronics as a member of advisory groups and "blue ribbon" panels. Due to his eminence in the area of optoelectronics, he has been a consultant to the national research agencies of a number of countries and to several major companies.

Elias has received a number of prestigious awards that honor his accomplishments. He is a fellow of three societies (IEEE, OSA, and the American Physical Society). In 2001 he won the Outstanding Technical Achievement Award from the Office of the U.S. Secretary of Defense. In the same year, he also won the Honeywell Technology Center Award for Advancement in Photonics.

### **Carnegie-Japan**

**I**n late March Alan Cramb and Harry Paxton set off for Tokyo on a long-standing invitation to visit CMU alumni at the annual Carnegie-Japan dinner. The meeting was held during the ISIJ meeting, where they were able to see many old friends at the reception. They also visited Nippon Steel at Kimitsu and JFE at Chiba to sample what is going on in the Japanese steel industry.

Carnegie-Japan, under the diligent eye of Dr. Paxton's former student Tatsuro Kunitake, is very much a success story. The membership is over 80 and almost half were in attendance for an excellent dinner (with minimal speeches and maximum fellowship as shown in the picture above).



▲ **The 6th Carnegie-Japan Alumni Meeting (March 31, 2004)**



▶ **Professor Paxton with Carnegie-Japan Alumni**



## RECENT PH.D. THESES

### **Adam Badri**

*“Initial Solidification Phenomena in Continuous Casting”*

Advisor: Alan W. Cramb

### **Nicholas Biery**

*“Local Deformation and Bulk Properties in Gamma-TiAl Based Alloys”*

Advisors: Marc De Graef and Tresa Pollock

### **Ellen Cerreta**

*“Creep Induced Substructures in Titanium Aluminides”*

Advisors: Tresa Pollock and Subhash Mahajan

### **Kai-Chieh Chang**

*“Microstructural and Chemical Study of SiO<sub>2</sub>/SiC Interfaces and Correlations With Electrical Properties of SiC MOS Diodes and SiC Mosfets”*

Advisor: Lisa M. Porter

### **Soonwuk Cheong**

*“Microstructure and Property Relationships in Cold-Rolled Motor Lamination Steel”*

Advisor: Anthony D. Rollett

### **Yoon Suk Choi**

*“Surface Roughening of 6022-T4 Al Sheets Deformed in Plane Strain Tension”*

Advisor: Henry R. Piehler

### **Melik Demirel**

*“Linking Experimental Characterization and Computational Modeling in Microstructural Evolution”*

Advisor: Anthony D. Rollett

### **Bassem El-Dasher**

*“Dislocation-Grain Boundary Interactions in Columnar Aluminum”*

Advisor: Anthony D. Rollett

### **Otávio Fortini**

*“Renewable Energy Steelmaking—On a New Process for Ironmaking”*

Advisor: Richard J. Fruehan

### **Jennifer Giocondi**

*“Effect of Dipolar Field, Surface Termination and Crystal Orientation on the Photochemical Reactivity of Transition Metal Oxides”*

Advisor: Gregory S. Rohrer

### **Ali Gungor**

*“Cu and Cu Alloy Thin Films: Evolution of Resistivity and Microstructure”*

Advisor: Katayun Barmak

### **Seoyong Ha**

*“Plastic Deformation of Silicon Carbide Crystals During Sublimation Bulk Growth”*

Advisor: Marek Skowronski

### **Aytekin Hitit**

*“Precipitation Reactions in a Martensitic Precipitation Strengthened Stainless Steel and the Effects of Nickel and Silicon on Precipitation Reactions and Toughness”*

Advisor: Warren M. Garrison

### **Amy Chuan-Yi Hsiao**

*“The Crystallization Kinetics of Fe-Zr and Fe-Zr-B-based Amorphous and Nanocrystalline Magnetic Materials”*

Advisor: Michael E. McHenry

### **Yu-Nu Hsu**

*“New Materials for Extremely High Magnetic Recording Density”*

Advisors: David E. Laughlin and David N. Lambeth

### **Luana Iorio**

*“The Effect of Carbon Level on Titanium Carbosulfide Formation and Toughness in Ultra-High Strength Steels”*

