University of Minnesota

CEMS NEWS
Chemical Engineering & Materials Science

A Newsletter for Alumni, Students and Friends of the Department • Spring Semester 2002

Message from the Department Head

Frank S. Bates

"What do you actually do at work?" The answers to this question, frequently directed at university faculty, are quite revealing. Nominally we each teach, conduct and direct research, and serve in the operation of the department, a job description common to every major academic research institution. In practice, every department executes its responsibilities in surprisingly different ways, over time creating an accumulation of customs that define a *culture*. All of you familiar with CEMS have experienced and contributed to our *culture*.

Teaching is a pivotal responsibility that offers the instructor a unique opportunity to shape how students think and solve problems and to nurture a respect for knowledge and scholarship. Undergraduate students are particularly malleable and require special attention, notwithstanding their large numbers. My colleagues and I benefit from a rich teaching *culture*, passed down over half a century, which relies on the team teaching of major undergraduate courses. In general, recitations are led by faculty members who attend lectures as part of their teaching obligation. This accomplishes two important goals: knowledge is passed down through generations of instructors and new course instructors acquire this knowledge by learning from an experienced faculty member. This semester, **David Norris**, who just arrived in January, is reciting in "Introduction to Materials Science and Engineering" (MatS 3011) under veteran **Dan Frisbie,** while **Yiannis Kaznessis** cut his teeth last fall with **Dave Morse** in "Chemical Engineering Thermodynamics" (ChEn 4101) shortly after arriving in August. And every professor teaches every semester – there are no dispensations based on seniority or fund raising.

Research styles also vary dramatically between institutions. Our *culture* is rooted in collaboration, a mode of operation taught and practiced at Minnesota long before it became part of the popular lexicon. **Gus Aris** and **Skip Scriven**, each with a host of co-advisors, have mentored many of our most successful alumni, and faculty, in this manner. Today **Mike Ward** epitomizes this *culture* of collaboration as he leads the National Science Foundation sponsored Materials Research Science and Engineering Center (MRSEC), housed in Amundson Hall. Under his stewardship, Ward has guided a partnership that spans seven departments and over 20 professors across the Institute of Technology, providing a research experience for 35 graduate students annually.

Finally, this spirit of cooperation also extends to service. A prime example played out last fall semester. Our department was scheduled for six-year accreditation reviews in both Chemical Engineering and Materials Science. This was a major undertaking that required skill, judgment, organization and plenty of hard work. I have searched for my appointment letters to the Accreditation Board for Engineering and Technology (ABET) leaders. They don't exist. **Lorraine Francis** and **Alon McCormick**, directors of undergraduate studies in MSE and Chem. E., simply did the job, and magnificently. These two colleagues epitomize our *culture* of service.

What do we do at work? Oh, just teach three hours a week…. That's our *culture*.

DEPARTMENT UPDATE

STAY CONNECTED!

MARK YOUR CALENDARS
CEMS RECEPTION ON TUESDAY NOVEMBER 5
AT THE ANNUAL AIChE MEETING IN INDIANAPOLIS
PLACE TO BE ANNOUNCED

FACULTY HONORS

MACOSKO INDUCTED INTO NAE 2001

Christopher W. Macosko was inducted into the National Academy of Engineering (NAE) on October 14, 2001. This honor is among the highest professional distinctions accorded an engineer. Academy membership honors those who have made important contributions to engineering theory and practice and who have demonstrated unusual accomplishment in the pioneering of new and developing fields of technology. Chris was honored for the invention, development, and dissemination of new methods of reactive polymer processing and rheological property measurement.

CUSSLER WINS LEWIS AND SEPARATION SCIENCE AND TECHNOLOGY AWARDS

Edward L. Cussler won the **2001 Warren K. Lewis Award for Chemical Engineering Education** from the American Institute of Chemical Engineers. The award recognizes distinguished and continuing contributions to chemical engineering education. **Ed Cussler** was also the winner of the **2002 American Chemical Society Award in Separations Science and Technology** sponsored by IBC Advanced Technologies, Inc. and Millipore Corporation. The award recognizes outstanding accomplishments in fundamental or applied research directed to separations science and technology. Ed will present a lecture at the annual Division of Industrial and Engineering Chemistry Symposium.

GERBERICH MADE FRACTURE CONFERENCE FELLOW

William W. Gerberich was elevated to Fellow of the conference at the 10th International Conference on Fracture, December 2-7, 2001. Since 1965 the conference, held every four years, has selected five Fellows who have contributed to the field worldwide through scholar publications and impact.

KELLER ELECTED AAAS FELLOW

Kenneth H. Keller was elected as a Fellow of the American Association for the Advancement of Science (AAAS) by the Societal Impacts of Science and Engineering section of the AAAS. Election as a Fellow of AAAS is an honor bestowed upon members by their peers. Fellows are recognized for their efforts to advance science or its applications.

PALMSTRØM NAMED APS FELLOW

Christopher J. Palmstrøm was named a Fellow of the American Physical Society (APS) for his original work on metallic compound/compound semiconductor heterostructures and thin film interfacial analysis.The APS Fellowship Program recognizes members who have made advances in knowledge through original research and publication, have made significant contributions in the application of physics to science and technology, to teaching physics, or service and participation in the activities of the Society. Only one-half of one percent of the APS membership are awarded this honor annually.

SEIDEL SENIOR DIBNER FELLOW

Robert Seidel was a senior Dibner Fellow at MIT in 2001. The Dibner Institute is an international center for advanced research in the history of science and technology at the Massachusetts Institute of Technology. Dr. Seidel's research topic was "From Lavoisier to Lewis: Chemical Engineering in the West, 1775-1955."

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BATES, CUSSLER AND KELLER ELECTED TO NAE CLASS OF 2002

Frank S. Bates, Edward L. Cussler and **Kenneth H. Keller** were elected to the National Academy of Engineering for 2002. Frank Bates was chosen "For important contributions on the phase behavior of polymer blends, particularly block co-polymers." Ed Cussler was selected "For pioneering research on membrane transport in chemical and biochemical separation, and for inspiring teaching." Ken Keller was nominated "For leadership in applying quantitative engineering analysis to vascular transport and artificial organ design and in public policy". They join fellow NAE members Rutherford Aris, H. Ted Davis, Chris Macosko, Lanny Schmidt and L. E. Scriven.

Back l to r: Christopher Macosko, Kenneth Keller, L. E. Scriven and Frank S. Bates. Front l to r: Edward L. Cussler, H. Ted Davis and Lanny Schmidt. Rutherford Aris, not pictured.

LEE RAYMOND RECEIVES HONORARY DOCTOR OF LAWS DEGREE

President Mark Yudof, Regent Patricia Spence, Lee Raymond and Dean H. Ted Davis

Lee Raymond

Lee Raymond and Regent Patricia Spence

Claire Aris, Rutherford Aris and Lee Raymond

John Raymond, Charlene Raymond, Lee Raymond and Robert Raymond

FROM MAYONNAISE TO PLASTICS

Ray D. Johnson, ChemE '39, doesn't have time for retirement and chooses to tackle life full blast. At age 85, Ray presides over Mayon Plastics in Hopkins, golfs when there isn't snow on the ground, and rides his bicycle with his wife, Mary, and the rest of the Tweeweilers. The Tweeweilers, Dutch for bicyclists, was formed by a group of friends who enjoyed exercising and vacationing together. Since the group's inception in 1982, the Johnsons, together with the Tweeweilers, have bicycled over the beautiful terrain of Switzerland, Austria, Germany, Denmark, France, and throughout our beloved Minnesota.

