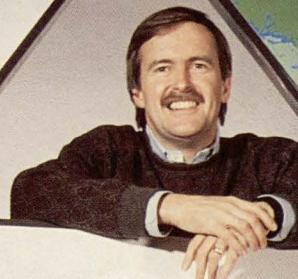


ITEMS

UNIVERSITY OF MINNESOTA
INSTITUTE OF TECHNOLOGY

Building a New World

*IT alumni project led by
Bryan Beaulieu ('72/ME) and
Bill Kamp ('71/Math)
has school children
building 42-foot globe.*



Also inside
*Technologists turned CEOs
share their views on leadership.*

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ITEMS

University of Minnesota
Institute of Technology

Spring 1993

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ITEMS is published three times a year to inform Institute of Technology alumni and friends about news, interesting alumni and faculty, and relevant issues. Letters to the editor, requests to receive *ITEMS*, and notices of address changes should be sent to the IT Dean's Office, Institute of Technology, 107 Walter Library, 117 Pleasant St. S.E., University of Minnesota, Minneapolis, MN 55455, or call Jon Meister, 612/626-1804. *ITEMS* welcomes letters and ideas from all readers.

The University of Minnesota is an equal opportunity educator and employer.

About the Cover: On May 4, some 10,000 Minnesota fourth through ninth graders will erect a 42-foot model of the Earth on Northrop Plaza. The "skin" of the model will consist of 1,620 panels that the children have made as part of the Building a New World Project. Pictured here with the geodesic framework for the globe are Brian Beaulieu, chair of the IT Week Executive Committee, and Bill Kamp, president of the IT Alumni Society and volunteer coordinator. *Photo by Rob Levine.*

NEWS

Racing with the Sun

On the morning of June 20, a group of high-performance cars will gather in Dallas, Texas, to begin a cross-country race. At the starting gun, drivers and their support crews will embark on a 1,000-mile journey ending six days later at the Minnesota Zoo in Apple Valley. Unlike other car races, however, pit stops will not include gassing up—these race cars are powered only by the sun.

Welcome to Sunrayce 93, an intercollegiate solar car race established in 1990 by General Motors and the U.S. Department of Energy as a way to encourage innovation and further interest in solar energy. Designed to showcase the talents of engineering students nationwide, all of the solar vehicles in the race are designed and built by teams of university students, incorporating ideas that may one day find a home in the production lines of electric vehicles.

Among the 36 solar cars streaking northward at speeds in excess of 45 miles per hour on June 20 will be a remarkable vehicle designed by students from the University of Minnesota. Named "Aurora," Minnesota's solar car is a collaborative effort of the Departments of Mechanical, Aerospace, and Electrical Engineering, with contributions from Computer Science, the School of Business, and several administrative offices. The real brains and brawn behind Aurora, however, come from the engineering students who have spent hours on its design and construction.

The University's entry in Sunrayce 93 began when students from the honorary engineering fraternity Tau Beta Pi learned of the event and resolved that a solar car race ending in Minnesota should include an entry from the University. A group of students, including Matt Kirkwood (Electrical), Kristine Korbel (Mechanical), and Pete Gumlack (Aerospace), submitted a proposal to Sunrayce sponsors demonstrating that their team had the engineering wherewithal to actually build a working solar car. Upon acceptance, the students began considering solar car designs based on predetermined guidelines.

Race guidelines call for terrestrial quality solar cells (no high-output satellite models) and conventional lead acid batteries. These guidelines help level the playing field among schools with differing budgets and encourage more creative solutions to design limitations.

While creativity and engineering skills are important to any design project, there is at least one other indispensable component: money. Before long, fund-raising efforts were cranked up. The students solicited donations of cash, materials, and services from corporations throughout the country and made phone calls, arranged meetings and gave presentations with a minimum of University involvement. Recent backing of the project by Dean Gordon Beavers and the University's IT Development Office, however, didn't hurt. To date, some \$300,000 in cash and supplies have been raised in support of the Aurora project, an amount that, as EE junior and Project Manager John Anderson points out, is a bargain for an experimental car of the caliber they intend to design.

Since no one has yet designed the perfect solar vehicle, this was the time for some blue-sky dreaming. The Minnesota students' relative lack of real-world experience was a plus. "Sometimes when you're a working engineer," says Anderson, "you tend to think in a line. As a student, you don't see that line, just a whole horizon full of possibilities."

Design work began in earnest when the creation of Aurora

was incorporated into the senior design projects of several ME students. Designing a car that can compete in Sunrayce 93 is a balancing act between two opposing needs common to all solar cars: maximizing the solar cell area while minimizing aerodynamic drag. To generate sufficient current to drive its electric motors, a solar car must be covered with a large number of photovoltaic cells and, ideally, these solar arrays should be oriented perpendicular to the solar radiation.

In the past, some solar racers have incorporated panels that tracked the sun during the race or mounted flat solar arrays on the roof, fixed at the most likely angle to the sun during the race. Unfortunately, this approach runs smack dab into an aerodynamic dilemma. The panels exert considerable drag and occasionally even act as sails, making the vehicle unsafe in cross winds. While the car design most desirable from an aerodynamic standpoint is low and sleek with no protruding surfaces, this design makes for very low photovoltaic output.

Minnesota's team, which now numbers close to 60, has balanced these competing needs with a striking aerodynamic shell design that has extremely low aerodynamic drag--essentially an airfoil surface bent into a semicircle and stretched into the third dimension. When engineers at the EDS Corporation performed computational flow modeling for the car design, the results were so unique that they thought something must be wrong with their input.

Measuring 20 feet long and six feet wide, the curved shell offers enough surface area for more than 1,700 solar cells, all of which are mounted on flat facets. The only problem is Aurora's designers had to ensure that the 3-D airfoil design did not actually provide too much lift. Otherwise, the driver might suddenly become the unwilling pilot of a flying car!

While Aurora is an exercise in design, it is also a race car, a fact that ME grad student and Design Manager Scott Grabow has strived to keep in mind. "We've designed the car for rapid repairability, like an Indy racer. We're also using proven, off-the-shelf components wherever possible to improve reliability."

Grabow's attention to detail comes from experience. He is a veteran of the 1990 Sunrayce, having helped build and race the entry from Mankato State University last year.

Faculty leadership for the solar car project is provided by ME Professors Virgil Marple and Patrick Starr. Starr has previously advised students in competition design projects, including an off-road "Baja" race car. Aurora is a much bigger project than past Baja races, however, according to Starr, largely because, as he puts it, "it has an order of magnitude more visibility and interest in the community."

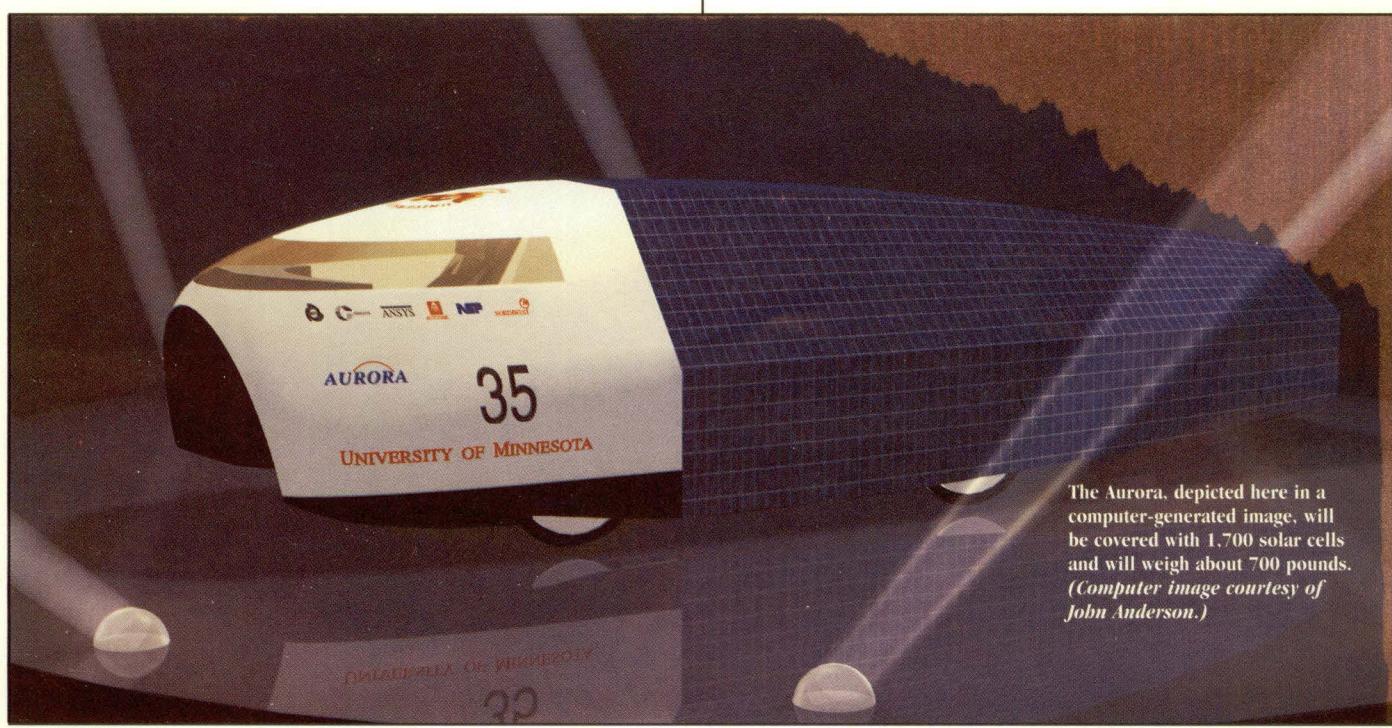
In fact, when Sunrayce 93 finishes at the Minnesota Zoo, the sports network ESPN will be on hand to provide national coverage. And, for all practical purposes, the race has become a major collegiate sporting event for the technical community. "This is on a par with the Super Bowl or the NCAA Final Four for this area," says Grabow. The Sunrayce finale also forms the main attraction of Minnesota SunFest, a weekend of solar and renewable energy events held at the Minnesota Zoo from June 25-27.

As Starr points out, however, the added notoriety is warranted, particularly given the educational benefits of a large project such as this and its focus on enhanced multi-disciplinary communication. "The aero people need information from the mechanical people, who need information from the electrical people," he says. "And students experience firsthand the need for coordination."

Although a lot of coordination and hard work lie ahead for the Aurora team (as this article went to press, many key components of the car still exist only on paper), Grabow, Anderson, Starr, and the rest of the Minnesota team are confident they will meet their deadline of April 8 in getting the solar racer put together, tested, and transported to the Indianapolis Speedway for the qualifying trials.

And, given what the team has accomplished thus far, it's a safe bet that Aurora and its crew will be in Dallas on race day, patiently waiting for the sun to rise. ■

By Jim Marti



The Aurora, depicted here in a computer-generated image, will be covered with 1,700 solar cells and will weigh about 700 pounds. (Computer image courtesy of John Anderson.)

ITAS Mentoring Program Matches Students with Alums

The IT Alumni Society (ITAS) mentoring program has grown dramatically since its inception, providing dozens of IT students with an opportunity to tap into the experience of practicing engineers and other technical personnel.

Initiated in March 1992 under the direction of Lee Paulson, past president of ITAS, and Don Flemming, chair of student relations, the mentoring program matches interested IT students with alumni volunteers.

"It's been a tremendous success," says Paulson. "In 1992, we matched 45 students with mentors. This year, more than 70 students are participating."

The program is designed to help students prepare for the transition from IT to the work place and plan a successful career path. Mentors are expected to meet with their students three times during a five-month period. Students typically visit the mentors' work places, or other companies of interest to the students. Many mentors have arranged for students to visit the work sites of friends and relatives to provide a broader perspective of what is available for career choices, according to Paulson.

A key element of the program's success to date has been the matching process. Students interested in participating are asked to fill out applications stating their needs and interests. David Frank, director of IT undergraduate programs, then tries to match the students with alumni volunteers who best meet the students' specific needs.

A kickoff reception was held in January to train both mentors and students on how to have a successful mentoring experience. More than 100 students and mentors attended the reception.

"We expect the mentoring program to continue to grow and would like to recruit more alumni volunteers to serve as mentors," says Frank. "It's a fantastic opportunity for students and mentors to gain insight into each other's worlds. And, it gives alumni an opportunity to make a direct connection with IT."

For more information, call Frank Robertson at 612/626-8282.



Help Wanted? Job Needed?

The IT Placement Office continues to assist employers and job seekers. Those looking for employees will find outstanding graduates with up to 30+ years of experience, as well as graduates just entering the work force.

For those who want to explore the job market, the IT Placement Office can help. It maintains a listing of available alumni, which is forwarded to employers and selected employment agencies for consideration on a periodic basis.

Interested employers and job seekers can contact the Placement Office at 612/624-4090 or send a letter indicating their needs to: IT Placement, 50 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455. ■

Alumni Survey Generates High Response

IT would like to extend its appreciation to the more than 12,000 alumni who responded to the IT alumni survey.

Although the responses have not all been compiled, preliminary results indicate that the number of companies founded by IT alumni may total more than 1,000.

The next issue of *ITEMS* will contain a more complete summary of the survey results.

A booklet containing a detailed listing of survey results will be available July 1. To obtain a copy of the booklet, call the IT Information Center at 612/626-1800 or 1/800/241-8001. ■



One-hundred-fifty-nine IT scholarship recipients, pictured here with Acting Dean Gordon Beavers in the Taylor Undergraduate Center in Lind Hall, were honored at a reception in October. Funds for the scholarships came from private companies, professional societies, alumni groups, and individual donors.

VIEWPOINT

Reflections on Leadership, II

Michael Wigley (78/CME)
President and CEO of
Great Plains Supply, Inc.



Photo by Rob Levine

Editor's Note: In last year's special IT 400 issue of ITEMS, we published excerpts from several essays on leadership written by Earl Bakken (48/EE), founder and former CEO of Medtronic, Inc. Having spent more than 40 years at the helm of Medtronic, Bakken offered the voice of experience. The following interview with Michael Wigley, president and CEO of Great Plains Supply Company, offers the voice of youth. Though hardly inexperienced, he ranks among the up-and-coming with respect to corporate leadership.

After earning bachelor's degrees in civil engineering and geology from the Institute of Technology in 1978, Wigley earned a master's degree in civil engineering from Stanford University in 1979 and a master's degree in business administration from Harvard Business School in 1986.

Since 1979, Wigley has held a variety of management and business consulting positions, including chair, president, and CEO of Hot Rock, Inc., a telemarketing firm he founded. In 1989, Wigley completed a leveraged buy-out of Harvest States Cooperatives' Great Plains Supply Company Division, which included 34 lumberyards and two truss and component manufacturing plants. The division lost money nine out of the 10 years prior to acquisition.

Under Wigley's leadership, Great Plains Supply thrived, generating sales of \$34 million, \$43 million, \$49 million, and then \$56 million (along with increasing net profits) during the first four fiscal years.

During an interview with ITEMS Publisher Linda Goertzen, Wigley shared the following thoughts on leadership.

Q Do you think leaders are born or made, and what characteristics make for good leaders?

It's a topic that interests me a lot, but I go back and forth about whether leadership is an inborn trait or learned. Some people are just natural leaders and don't ever have to analyze it. They just do it. Other people, like me, have to work at it. I analyze it all the time to try to learn and move forward.

When you think about the components of leadership and what makes leaders, clearly there are elements of character that come into play. Integrity, trustworthiness, honesty--I think those elements of character are fundamental to leadership.

Leaders also have to have or develop some sense of the human condition and what makes people tick. Another component is that leaders see things between the lines and hear things that aren't said.

Q How does a leader transmit those characteristics and skills down through an organization?

A leader has to establish a clear picture of the direction the organization is going. You have to have everyone reading from the same page and, to do that, someone has to say, "This is where we are going." At some point, a leader needs to mandate a direction.

With Great Plains Supply, we found ourselves in a turn-around situation. We were acquiring a company that was not doing very well, so there was a sense of urgency in getting it fixed.

I remember when I first went out and had a chance to make some presentations in our company. I had sent out written correspondence, but had not actually gone out and talked with people. The example I used with them was, "The train is rolling in this direction, and you are all standing on the platform. You are either going to get on now and go with us, or you are out of here. You have to decide--this is where we are going and this is what we are going to do. As I look across our organization today, our people are all heading in the same basic direction."

However, the direction in which you are heading has to be fundamentally correct. If the direction I established was flawed or based on something like cheating people and treating them like dirt, nobody's going to get on the train.

Q How did you establish the direction that the Great Plains Supply "train" was to take?

Mission statements are important. They provide an underlying sense of what the organization is trying to do. I also



*Integrity, trustworthiness,
honesty*

*--I think those elements of
character are fundamental to
leadership.*



believe great companies do five things and they do them all simultaneously:

- They deliver superior value to their customers
- They create an environment where their people can excel and grow
- They are reliable, honest, and tough partners with their key suppliers
- They deliver value to their communities by actively participating in community affairs making it a better place to be
- They deliver superior returns to their shareholders.

That's my definition of a great company, and it's also our mission statement. We have also established a set of operating principles that serve as fundamental values for the way our people interact with each other and with our customers and suppliers. Those principles are:

- Communicate openly, honestly, and directly
- Keep agreements
- Find life's balance
- Live with integrity
- Be open to the one-percent possibility; be aware
- Build a supportive team environment
- Accept ownership; be creative; take risks
- Strive for excellence
- Teach, coach, and lead by example

These are the rules of the game for us.

Q How did you effect change among the existing work force once you acquired Great Plains Supply, particularly given its previous financial performance?

People want to be winners. They absolutely do. But, you have to provide a direction they believe will let them win.

In my model of the world, 95 percent of the people are really good people and five percent are turkeys. Most of the world builds systems to protect themselves from the turkeys instead of building systems that let the other 95 percent of the world excel.

In this sense, I practice and believe in management by exception. You build a system that allows the 95 percent to thrive, and it brings the turkeys to the surface real fast. Then you fire the turkeys if they're your employees. If they're your customers, you tell them to do business with someone else. If they are among your suppliers, you quit doing business with them. Turkeys are no fun to do business with. You have to find them and get rid of them.

Most people want to make a real contribution to the firm they are associated with. They want to feel like they have an



*A big part of my job
is to put people at ease. I
usually keep myself in the
background.*



impact on what gets done, and they want to have a set of values that underlie what the organization is trying to accomplish.

If you want to build a system that allows the 95 percent of the good people to succeed, you have to allow room for failure. It's hard for a company to be accepting of failure. But, if you don't give people an opportunity to fail, you don't give people an opportunity to succeed.

When you start to establish operating principles in an organization, you start to build a culture. If you look at what kind of culture comes from operating principles like these, you find win-win solutions. You stop blaming and limit fear. If you can just get fear out of an organization, you can make a lot of progress.

Q With all of the change that comes from trying to turn a company around, how do you limit fear?

You have to try to channel that fear. We bought a company last summer that was profitable and an important player in

*People want to be winners.
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their marketplace, but they ran the company in a very "sleepy" way. There were way too many people doing way too little work. We expect people to take a lot of responsibility and authority and take care of the customer. In that environment, you have to cut back on numbers and that creates fear in the organization.

It puts a big strain on the people who remain, too. You have broken relationships and set new standards. All of a sudden the bar is a lot higher, and people don't know if they can jump over it. It's possible to channel that fear. You have to establish external standards and give people a chance to internalize them. It's part of the mechanism of change.

Q What is your personal leadership style?

A big part of my job is to put people at ease. I usually keep myself in the background. My model is sort of the opposite of the typical organizational structure that puts the king at the top of the pyramid. I think a leader sits at the bottom of the pyramid, and at the top are the front-line troops that determine value to your customers. The next layer is supply sergeants who deliver resources to the front-line troops. The leader sits at the bottom.

In our company, it's the people who drive the trucks and the sales people who deliver value to the customer.

Q How do you motivate the front-line troops, those who deliver the value to the customer?

There are both intrinsic and extrinsic components to what motivates and drives people. We all work because we need to eat, but that's just a small part of what motivates people. It has been my experience that what I call "back-pocket" motivators are relatively short lived. If you give somebody a raise, you are going to have a one- to two-week impact from it. If you have a performance-based compensation system, you might be able to drive performance for a quarter. If you offer people equity in the company, you might be able to drive performance for four to six months. That's the extrinsic side, and I don't think it really drives people.

What's important is the intrinsic side. Do I have value in my job? Am I contributing to this organization? Do I get to make decisions? Personal recognition is real important. It's also important on a day-to-day basis that they deliver some value to what we as a company are trying to accomplish.

I'll tell you a story to illustrate what I mean. We believe that the way to win contractors is by putting more money in their pockets. There is nothing that builds loyalty more than improving the economic performance of your customers. The way we do that is to help our customers keep a high level of crew utilization.

When I went out and analyzed it, I discovered that most of our customers were achieving between 60 and 65 percent utilization. In other words, people were actually banging hammers 60 to 65 percent of the time. Our objective is to drive that to somewhere between 85 to 90 percent of the time. One way that we do that is by delivering quality products to them every day so they don't have to put somebody on the job just to sort through the stuff that was delivered trying to pick good lumber from bad lumber.