Advisor: Warren M. Garrison

### **Taehoon Jang**

*“Investigation of Thermally Stable Ohmic Contact Formation and Degradation Mechanisms on n-type and p-type SiC”*

Advisor: Lisa M. Porter

### **Sangki Jeong**

*“Structure and Magnetic Properties of Polycrystalline FePt and CoPt Thin Films for High Density Recording Media”*

Advisor: Michael E. McHenry

### **Francis Johnson**

*“High-Temperature and Frequency-Dependent Properties and Structural Evolution of HITPERM, an FeCo-base Nanocomposite Soft Ferromagnetic Material”*

Advisor: Michael E. McHenry

### **James Kerr**

*“Foamability of Stainless Steelmaking Slags in an EAF”*

Advisor: Richard J. Fruehan

### **IL Seok Kim**

*“Synthesis, Structure and Properties of Electrochemically Active Nanocomposites”*

Advisor: Prashant N. Kumta





**Thomas Kuhr**

*“Processing Induced Extended Defects in Silicon Carbide”*

Advisor: Marek Skowronski

**Chih-Ling Lee**

*“A Study of the Biasing of Spin Valve Read Heads for Magnetic Recording”*

Advisors: Michael E. McHenry and James Bain

**Hwansoo Lee**

*“Sputtered Magnetic Tape Media Fabrication and Recording Performance”*

Advisors: David E. Laughlin and James Bain

**Ding-Chung Lu**

*“Dislocation Substructures and Mechanical Properties of RuAl-Based Intermetallic Compounds”*

Advisor: Tresa Pollock

**Christopher Manning**

*“The Behavior of Phosphorous in DRI/HBI During Electric Furnace Steelmaking”*

Advisor: Richard J. Fruehan

**Seungook Min**

*“Materials Issues in the Integration of Magnetic Structures on CMOS-MEMS”*

Advisor: David Greve

**Paretohs Misra**

*“The Role of Heat Transfer in Strip Casting”*

Advisor: Alan W. Cramb

**Jaehyun Moon**

*“The Wetting Characteristics and Diffusive Growth of Precursing Film in Single and Multi Component Metallic Systems”*

Advisors: Paul Wynblatt and Steve Garoff

**Paulo Nogueira**

*“Blast Furnace Burden Softening and Melting Phenomena”*

Advisor: Richard J. Fruehan

**Carl Orrling**

*“Crystallization Phenomena in Slags”*

Advisor: Alan W. Cramb

**Natthapong Phinichka**

*“Solidification of Iron Droplets”*

Advisor: Alan W. Cramb

**Kritstada Prapakorn**

*“The Solidification Behaviour of Calcium Aluminate Slags”*

Advisor: Alan W. Cramb

**Ravi Rastogi**

*“Formation of Oxide Deposits During Steel Flow Through a Tundish Submerged Entry Nozzle”*

Advisor: Alan W. Cramb

**Edward Sanchez**

*“The Formation of Threading Defects in Sublimation Grown Silicon Carbide”*

Advisor: Marek Skowronski

**David Saylor**

*“The Character Dependence of Interfacial Energies in Magnesia Energies in Ceramic Materials”*

Advisor: Gregory S. Rohrer

**Zhan Shi**

*“A Study of Selected Interfacial Phenomena in Metallic Alloys”*

Advisor: Paul Wynblatt

**Hyunjong Shim**

*“Study of Wetting and Absorption Transitions in Gallium-Based Alloys”*

Advisor: Paul Wynblatt

**William Slye**

*“The Determination of the Activities of Silicon and Aluminum Iron-Chromium Melts”*

Advisor: Richard J. Fruehan

**Suk-Joon Son**

*“Thermal Plasma Synthesis of Nanocrystalline Ferrite Particle”*

Advisor: Michael E. McHenry

**Mawin Supradist**

*“Theoretical and Experimental Investigation of the Thermal Behavior of a Mold Powder Used in the Continuous Casting Process”*

Advisor: Alan W. Cramb

**Zafer Turgut**

*“Thermal Plasma Synthesis of Coated Iron-Cobalt, Iron-Cobalt-Vanadium Nanoparticles as Precursors for Compacted Nanocrystalline Bulk Magnets”*

Advisor: Michael E. McHenry

**Chih-Chao Yang**

*“Extraction of Grain Boundary Energies and Mobilities from Triple Junction Geometry”*