"As long as I have the wherewithal, I'm going to use it," says Johnson, who took up downhill skiing at age 65 during a trip to Snow Mass, Colorado. Mary can attest to Johnson's gumption, but she is quick to point out that he diligently prepared for everything he has accomplished.

Johnson prepares so well that while he was attending college at the U, he carefully researched which major would yield the best wife. An article that he picked up one day said that home economists make the best wives and chemical engineers made good husbands. So, when a young woman Johnson knew happened to mention that she had a friend who was majoring in home economics, Johnson called the friend for a blind date.

Mary Thomes turned out to be talented and bright. Valedictorian of her high school class, she was a good match for Johnson's quick, inquisitive mind. They were married shortly after Johnson graduated with distinction and had accepted an offer from B.F. Goodrich in Akron, Ohio.

For the next seven years, Johnson worked at Goodrich in raw materials testing, plastic product research, and product development. In 1946, Charles Thomes, Johnson's father-in-law, asked him to become a partner in Thomes' mayonnaise and canned food business. Loving his plastics research job, Johnson countered with an idea to start a plastics company in Minneapolis. Within six months, Mayon Plastics – named in honor of Thomes' mayonnaise business – began producing garden hoses, which were in short supply following World War II.

Mayon Plastics started on a relatively small scale and became known for its flexible plastic tubing that didn't stiffen over time. When University of Minnesota surgeon C. Walton Lillehei began using the plastic tubing successfully in his procedures, word of its surgical applications spread throughout the medical community, and the demand for Mayon tubing stretched overseas. This international trade included Dr. Christiaan Barnard in South Africa, who used the plastic tubing in the first successful heart transplant. The story of the operation made the cover of *Time* magazine, giving Mayon Plastics worldwide praise and recognition for its tubing made of pure vinyl plastic.

Mary Johnson, Chris Leighton and Ray Johnson

After Johnson attended his 50-year reunion, he decided to establish the Ray D. and Mary T. Johnson / Mayon Plastics Chair in Chemical Engineering and Materials Science. "I knew I wanted to make a difference. But in 1989, when I discovered that George and Janet Piercy were the only people who had made a major contribution to date, Mary and I decided to be second," says Johnson. "I hope our support has inspired more alumni to help out since then".

Assistant Professor Chris Leighton was recently named the current Ray D. and Mary T. Johnson / Mayon Plastics Chair holder. This chair has been used to attract new faculty members at the earliest stages of their academic careers. Leighton, who joined the department in January 2001, is an expert in magnetic materials and has filled an important research and teaching need in the department.

SUNDAHLS CREATE FELLOWSHIP

L to R: Eva Sundahl, Robert Sundahl and Beverly Sundahl.

Robert and Beverly Sundahl have chosen to create the Robert and Beverly Sundahl Fellowship Endowment with a gift of $280,000 that has been matched by the University's 21st Century Graduate Fellowship Endowment, bringing the value of the Sundahl's gift to over $500,000, which is the recommended level of a fully endowed fellowship. The Sundahl Fellowship will fully support a graduate student in materials science for up to three years of his or her research.

Bob received his B.S., M.S., and Ph.D. in Materials Science from the department and is grateful for the training he received from Professor "Jack" Sivertsen while working towards his doctorate. Bob feels that the education he received from CEMS under the direction of Professor Sivertsen was instrumental in preparing him for a successful career at Bell Laboratories, Allied Signal, and Intel Corporation. Bob is a general manager of a new business development activity at Intel and is active in the assessment of technology investment opportunities. Thank you Bob and Beverly for your generosity.

THE CHEMICAL ENGINEERING PSYCHIATRIST

by Conrad Swartz

After completing his Ph.D. in Chemical Engineering (advisor John Dahler,1971) Conrad Swartz entered and completed medical school at the University of Minnesota and psychiatry training at the University of Iowa. He then used ChemE perspectives to improve psychiatry and medicine. Starting from the prediction that repeated oral doses of activated charcoal sequesters drug from the gastro-enterohepatic circulation, Dr. Swartz measured drug half-lives in overdose patients in intensive care at the U of Iowa Hospitals. He found tricyclic antidepressant half-lives of six to 10 hours, instead of the usual 72+ hours. This changed the treatment of overdoses.

Dr. Swartz then applied chemical kinetics in several new ways to manage drug doses. He derived methods and graphs to convert blood drug concentration into daily body drug exposure and compensate for time factors. He derived other methods and graphs for physicians to interpret drug blood levels prior to steady-state, and to interchange drugs which accumulate at different rates. He measured excess toxicity from hemodialysis for high lithium levels, a direct challenge to usual practice, which then changed.

Most of Dr. Swartz's research has been in electroconvulsive therapy (ECT), in which an electrical charge is used to induce a therapeutic seizure. He found that ECT with bilateral electrodes produces greater prolactin release than with unilateral electrodes, the first measured biological difference between these common methods and then, he applied chemical kinetics to express the amount. He used the same analysis to determine optimal times for blood sampling and total TSH release in the TSH test for hypothyroidism. More recently, Dr. Swartz developed and verified a method to use heart rate to describe ECT effectiveness, analogous to drug blood levels. He elucidated optimal characteristics for the electrical stimulus, and from anatomical-geometrical considerations he introduced a new ECT electrode placement. Dr. Swartz received 11 patents concerning ECT and designed several aspects of the Thymatron ECT instrument. Dr. Swartz also discovered that low testosterone is a risk for heart attacks in aging men.

Conrad Swartz

Dr. Swartz feels that engineering science training has facilitated his ability to confront the political perspective of the "standard practice"physician. He is now Professor and Chief, Division of Psychiatric Research, at Southern Illinois University School of Medicine in Springfield, Illinois. With the passage of time, and rusting math skills, Dr. Swartz hopes for collaboration with an academic ChemE in developing further medical applications. Please feel free to e-mail to him at ectdoc@pol.net.

Are you trained in chemical engineering or materials science, but working in a different field? Would you like to write an article about your experiences for the CEMS newsletter? Contact Julie Murphy (612-625-4356 or jjmurphy@umn.edu).

SIVERTSEN ESTABLISHES FELLOWSHIP IN HONOR OF HIS PARENTS

Professor John "Jack" Sivertsen joined the faculty of the Department of Metallurgy and Materials Science on January 1, 1958 and wears the distinction of being the last member of this former department to retire. Jack officially retired in May 1998. Known for his research on the relationship between structure and the physical and mechanical properties of magnetic and insulating thin film solids, Jack has always been dedicated to helping his students obtain a quality education. During his retirement party, Jack reflected, "My students have been the best part of my career. They have taught me so much!"

Jack established the Marvin S. and Norma V. Sivertsen Fellowship Fund to recognize his late parents, Marvin and Norma. In gratitude for the friendship that Robert Sundahl and Jack Sivertsen share, the Sivertsen Fellowship will be used to help supplement the research of the Robert and Beverly Sundahl graduate fellow.