That translates back into supply agreements that we cut with our preferred suppliers. We have 22 suppliers from whom we buy 85 percent of our stuff. Those guys know that one of our criteria is that we can reject *any* load that comes in for *any* quality criteria that *any* of our people determine.

The gate keeper on this whole quality issue becomes the yard guy at our store. He can say to himself, "I get to determine whether that truck gets to unload here or just turns around and heads back to Seattle." He now has a real job as the quality gate keeper in the company.

That's just one example of how you can build a business system in a way that's internally consistent from the way you

interact with your customers, to the way you build the process flow internally, to the way you interact upstream with your suppliers.

Q How do you ensure that the managers who deliver the resources to the front-line troops can get the job done?

That's probably the single biggest challenge we have--how to grow managers. It's one of the areas where I also invest a lot of time. I like to be involved in the hiring process--not necessarily to have the final say on whether they get hired or not, but at least to be able to add my perspective.

We have also developed a management training program internally that we use. I participate in all of the training sessions, and all of our officers are involved in at least one. It gives us a chance to see what our people are made of.

Communication is an important part of helping our managers do their jobs right. We try to communicate in whatever way we can and in as many different ways as possible. We use voice mail and our computer systems. We have fax machines at every location. We do a weekly newsletter that is oriented toward information that helps us serve our customers better.

We also provide a lot of purchasing and pricing information. We do a monthly financial report that lists out the performance of all locations on a whole bunch of different parameters, including sales and profit. We have seven key performance measures that are basically ratios, such as return on sales, cash flow on average current assets, productivity, and so forth. The report goes into detail of what's behind each number, so you can get into it as deep as you want. You can pull up what the total payroll hours were in a certain location.

We also do a written report on a monthly basis that champions what we got done and points out what we didn't get done. It's sort of "the good, the bad, and the ugly report." It covers the areas we are trying to improve on. We also hold quarterly and annual meetings.

Q Where would you like to take Great Plains Supply in the next five years?

I'd like us to become closer and closer to being a great company. That's the challenge we face.

BUILDING A NEW WORLD



**CONSTRUCTION DAY MAY 4TH, 1993
INSTITUTE OF TECHNOLOGY, UNIVERSITY OF MINNESOTA**

**10⁻⁶
SCALE**

**1:1,000,000 SCALE • 1400 PANELS • 10,000 STUDENTS K-12
200 ALUMNI MENTORS • 200 I.T. UNDERGRAD ASSISTANTS
ASSEMBLY TIME: 4 HOURS**

SPECIFICATIONS:

DIAMETER	41.8 FT.
HEIGHT	38 FT.
WEIGHT	6000 LBS.
SURFACE AREA	5538 FT ²
SIZE OF EACH PANEL	39" X 36"
FRAMEWORK	1 1/8" SQ. ALUMINUM

SCALE DETAILS:

HIGHEST MOUNTAIN	1/4 IN.
THICKNESS OF ATMOSPHERE	1/2 IN.
1 MILE	1/16 IN.
DISTANCE TO SPACE SHUTTLE	12 1/2 IN.
DISTANCE TO MOON	1/4 MI.
DISTANCE TO SUN	93 MI.
SIZE OF YOUR HOUSE	.001 IN.

* IF 41.8 FT WAS THE DIAMETER OF A HYDROGEN ATOM, A PROTON WOULD BE .005" IN DIAMETER. AN ELECTRON WOULD BE .000005".

ASSEMBLY PROCEDURE:



1 TOP ASSEMBLED ON CENTRAL PILLAR SYSTEM



2 CENTRAL PILLAR EXTENDED; MORE PANELS ADDED



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TO HELP BUILD A NEW WORLD, CALL TODAY 1-800-241-8001

Building a New World

Nothing so fascinates an engineer as a good project. And for Bryan Beaulieu (72/ME), few projects could be as gratifying as the rather fantastic project he has conceived to entice more than 200 IT alumni to become reacquainted with their alma mater while, at the same time, introducing 10,000 Minnesota fourth through ninth graders to the joys of engineering.

On May 4, the culmination of what may be the world's largest grade school and junior high school science project will take place on Northrop Plaza as these students erect a 42-foot, one-to-1,000,000 scale model of our planet Earth, complete with geographical features and political boundaries (accurate to within one-sixteenth of an inch) that they have painted onto the 1,620 triangles that will comprise the skin of this geodesic structure.

Beaulieu, who was recruited to chair the planning committee for IT Week 1993, is the founder and president of the Burnsville, Minn., company, Skyline Displays (see "Adventures in Business," p. 18). As chair, he wanted to build upon the efforts begun with the successful Entrepreneur's Forum during IT Week 1992 to get alumni reinvolved with IT.

"We wanted to get as many alumni involved as possible and get them back to campus," Beaulieu explains. "We thought the best way to do that would be to get them involved in a project."

At the same time, Beaulieu and other committee members, including IT Alumni Society President Bill Kamp (71/Mathematics), wanted to address the alarming lack of interest among young people today in technology and engineering.

"Kids in school almost exclusively study the natural sciences," says Kamp. "They do chemistry, biology, and so on, but seldom, if ever, get involved in a project where they actually build something. We wanted these kids to start considering problems of an engineering type and to expose them to some of the other sciences."

Faced with the challenge of coming up with an engineering project that would involve alumni and stimulate the interest

in science and engineering among children, Beaulieu decided on the idea of building a scale model of our planet. He believes it will not only be a fun and challenging project for children, but will address some of the serious shortcomings in their educations.

"Some of the educators I've spoken with have said that students coming into the technical colleges today have lost their sense of reality, so to speak, when it comes to distances, weights, and the scale of things," Beaulieu says. "They've learned so much through the virtual environment of television that they don't have any hands-on experience. They don't know how far 10 yards is, for example, or how much 10 pounds is."

Statistics suggest that the lack of interest in science and math becomes most pronounced among American children as they enter adolescence. At age 10, American children rank second in the world among industrialized nations in math and science, but by age 17, that ranking slips to seventeenth. When they've finished "Building a New World," 10,000 Minnesota children will have mastered a sense of scale--and a good deal more.

Beaulieu and his team of engineers settled on a geodesic structure with an aluminum framework--one that involves simple construction techniques and incorporates very high safety standards. Beaulieu's company manufactured and donated the 1,620 triangles (made of 1 1/8" square aluminum tubes) that will constitute the framework. The triangles can be quickly fastened together with nuts and bolts.

The skin of the scale model will consist of triangular panels of 1/8" polycarbonate material donated by General Electric. The

*A cast of thousands
tackles a truly global
engineering project
-building a 42-foot
scale model of
planet Earth.*

By Chuck Benda

panels--which will be cut, plotted, and painted by the children prior to construction--will be attached to the framework using a sort of "super-velcro" material donated by 3M Company.

The students will do the actual construction themselves, building the model from the top down. For safety reasons, they will work only at ground level, and the model will be raised as successive rows of panels are added. The engineering team has devised a "climbing crane" that will be powered by the students.

"The elevating mechanism was actually a more complicated design project than the dome itself," says Beaulieu. "We incorporated various gear reducers and ball screws so that a 40 or 50 pound fourth grader can lift a 4,000 pound ball."

Working well away from the actual structure, the students will take turns riding a stationary bicycle to provide the power to lift the globe. The energy will be transmitted to the climbing crane through a long drive shaft. It is expected to take about four hours to assemble the model.

The assembly, although sure to be an attention-grabbing event during IT Week, is really only the icing on the cake. To ensure the project has a lasting impact on the students, the project team developed a four- to six-week program to further de-

velop the students' science skills. They hired a curriculum writer to create a program of course work that includes geography, cartography, geometry, and environmental science.

"We involved some 200 schools throughout the state," says Kamp, who coordinated alumni and undergraduate student volunteers. "We also recruited an IT volunteer to go into each school and work with the students."

Prior to promoting the project at schools, however, it was necessary to find a means to accurately plot lines of latitude and longitude on the individual triangles so that students working on the panels had meaningful reference points to begin their cartography work.

"That was the real make it or break it part of this program," says Beaulieu. "Imagine taking a globe and drawing 1,620 triangles on it. Fortunately, the University's Geometry Center was able to complete all of the necessary calculations within a few hours."

Working from the data provided by the Geometry Center, the project team used laser plotters to produce full-size printouts of the lines of latitude and longitude on engineering vellum. Using these printouts and an atlas, the students could then determine what part of the world to reproduce on their triangle and trace in the lakes, rivers, and political boundaries.

Before transferring the information to the actual panels, however, the project team needed to insert a quality control check to ensure that boundaries and geographical features on panels created by different students matched up at the junctions of the various triangles. Enter the Central Intelligence Agency (CIA).

"We needed to be able to provide our volunteers with some method of quickly verifying the accuracy of the students' templates," says Kamp. "I was able to locate a CIA mapping database in the public domain, which allowed us to print out a second set of triangles with the geographical information and political boundaries in place. This gave our volunteers an accurate means of checking the students' work."

Once the templates were okayed, the students transferred the information to the polycarbonate triangles (working on the reverse side) and painted in the lakes, rivers, and political regions in the appropriate colors. When completed, they covered it with a thin piece of adhesive vinyl to protect the paint.

"Three-fourths of the panels are blue (representing oceans), so the students were able to whip through those fairly quickly," says Beaulieu. "But we made

sure each group of students got one or two panels that were more complicated. Depending upon what part of the world they're working on, it could be a lot of work. As a test, I worked on a sample panel of Ecuador. Ecuador, which is roughly the size of Minnesota, fills a single panel (about three feet on each side). Within Ecuador there are 28 states. Each has to be painted a different color."

With the panels completed, all that remains is the final assembly--a logistical challenge that has caused project members more than a few sleepless nights.

"The weather could be a big issue," says Beaulieu. "If we get a 30 mile-an-hour wind, that means we'll have roughly 5,000 pounds of pressure pushing on our globe. And the sheer numbers of people involved present another challenge."

"The final building date will be as much theater as it will be construction site work," Beaulieu continues. "We'll have about 10,000 students involved. We also want to show them a film on the concept of scale called 'The Powers of 10' and give them a tour of the campus. Just feeding them and providing sanitation facilities is going to be a challenge."

To handle the challenge, the team has hired two full-time people--an overall project coordinator and a construction supervisor. "But that's the whole idea--to get these people on campus," Beaulieu adds. "To get our alumni volunteers interested in the University again and get them back on campus. And to get these young students here and give them an idea of how exciting college can be."

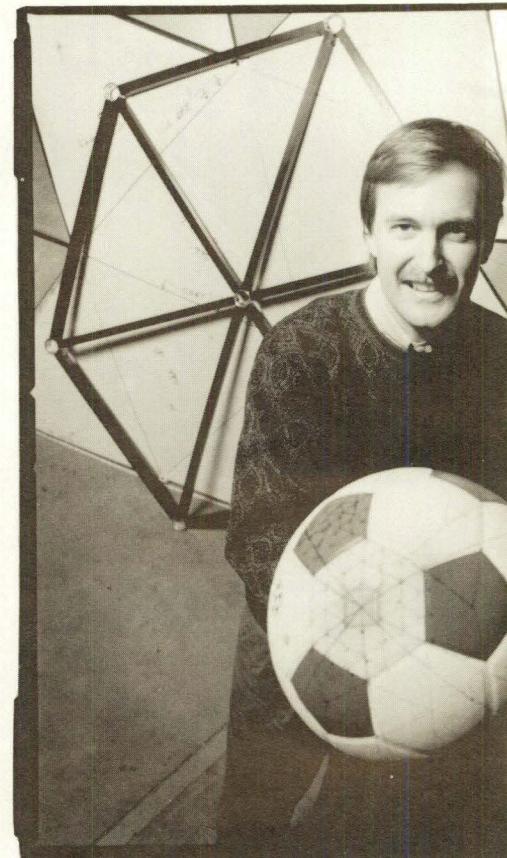
"They are prospective 'customers' for IT," Beaulieu continues. "We're seeing a substantial decline in the number of students asking to enroll and in the number who are qualified. We want to build up an awareness of what is available and get science and math into the schools so that students who do come here are prepared to succeed."

Although Beaulieu is partly motivated by a desire to give something back to the University and the community, he also sees this project providing a direct benefit to his and other Minnesota companies that rely on a well-trained work force.

"We're not getting the kind of work force we would like to have," Beaulieu says. "People don't know how to use a ruler. If they don't know how to use a ruler, how can they make displays for my company or make good decisions?"

"Recently, a group of 23 Harvard graduates were asked to explain why it is warmer in the summer. Only three knew that it was because the Earth tilted on its axis and therefore received more direct sunlight in the summer."

"That's kind of a symbol I have focused



on with this project," Beaulieu continues. "Here was a group of people--supposedly the cream of the crop--who will make decisions about global warming and the environment. People who will become lawyers and legislators--and they don't even know why it gets warm in the summer. That's pretty frightening."

If the early response from participants in the "Building a New World" project is any indication, however, there's desire among the masses to rekindle the fire for learning science and technology. Before the project was officially announced to schools, Beaulieu began receiving three to four phone calls each day from teachers statewide who had heard about the program through the grapevine and wanted to participate. Once the students were exposed, they became enthused.

"One kid went home after a meeting and stayed up most of the night calculating how big things would be based on the one-to-1,000,000 scale," says Beaulieu. "And one of the fathers at the meeting wanted to work on it himself. He didn't want to leave all the fun to the kids."

Once the model is completed, including assembly, the project team plans to make it available to other groups of students. The model can be disassembled



In the early going, project team leader Bryan Beaulieu relied on an ordinary soccer ball to help plot the locations of various segments of the model.

Bill Kamp located a CIA mapping database to print out extremely accurate templates for volunteers to use in checking the accuracy of the students' work.

and shipped around the state, or even the nation, to serve as a focal point for their study projects. The project team hopes to have other students reassemble the model at the state capital or in Washington, D.C.

The project has generated so much interest because it makes science and technology fun and exciting. Kamp, who served as a volunteer for the program in his son's school, is impatiently awaiting assembly day and hopes other alumni will return to campus to witness the assembly and participate in IT Week activities.

"This is a great project," he says. "It brings the science and the engineering together in a way that makes it appealing. It's a very gratifying project to work on. The kids are going to love it."

Including those "kids" who already have their engineering degrees.

IT Week Features Leadership Conference

Continuing in the tradition of last year's highly successful Enterprise Forum, on May 6, the IT Dean's Office will again sponsor a conference designed to impart experience and knowledge of some of IT's most successful alumni.

Titled "Leadership in a Technological World," the day-long conference will focus on leadership skills, empowerment, and the role of a technical education to corporate leadership. Sessions will be led by IT alumni who have fashioned for themselves high-powered careers as corporate leaders.

Conference speakers include Don O'Hare, former president and chair of Sunstrand Corp., Fidelis Umeh, president of SEI Information Technology, Michele Brekke, payload integration manager at NASA; and Bryan Beaulieu, founder of Skyline Displays, Inc.

For more information, call 612/626-1800 or 1/800/241-8001.

Schedule of Events

IT Week 1993

MAY 3

IT Week Opening Ceremonies Noon EE/CSci Plaza

MAY 4

"Building a New World"
Students assemble 42-foot scale
model of Earth 8:00 a.m. to 2:00 p.m. Northrop Plaza

MAY 5

IT Tech Fair
Two-day job fair sponsored by
Plumb Bob featuring representatives
from dozens of major companies 9:00 a.m. to 4:00 p.m. Grounds between EE/CSci and Lind Hall

IT Open House
Tours, activities, demonstrations 9:00 a.m. to 2:00 p.m.

ChemE Class of 1943 Reunion 11:00 a.m. Campus Club, Coffman Memorial Union

Geology Class of 1943 Reunion Noon Pillsbury Hall

IT Student Presidents Banquet
IT alumni celebrate the
accomplishments of IT student leaders 6:00 p.m. Campus Club, Coffman Memorial Union

MAY 6

Leadership in a Technological World
One-day conference on corporate
leadership 8:30 a.m. to 4:45 p.m. Various classrooms
Luncheon at Radisson Hotel Metrodome

IT Tech Fair 9:00 a.m. to 4:00 p.m. Grounds between EE/CSci and Lind Hall

IT Alumni Society Leadership Awards Banquet 6:00 p.m. Minneapolis Marriott City Center Hotel
Honors IT alumni who have taken
a leadership role in their professions.

MAY 7

IT Olympics 10:30 a.m. Church Street and EE/CSci Plaza

IT Student Picnic 11:00 a.m. Behind Lind Hall

The Makings of a Leader

W

hat--or who--makes a good leader? Are leadership skills innate or are they learned? Dozens of books have been written in recent years in an attempt to answer these and other questions about leadership and management and provide some guidance for those aspiring managers who would be king. The theories and answers are as diverse and numerous as the questions being asked. Ultimately, there are few definitive answers. One thing, however, is clear. In a society that is largely dependent on high technology, the leadership role in corporate America is increasingly being filled by people with technical educations.

Five years ago, a *Fortune* magazine survey asked more than 200 executives from Fortune 500 companies who they consider to be the most effective leaders in U.S. business. Eight out of the 10 leaders named had scientific or engineering educations. More recent research conducted through the IT Office of External Relations lends further support to the notion that a technical education may be the fast track to corporate leadership. More than 1,000 IT alumni have founded and led their companies to success, while hundreds more have served as top-level managers in companies around the world.

*Ten IT-trained executives
share the secrets
of their success
as corporate leaders.*

By Chuck Benda

We interviewed 10 of those IT-trained executives--Lee Berlin, Ken Carlson, William Crosley, Fred M. Green, Harry Heltzer, H. Anthony Hennen, Don O'Hare, Owen Schott, Joseph Shuster, and Tom Valenty--to try to discover the secrets of their success. Their credentials are impressive:

- Lee Berlin (44/Chemical). Chair and founder of Lectec Corporation. Formerly vice president of foreign ventures for 3M Company.
- Ken Carlson (41/Electrical). Former president and CEO of Picker Corp.
- William Crosley (50/Aeronautical). Founder and former CEO of Detector Electronics.
- Fred M. Green (67/Mechanical). Chair, president, and CEO of Ault, Inc.
- Harry Heltzer (33/Metallurgical). Former president and CEO of 3M Company.
- H. Anthony Hennen (66/Electrical, 1968 M.S., 1971 Ph.D.). Corporate vice president and general manager with Motorola.
- Don O'Hare (43/Civil and Mineral). Former president and chair of Sunstrand Corp.
- Owen Schott (65/Electrical). CEO of Schott Corporation.
- Joseph M. Shuster (55/Chemical). Founder and CEO of Teltech.
- Tom Valenty (41/Chemical). Former president of Onan Corp.

And their insights are revealing.

The Power of Experience

Perhaps the most conspicuous common denominator among this group of leaders is their wide ranging, diverse life and work experiences. Valenty first started working for Onan Corp. in 1936 while he was still in high school doing odd jobs--painting, working in shipping, etc.--all of which paid his way through IT. Like many of the others, he served in the Armed Forces. He then worked for Boeing Aircraft in Seattle before returning to Onan.

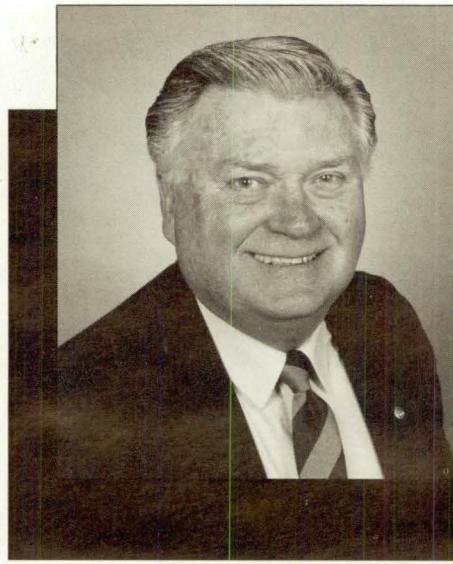
Green "ran the railroads," as he called it, spending his summers as a young man waiting tables and working as a porter on the Great Northern and the Northern Pacific. While in college, he worked for 3M and, after graduating, worked for Honeywell for several years.

Crosley, who grew up in a farm family that lost everything in the depression, worked in a drug store and ran a paper

route to pay tuition. He worked for other people until he was 46 and then founded his own company.

"The best way to become a CEO is to found your own company," Crosley says, only somewhat jokingly. Whether you hope to start your own company or make the climb to upper management, Crosley points out that it's a good idea to get a variety of work experience, perhaps with several companies. "When you come into a new company, you have to learn to live in their environment. You can get your on-the-job training and keep your eyes open for opportunity."

Sometimes that opportunity may only be found by changing jobs, however, says Crosley. "If you aren't happy with the



"In climbing the corporate ladder, lateral moves and other kinds of exposure are important in building a broad knowledge base that can launch you into many different directions," Schott adds.

Heltzer also worked his way up from the bottom, taking what he could to get his foot in the door.