Advisors: Anthony D. Rollett and William W. Mullins

**Yan Wang**

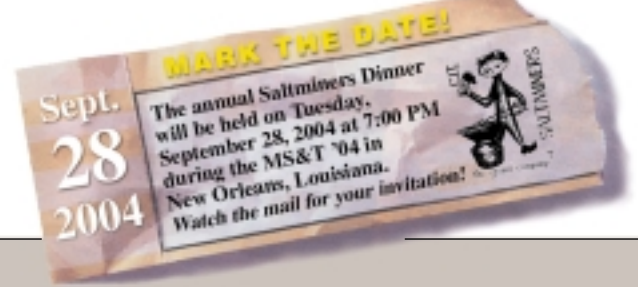
*“Inclusion Evolution in Molten and Solidifying Steel”*

Advisor: Sridhar Seetharaman

**Andrew Westmeyer**

*“Microstructure of Mixed Group III-Nitride Epitaxial Layers”*

Advisor: Subhash Mahajan



## DEPARTMENTAL CHAIRS

It is a very special occasion when a faculty member is awarded a named professorship. A chair is awarded to a faculty member who has made exceptional contributions that are recognized not only within the university but also in the community outside of the university. The occasion recognizes not only the professor but also the donor, and serves as a lasting connection between the donor, the professor, the department, and the university. MSE has been very fortunate to have four new chairs donated to the department in the last four years.

Chairs, of course, are vital to the department and the college as they stabilize our future. The income from any endowed chair is used to ensure faculty salaries and to provide support to the research program of the faculty. In this manner the department will have future financial stability. Thus the donation of a chair is an investment in the future of the department.

**D**R. **DAVID E. LAUGHLIN** was named the The Alcoa Professor of Physical Metallurgy in Materials Science and Engineering in 2001. This chair is the outgrowth of a professorship in light metals donated in 1945 by the Aluminum Company of America “to enable the Carnegie Institute of Technology to render more effective service in the education of man for the engineering, production, research and management of phases of industry.”

Professor Laughlin received his B.Sc. in metallurgical engineering from Drexel University in 1969 and his Ph.D. in materials science from the Massachusetts Institute of Technology in 1973. His research interests have centered on the investigation of phase transformations and structure by means of transmission electron microscopy. He has studied spinodal decomposition and ordering processes in several aluminum, copper and nickel based alloys as well as in III-V compounds by detailed analysis of their microstructure and electron diffraction patterns. Laughlin’s most recent research involves studying precipitation processes in Al based alloys for automotive applications, and investigating the magnetic properties and microstructure of soft magnets (HITPERM), hard magnets (FePt and CoPt), and magnetic thin films for recording media.

David is the supervisor of the X-ray Central Facility and co-supervisor of the Transmission Electron Microscope (TEM) Central Facility in MSE as well as the leader of the Media Group of the Data Storage Systems Center. He has held the position of editor of *Metallurgical and Materials Transactions* since 1987.



**I**n 2002, **DR. GREGORY S. ROHRER** was named The W.W. Mullins Professor in Materials Science and Engineering. The chair was endowed in 2001 in memory of the late W.W. Mullins, university professor of applied science, emeritus.

Professor Rohrer, who received his B.A. in physics from Franklin and Marshall College in 1984 and his Ph.D. in materials science and engineering from the University of Pennsylvania in 1989, is a recognized leader in the field of ceramics. He joined the faculty of the Department of Materials Science and Engineering in 1990 and has served as the director of Carnegie Mellon University’s National Science Foundation-funded Materials Research Science and Engineering Center (MRSEC) since 1999. MRSEC is an interdisciplinary center dedicated to the understanding, control, and optimization of interface dominated materials properties.

Greg’s principal research interests lie in the area of interface anisotropy. The physical and chemical properties of surfaces and grain boundaries vary with their crystallography and chemical composition. Rohrer has worked with students and colleagues at Carnegie Mellon to develop systematic experimental techniques that can be used to establish structure-property relations for interfaces. These structure-property relationships not only enrich our understanding of crystal growth, microstructural evolution, and heterogeneous chemical reactions, but can also be used to optimize the properties of surface active materials such as catalysts. Recently, Rohrer’s collaboration with Mullins resulted in a series of theoretical papers that provide an explanation for the long standing problem of why faceted crystals coarsen abnormally.