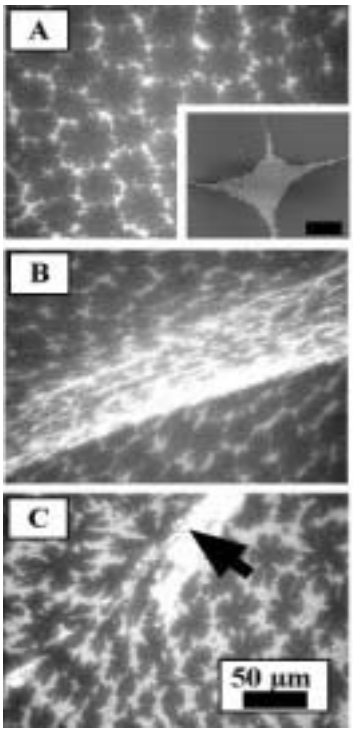
BIG JOE HELPS LITTLE PREEMIES: LUNG SURFACTANTS FOR NRDS

My research is devoted to understanding the relationship between the chemical constituents and performance of lung surfactants, a single molecule thick layer that lines the inside of every air-breathing lung – including ours. Lung surfactant is a relatively simple mixture of lipids and lung surfactant specific proteins that lowers the surface tension in the lungs. Lungs need a humid environment to work properly, and this means that the alveoli – the small sacs where gas exchange takes place – are lined by 10 – 50 microns of watery fluid. There has to be a huge area for gas exchange to occur efficiently, and for people, that means about one m^2 for every kg of body weight. With every breath an enormous surface area of water is expanded and contracted. In principle, this requires the exertion of considerable energy to overcome the relatively large forces associated with the air-water surface tension. However, most people expend little force and very little energy breathing due to the reduction in surface tension by lung surfactant.

A disease called Neonatal Respiratory Distress Syndrome (NRDS) shows the potentially fatal effects of a lack of the surfactants that most of us take for granted. During a normal pregnancy, the machinery for producing surfactant is one of the last things to develop. Many babies born more than about a month prematurely have no functioning surfactant. These babies literally do not have the strength to breathe. Since the early 80's, premature babies have been rescued by treatment with replacement surfactants made from extracts taken from cow lungs. The lipids and proteins in lung surfactants are remarkably similar in all air-breathing mammals, so replacing baby surfactant with cow surfactant has lead to a significant decrease in the US infant mortality rate during the past two decades. (Premature babies in Europe are treated with pig surfactant extracts, and those in Australia, by sheep extracts!).

However, as chemical engineers are acutely aware, isolating a gram or two of surfactant from a cow is not easy. During the extraction and isolation, some of the components of the surfactant are lost; there are also some lung tissue and blood components that come along for the ride. New diseases like Mad Cow Syndrome, that cross over to humans, lead to even more worry. We are trying to determine what each lipid and protein species in natural lung surfactant does, and how we can replace the difficult-to-extract components with something that does an equally good job.

One of the lung surfactant specific proteins, SP-B, although it makes up less than 2% of surfactant, is vital to proper surfactant performance. Unfortunately, SP-B is very difficult to extract. We are trying to determine just what SP-B does in the lung surfactant monolayer. In the lab, our lung model is very simple – just a little pool of water in a teflon dish – called a Langmuir trough. Teflon barriers sweep across the water surface to change the area available to the monolayer, simulating the changes in lung area during breathing. We measure the variation in surface tension during these artificial breathing cycles. We also use optical and atomic force microscopy to see how the monolayer is organized at the molecular scale. We have found that SP-B is critical to regulating the minimum surface tension, which is undoubtedly why it is so important physiologically. The reduction in surface tension caused by any monolayer is due to the molecules in the monolayer pushing each other apart, which opposes the natural tendency of the air-water interface to contract. A given monolayer can only take so much – the minimum surface tension happens when the monolayer can no longer push back any more without breaking. It turns out that SP-B regulates the "toughness" of the lung surfactant monolayer by organizing the distribution of the lipids – it makes the monolayer much more resistant to breaking, and hence, the minimum surface tension goes essentially to zero. We also find that if the monolayer does break, SP-B helps heal the monolayer for the next breathing cycle. In collaboration with Dr. Alan Waring of UCLA Medical School, we have patented a synthetic version of SP-B that is relatively easy to synthesize and we have obtained some encouraging results in animal models. We are also investigating the lipid composition of replacement surfactants to try to come up with a purely synthetic, simple mixture that will be cheaper and safer than animal products.



(A) Optical fluorescence microscopy image of a monolayer of a model lung surfactant mixture containing SP-B at 37°C immediately prior to collapse at nearly zero surface tension, showing the bright, fluid phase network segregating the condensed phase domains. The inset is an AFM image of an interstitial region; the height difference between the protein-rich network phase and the surrounding condensed domains is 5 nm. The SP-B protein acts to lubricate the solid phase domains, keeping the monolayer flexible. (B) A region in a collapsed monolayer showing the way the SP-B helps the monolayer to fold, rather than break. The folds extend many microns into the aqueous subphase and retain the monolayer morphology. This buckling process, similar to that in a piece of paper, allows the surface tension of the monolayer to remain low even after the monolayer can no longer be compressed. (C) Expansion of a collapsed monolayer showing unfolding of the monolayer (arrow). Since the monolayer is buckled, rather than broken, the material in the folds is rapidly re-incorporated into the monolayer and spreads out during inhalation. Without SP-B, the folding and respreading is severely inhibited.

My graduate training at the University of Minnesota, in Skip Scriven and Ted Davis' Low Tension group was directed at getting oil out of the ground using different types of surfactants. However, the basic features of surfactants are the same, regardless of what we use them for, and where we use them. In fact, I got interested in lung surfactants because the electron micrographs of our surfactants for oil production I took as a graduate student, looked just the same as pictures of surfactant in monkey and human lungs that I saw at an electron microscopy society meeting. That experience taught me the value of keeping your eyes and mind open to new ways of thinking about research problems, and just how consistent and beautiful nature is when it comes to structure and organization. It is still surprising to me that the surfactants that keep us alive are organized along the same basic principles as the detergent we use to clean our clothes, wash our hair, and get oil out of the ground.

I have a lot of good friends at the University of Minnesota that have influenced my career in so many ways. My favorite teacher was probably Dr. Arne Fredrickson – I always loved thermodynamics, and after taking his class, I TA'ed for him, too. Dr. Bill Gerberich taught me my first class in materials science – I still remember trying to figure out what a dislocation was. And my all time favorite person was Ed Cussler – he was writing his textbook, Diffusion, when I was taking his class. Part of our homework assignment was to make up problems that he could use in his book – and he would give us credit in the book. I use the book in the class I teach at UCSB, and I like to remember my classmates from their contributions to the book.

Which Who What

...were your favorite classes

...were your favorite professors

...is your advice to students and recent graduates

Joseph Zasadzinski

"My favorite class was thermodynamics."

"My favorite teachers were Arnie Fredrickson, Bill Gerberich and Ed Cussler."

"Head for somewhere warm! Never get tired of listening and learning."