"When I got out of school, I went to Minnesota Mining (3M) and knocked on the door," Heltzer says. "I convinced the fellow who was the superintendent of the Mineral Department that they just had to have someone like me who understood screening and mineral processing--so I got a job as a laborer for about three years. Every time I heaved that shovel, I would say, 'Hmph! Four years of college.'"

Others, like Hennen, experimented with different jobs to find their niche. "I tried a little farming, gas station work, the Army, and a number of part-time jobs,

"If you aren't happy with the industry that you start out in, look around for something else right away. Don't wait until it's too late."

William Crosley

industry that you start out in, look around for something else right away," he says. "Don't wait until it's too late." Spending too much time in a job that's not right for you leads to stagnation, he says.

"The worst thing in the world is to get into a position where you're paid so much you can't afford to leave and you can't stand your work," adds Heltzer.

Schott, who wound up leading the company his father, Oscar Schott (34/Electrical) founded, was asked to pay his dues elsewhere to gain experience.

"He encouraged me to go out and work for another company first, so I went to work for Westinghouse," Schott says. "When my father graduated from IT, he was lucky to get a job for 50 cents an hour running a punch press. A couple of years later, he went to work for Honeywell servicing furnaces and other industrial controls. Neither job had anything to do with his education, but the experience he gained proved invaluable."

including telephone linesman and construction worker," says Hennen. "I also worked at Honeywell for a while before I decided that I wanted to work in electronics for Motorola."

Experimenting with different kinds of work helps a person find an area of work they really enjoy and into which they can throw themselves, a key factor to success according to several of those interviewed for this article. "You can't be successful in any field unless you really want to be there," says O'Hare.

Diverse work experience also provides exposure to a variety of successful leaders and occasionally leads young managers to the doorstep of an invaluable component of career development--the mentor. By sharing their experiences, mentors provide young managers with a sort of short cut to leadership.

"My former immediate supervisor at Honeywell, Lloyd Hamilton, was a mentor to me," says Crosley. "Lloyd had been

working at Honeywell since he was 15. He didn't have a college education, but he had the ability to understand what made the world go around and to get on well with people in all areas of the company, from the president to the person at the bottom of the totem pole. Lloyd gave me a lot of good coaching."

It's important to be constantly alert to the opportunities to learn from those with whom you work, according to Crosley, which is an opinion Carlson shares wholeheartedly.

"None of the people I had the good fortune to work with sat me down and said, 'I am your mentor, now listen to me,'" says Carlson. "If you pay attention, you suddenly realize, 'This person is saying things I want to absorb. I want to observe what he does and how he does it.'" Carlson adds that, in every successful leader's life, there are three or four people who have influenced them tremendously.

Whether the experience comes from a varied and diverse life and job history or the shared wisdom of a mentor--or both--it is an essential component of successful leadership.

Character and Personal Values

"It's hard to say whether leadership is something you grow into or something you grow up with," says Valenty. "In my case, I think I learned a lot from watching my dad and my mother. Just basic values they teach you about relating to people and getting along in the world. I learned persistence--to stick it out through the hard times."

Whether they come from a person's home life or are developed through the early stages of a career, personal values not only promote success in the work place, but also serve as a refuge when the going gets tough.

"A leader has to have a good sense of values to sustain himself," adds O'Hare. "It's very important that senior people discipline themselves and not allow the peaks and valleys in, no matter how tough things get. Leaders are watched so very carefully by the rest of the office, it's imperative to keep the team together and create a feeling of confidence, even if you aren't sure where you're going at the time."

"I had the good fortune of having been taught a work ethic at home," O'Hare continues. "I see many younger people get too involved in a career path and, too often, start to worry about the next assignment before they complete the task at hand. As a result, they don't do an adequate job and become known as people who can't bring it to the bottom line."

"I try to give more than I get paid for," says Valenty. "It makes me feel good, and

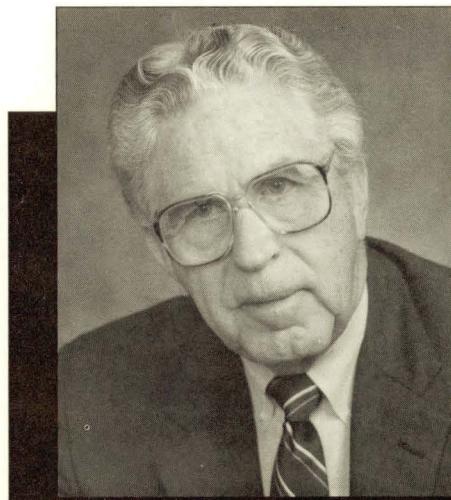
the rewards eventually come."

On the flip side, however, a strong character and sense of personal values can help the management-minded individual refrain from getting too caught up in matters of dollars and cents--which can quickly derail effective leadership.

"Too often, corporate values are all about the bottom line," says Schott.

"You have to be able to leave work at work so you don't sacrifice your family life," adds Crosley. "You should be able to balance the two."

That balance and sense of values rubs off on the people you lead and creates a work environment that allows them to thrive. For Green, the issue of personal values is simple and straightforward.



"I am honest and trustworthy," says Green. "I do what I say I am going to do. I try to understand people and what they are about and what they are trying to do."

"Predictability and consistency are important," adds O'Hare. "That's a leader: someone who has his values and portrays them consistently."

There are no guarantees, of course, but for the most part, in the business world, hard work and strong values do pay off. Especially when combined with the right education.

The IT Edge

"I don't think a lot of people in this state and in the legislature realize what IT represents to this state," says Green. "Technology is the chief employer in Minnesota. When you look at the areas of high-technological growth in this country, you see that they are rooted around the university systems."

IT also has proven itself to be a valuable training ground for future leaders. "My education helped me develop a very logical approach to working through whatever situations I encounter," says Carlson. "That doesn't just apply to technical problems. It tends to reduce emotional decision-making and make it more fact-oriented. That's really important."

According to Valenty, his education armed him with those same skills, and more. "They taught me to use my head. I learned how to reason," he says. "But perhaps more importantly, they taught me there are many resources you can use to find what you need."

"The University has been a great factor in my life," adds Shuster. "I wasn't an outstanding student, but I've always felt comfortable to go back there and get help. Much of what the University does is very subtle. I don't think there is any

"You need a proven track record of accomplishment in some discipline to be an effective leader. An M.B.A. or business school won't make you a leader by itself."

Don O'Hare

better foundation than a technical background if you plan on starting a company or getting into a management or leadership role."

A Leader's Tools

Despite the importance of experience, character, virtue, and education, they do not of themselves make a good leader. The complex and challenging world of the corporate leader requires a number of skills not taught in an engineering school, or, in some instances, a business school either.

"Management to me is just as much a profession as being an engineer," says Green. "If you want to be in management, you have to study and learn all the time."

For Green, that meant earning an M.B.A., but that is neither a total solution nor the only way to acquire the necessary skills, he says. Each of the leaders inter-

viewed listed several basic skills needed to succeed as a leader, including:

- Communication and the good analytical problem-solving skills that come with a technical education --Schott
- A strong understanding of the financial side of business --O'Hare
- The ability to quickly adapt to change --Valenty
- The ability to interact well with others, including being able to sidestep those who might keep you from optimizing your performance --Shuster
- A strong drive to succeed and to achieve breakthroughs --Berlin.

These and other leadership skills can often be learned through an organized course of study, such as an M.B.A. program or other business courses, but a

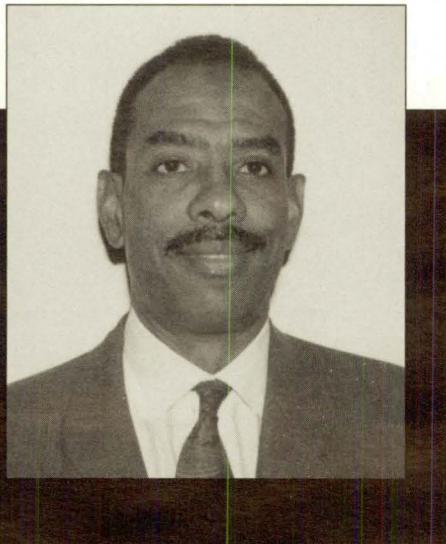
"For me, management is just as much a profession as being an engineer. If you want to be in management, you have to study and learn all the time."

Fred Green

no magical, calculable way to achieve a result," says Schott. "Listening is very important. You have to be able to ask questions, really listen, and then realize there is more than one way to achieve a desired result. A successful leader has the ability to let go and give people the opportunity to do things on their own, even if they fail sometimes. No leader has all the answers. You have to be able to draw on other people."

Along with the intangibles, effective leaders must incorporate skills and practices that may seem obvious, but, according to our experts, must not be overlooked.

"You have to lead by example," says Berlin. "If you want creativity, you have to be creative yourself. There's no magi-



leader often must bring to bear less tangible skills in order to succeed.

"In a corporation, you need to have a power base--a proven track record of accomplishment in some discipline--in order to be an effective leader," says O'Hare. "An M.B.A. or business school training won't make you a leader by itself. You have to start at a lower level and earn that power base. You should look at your education as something that will help you attain a higher level, rather than expect to be granted the higher level because of your education."

"You have to be able to focus your energies when and where they are needed most," says Carlson. "A CEO is pulled in a lot of directions, and if you ignore any one of them, you will have real problems. You have to be tuned in to the customers, the employees, and the owners or shareholders."

"If you are going to be an effective leader, you must understand that people do not perform like formulas and there is

cal way to get people to do things you wouldn't or couldn't do yourself."

Which brings us to the single most important need of every good leader--good followers.

Motivating the Troops

"Surround yourself with the right people," says Heltzer. "As you move up the line, things can get a bit hazy, and it takes longer to see the results you want. You can't always win."

Getting the right people on board, however, does not necessarily mean hiring people who see things your way. "I never wanted to be surrounded by 'yes-people,'" Heltzer says. "It's better to have people who will give me an argument about why I shouldn't do something."

Obviously, those people have to possess the basic technical or business skills and experience required of their positions, but the leaders we interviewed have established other criteria by which

they measure the people they want on their teams.

"We look for the basics--interest, enthusiasm, knowledge," says Hennen. "But, we also look for people who are willing to grow up within the company; to learn all the ins and outs of our particular industry."

"We want people who can make things work," says Schott. "A lot of people are good in class or have wonderful theoretical talents but are disasters in the real world. We need people who can troubleshoot when things don't go according to plan. In the business world, that can mean the difference between success and failure."

Success or failure for a company can also hinge on its ability to retain good people and keep them motivated, which often proves to be one of the greatest challenges a leader faces. One of the best ways to meet that challenge, according to our group of experts, is to make sure employees toil in a sea of opportunity.

"When I was at 3M, we almost never went outside to hire anyone for management positions," says Heltzer. "We promoted primarily from within. Each time someone gets promoted to a higher level, it opens another opportunity for someone else, which is tremendous for morale."

In addition to ensuring employees an opportunity to advance in their careers, many of our experts said they help employees continue their educations through tuition reimbursement, on-the-job training programs, and in-house seminars.

"You have to create the right environment for your employees and give them an opportunity to learn and grow," says

Advice to Students

Through the course of their interviews, the leaders with whom we spoke reflected on what they would tell IT students today to help them achieve positions of leadership. Here's a sampling of their insights.

Schott. "We also encourage them to create personal development plans."

Along with opportunity, several leaders felt it was important to get employees personally involved with the company's mission. "You have to clearly state what your company is trying to do," says Berlin. "Our mission statement is written out for every employee. It helps us get a clear focus on what we are doing, and why."

Schott goes a step further, holding regular half-day or day-long sessions in which employees are asked to help re-examine the company's mission statement and help determine what the company can do to reach its goals.

By creating opportunities for the supporting cast and involving them directly in the corporate mission, an astute leader can link employees' personal growth and success to that of the company's—a situation that keeps employees motivated and is likely to keep the right people in the right place at the right time.

But, the time will come when, no matter how well a leader has chosen his or her supporting cast, the chips start to fall, and the person at the top has to answer the call.

Meeting the Challenge

"If there ever comes a time when you think you have it made, then you are in deep trouble," says Schott. "If you stop growing, other people are going to pass you by. To survive in this atmosphere of change, you always have to grow and stretch."

One fact that seems to remain constant in the corporate world is that the playing

field is always changing according to those interviewed. Many times the opportunity to step to the next level comes when a company is in a state of upheaval. The new leader has to meet the challenge.

"My biggest challenge came when I first stepped in at Ault," says Green. "After five years of continued growth and good profits, the company had lost some major customers, and sales had dropped from \$18 million to \$10 million in a short period of time."

Carlson stepped into a similar situation when he joined Picker in 1968. The company had grown rapidly and had plants at diverse locations, some of which had actually evolved to a position where they were competing with each other for market share and duplicating efforts, with no central control. "We had to move contrary to the initial efforts that got the company going," says Carlson. "We had to convert

some systems, shut others down, and introduce new ones. I was viewed as the agent of change."

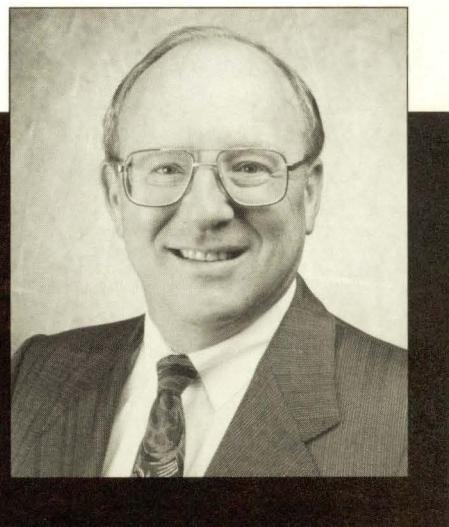
When the pressure is on, the effective leader must bring all of his or her skills to bear. Sometimes, resolution comes from getting back to basics. "We came out of our slump by developing a good sales and marketing program, drumming up new business, and developing some new products," says Green. "But sometimes, the only way out is to reinvent the wheel."

"You have to adapt to change and pay attention so you don't get hung up on the way you used to do things," says Schott. "What worked before will not necessarily

continued on p. 38

"I don't think there's any better foundation than a technical background if you plan on starting a company or getting into a management or leadership role."

Joseph Shuster



"If I had it to do all over again, to better prepare myself for a leadership role, I'd try to get a broader undergraduate education. I regret not devoting more time to the liberal arts. I think it would have helped me understand people better and be a more effective communicator."

-Don O'Hare

"Get involved with internships. The skills you pick up will be invaluable. It will give you an idea of what the real working world is like, and it gives the company a much better idea of what you are made of than any interview."

-Owen Schott

"Whatever field you get into, make sure you truly like what you're doing."

-Harry Heltzer

"Develop your interpersonal skills along with your technical knowledge. This is critical if you aspire to be the top executive in a company. I have seen brilliant engineers who, ultimately, became their own worst enemies by not developing their interpersonal skills. At some point, they find themselves out on an island where people can't reach them, and they can't reach back."

-Ken Carlson

"When you decide to do something, do it with persistence. Don't do it for a week or a month and then, when the going gets tough, quit."

-Tom Valenty

"You have to go through life with good antennae. If you want to be a leader, you must always be receiving, looking for opportunities. There will be negatives all around you, but there are opportunities in those negatives."

-Joseph Shuster

"Don't become an expert in just one area, particularly if you're an engineer. If you get a reputation of being an expert in one area, people will only look to you for that one area of expertise. That will cut you off quicker than quick."

-Fred Green

Adventures in Business

Skyline Display's founder and CEO carries a "Can-do!" attitude in his pocket--no matter what the challenge.

Bryan Beaulieu's hero used to be Tom Swift. Yes, that character in adventure books, that forerunner of Indiana Jones. Tom Swift could extract himself from any jam--a crushing avalanche, the tentacles of a killer octopus--with sheer intellect. ". . . and a few quick calculations on his pocket slide rule," laughs Beaulieu.

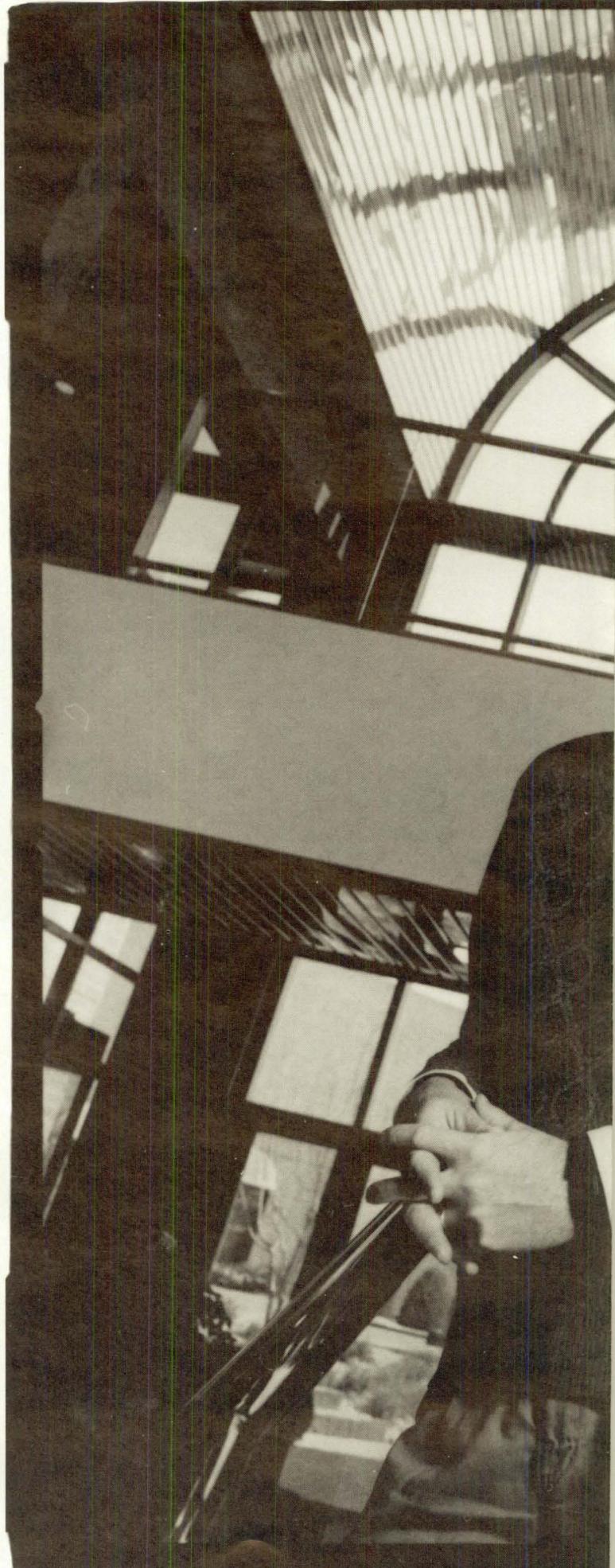
Beaulieu's literary tastes have matured a bit, yet for the 1972 IT grad and CEO of Skyline Displays, that Tom Swift attitude remains. Beaulieu's success stems from a willingness to take risks, grasp change, and embrace creative (some would say "gonzo") solutions to the challenges he encounters as an entrepreneur, a manager and a citizen.