Actively involved in the American Ceramic Society, the Materials Research Society and the American Chemical Society, Rohrer is currently an associate editor of the Journal of the American Ceramic Society. His research won the Roland Snow award of the American Ceramic Society for Ceramography in 1998 and the Ross Coffin Purdy Award for the best contribution to the technical ceramics literature in 2002.



In 2004, **DR. ROBERT F. DAVIS** was named The John and Clair Bertucci Distinguished Professor in Engineering. John R. Bertucci is chairman, chief executive officer, and president of MKS Instruments, Inc. He has served as chairman and CEO since November 1995, and was named

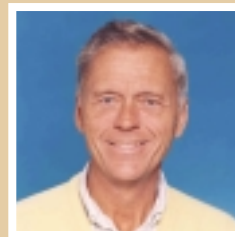
president in 1974. From 1970 to 1974, he was vice president and general manager of the company. Bertucci is a member of the Board of Trustees at Carnegie Mellon University. He also serves on the Board of the Associated Industries of Massachusetts (AIM), and is the vice-chairman and member of the Executive Board of Massachusetts High Tech Council. He received his M.S. in industrial administration and B.S. in metallurgy and materials science from Carnegie Institute of Technology. He is married to Claire Ruge Bertucci, who received her bachelor's degree in business studies from the Margaret Morrison Carnegie College.

Professor Davis joined the faculty of the Materials Science and Engineering Department in 2004 after a celebrated career at North Carolina State University, where he was the Kobe Steel Ltd. Distinguished University Professor of Materials Science and Engineering. To read more about Professor Davis, please see "Faculty News" on page 6.

In 2004, **DR. ELIAS TOWE** was named The A. and E. Grobstein Memorial Professor of Materials Science and Engineering. The Grobstein Memorial Professorship has been established to recognize the contributions of Albert and Ethel Grobstein to the department.



Professor Towe joined the faculty of the Materials Science and Engineering Department in 2001. He was previously on the faculty at the University of Virginia and also served as program manager for DARPA in the Microsystems Technology Office. To read more about Professor Towe, please see "Faculty News" on page 7.



**DR. RICHARD J. FRUEHAN** has held The U.S. Steel Professorship in Materials Science and Engineering since 1998. The Professorship, which was endowed in 1986, is part of a long and mutually beneficial relationship between Carnegie Mellon and USX Corporation dating back approximately fifty years.

A university professor and member of the National Academy of Engineering, Fruehan is also co-director of the Center for Iron and Steelmaking Research, as well as the co-director of the Sloan Steel Industry Center, whose research focuses on the issues relevant to the competitiveness of the steel industry including economics, management, human resources and technology development. Fruehan's current research deals with the thermodynamics and kinetics of iron and steelmaking reactions, and the kinetics of interfacial reactions relevant to the production of iron and steel. He received his B.S. (1963) and Ph.D. (1966) from the University of Pennsylvania and has been the recipient of a number of awards including the Champion H. Mathewson Gold Medal Award, the R.W. Hunt Medal and the Albert Saveur Award.

In 1998, **DR. ALAN W. CRAMB** received the POSCO Professorship in Iron and Steel Making. Located near Seoul, South Korea, Pohang Iron and Steel Company (POSCO) is the second largest steel company in the world. In 1986, POSCO's Educational Foundation established the Pohang Institute of Science and Technology, Korea's first private research-oriented institution of higher learning. At its dedication in 1987, representatives from Carnegie Mellon and four other universities, three from Europe and another from the U.S. signed an agreement of friendship and collaboration. Wishing to further contribute to the advancement of knowledge in materials science and engineering and to work toward the betterment of mankind through international cooperative efforts, the company endowed this Professorship.



Cramb, who joined the department in 1986 received his B.S. (1975) from the University of Strathclyde in Glasgow, Scotland and his Ph.D. (1979) from the University of Pennsylvania. In addition to his duties as department head, he is the co-director of the Center for Iron and Steelmaking Research which is the largest academic research program in North America.

**“The MSE department is comprised of 16 full-time , faculty about 70 graduate students, and about 60 undergraduate students.”**



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