HAD ROBERT W. GORE (PH.D, 1963) NOT GONE TO THE U, OUR WORLD MIGHT BE A SOGGIER PLACE

Stephen Biever, Development Officer for CEMS

Robert W. Gore, Chairman of W. L. Gore & Associates, was asked recently about what or who could have possibly enticed him away from the more temperate climate of Delaware where he received his undergraduate degree to attend graduate school at the University of Minnesota. After admitting that sitting through his first Gophers football game on a snowy September afternoon seemed like an unnatural phenomenon, Bob responded by saying, "The U has been a top technology school for a number of years. The Chemical Engineering program is ranked number one in the nation. And an impressive number of U grads are now leading faculty members at other top engineering schools such as Princeton, MIT, Michigan, Stanford, and more."

Six years after he earned his doctorate in chemical engineering from the University of Minnesota, Gore discovered that polytetrafluoroethylene (PTFE) could be stretched to form a strong, porous material. This material, now commonly known as GORE-TEX® Expanded PTFE, changed the future of W.L. Gore & Associates and made GORE-TEX® products world famous.

"The greatest years of my life were at the University because we had the basic freedom to explore," Gore recollects. "There was a free give-and-take of ideas. To a high degree, the Gore corporate culture parallels the environment I experienced at the U of M."

Bob and Sally Gore have recently set in motion a program called the First-Year Graduate Student Fellowship Initiative with a generous gift of $1.0 million that has been matched by the University's 21st Century Graduate Fellowship Endowment, bringing the value of the Gore's gift to $2.0 million. The First-Year Initiative that the Gores have kicked-off is aimed at preserving the qualities of the department that Bob appreciated as a graduate student, including freedom to explore and experiment under the direction of the finest faculty in the world.

We understand that the best universities in the country recruit today's prospective graduate students aggressively, with the competitive edge often determined by one or two key factors. The breadth and stature of the faculty and department, a category where we excel and have been ranked number one by the National Research Council for the past two decades, is probably the initial determinant in a student's mind. Selecting an advisor runs a close second. Prospective graduate students are aware of the importance of having an advisor with adequate funding and are gravitating to academic institutions that offer fellowship support for the first year of graduate studies.

A full year of support by the First-Year Graduate Student Fellowship Initiative will remove the financial barriers that deter many highly qualified undergraduates from pursuing an advanced degree and offers first-year students an opportunity to select an advisor and a research topic based solely on genuine academic interest, decoupling the selection of a career direction from the immediate need to attract funding. A student researcher can work with a faculty member in developing a research concept and have the entire first academic year to establish a long-term base of support. To accomplish our Initiative, we estimate that an endowment of $10.0 million would fully support an entering class of 40 students for an entire first year.

Stephen Biever

We offer a special thanks to Bob and Sally Gore for leveraging the University's match with their gift of $1.0 million and for bringing us $2.0 million closer to our Initiative goal. Your gift will help create a new competitive difference in recruiting graduate students and young faculty in higher education today.

GORE-TEX ® is a registered trademark of W. L. Gore & Associates, Inc.

Focus On: Electronic, Photonic and M

Electronic, Photonic and Magnetic Material faculty (clockwise from left): Associate Professor C. Daniel Frisbie, Associate Professor David Norris, Professor Christopher J. Palmstrøm, Assistant Professor Chris Leighton and Professor James R. Chelikowsky. Not pictured: Associate Professor Renata Wentzcovitch.

"One of the most significant events of th
1954. On this date, the first commercial s
no other technological advance has had

One of the most significant events of the twentieth century occurred on May 10, 1954. On this date, Texas Instruments issued a press release. In part the release read: "A revolutionary new electronic product—long predicted and awaited—became a reality today with the announcement by Texas Instruments Incorporated of the start of commercial production of silicon transistors. By using silicon instead of germanium, the initial commercial silicon transistor immediately raises power outputs and doubles operating temperatures! The potential application of this entirely new transistor is so great that major electronics firms have been conducting silicon experiments for some time."

Perhaps no press release on a technological advance has been so prophetic. By the late 1950's, integrated circuits were developed based on silicon technology. In 1970, a typical device might contain two thousand transistors. Today, the Pentium IV processor contains 42 million transistors and by the end of this decade, this number will likely increase to one billion transistors.

The technological implication of this progression can be illustrated by examining advances in computer technology. In 1955 a high speed computer weighed three tons, consumed 50 kilowatts of power, cost about a quarter of a million dollars and performed about 50 multiplications a second. In 1977, a $300 handheld computer weighed less than a pound, consumed less than a watt of power, and could perform 250 multiplications a second. Today, one can buy a hand held organizer that stores millions of pieces of information, performs thousands of calculations per second and wirelessly connects to the internet for about the same cost as the handheld computer of the 1970's.

The most striking element of this progression is that it shows no sign of abating. Over thirty years ago, Gordon Moore, a pioneer in integrated circuits, predicted that the number of transistors per integrated circuit would double every 18 months. This prediction, known as Moore's Law has held for the past three decades and should hold for at least the next decade using current technology, but it cannot hold forever, e.g., eventually one will reach the atomic limit!

Faculty members whose research resides within this general area make novel electronic, photonic and magnetic materials with the goal of providing new approaches to electronic, photonic and magnetic devices. They try to characterize the properties and understand the underlying physical laws of these materials.

For example, with the increasing desire for faster computers and data retrieval and the prediction that current technology will reach its limit, there is a clear need for radical changes of how information is processed and stored. One area of research within the CEMS electronic, photonic and magnetic materials group emphasizes the integration of single crystal magnetic and semiconductor materials for the development of spin sensitive (magnetic) devices, or spintronic devices. These devices rely on the manipulation and detection of the mobile carrier (electron or hole) spin as well as its charge. Such devices may result in making hard drives obsolete and in the fabrication of quantum computers, where the carrier spin is the quantum state that is utilized for the computation. Ultra fast nonvolatile magnetic memory devices, which are written and probed electronically, will make the start up of computers nearly instantaneous. Quantum computers will revolutionize computation and allow certain computational functions to be performed with much greater speed compared to the currently used digital computers.

Although silicon has been the dominant electronic material, other electronic materials exist and will undoubtedly play an important role. Organic semiconductors are an emerging class of electronic materials that offer intriguing prospects for low cost 'plastic electronics'. Also, one can consider devices where the electronic operations occur at the molecular level. "Molecular electronics" refers to another emerging research area in which the electrical transport properties of molecules are utilized for some function, e.g., electrical switching or sensing. Key challenges for molecular electronics are the discovery of reproducible and robust methods for electrically addressing individual molecules and the elucidation of the connection between molecular structure and charge transport properties. Possible applications from this research will include low cost, mechanically flexible flat panel displays and solar cells, in addition to "smart" labels and ID's.

Yet another new class of materials – photonic band gap crystals -- offers an interesting alternative to traditional electronic materials. Instead of using electrons as the means for performing data operations and storage, one can use light or photons to perform similar functions. Photonic "band gap crystals" are structures that are three-dimensionally periodic on a length scale comparable to the wavelength of light (about 0.5 micrometers, approximately 1/100th the width of a human

agnetic Materials

e twentieth century occurred on May 10, ilicon transistor was announced. Perhaps more impact on our daily lives. "

hair). When light strikes these structures, it can be reflected in new directions. Properly designed photonic band gap crystals allow light to be manipulated as it travels through the material. Photonic band gap crystals have potential for the formation of optical integrated circuits — ultra compact 'chips' that are able to manipulate photonic signals. Since much of our telephone and internet traffic is transmitted as pulses of light along optical fibers, these photonic circuits are needed to replace the large and expensive devices that currently control signals over optical networks. However, such circuits have not been realized due to difficulties in making photonic band gap crystals. Recent work has demonstrated a very simple chemical approach to synthesizing these materials.