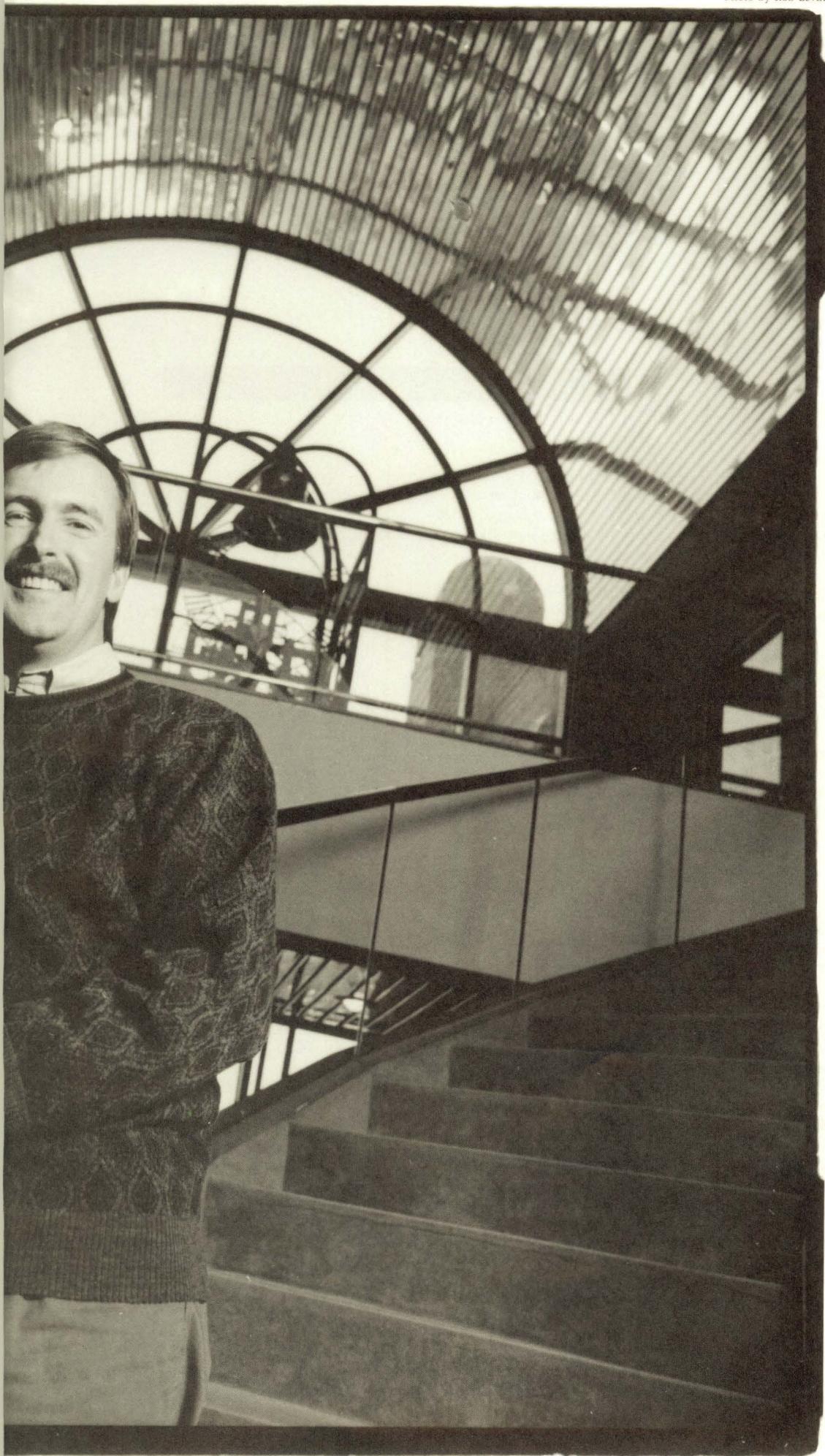
A Cliffhanger

In the late 1970s, Beaulieu, like Tom Swift, found himself in a bit of a cliff-hanger. He had designed what he thought were terrific portable shelters for construction sites, but no one wanted to buy them. One day at a trade show, he turned a shelter on its side to separate his space from another exhibitor's and, in so doing, inadvertently created something the public did want--a lightweight portable trade show display that offered an alternative to the costly and unwieldy custom displays that were then the norm.

That was the beginning of Skyline Displays, a Burnsville, Minnesota company that now boasts more than 250 employees and a worldwide distribution network. In 1990, *Inc. Magazine* rated Skyline as one of the nation's fastest growing companies and, this

By Terri Peterson Smith





Bryan Beaulieu (72/ME)
Founder of Skyline Displays

year, Beaulieu predicts sales of \$60 million.

Founding a \$60-million company required more than a few calculations on a pocket slide rule, however. Before starting Skyline Displays with his partner Gordon Savoie, Beaulieu gleaned important entrepreneurial and leadership skills through voracious reading and experience in a number of jobs.

Beaulieu began his career at Cherne Industrial after receiving his B.S. in mechanical engineering from the University of Minnesota. Lloyd Cherne, another IT grad, became his mentor and offered the young engineer abundant hands-on learning opportunities.

Beaulieu later worked for Rupp Industries (where he came up with his portable shelter idea) and then moved to the Research Department at the Tennant Company while Savoie raised capital for their prospective business.

Now, as in the beginning, that business is based on embracing change and taking advantage of every opportunity that arises--whether foreseen or, like the shelters-turned-displays, unforeseen.

Take one of Skyline's products called Mirage, for example. Developed in 1984, Mirage is considered something of an engineering marvel because its expandable web-like frame supports a 10-foot seamless mural. But, that's not what makes it so unique to Skyline. Mirage, which projects a computer-generated, color display, supports such dramatic graphics that those graphics have become an even larger part of the business than the display itself.

"We will make our entire product line obsolete in ten years," Beaulieu predicts. "Instead of displays, 'information' will be Skyline's business." The company is beginning to put graphic trade show presentations on database, for example, resulting in a computerized "virtual" trade show experience.

"We're always becoming something else," says Beaulieu, who points out that, as a result, many members of his staff have changed jobs several times since the company's inception. "These people used to be silk-screener," he says, pointing to a group of people huddled together in the glow of a large color computer monitor. "Now, they're learning the high-tech art of computerized graphic design using state-of-the-art equipment."

Rallying the Troops

Success and its resulting rapid growth can sometimes create difficulties, however, even when business is moving along just fine. Such was the case for Skyline Displays when, in 1990, it had hundreds

of people all going in different directions, drifting apart, and losing that small company *esprit de corps*, according to Beaulieu. It was a much bigger problem than the traditional sales meeting or golf outing could address.

Beaulieu addressed the matter at hand through a little creative problem solving, \$70,000 worth of lumber, and four days' work. In that time, Skyline employees united to build "Skyland," an acre's worth of slides and playground equipment for Burnsville's Cliff Fen Park. At the same time, they also built teams and cemented relationships that, according to Beaulieu, are still firmly intact today. The project lifted company morale like an old-fashioned barn raising.

Through such examples of proactive and personal leadership, Beaulieu encourages Skyline employees to emulate his energetic, creative attitude whether they're developing new products or new personnel policies. "We're always telling people, 'Find a better way to do it.' Everyone has to be an inventor."

In fact, when hiring, Beaulieu says he never looks at a transcript and doesn't pay much attention to resumes. Instead, he looks for evidence of creativity, the ability to learn and, above all, passion. He even plans to institute a new criterion for salary increases in the near future: "How much did you learn this year?"

Under Beaulieu's direction, employees are breaking into small self-managed work groups of 50 people each. "In business the recipe for success changes daily, and you can react more quickly in small groups," he explains.

Beaulieu advocates employee self-management to create a sense of empowerment and ownership in the company. He wants everyone to feel they have as much control over their lives at work as they do at home.

"This is as close to being in one's own business as possible without actually owning the business," says Paul Pirkl (70/ME) Skyline Display's vice president of manufacturing. "The entrepreneurial atmosphere prevails."

Escape From "Sesame Street"

Beaulieu reports a decline in the quality of job candidates he interviews and laments the shabby state of American science education.

"We now have a Sesame Street generation," he says of our video-saturated youth. "They've been raised in a virtual environment with less awareness of the physical world. How heavy is ten pounds? How long is ten inches? They don't know what that really means."

As the father of a ten-year-old girl and a 13-year-old boy, Beaulieu feels he has a personal stake in solving the problem and, once again, is taking action.

Beaulieu has organized a project called "Building a New World" as part of IT Week in which 10,000 students from Minnesota, along with 200 alumni, will construct a highly detailed replica of the Earth. At 41.8 feet in diameter, it's believed to be the largest globe ever built (see "Building a New World," p. 8).

Beaulieu hopes the project creates a tangible image of what engineers do and sends the message that the University is more than just "bricks and a few teachers." He also hopes it illustrates the importance of mentoring to demonstrate leadership.

Does the CEO of his own company still have heroes? You bet your pocket slide rule he does. Instead of Tom Swift, Beaulieu now looks to Tom Peters for inspiration, the author of *In Search of Excellence* and *Liberation Management*.

"I want to be in his next book," he confides.



CDTL master's students, like Sheryl Hohle, attend class on weekends and usually continue to work full time.

Making Corporate Leaders Out of Engineers

The M.B.A. is old hat.

The M.O.T. is where it's at.

*Unique IT program turns
technologists into managers.*

By Terri Peterson Smith



A

nswer this. Is it easier for an engineer to get a business education or for a business person to get an engineering education?

If you chose the former of those two answers, you're in agreement with industry and University leaders, who together in 1987, created the Center for the Development of Technological Leadership (CDTL) at the University of Minnesota for that purpose.

Whichever way you look at it, there's a crying need for a greater union between technologists and corporate management, a problem that has plagued the corporate world for some time and one that the academic community has only recently sought to address.

"Providing more management competence for engineers and scientists is critical to ensuring our next generation of industry leaders and is essential to U.S. industries' competitiveness in the global market," says Clinton O. Larson, vice president of Operations for Honeywell.

To back up that belief, Honeywell put up \$2.7 million, which the university met with an additional \$2.3 million, to endow CDTL. Participating in this interdisciplinary center are eminent faculty members from IT, the Carlson School of Management, the College of Liberal Arts, the Humphrey Institute of Public Affairs and the College of Agriculture.

CDTL programs include:

- Integrated Degrees in Engineering, Arts and Science (IDEAS), a dual-degree program for students in IT and the College of Liberal Arts
- Management minor for undergraduate students in IT
- The Honeywell W. R. Sweatt Lectures in Technology Leadership (see 1993 schedule for upcoming lectures, p. 23)
- The Master of Science in the Management of Technology (MOT)

The latter of these programs--the Center's crown jewel--represents the equivalent of an M.B.A. for engineers and scientists. Modeled after a program at M.I.T., it's the first of its kind at a public university in this country.

MOT vs. MBA

"In the U.S. we have good ideas, but do a lousy job of commercializing them," says Gregg Widin, who works for 3M as a liaison between the Hard Goods Electronics Support Division and the Life Sciences Division. Widin is a product of the first MOT class of 1992, along with 35 other practicing scientists and engineers.

One of his classmates, Sheryl Hohle, a scientist at Bio-Metric Systems, concurs. "Technology is tough to sell," she explains. "You can't hold it in your hand. I also became frustrated with the fact that marketing people sometimes have a tough time differentiating between science and science fiction. It's clear that it takes a strong scientific background to market technology without being misleading."

Conversely, both Widin and Hohle recognize that scientists often lack critical expertise in business areas, such as economic forecasting, budgetary decision making, and teamwork. Although both thought first about pursuing an M.B.A. program to bridge that gap, they believed that, with the plethora of M.B.A.s in the business world today, that darling degree

of the 80's would no longer distinguish them from the rest of the pack.

"The subject matter of an M.B.A. program wasn't relevant to this industry," says Hohle. "Whereas, the MOT program presented a more practical solution."

Weekend Warriors

"MOT has an 'executive masters' format," says Widin. "That sounds pretentious, but it does have meaning. It's offered for people who work full time, but it's not one of those two-week wonders or instant 'know-it-all' kinds of things that are becoming increasingly prevalent even at prestigious schools."

Instead, MOT students make a two-year commitment as weekend warriors, attending classes all day Friday one week and on Saturday the next. They also participate in study groups in between time for an added 15-20 hours a week outside of class. That's quite a load for someone with a full-time job and often a family, too, according to Widin. "Literally, all you do is work, eat, sleep, and study," he says.

To ease the burden, MOT staffers buy books and arrange parking, lunches, and registration for students. "They get the superfluous things out of the way," says Widin, "even though it's almost impossible to minimize the difficulty of registration at the University of Minnesota."

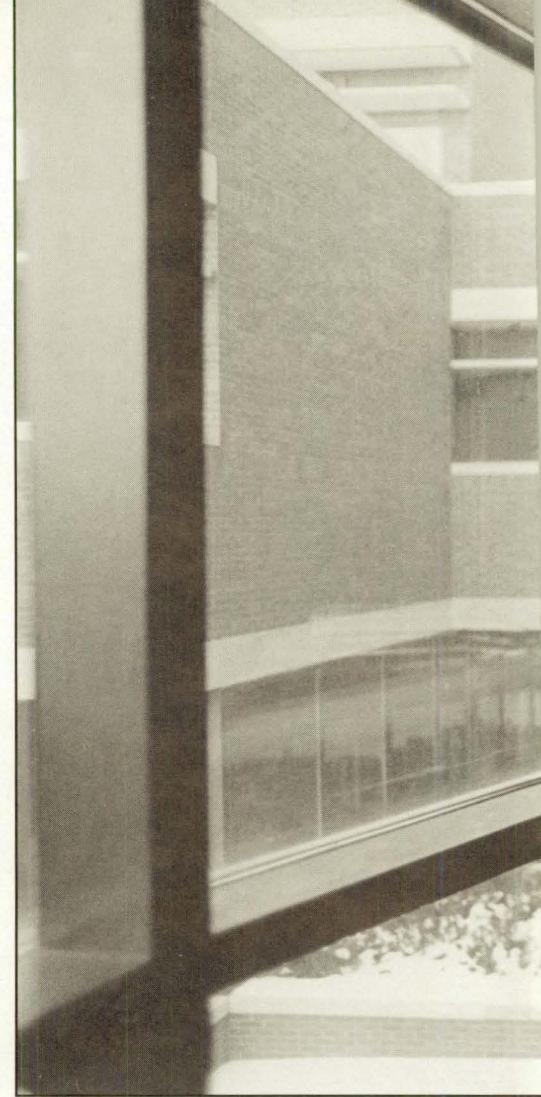
Another time-saving factor is that students do their "homework" on-the-job and incorporate classroom strategies into their businesses. The program culminates with a "capstone project" that must be useful to the student's employer.

"It's all real-life, applied learning," says Hohle, whose capstone project was a market research study to determine the investment potential for a product her company is developing. "It's not just sitting in a classroom and reading."

The curriculum focuses on objective risk management, teamwork and integration, management of professionals, presentation skills, and quality control. And, although MOT brings its students together with top professors (half from IT, half from the Carlson School of Management) as well as guest speakers from industry, much of the program's success lies with the students and the knowledge they bring to the classroom.

To enter the program, students must be working professionals with at least five years' experience. Such seasoned veterans of the work force demand a lot from a graduate program, according to Hohle.

"We had a very independent, feisty, and diverse group," she says. "The average age was probably 32. With that kind of group, a professor can't just say, 'That's



how it is,' because we'd know it isn't true. You learn as much from each other as you do from the professors."

Students go through the program as cohorts, taking all of their classes together and participating in the same study groups for the entire two years. Such an intense environment makes for lively discussions and forges close bonds among them.

The Payoff

As a result of the program, MOT grads thus far report changes not only in their jobs and their outlooks, but also in their approach to business.

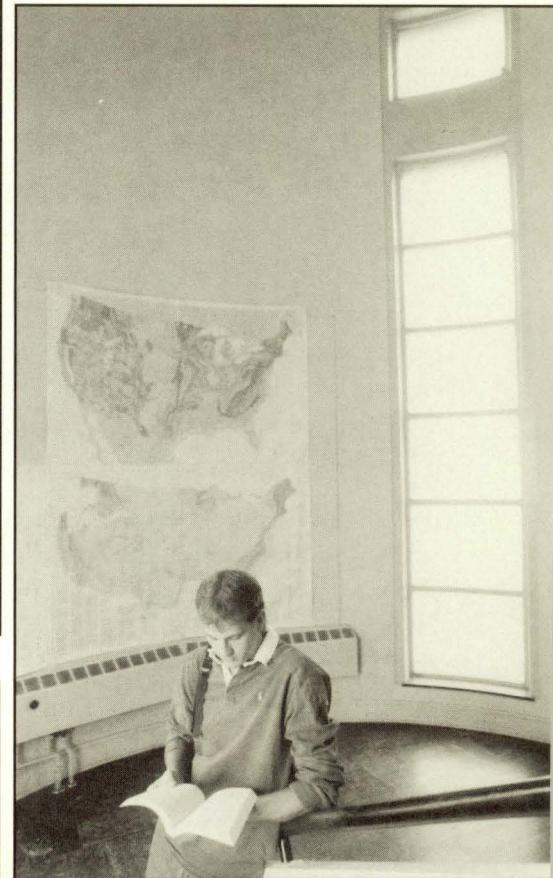
Widin, for example, made a lateral move at 3M into a more "mainstream" area. Another '92 grad, Barbara Timm-Brock, recently became a vice president at Pizza Hut. "I can already see the value of the program in my job," she says. "I approach problems, especially interdisciplinary problems, much more broadly."

Sheryl Hohle, who paid her own way through the program, says it was well worth the time and expense, particularly given the program's focus on ethics and leadership.

"Leaders are proactive rather than



Gregg Widin, 3M Company, was a member of CDTL's class of '92, the first group to earn master's degrees in the MOT program.



Sweatt Lectures In Technology Leadership Series 1993

April 29

James C. McGroddy,
IBM vice president and
director of research

**"Industry, Government,
Universities, and Technological
Leadership--an Industry
Perspective"**

May 20

H. Guyford Stever,
Carnegie Commission on
Science, Technology,
and Government

**"Enabling the Future--
Linking Technology to Long-
Term Societal Goals"**

All lectures are scheduled at 4:00 p.m. on Thursdays in room 3-210 in the Electrical Engineering and Computer Sciences Building at 200 Union St. S.E. Lectures are recorded for broadcast on KUOM Radio, 770 AM, on the Saturday following the lecture. For more information, call 612/624-5747.

reactive," she says. They're passionate about what they're doing and continually looking for new approaches." Many MOT grads possess those leadership characteristics according to Hohle, who predicts that many will eventually serve in government.

"In the post World War II years, the U.S. could afford to develop technical competency in the school of hard knocks," adds Widin. "There was none of the deadly competition that's present today, and you could experiment on real, live businesses without killing them. That can't be done anymore. U.S. industry needs to take advantage of all possibilities and all available tools to create a competitive edge. MOT is one way to do that." **I**

Management of Technology

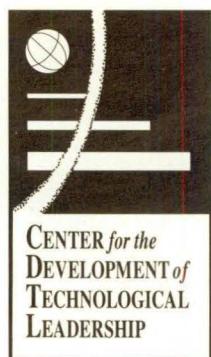
—A Bridge to Technological Leadership in the 21st Century

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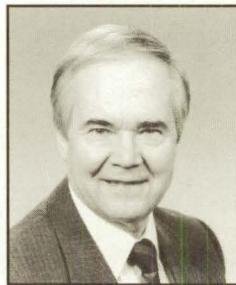
Discover how the Management of Technology Program can help your organization thrive in today's changing and competitive global market. An informative video and publications about this unique graduate program are available. Corporate visits and University sessions are also offered.

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Yechiel Shulman, Sc.D.
Director
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CRITICAL KNOWLEDGE

"This program provides engineers and scientists with the critical knowledge needed to help them bridge the difficult step from performing technology to managing technology."

UNIQUE DELIVERY

"The Management of Technology Program provided the tools I need to manage technological options and implementation plans. It also enabled me to continue working—classes are held on alternating Fridays and Saturdays."

NEW PERSPECTIVES

"Jointly developed by industry professionals and University faculty, this interdisciplinary program challenges participants to develop a sense of the strategic technologies changing research, design, and manufacturing environments."

Supporting a New Generation of Leaders

Like students everywhere, IT students typically discover that one of the biggest challenges they face is finding a way to pay for their education. IT students have long been offered a variety of scholarships, the majority of which can be applied only toward undergraduate education. Now, a unique new scholarship program is being established at IT to not only attract the best and brightest students, but to support them through the completion of their masters' degrees.

The Technical Leadership Challenge Fund (TLC) will provide scholars tuition, fees, and a grant for books and supplies for six years. The TLC Fund is designed to encourage high school students who have demonstrated leadership talents and an interest in organizational leadership to obtain a science or engineering master's degree at the Institute of Technology.

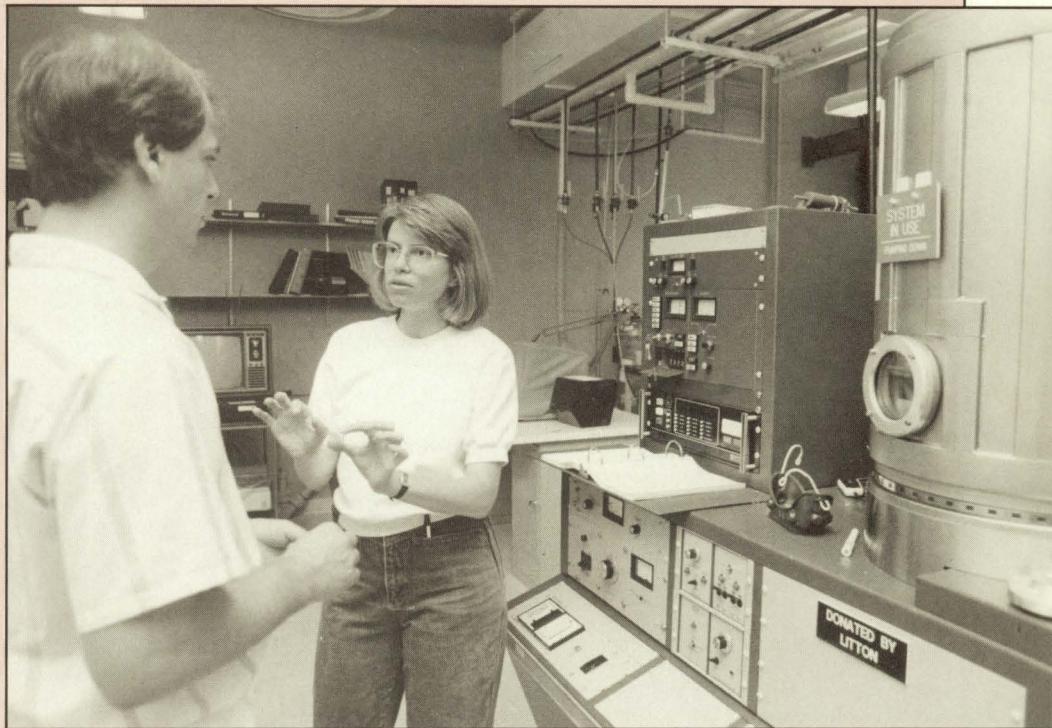
The fund, which is still in the start-up phase, will be established through the donations of private individuals and matching contributions from participating communities. The goal is to develop a \$10 million fund that can support 75 student scholars at a time, or about 12 to 13 students annually.