Source information about this topic was found at www.greatachievements.org/

Electronic, Photonic and Magentic Materials

Epitaxial growth processes and heterostructure formation

Properties of thin films

Molecular materials and interfaces

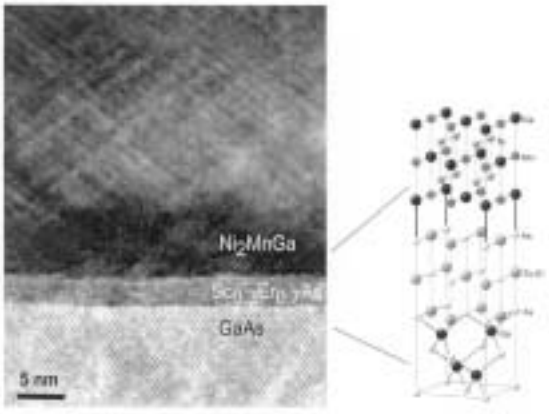
Molecular electronics

Magnetic materials

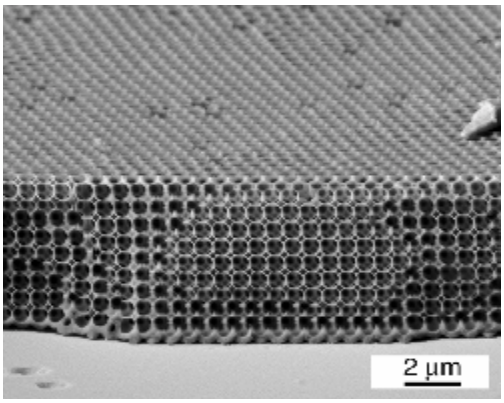
Structural/electronic properties of complex systems

Mechanical behavior of materials

Microelectronic device fabrication and packaging



The figure shows a high resolution cross sectional transmission electron micrograph of an epitaxial Ni2MnGa Heusler alloy (Ni2MnGa) grown on GaAs with a ScErAs interlayer (grown by Jianwei Dong). The ScErAs interlayer acts as diffusion barrier to minimize interfacial reactions between the Ni2MnGa and the GaAs and as a template for growing the Ni2MnGa. Ni2MnGa is a ferromagnetic shape memory alloy that may have both MEMS and spintronic applications. The ball and stick model illustrates the crystal structures of the different layers.



A silicon photonic bandgap crystal made by the Norris group using colloidal assembly.

Visit the Chemical Engineering and Materials Science Department Website
www.cems.umn.edu

OUR ALUMNI ARE THE BEST!

The response to the Class Notes section of the newsletter has been phenomenal. Your peers want to hear what you are doing. Keep sending those emails and letters. Your notes brighten my day!

The next edition of Class Notes will concentrate on our mid-career alumni. We want to hear about how you are doing in your professional and personal life.

Responses received by July 15, 2002 will be included in the Fall 2002 newsletter. All submissions are subject to editing.

Send your contribution to:
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Fax: 612-626-7246

2001

Edmund Kao (Ph.D. ChE, 2001) I'm in Houston, TX, working all day in a set of puffy, white paper coveralls. Insofar as the uniforms are concerned, the pharmaceutical industry is not so different from fast-food. Life is pretty good, and if you're looking for pictures and stories of my recent adventures, check out my web site: http://homepage.mac.com/edmundkao.

2000

Nikolaos V. Mantzaris (Ph.D. ChE, 2000) joined the Department of Chemical Engineering at Rice University in July 2001. I completed a two-year postdoc with Hans Othmer in the Department of Mathematics at the University of Minnesota. I got married in May 2001 to Fay Anagnostopoulou (who is another University of Minnesota alumna with a BA in Architecture and a BA in Advertising). All that while still trying to recover from Skip's 1995 class "Intermediate Fluid Mechanics". God help me!

1998

J. Slava Thaler, (BChE,1998) has made a professional move into personal, professional, and corporate training & coaching by accepting the Director of Motivational Consulting position at ReachApex, Inc (www.reachapex.com). He makes this move after graduate work in psychology and coaching (yes, Chemical Engineers can do anything, if we put our minds to it!), and having an article entitled "Achieving Success" published in the December 2001 edition of "Chemical Engineering Progress" Magazine. Slava is excited to work with engineers and other professionals to help them maximize their life and corporate success. Slava may be contacted via e-mail at sthaler@reachapex.com

1996

Thomas Cooney (Ph.D. MatS, 1996) My wife, Julene, and I welcomed twins into the world August 10th, 2001. Katherine Marian Cooney and Sheldon Reed Cooney were both born at 2lbs 8oz at Good Samaritan hospital in Phoenix. Babies and mom are doing great. Kate's (11.5 lbs) on the left in the picture and Sheldon's(13 lbs) on the right.

S. Michael Kilbey (Ph.D. ChE, 1996) is a member of the Chemical Engineering faculty at Clemson University, was granted tenure and promoted to Associate Professor. Mike's research group has been focusing on the synthesis, assembly, and characterization of ultrathin layers of conducting polymers at surfaces, and they continue to investigate structure-property relationships of surface-tethered polymer systems. In addition to his research activities, Mike enjoys his teaching activities. As reported here before, Mike is the youngest ever and first chemical engineer to win Clemson's Alumni Master Teacher award, and last year he was named one of the Dow Outstanding Young Faculty awardees. This award, given by the Dow Chemical Company, is made by the American Society for Engineering Education.

Rasti Levicky (Ph.D. ChE, 1996) is an Assistant Professor of Chemical Engineering at Columbia University in New York City. The recent past has seen the arrival of Alexander Adam Levicky on November 15, 2000, who has done an excellent job of being a source of constant delight and education ever since. These days Alex occasionally visits dad in his office to help clean up those piles of papers. He also takes walks with mom through the Columbia campus and by now knows the place as well as anyone. On a professional note, this past year Professor Levicky was honored to receive the National Science Foundation's CAREER award and the Columbia Engineering School Alumni Association's Distinguished Faculty Teaching Award, presented at Commencement to recognize dedication to education. In June 2001, Professor Levicky organized a two day symposium on "Nanostructured Materials: Present Science and Future Technology", co-sponsored by NSF's Materials Research Science and Engineering Center at Columbia University and NSF's Integrative Graduate Education and Research Training program at City College of New York. About 150 people attended 20

lectures, and a poster session focused on this important, emerging technological area.

1995

Stephane Bancel (M.S. ChE, 1995) I got married to Brenda in September. I work for Eli Lilly in London on the lead team of a manufacturing site, in charge of supply services, a division of 80 people. I was promoted to Director, Global Manufacturing Strategy, reporting to the VP of Global Manufacturing for Lilly. We are moving to Indianapolis in mid-March. The most important news is that Brenda is pregnant! Yahoo! We are expecting a baby girl about June 30th. We are really excited about the news and cannot wait to meet her.