The TLC Fund is modeled on The Cyrus Scholarship, a program established in 1987 through an endowment by Richard Hanschen (43/EE) to support IT students from the Cyrus, Minn., area. Like the TLC Fund, the Cyrus Scholarship was designed to support IT students from their freshmen year through the completion of their masters' degrees.

Minnesota communities will be invited to participate in the TLC Fund by making a financial commitment in an amount that, when combined with a matching amount from the TLC Fund seed money, will support a given number of scholars from that community in perpetuity.

In the years to come, the accomplishments of past scholarship winners will be publicized within their communities with the hope that these scholars will become role models for future generations of high school students in much the same way that professional athletes and other popular personalities now serve as significant role models in their lives.

In order to retain their awarded scholarships, students will be required to maintain a minimum G.P.A. of 3.2 or the minimum G.P.A. required to gain entrance into their department's graduate program. They will also be required to carry an average of not less than 15 credits per quarter. The level of support was set at roughly \$4,500 (at current tuition rates), or about one-half of the student's annual cost of attending IT.



This level of support was chosen to allow students to concentrate on their studies during the school year without having to take part-time jobs, yet still encourage summer employment and the experience it offers.

Upon completion of their undergraduate work, TLC scholars will be encouraged to apply to the Center for Development of Technological Leadership programs and other related programs to continue their development as leaders.

IT is currently seeking donors interested in supporting the TLC fund through contributions. Donations of any amount are welcome. Donors of \$10,000 or more will receive a President's Club Plaque, lifetime membership in the President's Club, and an annual report on the scholarship recipients. Donors of \$100,000 or more will receive a Trustee's Society Plaque, mention in perpetuity on the TLC Fund's promotional materials, and an invitation to IT's annual banquet. Donors of \$1 million or more will be named "Builders for the Future," have their names engraved in Northrop Auditorium, and be invited to become a member of (or designate a member to) the TLC Fund's Executive Committee.

For more information on how to support the TLC Fund, contact the IT External Relations Office at 612/626-1807. ■

FACULTY

The Right Connections

Editor's Note: The following article is based on a recent interview with Professor Emeritus Otto H. Schmitt and an article by Jill S. Williams that appeared in Biomedical Instrumentation & Technology, Dec. 1992, p. 449.

Professor Emeritus Otto H. Schmitt never forgets a face. That's because, as all those who have met this distinguished faculty member know, a meeting with Schmitt always begins the same—with a ceremony that automatically results in the visitor's life-long membership in what Schmitt calls his "Rogues Gallery" or "Decadency Program." The ceremony starts by the visitor signing a guest book and then posing for a photograph, taken by Schmitt himself with a Polaroid camera.

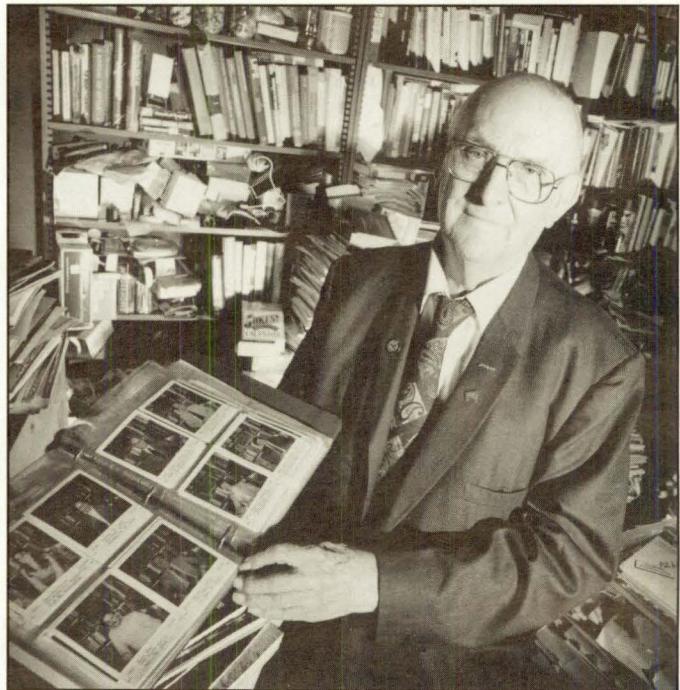
"It's truly a "Decadency Program," says Schmitt. "Once a decade, I get a new photograph of the person and have them sign in again. The worry is to see whether you've become more attractive and beautiful in the past 10 years or not."

Some visitors, such as Earl Baaken, founder and former CEO of Medtronic Inc., have been members of Schmitt's program for at least three decades and are easily identified among Schmitt's 13 photo albums that include more than 2,000 pictures and at least six Nobel Prize winners.

Why does he do it? "Because I like people," Schmitt says, which partially explains not only why he is considered to be such a good leader and mentor among his students, alumni, and people in the industry, but his approach to both learning and teaching.

A professor of biophysics, biomedical engineering, and electrical engineering at the Institute of Technology since 1939, Schmitt technically retired nine years ago. At 79 years of age, Schmitt holds a triple Ph.D. in physics, mathematics, and zoology; a resume so packed with accomplishments it takes one page, single-spaced, to list only the highlights; a list of more than 260 publications to his name that include only those through 1983; and a list of inventions—patented and unpatented—that include the Schmitt Trigger circuit, which is hysteretically bistable and so has become standard in digital computers and many biomedical applications where noise-free 0 or 1 signals are desired. The DC transformer, the differential amplifier, the cathode or emitter follower, the three quadrature compaction algorithm, the 3-D virtual reality displays, and the corrected differentiator and integrator are some of his much-used circuits in medical, military, and industrial devices.

If Schmitt's long list of accomplishments portray the man's genius and vigor for invention, the personal artifacts he carries about his person seem to somehow aptly depict his interesting character. He carries three watches, one on each wrist and a penwatch in his pocket ("You have to have a non-replicate redundancy tiebreaker"); several rulers, a flashlight ("to light up the page on conference programs when they have the lights out!"); a two-inch-high stack of membership cards for the various organizations throughout the world to which he belongs; a handful of multicolor pens; a surgical knife; a Navy electrician's knife; a lighted magnifying glass; and packaged snacks, all keeping company with the usual pocket paraphernalia. Last, but not least, is a stack of index cards filled with reminders and addresses of friends and former students he'd like to contact. Not surprisingly, Schmitt still regularly receives 10-20 pounds of



Electrical Engineering Professor Emeritus Otto Schmitt has an office full of memories.

mail each day, much of which is from former students and diverse colleagues, and numerous visitors worldwide.

Like his pockets, Schmitt's head is filled to overflowing with ideas and thoughts, constantly making connections among them where none seem to be apparent. For example, he frequently turns his mathematical abilities to questions that few would undertake. Take the topic of invention and innovation:

"Have you heard of the notion of the theory and technology of invention and innovation?" he asks. "People think that invention and innovation are something you do by sheer brilliance. I have a set of principles that show you can mathematically do this deliberately rather than having to think hard. It's very interesting. One after the other, things keep turning up, and there are marvelous connections."

Schmitt also developed an index designed to quantitatively measure an individual's perceived quality of life, call the Santosa Index. (The term "Santosa" is a Sanskrit word Schmitt first learned from his foreign students meaning "the best combination of all good things.") The index takes into account features such as fear of death, fulfillment, business plans, fame, wealth, research goals, ethics, and shared consciousness. Through this effort, Schmitt is attempting to bring attention to the role of health care as one that "enhances the quality of life beyond mere absence of manifest illness, extension of life, rehabilitation, and even total fitness."

Schmitt strongly feels that bridges must be built between traditional disciplines, such as physics, engineering, and biology—multidisciplinary rather than interdisciplinary. He also believes strongly in the importance of bringing together members of different disciplines "to talk to each other and think creatively with each other." Today, he sees himself as an emissary, moving among different groups, learning their special

jargons, spreading ideas, and making new connections.

"Let's get people to know each other well enough to realize that if you talk to them with the right figures of thought, that they have something to add to your repertoire. That's what I've been trying to do vigorously, but without getting excommunicated by any of these groups."

Schmitt had many good teachers throughout the years, all of whom helped him formulate such an approach. One of the first came about when Schmitt was just six years old by way of a man named Jacob Siler, a remarkable Civil War hero, a historical photographer, a photographic and microscopic technical expert, and a biomedical engineer as well as a patent medicine manufacturer, philosopher, and theologian who had befriended Schmitt's orphaned father.

One generation later, by special invitation, Siler invited "Master Otto Schmitt, Jr." to visit his "residence" (an old shack on 7th Street in a bad neighborhood of St. Louis) at 3 p.m. on Saturday afternoons for "scientific, philosophical, technical, and theosophical discussions."

Siler introduced Schmitt to physiologic, medical, and surgical techniques, microscopy, and comparative theology. "I'll never forget those meetings," recalls Schmitt. "Each time, they had some theme. He taught me the principles of microscopy, staining, sectioning, and what not. When he got done with the session, he told me, 'now take the microscope—take it home—and learn to use it.'"

With the help of three high-school buddies and one of Siler's book reports on Nikola Tesla, Schmitt built a large tesla coil system using a pole power transformer run backward, his mother's dishpan, and salt-water-filled Mason jars for a tuning condenser. The system yielded about 200,000 volts.

"I learned which currents your body could stand and that, at this frequency, they burn but don't shock you," says Schmitt. "I stood up on a platform, took hold of this thing, and fire started coming out of my nose and ears, and light bulbs lit up in my hands. My mother came in and fainted!"

Schmitt spent a good part of what would have been his high-school senior year in Germany at the Dahlemendorf branch of what is now the Max Planck Institute of Biologie where his brother, Francis, was doing postdoctoral studies.

"I was a rascal," he says. "I never graduated from high school. You see, my brother initially was doing post-doctoral work at the University of California in Berkeley on ultrasonics. My family drove out there, and I spent a month learning about this and electro-dissection, which is now becoming important. But that was at the tail end of the 1920s! It was much better than going to high school."

"Then, my brother got his second post-doctoral fellowship in Germany," Schmitt continues, "so our family went to Berlin. Imagine, there were four Nobel Prize winners in this one place, and here I was shaking the tails and asking about this and that! It was a wonderful educational experience. But, when I came back, there was this matter of getting into college."

When Schmitt returned to the United States and tried to enter Washington University in St. Louis, he learned that he would have to pass first-year college examinations in four subjects (including physics, mathematics, and chemistry) to replace the missed senior high school year. With the aid of Professor Lee DuBridge, who later developed the MIT Radlab and finally became the president of Cal Tech, Schmitt learned the whole first year of college physics in three days and thus entered college as a sophomore.

In many ways, Schmitt is still learning through the wisdom of all of his many acquaintances—even his students. "I let my students teach me," he says. "I raise questions, and then we explore them. It's surprising how different it is from simply preaching. Pretty soon a student will go off and research a topic further, and eventually somebody is doing a thesis on it."

Perhaps Schmitt's greatest success is that he has turned out roughly 30 Ph.D. students, most of whom have excelled in their fields. "It's remarkable how many of these students have become productive and famous in their own areas," he says. "And, they keep coming back—each time with new titles."

Sparking interest in new areas is still Schmitt's game plan with just about everyone he encounters. Schmitt, for example, no longer patents his inventions, but prefers to "give away" many of his ideas. He cleverly packages them as part of his "idea stealing program" letting ideas slip out at opportune moments when entrepreneurial students or colleagues are nearby. He found that when he tried to give valuable ideas away, no one took them seriously. He now proudly reports that he has about one idea successfully stolen per month. His goal, he once told an interviewer, is to "get the thing in service to benefit people without having to do all the financial and government mess" involved in getting patents and finding marketers.

That's because Schmitt believes much more than innovation is required to become a successful inventor. Ideas must be carefully marketed; otherwise, they will never do any good, he says. Toward that end, one must practice what he calls "the gradualness principle." "A really new idea takes 15 years to realize," he says, "30 more before it can honestly be reinvented, and a century before it has a secure spot in science."

If he's right, we will be well into the 21st century before Schmitt's legacy can be measured accurately. ■

Aerospace

Assistant Professor **Amy Alving** was named a University of Minnesota McKnight-Land Grant Professor in January 1993. The McKnight-Land Grant Professorship is a two-year award made possible by an endowment from the McKnight Foundation. Alving also received a 1992 Fellowship in Science and Engineering from the David and Lucille Packard Foundation in October 1992. The Fellowship is a five-year

grant to support the recipients' research. Only 20 fellowships were awarded nationwide from a pool of 101 nominations. Assistant Professor **Gary Balas** was named a University of Minnesota McKnight-Land Grant Professor in January 1993. Professor **William L. Garrard** was appointed head of the Department of Aerospace Engineering and Mechanics on September 16, 1992. **Daniel D. Joseph**, who is the Russell J. Penrose Professor of Aerospace Engi-

neering and Mechanics, was presented with the Chemical Research and Development Distinguished Service Award by the U.S. Army on October 29, 1992. The award was presented in recognition of his exceptional technical contributions in establishing a means for eliminating viscous liquid-filled projectile flight instabilities by means of an immiscible, low-viscosity liquid additive. Joseph's accomplishment represents a significant achievement in solving a serious flight-dy-

namics problem and provides a means to design improved projectile configurations for future chemical and conventional munitions. Professor **P. R. Sethna** resigned as head of the Department of Aerospace Engineering and Mechanics on September 15, 1992, after 26 years of service. Sethna will continue to work as a faculty member, teaching and conducting research. Assistant Professor **Thomas W. Shield** received the National Science Foundation's Young Investigator

Award on September 1, 1992. The prestigious award is granted to only 10 percent of the applicants. Shield's research will focus on establishing the micromechanical material behavior at crack tips in single metallic crystals and on developing an understanding of the role of microstructures in the overall behavior of shape-memory single crystals. Microscopic moire methods will be used to measure the surface strains for these studies.

Charles Babbage Institute

Arthur L. Norberg, associate professor and director of the Charles Babbage Institute for the History of Science and Technology, was elected a Fellow of the American Association for the Advancement of Science in February 1993.

Civil and Mineral

Emmanuel Detournay joined the department as an associate professor in January 1993. Detournay earned his degree "Ingénieur Civil des Mines" from the University of Liège, Belgium in 1976 and his master's and Ph.D. degrees in geo-engineering from IT in 1979 and 1983, respectively. Detournay's research interests are (1) the analysis of the geomechanical process to further the understanding of engineering problems through mathematical modeling and (2) research in linear and non-linear fluid/solid interaction, plasticity, fracture mechanics, and constitutive response. **Daryl F. Dwyer**

joined the department as an associate professor in December 1992. He earned his bachelor's degree in biology and psychology from Wilkes College in 1978, his master's degree from the State University of New York at Buffalo in 1981, and his Ph.D. degree from Michigan State University in 1986. Dwyer's research interests are in microbial physiology and ecology. Professor **Cesar**

Farell was chosen as a consultant to the United Nations Development Program for the design and construction of a new boundary-layer wind tunnel at the Council of Scientific and Industrial Research's Structural Engineering Research Center in Madras, India. Record Professor **Theodore V. Galambos** was named the recipient of the American Society of Civil Engineers' (ASCE) 1992 Ernest E.

Howard Award. The ASCE award is presented annually to a member who has made a significant contribution to the advancement of structural engineering. Galambos was cited for his lifetime of achievements in the field of structural engineering and his work on design methodology. **Jerome F. Hajjar** joined the department as an assistant professor in August 1992. Hajjar earned a bachelor's degree in engineering mechanics from Yale University in 1982, a master's and Ph.D. degrees in structural engineering from Cornell University in 1985 and 1988, respectively. His research interests include steel and composite structures, non-linear structural dynamics, parallel processing, and geometric modeling and scientific visualization.

Associate Professor **Roberto T. Leon** has been named the recipient of the 1993 R. R. Higgins Lectureship Award. The award, which is presented by the American Institute of Steel Construction, carries a \$5,000 stipend. Leon was selected on the basis of his reputation as a lecturer and a jury evaluation of the papers submitted along with his nomination. Professor **Michael J. Semmens**

has been selected as the University of Minnesota coordinator for a three-university consortium established by the Environmental Protection Agency (EPA). The consortium, which consists of Michigan Technical University as the lead institution, and the Universities of

Minnesota and Wisconsin as partners, will create a Center of Excellence focusing on Clean Industrial Technologies. **Mark B. Snyder** will join the department in June 1993 as an assistant professor. Snyder earned his bachelor's, master's, and Ph.D. degrees in civil engineering from the University of Illinois in 1979, 1980, and 1989, respectively. His research interests include pavement design, behavior, and performance; freeze/thaw resistance and durability of portland cement materials; pavement rehabilitation; and pavement management systems. Professor **Yorgos Stephanedes**

along with A. Chassiakos and D. Michalopoulos, received the 1993 D. Grant Mickle Award from the Transportation Research Board of the National Academy of Sciences for their paper titled "Comparative Performance Evaluation of Incident Detection Algorithms." Stephanedes also has been selected to serve on the editorial board of *The Transportation Research Journal—Section on Intelligent Vehicle and Highway Systems*. Finally, Stephanedes was named to the Council of Standards Organizations, a 12-member council founded by Intelligent Vehicle and Highway Systems America to coordinate standards setting.

Computer Science

Assistant Professor **Phillip Barry** received a \$38,000 grant from Rice University for a research project titled "Blossoming and Successive Linear Combination Algorithms: An Algorithmic Approach to Computer-Aided Geometric Designs." Assistant Professor **Anthony Chronopoulos**

received a \$35,000 grant from the Minnesota Department of Administration for a research project titled "Parallel Traffic Flow Simulation Computations of Freeway Networks." Profes-

sor **David Du** received a \$30,000 grant from Bellcore for a research project titled "Heterogeneous Computing Environment Based on High-Speed Optical Networks."

Assistant Professor **Ravi Janardan** received a \$112,000 grant from the National Science Foundation for a research project titled "Efficient Dynamic Data Structures for Geometric Problems." Assistant Professor **Vipin Kumar** received a \$48,000 grant from the National Science Foundation for a research project titled "SGER-Parallel Multi-Agent Planning." Assistant Professor **Zhiyuan Li** received a \$100,000 grant from the National Science Foundation for a research project titled "RIA-Hierarchical Program Analysis in High Performance Compilers for Parallel Computers." Assistant Professor **Nikolaos Papanikolopoulos**

received a \$45,000 grant from Carnegie Mellon University for a research project titled "Real-Time Servo Control Using Computer Vision." Assistant Professor **Haesun Park** received an \$104,000 grant from the National Science Foundation for a research project titled "Fast and Accurate Parallel Solutions for Recursive Least Square Problems." Professor **Linda Petzold**

was recently appointed to a two-year term as vice president for publications for the Society of Industrial and Applied Mathematics (SIAM). Petzold has served as editor-in-chief of the *SIAM Journal on Scientific Computing* since 1990. She recently received a \$75,000 grant from the Department of the Army for a research project titled "TACOM Real-Time Simulation of Large-Scale Multibody Systems Using Automated Equation Decoupling Techniques." Petzold is also working on two other research projects funded by the Army and the Department of Energy. Assistant Professor **John Riedl** received a \$49,000 grant from the Na-

tional Science Foundation for a research project titled "Flexible Collaborative Software Engineering." Professor **J. B. Rosen** has retired after 21 years of service with the Computer Science Department. Rosen has been a leader in research in large-scale optimization and continues to pursue his research interests during retirement. He is a fellow of the Minnesota Supercomputing Institute, a consultant to Argonne National Laboratory, and serves on the editorial boards of several professional journals. Professor **Youcef Saad** received a \$1.4 million grant from the Department of Commerce for a research project titled "Parallel Scalable Libraries for Large-Scale Applications." Professor **James Slagle** received a \$170,000 grant from the Minnesota Department of Transportation for a research project titled "Minnesota Road Information Processing System (IPS)-Phase II." Professor **Eugene Sbragowitz** received a \$46,000 grant from the National Science Foundation for a research project titled "Fuzzy Logic Approach to Physical Design of VLSI and PCB." Associate Professor **Wei-Tek Tsai** received a \$26,000 grant from Fujitsu Labs for a research project titled "Software Representation to Support Change."

Electrical

Professors **Mos Kaveh** and **Allen Tannenbaum** each presented two lectures as part of the Distinguished Lecture Series of the Engineering Mathematics Program of the University of Texas in Dallas. Assistant Professor **David J. Lilja** received the National Science Foundation Research Initiation Award in August 1992. **Lori Lucke** joined the department as an assistant professor in December 1992. Lucke earned her Ph.D. degree from the University of Minnesota with specialties in VLSI for signal

processing and computer engineering. Associate Professor **Keshab K. Parhi** received an award for his paper presented at the IEEE International Conference on Acoustics, Speech, and Signal Processing in San Francisco, Calif. Parhi, who is a 1992-94 McKnight Land-Grant Professor and the recipient of an NSF Young Investigator Award, recently took a one-quarter leave to conduct research at the NEC Computer and Communication Laboratory in Kawasaki, Japan. Parhi's research was on VLSI wavelet processor architectures. During his visit to Japan, Parhi also visited and gave lectures at NTT Laboratory, Toshiba Laboratory, Tokyo Institute of Technology, and Tohoku University. **Andrew Teel** joined the department as an assistant professor in December 1992. Teel earned his Ph.D. degree in nonlinear controls from the University of California-Berkeley. Prior to joining the faculty, Teel spent six months in France doing postdoctoral work.

Mechanical

Professor **Avram Bar-Cohen** was elected a fellow of the Institute of Electrical and Electronics Engineers. Bar-Cohen, who was promoted to full professor in September 1992, was cited for his "contributions to the understanding of thermal phenomena in electronic packaging." Lecturer **Edward L. Barnett** received certification in Systems Integration from the Institute of Industrial Engineers. **Saifallah Benjaafar** joined the department as an assistant professor in September 1992. Benjaafar earned his Ph.D. degree in industrial engineering from Purdue University. Professor **Perry L. Blackshear, Jr.**, retired from the department last year after serving on the faculty for 35 years. **Kevin J. Dooley** was promoted to associate professor with tenure in September 1992.

Dooley, who was voted Best Teacher by students in the Management of Technology Program, won the Process Knowledge Bases Award supported by 3M Company and Honeywell, Inc. He has begun teaching a course on the theory behind the Deming management method. Associate Professor **Steven L. Girsick** has been invited to give a lecture titled "Particle Nucleation and Growth in Plasma Reactors" at the International Seminar on Heat and Mass Transfer under Plasma Conditions to be held in Estoril, Portugal, on May 24-28, 1993. Regents' Professor and Department Head **Richard J. Goldstein** has been named an honorary member of the American Society of Mechanical Engineers. Goldstein was honored for his "outstanding contributions to his profession, the ASME, and the University of Minnesota through teaching, research, publishing, and consulting activities." Assistant Professor **Shabrukh A. Irani** was awarded a NeXT workstation under the auspices of the Project MinNeXT to develop instructional software. The topic of the software will be graph theory application in CAD/CAM. Distinguished Alumni Professor **Benjamin Y. H. Liu** recently presented lectures at the 182nd meeting of the Electromechanical Society in Toronto, Canada, and at the 4th Chinese Aerosol Conference in Heifei, Peoples Republic of China. Professor **Peter H. McMurry** recently received the George Taylor Distinguished Research Award from the Institute of Technology. McMurry was cited for his work on aerosol chemistry and physics, as well as the "analytical rigor and keen physical insight" that are the trademarks of his work. Distinguished Alumni Professor **Emil Pfender** recently presented three seminars in Germany on diamond synthesis. The seminars were held at the University of

Dortmund, the University of Ilmenau, and Siemens Research Center at Erlangen. **David Y. H. Pui** was promoted to full professor in September 1992. Pui was recently elected a board member of Gesellschaft fuer Aerosolforschung (GAeF). GAeF presented Pui with the Smoluchowski Award in recognition of his work in the field of electrical charging and behavior of aerosol particles. Pui also presented an invited seminar titled "Aerosols and Industry" to the Mechanical Engineering Department at Hong Kong University of Science and Technology. Professor and Associate Department Head **James W. Ramsey** received the Continuing Education and Extension (CEE) Distinguished Teaching Award from the University of Minnesota CEE. Ramsey was honored for "outstanding teaching and commitment to CEE student growth and sustained excellence in CEE instructional endeavors." Professor **Donald R. Riley** received the George Taylor Distinguished Service Award from the Institute of Technology. The citation accompanying the award said "Don Riley's efforts to improve the computational environment available for research and education extend beyond his department to the Institute of Technology and the University at large. He has enthusiastically promoted cooperative efforts between the university, industry, and government to improve technology in the State of Minnesota."

Associate Professor **Kim A. Stelson** is serving as a visiting faculty member at the Hong Kong University of Science and Technology during his 1992-93 sabbatical leave. Assistant Professor **Paul J. Strykowski** conducted a research project titled "Active Control of Supersonic Heated Jets Using Counterflow Feedback" while on leave winter quarter at Florida State University. **I**



IT DONOR PROFILE

Oscar Schott

Home:

Victoria, Minn.

Career:

Oscar Schott graduated from IT's Department of Electrical Engineering in 1934. The job market was tough, and Schott found himself rapidly moving through a variety of jobs, from punch press operator, to lathe operator, to furnace control installer. After 17 years working for other people, including Honeywell, Inc. and Telex Hearing Aids, Schott founded his own company in 1951, working at first out of his basement at home. Today, the Schott Corporation, which designs and builds custom transformers, employs more than 400 people. Although Schott still serves as chair of the board, he spends a good deal of his spare time traveling the U.S. in his motor home.

Family:

Oscar met and married his wife, Dagmar, shortly after graduating from IT. Dagmar died in 1991. Schott has two sons--Owen, who is CEO of Schott Corporation, and Dell, who is chief financial officer of Schott Corporation.

Recent Gifts:

Through endowments to IT, Schott has established the Oscar A. Schott Professorship in Power Electronics and Systems, as well as a scholarship for electrical engineering students which has been awarded to four students to date.

Quote:

"To compete in today's world, we must take advantage of all available resources. We must educate our youth in science and mathematics so they will better understand and appreciate technology."

Photo by Rob Levine

ALUMNI

1934

Jennings F. Johnson (*Electrical*) retired in 1978 and is living in Sequim, Wash. He had been a vice president of Minnesota Power & Light Co. in Duluth, Minn.

1936

Cyrus O. Guss (*Electrical, M.S.; 1940 Ph.D.*) is retired and lives in Golden, Colo. He had been a professor at the University of Nevada, Reno.

1938

Donald H. Erickson (*Electrical*) is retired from AT&T and lives in Glen Rock, N.J.

1940

Clarence J. Jackson (*Aeronautical*) is a retired colonel in the United States Air Force. Shortly before completing his senior year at the Institute of Technology, Jackson joined the Air Force, where he attended the USAF Institute of Technology. There, he completed two years of study and, shortly after graduation, received accreditation. Jackson performed a wide variety of duties for the Air Force during his career, including four and one-half years in the Training Command where he taught basic flying. During that time, he became director of training for a Basic School of 100 students and 350 instructors. He also spent more than four years in the Air Proving Ground Command, which included operational testing of nuclear weapons. Jackson spent three years in Europe with the Supreme Headquarters Allied Powers--Europe, where part of his duties included writing speeches and other materials for Field Marshall Montgomery. Prior to his retirement, Jackson was director of Safety for the 9th Air Force, Tactical Air Command.

1942

Russell E. Monson (*Aerospace*) is retired and lives in El Cerrito, Calif. He had been a project manager for Kaiser Engineers.

1943

Robert R. Kollitz (*Mechanical, 1947 M.S.*) is retired and lives in

St. Paul, Minn. He was a manager for 3M Co. **Thomas B. Ludlow** (*Chemical*) is retired and lives in St. Paul, Minn. Ludlow is the founder of Johanna Plastics, Inc.

1944

Bernard J. Shanks (*Aerospace, 1947 M.S.*) retired and is living in Santa Monica, Calif. Previously, he worked as an engineer for The Aerospace Corp.

1945

Herbert H. Schroeder (*Chemical; Business, 1950 M.B.A.*) retired in 1987 after 28 years of working for 3M. Schroeder's career focused on research and new business development. In his final position with 3M, he was an administrator of government research contracts. Prior to joining 3M, Schroeder served in the U.S. Navy Reserve and held positions with Hercules Chemical, Oscar Mayer, and Lithium Corporation.

1946

Philip E. Fuller (*Mechanical*) is retired and lives in Edina, Minn. Fuller was a vice president for HDR Engineering, Inc. **Gaius W. Thede** (*Electrical*) lives in Honolulu, Hawaii. Thede earned his Ph.D. degree from the Pacific School of Religion in Berkeley, Calif., and serves as a director of the Wesley Foundation.

1947

Ralph E. Miller, Jr., (*Civil*) is retired and lives in Seattle, Wash. Miller earned his Ph.D. degree from the University of Stuttgart, Germany. He served as a director for The Boeing Company.

1948

Lee C. Paulson (*Aerospace, 1949 M.S.*) is retired and lives in Columbia Heights, Minn. He was a director for Honeywell, Inc. **Daniel J. Taravella** is retired and lives in Mine Hill, N.J. Taravella earned his master's degree from Stevens Institute of Technology in Hoboken, N.J., and worked as a consultant for Ridam Engineering Company.

1949

John D. Buezis (*Mechanical*) retired and is living in Seal Beach, Calif. He was a manager for Honeywell, Inc. **Carl A. Evans, Jr.**, (*Electrical*) is retired and lives in St. Paul, Minn. He was an engineer for Whirlpool Corp. **Robert E. Hanisch** (*Electrical*) is retired and lives in Minneapolis, Minn. Hanisch was a staff engineer for Northern States Power Co. **Harvey A. Mahlman** (*Chemistry*) is retired and lives in Knoxville, Tenn. Mahlman, who earned his master's degree from the University of Tennessee, had been a manager with the Tennessee Valley Authority.

Paul E. Melancon (*Geology*) is retired and lives in Austin, Texas. He was a consultant for AMAX Oil & Gas Co. **Francis W. Stiever** (*Electrical*) is retired and lives in Huron, S.D. Stiever worked as an engineer for the U.S. Department of Energy.

John S. Sumner (*Physics*) is retired and lives in Tucson, Ariz. Sumner, who earned his Ph.D. degree from the University of Wisconsin, was a professor at the University of Arizona.

1950

James E. Erskine (*Electrical*) is president of Erskine Sales and Engineering Company, an engineering representatives' firm for utility and industrial sales in Glendora, Calif. **Palmer O. Hanson, Jr.**, (*Aeronautical*) retired from Honeywell, Inc. in 1988 after 31 years with that company. He was a senior engineering fellow at the time of his retirement. Hanson, who served five years in the U.S. Navy, received Honeywell's H. W. Sweatt Award for outstanding engineering and technical achievements in 1981. He is a member of the American Institute of Aeronautics and Astronautics and the Institute of Navigation. He has published five technical papers in the field of inertial navigation. **Halvor U. Johansen** (*Aerospace*) is retired and lives in Idaho Falls, Idaho. Johansen, who earned his master's degree from the University of Idaho, had been a manager for Westinghouse Idaho Nuclear Co. **Allan T. Kucera**

(*Chemical*) retired and is living in Allerton, Iowa. Kucera had been an engineer for Hercules, Inc. **Albert L. Lehman** (*Civil*) is retired and lives in Maplewood, Minn. He had been a manager for 3M Company.

1951

Gerald B. Herzog (*Electrical*) is retired and lives in San Jose, Calif. He was a vice president for Performance Semiconductor.

1953

Keith D. Graham (*Mathematics, M.S., 1973 Ph.D.*) is retired and lives in Champlin, Minn. Graham, who earned his bachelor's degree from the South Dakota School of Mines & Technology, still works part time as a scientist for Honeywell, Inc.

Raghunath G. Mokadam

(*Mechanical, Ph.D.*) is retired and lives in Rockford, Ill. Mokadam, who earned his master's degree from the University of Louisville, worked as an engineer for Sundstrand Corporation.

1954

Julian V. Bilski (*Industrial*) is a consultant for Apex Leasing, Inc. Bilski lives in Mendota Heights, Minn. **Milton E. Franke**

(*Mechanical, M.S.*) has been named a fellow of the American Society of Mechanical Engineers. Franke, who lives in Dayton, Ohio, is a professor at the Air Force Institute of Technology. He earned his undergraduate degree at the University of Florida and his Ph.D. degree from Ohio State University in 1967. He is a member of the American Institute of Aeronautics and Astronautics and the American Society for Engineering Education. **David Hann** (*Electrical*) is the mayor of Paradise Valley, Ariz. Hann, who previously worked as a product planning manager for General Electric Co., currently works as a management consultant. He and his wife, Leigh, have four sons and four granddaughters. He is currently restoring a 1931 Model A Ford in his spare time. **Harold Reinsma** (*Civil*) retired from Caterpillar Tractor Co. in Peoria, Ill., in 1991. Reinsma holds more than 40 patents.

The Long Road to Leadership

Though an IT education played an integral role in Fidelis Umeh's success in the business world, perhaps more important was the education he gained from a richly diverse life. That life has taken Umeh from a poor equatorial village located some 200 miles from Lagos, Nigeria (where almost no one completed elementary school), through the frigid climates of Minnesota where he earned a Ph.D. degree in electrical engineering, to Rosemont, Ill., where Umeh is now president of SEI Information Technology, an innovative company that specializes in computer systems and information technology. Along the way, Umeh acquired an understanding of and respect for cultural diversity, which he believes gives him a distinct advantage as a manager.

"I see problems from a slightly different angle," says Umeh. "My management style is very 'people sensitive.' We look beyond the eight or nine hours a day we want from our employees. When people who work very hard for us hit some problem in their personal lives, we want to be a part of the solution to those problems, too."

"The people who work here are the ones who make this company so successful," Umeh continues. "I work hard, but none of that would amount to much if the people here didn't go the extra mile. I want to go that extra mile for them, too."

Going the extra mile for what he believes in has been a lifelong affair for Umeh. Take education, for example. Although Umeh's family believed in its value, growing up, there was no money to pay for Umeh's high school studies. In fact, Umeh estimates that, in the 58 years his father was alive, the amount of money that passed through his hands was less than the equivalent of \$100.

Umeh worked hard, however, and managed to win a high school scholarship--one of ten awarded to 4,000 applicants. Upon graduation, he was again awarded a scholarship--one of 24 awarded to 8,000 applicants this time--that enabled him to

attend the Institute of Technology. The scholarship, however, didn't solve all of his problems.

"When I arrived in Minnesota in 1960, I was out of my element," Umeh says. "I had never selected my own classes; they were always chosen for me. What's more, the size of the place was overwhelming, not to mention my first winter in Minnesota. I didn't understand what cold was."

A fellow Nigerian helped Umeh with course selection for the first quarter, and a friendly foreign student advisor convinced him to stick out that first winter, even though Umeh wanted to quit and return home to warmer surroundings. By

The people who work for me are the ones who make me successful. I work hard, but none of that would amount to much if the people here did not go the extra mile.

1965, Umeh had earned his bachelor's degree in electrical engineering and received several job offers in the U.S. He chose, however, to return to Nigeria to help build his country.

His good intentions were met by a struggling Nigerian economy and no jobs for electrical engineers. As a result, he took a position with IBM, working for that company in England, Denmark, and France for two years. At that time, Umeh returned to IT to complete his master's and Ph.D. degrees in electrical engineering and then found work--this time in the U.S.--at SEI.

1955

Robert G. Knoll (*Geology*) is a manager for Texaco International Ltd. He lives in Bellaire, Texas.
Ross D. Schmidt (*Mechanical, M.S.*) is retired and lives in Chisago City, Minn. Schmidt, who earned his bachelor's degree from the University of New Mexico, was a supervisor for Honeywell, Inc.

1956

George A. Champine (*Physics, 1959 M.S.; Information Systems, 1975 Ph.D.*) is a director for Digital Equipment. He lives in Stow, Mass. **Stanley B. Nickells** (*Mechanical*) is retired and lives in Edina, Minn. He was a manager for Honeywell, Inc.

1958

Gerald S. Allen (*Civil*) owns Serco Laboratories. Allen lives in Columbia Heights, Minn.
Warren D. Arndt (*Mechanical*) is an engineer for Thermo King Corp. Arndt lives in Roseville,

Minn. **Dale F. Stein** (*Metallurgical*) is president emeritus of Michigan Technological University. Stein, who earned his Ph.D. degree from Rensselaer Polytechnic Institute, lives in Houghton, Mich.

1959

Arden E. Baldwin (*Mechanical*) is an engineer for Caterpillar, Inc. Baldwin, who earned his master's degree from Bradley University, lives in East Peoria, Ill.

1960

Arthur S. Braufman (*Chemical*) is a manager for Miles, Inc. Braufman lives in Berkeley, Calif. **Richard R. Smith** (*Aerospace*) is a manager for the U.S. Air Force. Smith, who earned his master's degree from Ohio State University, lives in Dayton, Ohio. **John W. Swanson** (*Mechanical*) is an engineer for Helmick & Lutz Co. He lives in Circle Pines, Minn. **Allan D. Taylor** (*Metallurgical*) is retired and lives in Walnut

Creek, Calif. He was an engineer for Bechtel Corp.

1961

Robin L. Berg (*Mechanical*) is a vice president for Xerxes Corp. Berg lives in Hudson, Wis. **Dennis J. Enright** (*Mechanical; 1969 M.B.A.*) is a vice president for 3M Company. He lives in Austin, Texas.

1962

Alden E. Hardwick (*Mechanical, 1966 M.S.*) is a manager for Rosemount, Inc. He lives in Belle Plaine, Minn. **Richard W. Johnson** (*Civil*) is president of Johnson Bros. Corp. He lives in Litchfield, Minn. **Mark A Nyberg** (*Electrical*) is a manager in the Missile Systems Division of Raytheon Company. Nyberg, who earned his master's degree from the University of California-Los Angeles, lives in Acton, Mass. **Edward W. Olson** (*Civil*) retired and lives in Minneapolis, Minn.

He was an engineer for Setter Leach & Lindstrom.

1963

Edward J. Haugland (*Physics*) is a scientist for NASA's Lewis Research Center. Haugland, who earned his Ph.D. degree from Case Western Reserve University, lives in Cleveland, Ohio.

Dennis L. Olander (*Chemical*) is a supervisor with 3M Company. Olander, who earned his master's degree from Washington University in St. Louis, Mo., lives in St. Paul, Minn.

1964

Rudolph L. Kramer (*Mechanical*) is an engineer for The Gillette Co. He lives in St. Paul, Minn. **Donald A. Wallgren** (*Civil*) was named vice president of environmental management for Waste Management, Inc. in August 1992. Wallgren joined the Oak Brook, Ill., firm in 1979. Prior to that time, he worked for the U.S. Environmental Protection

Although Umeh intended to simply write computer systems for the company, SEI Chair Russell Shields had other ideas. He urged Umeh to get into management. While Umeh insisted he didn't like management, Shields persisted, challenging him to make management his ambition.

Umeh accepted the challenge and began developing an innovative approach to management--an approach that eventually became the driving force behind SEI's success.

"All of our managers manage for one or two years and then go back to the field for awhile, working for a manager who they supervised the previous couple of years," says Umeh. "Those who are interested can return to management later. At SEI, employees become managers through assignment to a particular project for a given period of time rather than through promotion. It's an approach that helps keep them abreast of the ever-changing marketplace they serve."

Whether working in management or in the field, all SEI employees are expected to support SEI's mission statement--"To provide total solutions to complex business issues with our clients through strategic partnering and apt application of technology."

"It's more than just a string of nice sounding words," says Umeh. "Our service covers more than just building computer systems. We build relationships between SEI and our clients. That means we don't just do what we're asked to do. We provide a total solution, even if it means helping clients find other resources."

"Our niche is solving complex problems through strategic partnering," Umeh continues. "To do that, we have to provide solutions that are best for our clients' businesses and in partnership with them."

"Our solutions also incorporate apt applications of technology based on our client profiles on how they want to implement technology. We don't use technology just because it's there. That, however, often provides a challenge to our employees because we hire the kind of people who like to solve complex problems."

Agency, Oscar Mayer & Co., and the U.S. Public Health Service. Wallgren also serves on the board of directors of Central DuPage Hospital, the board of the Nature of Illinois Foundation, the board of advisors for the Business School at Northern Illinois University, and the board of advisors for the Armour School of Engineering in the Illinois Institute of Technology. He holds an M.B.A. degree from Northern Illinois University.

1965

Raymond P. Cekalla (*Civil*) is an engineer for the Minnesota Department of Transportation. He lives in Oakdale, Minn. **Barton E. Dahneke** (*Mechanical, M.S., 1967 Ph.D.*) is a scientist for Eastman Kodak Company. Dahneke, who earned his bachelor's degree from Brigham Young University, lives in Palmyra, N.Y. **Stephen R. Frauenshuh, Sr.**, (*Civil*) is president of Bituminous

Consulting and Contracting, Inc. He lives in McGregor, Minn. **Gary R. Hauck** (*Chemical*) is a manager for General Mills, Inc. He lives in Long Beach, Calif. **Robert F. Hoeft** (*Mechanical, 1967 M.S.*) is a manager for General Electric Co. He lives in Schenectady, N.Y. **Stephen B. Venzke** (*Electrical*) is an engineer for Hewlett Packard Co. Venzke, who earned his master's degree from Colorado State University, lives in Loveland, Colo.