Carson Brown II (BChE, 1995) My professional life of the past year has been going to school full-time at the Kellogg School of Management at Northwestern University. I graduate this spring with a dual degree in MEM (Master of Engineering Management) and MBA. My wife April and I are expecting our first child in May.

1994

Julie (Swanfield) Zambroski (BChE, 1994) has been with Intel in Arizona for the last 7½ years. My current position is Group Leader for the Gas/Chemical area in Fab 22. I recently completed my Executive MBA at Arizona State University. It is interesting to note how many University of Minnesota engineering graduates are here in Arizona at Intel. It is clear that the education provided is highly valued and sought out. On a personal note, I am married and have one son, Andrew, who is 3 and another boy born in December.

1993

Barbara A. (Menning) Panvica (BChE, 1993). My husband Terry and I recently had our second child, Tomas John, in March. His older brother Lukas was three years old in November.

Paul R. Van Tassel (Ph.D. ChE, 1993) is an Associate Professor in the Department of Chemical Engineering and Materials Science at Wayne State University. You can reach him by email at pvt@wayne.edu.

1992

Kariofilis Konstadinidis (Ph.D. ChE, 1992) ran his first Boston Marathon in April 2001. Finish time 3:18.

Lee Tonkovich (Ph.D. ChE, 1992) accepted a new position as Director of Technology Development at Velocys Inc. Velocys is a new start-up company commercializing microtechnology and micro-reactors.

She welcomed her first child, Benjamin Andrew Daymo, on September 17, 2001. She is happily living near Columbus, Ohio with husband (Eric), her new son, and two gigantic dogs (Rocky and Linzee).

1990

Terumi (Nagase) McKenna (M.S. ChE, 1990) completed her Ph.D. at Carnegie Mellon University. She is a research engineer at the Alfred H. Nissan Technical Center of Westvaco in Laurel, MD.

Kathleen Moran (BChE, 1990) was named the new market segment manager of dietary supplements at Cognis Nutrition and Health. Cognis Nutrition and Health extracts active ingredients exclusively from natural raw materials for nutritional supplements, functional foods, animal feed, pharmaceuticals and cosmetic products.

1989

Wayne R. Willkomm (Ph.D. ChE, 1990) has been named president of Kryptane Systems, a manufacturer of cast polyurethanes. Products include custom manufacture of high performance wheels, rollers and springs. Wayne, Linda and kids are enjoying the Rocky Mountains, living just outside of Boulder, Colorado.

1988

Arup Chakraborty (Postdoc, 1988) has recently been named Chair of the Department of Chemical Engineering at the University of California-Berkeley.

1987

Stephanie Hughes (BChE, 1987) Having long ago completed MS degrees in Chem E ('88) and Environmental Engineering ('90) from Stanford, Stephanie is now Source Control Manager for the Regional Water Quality Control Plant in Palo Alto, California. I am working on issues of mercury, dioxin, and pesticide pollution. Stephanie and her husband, Ben Griffin (BS, EE, 1987), are enjoying the recent acquisition of a cabin and 50 wooded acres in the Santa Cruz mountains. (Many of my '87 classmates will remember Ben, as he used to join us in the study lounge and the great Chem E parties!)

Jenny (Berman) Ross (BChE, 1987) I am working for the Federal Aviation Administration (FAA) in Des Plaines, IL, as the Regional Program Manager for Environment and Safety. I have an eight state region in the Midwest. Last year, I completed an MBA, and a few years ago I

received my PE license. I have been married for almost 10 years to Michael Ross, an architect, and have two children. Matthew (9), and Perry Elizabeth (6). Matt may grow up to be the third generation of Chemical Engineer in the family — he is learning about drag reduction early from his grandfather, Dr. Neil Berman who taught Chemical Engineering at Arizona State, as they discuss building faster pinewood derby cars. In addition to Cub Scouts, Matt studies and competes in karate and plays soccer and basketball. Perry also studies and competes in karate and plays soccer.

1986

Jules J. Magda (Ph.D. ChE, 1986) currently a professor in Department of Chemical and Fuels Engineering at the University of Utah. My first Ph.D. student, Dr. Seong-Gi Baek, has recently started a rheometer company in Minnesota (RheoSense, Inc., Woodbury, MN, (651) 714-2419, www.rheosense.com). I will serve part-time on the advisory board of this company.

1984

Holly (Bratland) Boehne (BChE, 1984) is now the Vice President of Engineering at Ecolab in Eagan, MN. The Director of Process Development, the Director of Packaging and the Director of Dispensing Systems all report to her.

1983

Reed L. Christiansen (BChE, 1983) We recently transferred back to the Upper Midwest, which has brought us closer to our extended family. I am now Assistant Manager of Vehicle/Wax Manufacturing for Lawter International in Pleasant Prairie, WI. Lawter is a wholly owned subsidiary of Eastman Chemical Company providing intermediates to the inks industry.

Robert M. Siegfried (Ph.D. ChE, 1983) is an Associate Professor at Adelphi University in the Department of Mathematics and Computer Science. After spending eleven years in exile in New Jersey, I am back home in New York. My son is five-and-a-half and is in kindergarten, wreaking a little havoc as he passes through. He has already told the teacher who teaches them Spanish that he thinks that Spanish is stupid, so I know he is not going to be any more of a linguist that his old man. But he knows his way around computers, is into problem solving and will probably make a good engineer.

1982

Blake Albrecht (BChE, 1982) As far as my time there, I mostly remember cold and a lot of work. In 1982, I started working at the Lockheed Skunk Works in Burbank California. I spent 5 yrs at Lockheed as an M&P engineer working on the F117, SR71, F22 and many other classified programs. I have to say it was quite a thrill working on all the Top Secret programs at the height of the cold war. In 1987 I transferred to Northrop Grumman and have since moved up to a department manager position in the area of Low Observables (also known as Stealth). I manage 30 engineers who perform LO R&D, supporting many programs including B-2, F-18, Future Strike Aircraft, Naval UCAV, Pegasus, Global Hawk, Targets and many others. My career has been very interesting, challenging and often exciting. It is unusual for a Chemical Engineer to wind up where I am, however my first choice for a major when starting school at U of M was Aerospace Engineering. I purposely chose Chemical Engineering instead because the job outlook was so good due to the oil situation in 1978. When I finally graduated in 1982 the job market for Chemical Engineers had crumbled; and Aerospace was in a big build up under Reagan. The moral of the story to future students is that whatever engineering area is hot when you start college may not be the hot area once you graduate (as an example look at dot com's). Fortunately engineering skills are very universal; and it's not that difficult to migrate to different disciplines, once you are out working.

Peter G. Marsnik (BChE, 1982). I received my MBA from St. Thomas in1987. I started ClearWater Systems, LLC in March 2000 after 18 years at HutchinsonTechnology. I am a consultant on pure water and wastewater for industrial applications. I live and work in Eau Claire, WI. I'm married (Patty) with two children (Jacob - 8, Becca - 7).

1981

Kristine M. Black (M.S. MatS, 1981) works for Medtronic in Tempe, Arizona at their Microelectronics Center as the Sr. Materials QA Manager.