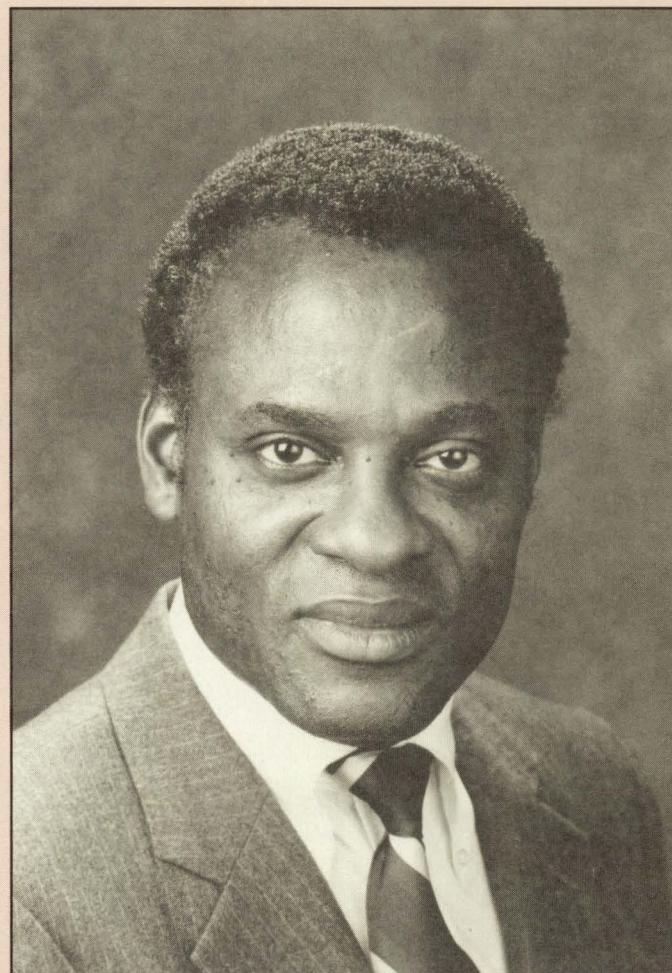
1966

Robert J. Engelking (*Chemical*) is vice president of Environmental Solutions. He lives in Edina, Minn. **David J. Houle** (*Aerospace*) is a manager for Douglas Aircraft, M.D.C. He lives in Los Alamitos, Calif. **Edward E. W. Martinson** (*Electrical*) retired as a director of Honeywell, Inc. in 1977. Martinson, who worked 41 years for Honeywell, lives in Mounds View, Minn.

To ensure SEI retains the kind of employees needed to fulfill its mission statement, Umeh instituted SEI's Profit Participation Program (PPP). Before the program was initiated in 1986, a number of SEI's best employees left the company to start their own firms. "They had nothing against SEI," Umeh points out, "but they wanted to run their own businesses."

Through PPP, SEI's top employees invest a portion of their gross earnings into the operation of the company. At the end of the year, profits are distributed to those employees in proportion to their contribution. Since the program was initiated, SEI has retained all of its top-level people.

"Our people are the key to our success," says Umeh. "I listen to what they're saying because, in the end, they're the future of SEI." **I**



Fidelis Umeh (65/Electrical), president of SEI Information Technology

1967

Stephen H. Johnson (*Geophysics, M.S.*) is a scientist with Amoco Production Company. Johnson, who earned his Ph.D. degree from Oregon State University, lives in Houston, Texas. **Jack H. Markwardt** (*Mechanical*) is a consultant for Teledyne Brown Engineering. Markwardt, who earned his master's degree from the Air Force Institute of Technology, lives in Oakton, Va.

1968

Jerome T. Abbe (*Aerospace*) is an engineer for Sikorsky Aircraft Co. Abbe, who earned his master's degree from the University of Bridgeport, lives in Seymour, Conn. **Richard A. Landholm** (*Chemistry, Ph.D.*) is a scientist for Eastman Kodak Co. He lives in Pittsford, N.Y. **Donald E. Sobania** (*Civil*) is an engineer for the City of St. Paul, Minn. Sobania, who earned his master's degree from Hamline University, lives in St. Paul, Minn.

1969

Walden J. Bahn (*Electrical*) is an engineer for Dotronix, Inc. He lives in Apple Valley, Minn. **Paul**

E. Coleman (*Chemical; Electrical, 1976*) is a radiologist at Nebraska Methodist Hospital. Coleman, who earned his M.D. degree in 1983, lives in Omaha, Neb. **M. Yousef Jabbari** (*Mechanical, M.S., 1973 Ph.D.*) is a research associate at the University of Minnesota. Jabbari, who earned his bachelor's degree at the Tehran Institute of Technology, lives in Roseville, Minn.

1970

Robert J. Henriksen (*Electrical*) is an engineer for Montana Power Co. He lives in Colstrip, Mont. **William D. Juusola** (*Electrical*) is an engineer for MTS Systems Corp. He lives in Maple Plain, Minn.

1971

William C. Brice (*Geological, M.S.; Mineral Resources, 1981 Ph.D.*) is a director for the Minnesota Department of Natural Resources. Brice, who earned his bachelor's degree at Michigan Technological University, lives in Shoreview, Minn. **Frederick R. Faxvog** (*Electrical, Ph.D.*) is a manager for Honeywell, S.R.C. He lives in Long Lake, Minn. **Karen E. Hawley** (*Electrical*) is a director for Honeywell, Inc. She

lives in Brooklyn Park, Minn. **William J. Sonsin** (*Mathematics, M.S.*) works in sales of financial services and products for IDS Financial Services. Sonsin, who earned his bachelor's degree from Michigan State University, lives in New Hope, Minn. **Bernard S. Spring-rose** (*Chemical*) is a founder and chief executive officer of Bio-sensor Corp. He earned his master's degree in engineering from Washington University and his M.B.A. degree from the College of St. Thomas. Springrose lives in Plymouth, Minn.

1972

Timothy R. Hedlund (*Mechanical*) is a founder and president of Midmac Systems, Inc. Hedlund, who earned his master's degree from Stanford University, lives in Shoreview, Minn.

1973

Robert C. Anderson (*Chemical*) is a vice president for Genex. He lives in Mahtomedi, Minn. **Robert J. Holt** (*Civil*) is an engineer for The Boeing Company. He lives in Seattle, Wash. **Michael G. Mudrey, Jr.**, (*Geology, Ph.D.*) is a professor at the University of Wisconsin.

Mudrey, who earned his master's degree at the University of Northern Illinois, lives in Mount Horeb, Wis. **Gregory N. Pippert** (*Mathematics*) is an engineer for Hughes Aircraft Co. He lives in Fullerton, Calif.

1974

George F. Heyne (*Computer Science, M.S.*) is a programmer for IBM Corp. Heyne, who earned his bachelor's degree from Kansas State University, lives in Rochester, Minn. **Terrance L. Hurlburt** (*Chemical*) is a vice president of Enterprise Products Co. Hurlburt lives in Dayton, Texas. **Gordon M. Reher**

(*Physics*) is an instructor for Northwest Airlines. He lives in Burnsville, Minn. **Scott R. Storror** (*Electrical*) is an engineer for Northern States Power Co. He lives in Eau Claire, Wis.

1975

Mary E. Awantang (*Biochemistry, Ph.D.*) is a scientist for the U.S. Government Department of State. She lives in De Pere, Wis. **Robert E. Erikson** (*Civil*) is a manager for Amoco Corporation. He lives in Hazel Crest, Ill. **James F. Moore** (*Computer Science*) is an engineer for

Building on a Dream

"I decided I was going to be an astronaut when I was 16--when we first landed a man on the moon," says Michele Brekke. "I watched those guys bouncing around up there, and it hit me 'That's what I'm going to do.'"

Becoming an astronaut was such a novel idea in 1969--much less a woman astronaut--that Brekke could find no one in her home town of Rochester, N.Y., who could tell her just how one went about becoming one. Brekke finally wrote to her congressman who responded in a less than encouraging manner.

"I hate to tell you this, but NASA isn't hiring women to be astronauts right now," the congressman wrote back in a letter to her. "And besides, they require 2,000 hours of jet pilot training, which you can only get in the Air Force. And, the Air Force isn't letting women be pilots." Her congressman's pessimistic report didn't discourage Brekke from pursuing her dream, however. In fact, it seemed to have steeled her resolve.

"I didn't let it phase me," she says. "I just told myself, 'I bet some day NASA will change their attitude and they'll hire women and they won't have to be jet pilots.' In a way, it may have been the best thing that could have happened to me. Having the goal of becoming an astronaut helped me get over all the various hurdles I ultimately had to overcome."

Acting on her congressman's suggestion that a degree in aerospace engineering would help her chances, Brekke selected the Institute of Technology as the best place to begin fulfilling her dream. There she came under the influence of former Aerospace Engineering Professor Helmut Heinrich.

Heinrich, who has since passed away, helped Brekke focus her efforts to achieve her dream.

"Dr. Heinrich took me under his wing and gave me opportunities to really show my stuff and let me see what I could do," Brekke says. "He also gave me good advice, urging me to complete my master's degree before entering the work force."

Ironically, when Brekke completed her master's degree in aerospace engineering in 1977, NASA announced it was opening the doors of its astronaut training program to women. She

*Having the goal
of becoming an astronaut
helped me get over
all of the hurdles
I ultimately had to overcome.*

applied for the program and, although she wasn't accepted, was offered a job as an instructor to help train astronauts at Johnson Space Center in Houston, Texas.

Brekke quickly advanced in that position, eventually becoming a group leader among the instructors. Five years later, however, she was ready to move forward.

"By the end of five years, I had basically learned the entire space shuttle system, and I had gotten to the point where I

Hughes Training, Inc. He lives in Vadnais Heights, Minn. **Robert L. Undersander** (*Geophysics*) is a manager for General Dynamics. He lives in Grafton, Va.

1977

Ralph D. Forsgren (*Mechanical*) is an engineer for Donaldson Co. He lives in Bloomington, Minn. **Jeffrey S. Hon** (*Mechanical*) is a vice president of Racine Railroad Products. He lives in Waterford, Wis. **Elizabeth M. Lederle** (*Civil*) is an engineer for U.S. West. Lederle, who earned her master's degree from Michigan Technological University, lives in Edina, Minn. **Richard A. Thompson** (*Civil*) is a supervisor for the City of St. Paul and lives in St. Paul, Minn.

1978

Steven L. Bluhm (*Chemical*) is an engineer for Northern States Power Co. He lives in Ramsey, Minn. **Steven W. Eng** (*Civil*) is an engineer for the State of Alaska. Eng, who earned his master's degree from the University of Alaska--Anchorage, lives in Anchorage, Alaska. **Mark J. Olson** (*Electrical*) is president of Upper Midwest Industries, APG Division.

Wesley E. Sund (*Chemical*) is in international sales for Rosemount, Inc. Sund lives in Eden Prairie, Minn.

1979

Harvey S. Allen (*Civil*) is an engineer for the Minnesota Department of Transportation. He lives in Brainerd, Minn. **Paul A. Burda** (*Materials Science, M.S.*) is a consultant for Pacific Gas & Electric. Allen, who earned his Ph.D. degree from the Institute of Chemical Technology in Prague, Czechoslovakia, lives in San Ramon, Calif.

1980

Linda M. Deiters (*Mechanical*) is a manager for 3M Company. Deiters, who earned her M.B.A. degree from the University of Minnesota, lives in Tucson, Ariz. **Janet M. Foster** (*Geophysics*) is a scientist for Halliburton Geophysical Service. She lives in Midland, Texas. **Terrance J. Hayden** (*Mechanical*) is a manager for Rosemount, Inc. Hayden, who earned his M.B.A. degree from the Carlson School of Management, lives in Minneapolis, Minn. **David E. Soenen** (*Mechanical*) is a manager for 3M Company. He

needed more challenge," she says.

Brekke became a payload officer and was soon promoted to lead payload officer. As such, she was responsible for coordinating efforts associated with payloads the shuttle carried on its missions. Just three years later, in 1985, Brekke became the first woman flight director at NASA. Working three to a mission, flight directors manage all of the people in mission control leading up to and during space shuttle missions.

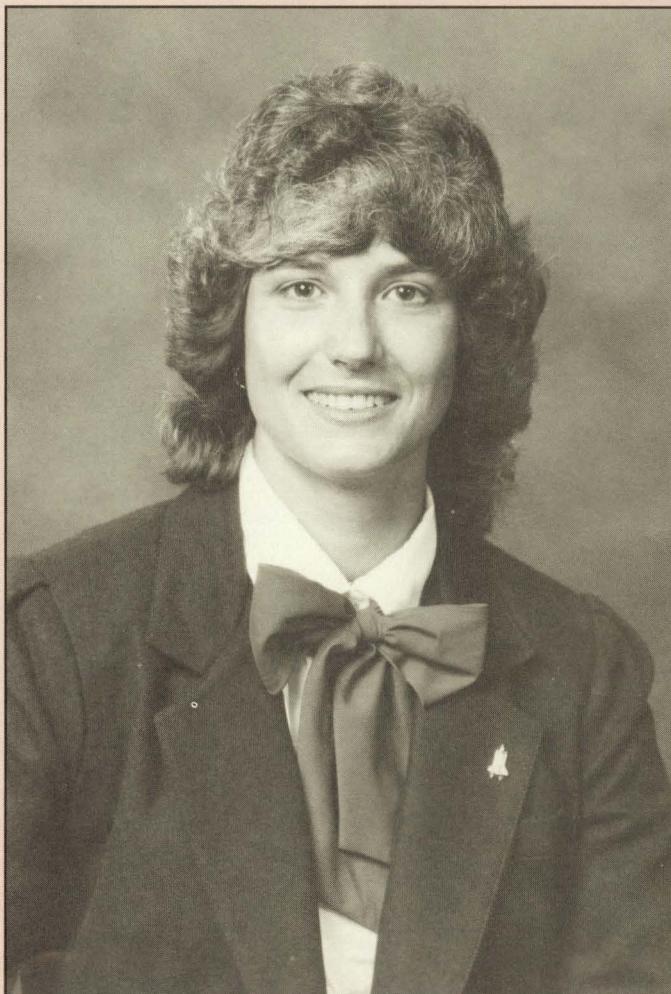
After working two and a half years in that position, Brekke's focus began to change slightly--this time toward her family of three children and her husband, Bob. In an effort to give more time to that side of her life, Brekke relinquished her post as a flight director to take on her current position as a payload integration manager.

Now, Brekke works with space shuttle "customers," overseeing all preparations for shuttle payloads--usually satellites--and ensuring that NASA delivers what the customers need. Two recent projects included a satellite that will collect scientific data for the European Space Agency and an orbiting ultraviolet spectrometer telescope for the German Space Agency.

Although no amount of discouragement along the way had been able to kill Brekke's dream of becoming an astronaut, somewhere during her rise through the ranks at NASA that childhood dream was laid to rest.

"I have no regrets," she says reflecting on what might have been. "The dream served me well. Once I got here, I realized that a ground career was just as fulfilling as the dream I had as a teenager. When you look at all of the sacrifices the astronauts have to make, I doubt that I would have been as fulfilled being an astronaut as I am now."

Michele Brekke (75 Aerospace), payload integration manager at NASA



Part of her satisfaction comes from the seemingly endless array of opportunities NASA presents for her. As things stand now, she is in charge of payload integration for the first assembly mission of NASA's space station, which is scheduled for March of 1996. Although funding for the project is an iffy proposition given the current political and economic climate, Brekke hopes to become mission manager in the future.

"This is an exciting place to work," says Brekke. "Every morning I wake up knowing that the work I do is writing pages in the history books. I really feel like I'm making a contribution."

From Sparse Beginnings

H. David Dalquist's office at Northland Aluminum Products headquarters is filled with artifacts of ships and sailing. Such a collection is altogether fitting for a man who has carefully skippered his business through four decades of growth.

From simple beginnings, Northland Aluminum Products has become a leader in the highly competitive industry of housewares with the company's Nordic Ware brand now distributed throughout Europe and Canada and a common household item in the U.S.

So, how did Dalquist go about building and leading a global housewares company? It began in 1946, shortly after Dalquist returned from Navy service following World War II. He had already completed his degree in chemical engineering in 1942 at the Institute of Technology, as well as several business courses and some metallurgical training. Now, he was ready to put those skills to use.

"My brother, Mark, and I decided to found this new little bitty business on a shoestring," says Dalquist. "We started out with \$400 and a workbench."

It was from that workbench that Dalquist and his brother made a product to fill a very specialized niche in the marketplace—baking pans for making krumkake, a seasonal treat close to the hearts of all Scandinavians (and anyone else who's tasted one).

"I went down to Dayton's with the first samples of our krumkake iron," Dalquist recalls. "The buyer was curious and said, 'Well, if you think they'll sell, I'll put in a dozen of them.' So, we delivered a dozen, and they sold."

The little bitty business soon increased its product line to include such items as models for a line of electrical housewares planned by General Mills. By the late 1940s, the Dalquists

were also developing several products cast from aluminum, including cookware found in many Scandinavian kitchens like rosette irons and platte pans (for making small Swedish pancakes). Gradually, these ethnic specialties became the focus of the fledgling company.

In 1948, the brothers bought the small Northland Aluminum Products company in North Minneapolis and, along with their own line of aluminum products, began producing bakeware and household items under the distinctive Nordic Ware trademark.

Dalquist recalls the challenges of those early years. "I was married and had a child at the time, which meant I had to have some sort of income," he says. "That's hard to do with a new business. It was pretty much hand to mouth."

Like many entrepreneurs, however, Dalquist also considers

*My theory is, if you can sell it,
you can almost always
manufacture it.
The converse is not always true.*

those years among the most satisfying of his career. "It was rewarding to see that yes, indeed, we could stay alive, even if we couldn't make any money," he says.

While the job may still be rewarding, the financial picture has definitely changed. Northland Aluminum has quietly become one of the industry's leaders, with sales recently topping the \$70 million mark.

"I always felt if I couldn't do it, I should be ashamed of

lives in Yardley, Pa. **John L. Uttermoehl** (*Mechanical*) is an engineer for 3M Company. He lives in Lake Elmo, Minn.

1981

Scott C. Johnson (*Mechanical*) is an engineer for Nova-Tech Engineering. He lives in Willmar, Minn. **Kevin J. Olson** (*Mechanical*) is an engineer for Alliant Techsystems. He lives in White Bear Lake, Minn. **Barbara S. Swan** (*Electrical*) is an engineer for Array Technology. She lives in Littleton, Colo. **John P. Thorne** (*Electrical*) is an engineer for Hughes. He lives in Upland, Calif.

1982

Anthony C. Miraglio (*Mechanical, M.S.*) is a consultant for Northern States Power Co. Miraglio, who earned a master's degree from the University of Illinois at Chicago Circle, lives in Blaine, Minn. **Bruce A. Perkett** (*Chemical*) is an engineer for Dexter Corp. He lives in Kenosha, Wis. **Donald G. Peterson** (*Chemical, M.S.*) is an engineer for 3M Company. Peterson, who earned his

bachelor's degree at Purdue University, lives in St. Paul, Minn. **James M. Sellner** (*Mining; Geological, 1985 M.S.*) is an engineer for the Minnesota Department of Natural Resources, Division of Minerals. He lives in Pengilly, Minn. **David R. Sorenson** (*Mechanical*) is a director for Image Systems Corp. Sorenson, who earned a master's degree from the University of St. Thomas, lives in Eden Prairie, Minn. **Douglas H. Thomesen** (*Mechanical*) is an engineer for Pratt & Whitney Aircraft. He lives in North Palm Beach, Fla.

1983

Todd G. Backer (*Chemical; Metallurgical*) is a manager for Cypress Semiconductor. Backer, who earned a master's degree from the University of Texas at Austin, lives in Apple Valley, Minn. **Paul L. Buelow** (*Mechanical*) is an engineer for Hughes Aircraft. He lives in Ontario, Calif. **James L. Gallagher** (*Chemical; Materials Science*) is an engineer for The Upjohn Company. He lives in Kalamazoo, Mich. **David J. Gravel** (*Mechanical*) is an

engineer for IBM. Gravel, who earned his master's degree from Rensselaer Polytechnic Institute, lives in Highland, N.Y. **Diane L. Gustus** (*Computer Science*) is a programmer for West Publishing. She lives in Bloomington, Minn. **Gary E. Iverson** (*Chemical*) is a consultant for Intel Corporation. Iverson, who earned his master's degree from the University of Phoenix, lives in Mesa, Ariz. **Paul M. Lindemann** (*Mechanical*) is an engineer for Spectrum Colors. Lindemann, who earned a master's degree from the College of St. Thomas, lives in Prior Lake, Minn.