Raymond J. Gorte (Ph.D. ChE, 1981) was the 2001 recipient of the Penn Engineering Distinguished Research Award from the School of Engineering and Applied Science at the University of Pennsylvania. Dr. Gorte gave a lecture on "Developing Fuel Cells That Run on Real Fuels" in September. Dr. Gorte is currently the Russell Pearce and Elizabeth Crimian Heuer Professor of Chemical Engineering at the University of Pennsylvania. His work on fuels cells has been featured on NPR Science Friday, Reuters and MSNBC. His other research interests include zeolite acid catalysis, zeolite adsorption for separations, three-way automotive catalysis, and fuel-processing catalysis.

Kishore Mohanty (Ph.D. ChE, 1981) became the Executive Editor of the Society of Petroleum Engineers Journal starting 2002.

G. Peter Nichols (BChE, 1981) is working as an intellectual property attorney at Brinks Hofer Gilson & Lione in Chicago. I represent clients in the chemical and chemical engineering fields. I am happy to say that my ChemE education has served me well. My

family, including six children, reside in Wilmette, a suburb of Chicago. I would be happy to hear from any 1981 alums who are in the area.

Prabodh Pathak (Ph.D.ChE, 1981) after 20 years in the upstream oil business with ARCO, I recently started a new petroleum optimization software company with some friends from other oil companies. It is fun to be an entrepreneur again after a long time in the corporate world.

1979

Douglas Lauffenberger (Ph.D. ChE, 1979) was inducted into the NAE in October 2001 for contributions in molecular and cellular engineering and for interfacing modern biology with engineering principles. Dr. Lauffenburger is the Co-director, Division of Bioengineering and Environmental Health, and Director, Biotechnology Process Engineering Center, at the Massachusetts Institute of Technology.

1978

Mary (Husnik) Schumacher (BChE, 1978) is the Chief Technical Officer at Ecolab in Eagan, MN.

1977

James L. Vodnick (BChE, 1977) was promoted to the Manager of Papermaking Research and Development at Potlatch Corporation in Cloquet, MN.

1976

Jeffrey C. Kantor (BChE, 1976). Since July 1, 2001, I've held the positions of Vice President for Graduate Studies and Research, and Dean of the Graduate School at the University of Notre Dame. For the preceding five years I was Vice President and Associate Provost at the University and prior to that served a brief term as chair of the Chemical Engineering department. These administrative assignments have slowed (but not stopped!) my research career but have also provided me with an opportunity to serve Notre Dame, where I have been for the past 21 years. Fellow classmates may remember hanging out with Diane Bradley, my frequent escort to various events at Minnesota. We were married a year following graduation from Minnesota, and are now living happily in Granger, Indiana, with two teenage boys.

1972

Larry Mattila (BChE, 1972) I am working at Specialty Minerals in Bethlehem, PA as Business Manager-Latin America. My son, John Mattila, graduated this June with a BSChE degree from the University of Delaware. My old advisor, Skip Scriven, may remember that school himself even though it was 30+ years ago. Ask Dr. Scriven if he still remembers when he was the mathematics teaching assistant to a group of freshmen and sophomore Chem E's. He scared us into learning calculus.

1970

Bernard Bodin (M.Sc, ChEn, 1970) Following graduation in 1970, I went to Germany for my military service, then joined a pressure vessel manufacturer in Britanny and got married. I soon joined a chemical engineering company which sent me to manage petrochemical plant construction sites in Korea and China. I then left for another company in the same group and went into other types of construction in Nigeria (aborted metro project), Indonesia (cold rolling mill), Venezuela (Caracas metro), and England (Channel Tunnel). I am presently running the transport systems division in Spie. We have one daughter, 25 and three boys, 21 to 15. Our daughter, who has a MBA from CUNY in New York, is about to get married. I keep a wonderful memory of my stay, as a Fullbright student, at the U, in 1969-1970

L to R: Mary, myself, Dr. Marc Rogers (former UMn grad student), Ben and Zach.

Douglas Edmonson (BChE, 1970) is the Vice President of Technology Innovation at Sara Lee Bakery Group in St. Louis. My wife Mary is a retired teacher/librarian. We have fourchildren, Penelope, Ben, Emily and Zachary and one grandson, Patrick. The picture is from the 2001 Big 10 indoor track championship, where Zach took 6th in 800 meters. Zach is a Civil Engineering student. You can send me email at douglas.edmonson @slbg.com or edmonsondm@hotmail.com

Shyam P. Murarka (Ph.D. MetE, 1970) is currently the Elaine S. and Jack S. Parker Chair in Engineering and a Professor in the Center for Integrated Electronics, Electronics Manufacturing and Electronic Media (CIEEM) and Materials Science and Engineering Department at Rensselaer Polytechnic Institute. He is presently actively involved in the area of multilevel interconnections specifically high conductivity metals, low dielectric constant interlayer dielectric, and planarization.

William A. Thomas (B.S.MetE, 1970) My memories mostly relate to the unique atmosphere at the U during that time including the Viet Nam and racial protests, the Dinkytown and Coffman Memorial occupations, the draft lottery, pass/fail grading in engineering classes etc. The Chem. E. and Met. E. departments even formed an Viet Nam Ad Hoc Committee composed of student and faculty members to respond to the heightened war controversy and show it was not "business as usual" within their schools. Dr.'s Morris Nicholson (recently deceased), Dale Stein, Toth and Gus Bitsianus were the professors teaching most of our Metallurgy classes. There were eight in our class and we were one of the last graduating classes before the Metallugical Engineering department lost department status and eventually morphed into Chemical Engineering and Materials Science. Although I only worked briefly in my field after graduating, the University did a good job of preparing me for my career in technical and management positions within manufacturing and product development.

1967

David Kudish (M.S., ChE, 1967) After I left the University of Minnesota in August, 1967 — that is, after I defended my Master's Thesis in Chemical Engineering — I drove home to New York City to take my draft board physical exam. I had an occupational derferment from the draft due to Defense Department work at Shell Chemical Co. (This was 1967 and the war in Viet Nam was really heating up.) I left Shell and joined the US Air Force. When I was discharged, I felt that my career interests had changed. I spent time in the Air Force library on base reading up about the economy and the capital markets. I sought a job on Wall Street in the investment business. I joined Dean Witter & Co. and then moved over to Oppenheimer & Co., both engagements in New York. I was recruited to join Hewitt Associates in 1974 in Chicago. I started an investment consulting business for Hewitt. I was invited by Hewitt to become a partner in 1979— a very prestigious appointment in a rather short period of time. However, as terrific a firm as Hewitt was, I had entrepreneurial ideas that could not be fulfilled at the firm. So, I resigned the partnership and founded an independent investment consulting firm, Stratford Advisory Group, Inc., in 1982. With a lot of luck, considerable hard work, and a dedicated team of professionals, we propelled Stratford to the top ranks of firms in our field. In 1994, I enrolled in the Owners' Presidents Management program at the Harvard Business School. My mission was to create a successful succession plan while harvesting the lock-up value of the business enterprise that I helped to create. I sold of 80% of the company to my colleagues in 1996; I sold the remaining 20% this past June 30th. I am now semi retired. A year ago, I handed over day-to-day management responsibility to a talented team of younger professionals who are capable of building upon the foundation that I helped to establish. I was asked to remain in an advisory capacity and currently enjoy the title of Chairman Emeritus. I was married in 1968... and divorced in 1986. My eldest daughter, Lisa, is a venture capitalist in Chicago. My son, Seth, teaches school in Hollywood, Florida. My youngest child, Debra, attends college at American University in Washington D.C. I divide my time between Aspen, Colorado and South Florida, although I maintain a residence in Chicago. I am active in several philanthropic boards. I nurture my interests in science, classical music and opera by attending lectures and performances. I am active in the Jewish communities in which I reside. I sail, hike, bike and ski... and, as a consideration to others, I do not play golf.

1964

Charles T. Novak (BChE, 1964) is enjoying retirement.

Charles Siebenthal (Ph.D. ChE, 1964) I retired in June 2000 after having four different careers : A research career with Shell Development Company, an environmental engineering consulting career with Metcalf & Eddy, another R&D career with Bechtel National, and a third R&D career with the Electric Power Research Institute. I wore out while managing the electric power industry's worldwide program on Y2K embedded systems and decided to call it a career. Currently I am doing research for a book on the history of my favorite railroad and preparing to launch my long awaited model railroad. I live in Windsor, California, with my wife Judy. We have three daughters scattered through the U. S. and two grandchildren with hopes for more. I can be reached by email at vandtrr@cs.com

1961

G. Rajan (M.S. ChE, 1961) took his M.S. degree in Chemical Engineering in March 1961. From March 1961 to September 1961 he worked as an Assistant Scientist in the Hormel Institute of the University of Minnesota in Austin, MN. He then returned to India where he was absorbed with superannuation as a Scientific Officer in the Bhabha Atomic Research Centre of the government of India where he worked for 33 years. He retired in June 1995.

1954

Roger Avelsgaard (BChE, 1954). I recall a humorous incident in Unit Ops class in 1953. In those days streetcars plied their trade on Washington Avenue, right outside the windows of Amundson Hall. The streetcars were noisy, and often a lecture would be interrupted while they went by. One day a particularly noisy streetcar banged by, bumping loudly, and shaking the windows. Professor Norm Ceaglske had to stand silently, waiting for the banging machine to go by. Presently, he turned wordless to the blackboard, drew a large square, and inside the square a smaller circle. The class burst into laughter recognizing Professor

Ceaglske's silent comment on the shape of the offending streecar's wheel. I did my senior thesis with Dr. Isbin. I admired him so much. My fee statement for Fall Quarter 1949 was for thirty five dollars! That included a full load of eighteen credits, the Student Health Service fee, and even 50 cents for the Minnesota Daily! In those days one could, and many did, earn enough during summers and part time to pay for a year of school. Some of the part-time jobs I had were running the elevator in Morrill Hall, working in the Nicholson Hall Bookstore, setting pins in the bowling alleys in the Student Union, and, my best job, working for John Antolak in Amundson Hall, although I'm not sure how much help I was. After five years working for Aramco in Saudi Arabia, I went back to graduate school and earned a Ph.D. in mathematics. I taught at Bemidji State University for 30 years.

1948

Rosalie (Sperling) Dinkey (BChE 1948) Funny story about the department: we were interrupted by unpleasant fumes when someone knocked the valve off a tank of mercaptan. Fast building evacuation followed. I remember Chem Manufacture in the basement. I caused the evacuation of the main lab, when I threw a pound of sulfur into the furnace while making something. It was a great hands-on class around real equipment.

1943

Morris E. Fine (Ph.D. MetE, 1943) The Institute of Technology had only recently formed, when I entered as a freshman in 1936. Prior to that the School of Mines and Metallurgy was a separate unit of the University. There was rivalry between the "miners" and "engineers" which surfaced on Engineer's Day. The tradition was for the miners to disrupt the parade and steal the "Blarney Stone" and run it through the rock crusher in the ore dressing lab. Some rowdies stole the Blarney Stone on Engineer's Day 1940. Part of the ceremony was for all who were to graduate to kiss the Blarney Stone. When my turn came I recognized the stone was not the Blarney Stone, but the magnificent copper nugget from the entrance of the "Mines" buiilding. I was responsible for Jack Sivertsen joining the faculty. My PhD thesis adviser was Ralph Dowdell, who had a very distinguished career, having won the Howe Award before the war. He was Chairman of the ASM Handbook Committee for the edition that came out in 1940. This was a bible for many years, until a new edition came out perhaps 10 years later. But in his later years after WW II he was criticized because of insufficient activity in research. At that time there was large enrollment in engineering with the returning veterans, and a few faculty members, mainly Professors Dowdell and Jerabek, had a full-time job teaching service courses in metallurgy, including materials to large numbers of engineering students. This instruction included a laboratory which took a huge amount of time. I opted to go to Bell Labs after WW II rather than return as a faculty member, otherwise I would have been caught up in this large effort. When I took a leave of absence from Bell Labs to join Northwestern in 1954, I found this same problem, teaching a materials course with lab to large numbers of students. I was able to convince the other departments to drop the lab requirement from the service materials course after teaching the course for one year with several time-consuming lab sections. The lab was not popular with the students who took the course as determine by the standard course evaluation questionnaire responses. I mention all of this because insufficient research was a factor in the decision to dismantle the old School of Mines.

1937

Calman J. Kish (BChE, 1937) worked at the Public Service Electric and Gas Co. for three years after graduation. He was hired as a production supervisor with Merck and Co. from 1940-1945. In 1946 he became the general manager of Fairmont Chemical Co., Inc. The company produced hydrazine which was used in rocket aircraft. Fairmount Chemical supplied anhydrous hydrazine to White Sands Rocket and Space Center and other agencies. After 41 years in the chemical industry, Calman retired as President of Fairmount Chemical Co., Inc. in 1978. There is a nice article about Calman on the AIChE website (www.aiche.org/careerservices/manage/cheprofiles/inperson.htm). Calman and his wife, Dorothy Berline Kish (another U of MN alum), have been married for 63 years and have two children, five grandchildren and seven great-grandchildren. See a "special sweethearts" article on Calman and Dorothy in the Spring 2001 edition of the University of Minnesota College of Education's news magazine (www.coled.umn.edu//alum/link/2001spring/sweetheart.html).

In Memoriam

J. Argall (BChE, 1952) died on June 29, 2001 in Omaha, Nebraska.

Roy Hella (BChE, 1928) passed away August 27, 2001.

Charles Johnson (BChE, 1941) departed on May 21, 2001 in Hot Springs, Arkansas.

Edward Ritchell (Ph.D. ChE, 1941) expired on June 22, 2001 in Winston-Salem, NC.

Allen Gene Widner (BS Biochemical Engineering, 1958) died on November 3, 2001 in Kansas City, KS, from the effects of ALS. He was employed by AT&T in Kansas City as a manufacturing engineer from 1959-1987 and as a consultant from 1987-88.

Arvind Varma (Ph.D., 1972), shown here with his wife Karen, received a plaque in honor of his being a Piercy Professor in the department. Dr. Varma spent Fall semester in the department. Dr. Varma is the Arthur J. Schmitt Professor of Chemical Engineering and the Director of the Center for Molecularly Engineering Material at the University of Notre Dame.

This issue of CEMS News is available on the CEMS Department Website: www.cems.umn.edu.

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