1984

Jeffrey A. Bennett (*Chemical*) is an engineer for Raychem Corp. He lives in Sunnyvale, Calif. **Mitchell E. Larson** (*Mechanical*) is a manager for Pope and Talbot. He lives in Peachtree City, Ga. **Mark L. Schuleman** (*Electrical*) is a product manager for 3M Company. He lives in Golden Valley, Minn. **Kenton E. Spading** (*Civil*) is an engineer with the U.S. Army Corps of Engineers. Spading lives in St. Paul, Minn. **Robert J. Swanson** (*Geophysics*) is an engineer with Unocal Corporation. Swanson, who earned his master's degree in petroleum engineering from the New Mexico Institute of Mining and Technology, lives in La Quinta, Calif.

1985

David K. Duebner (*Electrical*) is an engineer for Northern States Power Co. He lives in Eau Claire, Wis. **Devesh Kapur** (*Chemical, M.S.*) is a research fellow at the Brookings Institution in Washington, D.C. Kapur expects to complete work toward his Ph.D. from Princeton University in the spring of 1993. **Richard J. Kvitek** (*Chemistry, Ph.D.*) is a scientist for IBM. Kvitek earned his bachelor's degree from the University of Wisconsin-Green Bay. **Lisa M. Lee** (*Geological*) is an engineer for Barr Engineering Co. Lee, who earned her master's degree from the University of Idaho, lives in Bloomington, Minn. **Robert C. Olson** (*Mechanical*) is an engineer for Conwed Plastics. He lives in Coon Rapids, Minn. **Scott W. Otterson** (*Electrical*) is an engineer for General Motors.

myself," says Dalquist, "because the Institute of Technology had provided me with excellent grounding in engineering in general, and in chemical engineering in particular.

Dalquist also credits his success to a combination of engineering and business training, which he recommends to those who might want to follow in his tracks. "The more a person understands how business is married to technology, the better they will do," he says. "In speaking of people who are very bright and good at marketing and sales, I've more than once said, 'if they just had some engineering background, they'd be top material for us.'"

Dalquist has applied his multi-disciplinary background and good down-to-earth business sense in leading his company of more than 400 employees. He has taken steps to motivate employees through a liberal benefits package and bonuses for special production goals. The company has also strengthened quality programs. Engineers are constantly in touch with assembly workers to glean new ideas and to quickly address production problems.

To successfully compete in a global economy, Dalquist has always kept the company's essential nature in mind. "This company, from its inception, has been sales and marketing driven," he says. "My theory is, if you can sell it, you can almost always make it. The converse is not true."

At the same time, Dalquist sees the need to move into higher technology products, given that the manufacture of low-to-middle-tech goods (like housewares) is increasingly being done in other countries, such as Asia and Mexico.

Dalquist, who recently retired as president of the company and assume the role as chair, has turned over the helm to his son, Dave. Like father, like son, Dave continues to develop new products and add higher technology items to the product mix.

He lives in Sterling Heights, Ill. **Christopher Zerby** (*Aerospace; Mechanical, 1991 M.S.*) is a manufacturing project engineer at Rosemount Inc.'s Solid State Center. Currently, he is working to bring a precise silicon pressure sensor from development into production. From 1985 to 1989, Zerby worked as an engineer at General Dynamics, Space Systems Division, where he participated in the Shuttle/Centaur Project and the Advanced Launch System Study.

1986

Jason J. Ball (*Chemical*) is a manager for Cargill, Inc. Ball, who earned his master's degree from Indiana University, lives in Carpentersville, Ill. **Reza Ghotbi** (*Electrical, 1990 Ph.D.*) is an advisory engineer for IBM. He has four patent applications pending and is the author of 10 publications, two of which received Outstanding Paper of the Year Awards. Ghotbi served as chair of the IEEE Computer Society in Tucson, Ariz., in 1991 and as secretary of the IEEE Southern Minnesota Section in Rochester, Minn., in 1992.

Suzanne M. Hay (*Mechanical*) is an engineer for Northern States Power Co. She lives in Big Lake, Minn. **John C. Homan** (*Mechanical*) is a manager for Environmental Laboratories, Inc. He lives in Bloomington, Minn. **Steven E. Paulson** (*Geology, M.S.*) is a scientist for the U.S. Bureau of Mines. Paulson, who earned his bachelor's degree from Northern Illinois University, lives in Burnsville, Minn. **Barry F. Power** (*Geological; Civil, 1990 M.S.*) works for Wenck Associates, Inc., an environmental consulting engineering firm in Maple Plain, Minn. He recently published a paper titled "Parameter Estimation Techniques Using the Analytic Element Method," in the magazine, *Ground Water*.

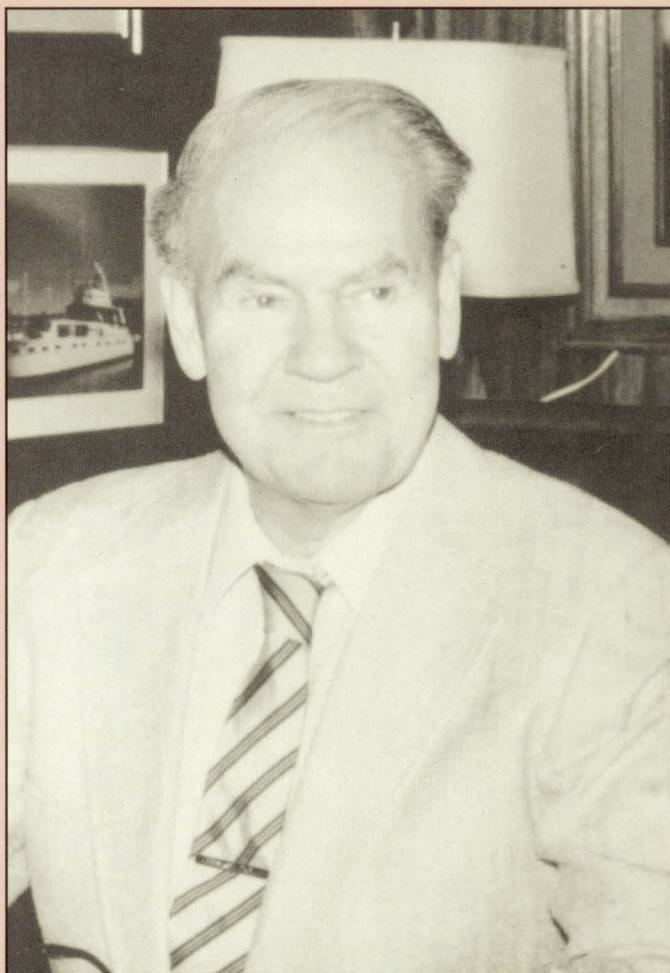
1987

Daniel J. Dee (*Electrical*) is a manager for Interactive Technologies, Inc. He lives in St. Paul, Minn. **Robert J. Elfner** (*Mechanical*) is a supervisor for IDS Financial Services, Inc. He lives in St. Paul, Minn. **Stephen J. Gerster** (*Civil*) is an engineer for Progressive Contractors, Inc.

In the meantime, Dalquist senior has become involved in a new, innovative outside project—working with a surgeon to develop a medical device to remove plaque from clogged arteries using ultrasound.

"This technology is just a little short of amazing," says Dalquist. "And, it illustrates what needs to be done, in my opinion, not only for the human race, but for keeping jobs in Minneapolis. We've got to be on the cutting edge of this technology and innovation."

If building a \$70 million company after starting out with just \$400 and a workbench is any indication, there's little doubt that Dalquist will help bring that about. ■



H. David Dalquist (1942/Chemical), chair of Northland Aluminum Products

work now. Don't spend a lot of time looking back. Always look forward."

No matter where a leader looks or how skillfully he or she acts, however, the experience of this group of leaders suggests even the most successful presidents and CEOs can't avoid the occasional stumble. Although he had already retired from 3M at the time and thus couldn't err in fact--only in judgement--Heltzer recalled his failed assessment of a new product in the development stages.

"The first time I saw 3M's Post-it Notes," says Heltzer, "I looked at them and said, 'Those guys have to be crazy. Nobody is going to pay that kind of money for scratch paper just because it's got a little goo on it.' Well, you know the story as well as I do. They couldn't make them fast enough."

Though Heltzer can laugh about his mistaken assessment, when the blunders are for real, the responsibility can weigh heavily on an executives' shoulders.

"The people problems are often the hardest," says O'Hare. "I gave up on some people that I think I could have gone the extra mile for. There are few people in top management positions who don't personally feel the trauma involved in personnel decisions, like layoffs or the transfer of a family. But you have to learn from your mistakes and go on."

For those who do learn, make the changes, and meet the challenge, the rewards are considerable. More important than

the compensation levels typically associated with high-level management positions and the life-style that affords, are the less tangible rewards.

"The most rewarding time as a manager is often tied to the most difficult time," says O'Hare. "Getting our company back on track and reestablishing a good management team was very satisfying." Green and Carlson, who both survived the turmoil of turning their companies around, agree.

But success in the corporate world can prove doubly satisfying when the impact reaches beyond the bottom line into the real world. "One of the things that makes you feel really good is when your ideas succeed and deliver something of real value to others," says Shuster. "The service we've put together here at Teltech is the best knowledge service in the world, and it helps other companies succeed."

"I think the greatest success of my career was being involved in the creation of 3M's reflector products [used on road signs and highway markers]," says Heltzer. "I think it has probably saved more lives in the world than anyone has given it credit for. The accidents that don't happen don't make news."

Perhaps the kinds of accomplishments that afford these leaders the greatest pride provides one more hint of what leadership is all about--shaping a team of people to achieve results that reach beyond the board room and the bottom line and make a real difference in the world at large. ■

He lives in Andover, Minn.
Sheryl L. Lager (*Electrical*) is an engineer for Medtronic, Inc. She lives in Mounds View, Minn.
Robin J. Lindemann (*Aerospace*) is an engineer for Alliant Techsystems, Inc. She lives in Coon Rapids, Minn.

1988

Todd P. Carpenter (*Electrical*) is a scientist for Honeywell Systems Research Center. He lives in St. Paul, Minn. **Dennis J. Cronin** (*Aerospace*) is a graduate assistant at Iowa State University. He earned a master's degree from Iowa State University of Science and Technology and is living in Ames, Iowa. **Gregory R. Edlund** (*Physics*) is an engineer for Supercomputer Systems, Inc. He lives in Eau Claire, Wis. **Brian J. Hayes** (*Electrical*) is an engineer for Aquatrol Corporation. He lives in Inver Grove, Minn. **Nicholas M. Neeb** (*Aerospace*) is an engineer for Lockheed Engineering and Sciences Co. He lives in Houston, Texas. **Bill Radich** (*Electrical, 1990 M.S.*) is a graduate student at IT working toward his Ph.D. degree.

Michael G. Richardson (*Civil*) is an engineer for International Paper Co. Richardson, who earned his master's degree from Ohio State University, lives in Georgetown, S.C. **Peter P. Ries, Jr.** (*Electrical*) is an engineer for Rosemount, Inc. He lives in South St. Paul, Minn. **Mark A.**

Schmidt (*Mechanical*) is an engineer for Hutchinson Technology, Inc. He lives in Hutchinson, Minn. **Jeffrey M. Schwarz** (*Chemical*) is an engineer for Northern Environmental. He lives in Hudson, Wis. **John R. Tabor** (*Geology, Ph.D.*) is a scientist for Shell Oil Co. Tabor, who earned his master's degree from the University of Illinois--Urbana, lives in Houston, Texas.

1989

Julie L. Allen (*Electrical*) is an engineer for Honeywell, Inc. She lives in St. Francis, Minn. **Roger A. Faber** (*Mechanical*) is an engineer for Detroit Diesel Corp. He lives in South Lyon, Mich. **Rajiv Jain** (*Electrical*) is a manager for K. J. Management. Jain, who earned his master's degree from Purdue University, lives in Roseville, Minn. **Catherine A. Klatt** (*Civil*) is an engineer for the State of New York, lives in Delanson, N.Y. **Carmelo L. Yasis** (*Chemical*) is a manager for General Mills and lives in Lake Elmo, Minn.

1990

Sachin V. Chauhan (*Electrical*) is an engineer for Spanlink Communications. He lives in St. Louis Park, Minn. **Peter R. Fryer** (*Agricultural*) is an engineer for Montgomery Engineers. He lives in Excelsior, Minn. **Mary Jo**

Kohler (*Electrical*) is an engineer for Westinghouse Electric Corp. She lives in Troy, Mich. **Eric Minor** (*Electrical*) is a systems engineer for EDS and is part of the company's Service Technology Group. He helped develop a system that General Motors' dealers use to diagnose cars. **Brian R. Page** (*Mechanical*) lives in Edina, Minn., and is an engineer for Electronic Data Systems. **Sharon M. Pearson** (*Electrical*) is an engineer for Honeywell, Inc. She lives in Spring Lake Park, Minn. **Judith A. Richardson** (*Mechanical*) lives in Bloomington, Minn., and is an engineer for Sheldahl, Inc.

1991

Andrew B. Conru (*Mechanical*) is a student at Stanford University. **Jeffrey A. Doering** (*Aerospace*) is an engineer for Ford Motor Co. Doering, who earned his master's degree in mechanical engineering from Stanford University, lives in Dearborn, Mich. **Daniel C. Egan** (*Mechanical*) is an engineer for 3M Company. He lives in White Bear Lake, Minn. **Hazem M. Elgamal** (*Chemical*) is an engineer for 3M Company. He lives in Bloomington, Minn. **Sandra K. Haissig** (*Chemical*) is an engineer for Abbott Laboratories. She lives in Lindenhurst, Ill. **Gregory K. Hall** (*Materials Science*) is an engineer for 3M Medical Imaging. He lives in St.

Paul, Minn. **Thomas E. McMullen** (*Civil*) is an engineer for Peer Environmental. He lives in Minneapolis, Minn. **Thanhha Thi Vo** (*Aerospace*) is a design engineer for Rosemount Aerospace, Inc. Vo works in the total temperature and flow sensors area for engine and aircraft applications and is currently working toward a master's degree in mechanical engineering at the Institute of Technology. **Robert D. Vollhaber** (*Civil*) is an engineer for Northern Environmental Technology, Inc. He lives in Forest Lake, Minn.

1992

Paul H. Angier (*Computer Science*) is a technician for AccounTemps Agency. He lives in Plymouth, Minn. **Kalman R. Bundy** (*Mechanical*) is an engineer for Bedford Industries. He lives in Worthington, Minn. **Paul J. Carroll** (*Mechanical*) is an engineer for MTS Systems Corp. He lives in Plymouth, Minn. **Stacey A. Jones-Humble** (*Chemistry*) is a scientist for Burroughs Wellcome Co. She lives in Wake Forest, N.C. **Scott C. Morgan** (*Agricultural*) is a technician at St. Anthony Falls Hydraulic Laboratory. He lives in St. Paul, Minn. **Daniel G. Saxton** (*Mechanical*) is an engineer for Ellerbe Becket. He lives in Eden Prairie, Minn. ■

DEATHS

Millard B. "Borgy" Borgeson

(*Mechanical 1933*), 80, on December 24, 1991, at his home in St. Anthony Village, Minn. Borgeson graduated from South High School in Minneapolis, Minn., in 1928. He was the East Coast consulting engineer for Sorbo-Mat Process Engineers for many years and retired from FMC Corp. in Minneapolis in 1976.

Elmer J. "Christy" Christenson

(*Civil and Mineral 1927*) of St. Paul, Minn., on August 19, 1991. Christenson was a native of Ellsworth, Wis. He attended St. Olaf College for a year and worked for a year as a messenger for the Federal Reserve Bank in Minneapolis before enrolling at the University of Minnesota. After graduating, Christenson went to work for the U.S. Corps of Engineers. He stayed with the Corps for nearly 38 years, working primarily on dams and water control on the Mississippi River in Minnesota. Christenson was a life member of the American Society of Civil Engineers and was an active member of the Como Park Lutheran Church.

Robert J. Ellison (*Civil 1937*), 76, on January 7, 1992, in Minnetonka, Minn., of a heart attack or stroke. Ellison was

founder and former CEO of Ellison, Pihlstrom, Ayres, Inc., a St. Paul consulting engineering firm that specializes in sewage treatment plants, water systems, highways, and airports. Ellison founded the firm in 1950 and served as its president until he retired in 1980. A St. Paul native, Ellison served in the U.S. Army for five years during World War II, attaining the rank of major.

Robert J. Hazelrigg (*Mechanical*), 71, on October 17, 1991, at North Memorial Medical Center in Robbinsdale, Minn. Hazelrigg, who lived in Golden Valley, Minn., was an engineer and sales manager for J. M. Grimstad Co., a hydraulic pump and valve manufacturer. A native of Lincoln, Neb., Hazelrigg was a member of the Executive Committee of the Minnesota Section of the American Society of Mechanical Engineers.

Kenneth O. Johnson (*Chemical 1932*), 81, on February 8, 1992, of pneumonia. Johnson, who lived in Bloomington, Minn., retired as president of the Jos. E. Johnson & Son Construction company, a St. Paul home remodeling and construction company. He was the third generation of Johnsons to work for the family firm. Johnson led

a popular dance band during his college years, played with the USO during World War II, and continued throughout his life to perform at social events.

Edward Leete, 63, on February 8, 1992, of cancer. Leete, who joined IT in 1958 and became a full professor in 1963, taught organic chemistry and was a noted researcher in phytochemistry (the study of plant chemistry). He received the University of Minnesota Distinguished Teaching Award in 1966, was elected a fellow of the American Association for the Advancement of Science in 1989, and, in 1990, received both the first International Phytochemistry prize and medal (sponsored by Pergamon Press) and the Minnesota Award from the Minnesota Section of the American Chemical Society. A native of Leeds, England, Leete completed his undergraduate work at the University of Leeds, where he was awarded the LeBlanc Medal as the top student in the College of Technology. He taught at the University of California at Los Angeles before joining the IT faculty. In 1965, he was awarded a doctor of science degree from the University of Leeds. Leete was an accomplished sculptor and

painter and exhibited his acrylic paintings in 1970 at the Walker Art Center in Minneapolis.

Milton E. Lindemann (*Chemistry 1947*), 76, of St. Paul, Minn., on April 21, 1992. Lindemann was the founder and former owner of the Lynde Co., a chemical formulating and distributing business he started in his garage in 1954. Lindemann formulated and sold insecticides and fumigants and distributed chemicals for other corporations. He sold his company to Hawkins Chemical Co. in 1974, but continued to work as a sales person and consultant for that firm. Lindemann served in the Army Air Corps and Medical Corps during World War II.

Clyde F. Norton (*Electrical 1935*), 78, of Minnetonka, Minn., on January 25, 1992. Norton, an honors graduate of the University of Minnesota, was born in Arlington, Minn. In 1927, he began what was to become a 64-year career as an amateur ham radio operator by earning his license at the age of 14. Norton worked for Western Union and, most recently, Northwest Airlines, where he was instrumental in developing computerized reservation procedures.

Margaret "Margo" Whelan

continued on back cover

News About You

Name _____

Employer/Location _____

Address _____

Other News _____

City, State _____

Graduation Year/Degree/Department _____

Job _____

O'Meara (*Civil* 1942) on January 30, 1991, in Inglewood, Calif. O'Meara, a pioneer among women in engineering and construction, worked in aeronautics during the war and, beginning in 1951, as a construction manager on a number of major civic and commercial buildings in Los Angeles, Calif.

Albert Ostrin (*Mechanical*), 79, of heart disease on July 4, 1992. Ostrin was the founder of Pollution Controls Inc. in Shakopee, Minn. The holder of 14 patents for pollution control equipment, Ostrin developed Minnesota's first industrial waste disposal facility in the early 1960s

and developed a water-cooled kiln to burn chemical wastes, producing a toxin-free residue. When Ostrin's company was bought out in 1972, he moved to Florida and started a heating and air conditioning business. Ostrin, who was a Big Ten wrestling champion, had been living in Fort Lauderdale, Fla., for the past 10 years.

J. Ian Richards (*Mathematics* 1957), 55, of Lauderdale, Minn., on June 21, 1992. Richards was a professor of mathematics at the Institute of Technology for 30 years. He won the prestigious William L. Putnam Award as an undergraduate and went on to

earn his master's (1959) and Ph.D. (1960) degrees in mathematics at Harvard University. He completed two years of postdoctoral work at MIT before joining IT in 1962. Richards was the co-author of several books on advanced mathematics and was a white-water canoeing enthusiast. **John Tacheny** (*Civil* 1973), 53, of Minneapolis, Minn., on March 30, 1992, of leukemia. Tacheny was the sewer construction engineer for the City of Minneapolis, where he worked for almost 32 years. He was active in Boy Scouts of America and, in 1991, received an award from the Minneapolis Committee on Urban

Environment for the Sibley holding pond—a unique stormwater retention pond in South Minneapolis.

John Tomlinson (*Chemical* 1952), 62, of Inver Grove Heights, Minn., on July 1, 1992, of a heart attack. Tomlinson, former Minnesota commissioner of revenue, was known as the "answer man" on matters of state tax and finance. Prior to joining the Department of Revenue in 1987, Tomlinson served in the State House of Representatives for 14 years and as a chemical engineer for 3M Company for 33 years. **I**



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