Thank YOU! Your response to our “Retrofitting for the Future” campaign to renovate the IOE building has been exceptional. Thanks to your support, we will be able to complete the renovation of the existing IOE building during 1995. We expect to move into both our remodeled areas and our new space in the Engineering Center Building (see photo, back page) in Fall 1995. We hope you can come visit when everything is done.

Our retrofitting and new facility should add greatly to our ability to communicate and interact with our students. We will have our classrooms in the same structure as all offices. Our undergraduate and graduate program offices will be located by our new front door for easy access. We will have a central reception area for students to gather and mingle with faculty. We will also have new computer and ergonomics laboratories that will give our students greatly expanded opportunities.

In addition to preparing for our new building, we have begun an extensive follow-up on our 1993 survey in small group discussions with the IOE Alumni Academy. The survey results (see article p. 7) indicate definite career progressions from engineering functions into management and other professional activities for most IOE graduates. They also show great consistency in the topics that we might consider as core skills for an IOE. We are using these results to develop a set of alternative career paths for IOEs and to help direct our curriculum review.

Within the College of Engineering, IOE has recently experienced unprecedented popularity. We now have a record 380 undergraduate students in our department and over 180 graduate students. The new undergraduate honors program in Engineering Global Leadership (EGL) has been especially popular among new engineering students. EGL is one of a suite of programs organized under the Michigan Joint Manufacturing Initiative co-directed by Jim Bean (see article p. 5), which has forged new ties with the Business School and across campus.

Other ongoing interdisciplinary projects include the College of Engineering’s Program in Manufacturing, which Yavuz Bozer will direct in 1995, the Intelligent Transportation System (formerly IVHS) project under Chip White (p. 4), the Japan Technology Management Program directed by Jeff Liker (p. 6), and the Program in Occupational Safety Engineering and Ergonomics led by Monroe Keyserling (p. 4). These projects clearly distinguish the IOE department as the leader of interdisciplinary work in the College of Engineering. We see a trend toward increased awareness of the importance of these efforts within the College and across the University.

In other news from the department, we are proud to announce that Don Chaffin has become the first IOE professor elected to the National Academy of Engineering. This prestigious honor and Don’s position as the G. Lawton and Louise G. Johnson Professor of Engineering have enhanced the department’s image nationally as well as within the College of Engineering. We are hopeful and confident that more of our faculty will receive such recognition in the future.

In other department news, we are extremely happy to have two new faculty members, Rachel Zhang from Northwestern and Tava Lennon from Stanford. We hope to be able to recruit again this year.

As I mentioned in last year’s message, we have not always been able to convince the College of the urgency of our needs and of the particular stresses that we feel in IOE. We have made some gains this past year with some increases in our flexible funding. The next year will bring us a new dean (Peter Banks will move to become president of ERIM in January 1995) and new opportunities. We look forward to them and to your continued support.

--John R. Birge, IOE Department Chair
The Department of Industrial and Operations Engineering is at the top of the rankings for our discipline. Although these lists are academic in nature, we understand that the acumen of our faculty and the excellence of our students is only a portion of the overall equation. The calibre and accomplishments of our alumni are an integral part of both our reputation and our standing among the leaders and best. Robert H. Lurie was one of our most distinguished alumni.

In his undergraduate years, Mr. Lurie served on the Soph Show Committee and was a member of AEP, where he got to know fraternity brother, Sam Zell (AB '63, JD '66). Before graduation, he and Mr. Zell were engaged in the successful acquisition and management of a number of Ann Arbor rental properties. Their youthful collaboration presaged extraordinary achievements.

Twenty-five years later, Mr. Lurie, together with Mr. Zell, were recognized broadly as one of America’s most remarkable business partnerships. Mr. Lurie was known as the partnership’s “number genius.” According to his wife, Ann Lurie, Bob frequently acknowledged that his natural talents in this area were broadened and fine-tuned here in IOE.

In his memory, Mrs. Lurie has made a $12 million commitment to establish the Robert H. Lurie Fund which will be allocated to new campus buildings, including a carillon tower on the North Campus. Mrs. Lurie’s generous gift has lent strategic impetus to the quest to satisfy the facilities needs of the IOE department. (Editor’s note: Please see related features in this publication.)

At the time of his death in 1990, Bob Lurie was president of Equity Group Investments and Great American Management and Investment, and part owner and member of the Board of Directors of both the Chicago Bulls and the Chicago White Sox. He also owned, or was a major stockholder in, Great American Management and Investment, Inc., a publicly traded holding company with interests in several publicly and privately owned companies; Equity Group Investments, a diversified, privately held company with major interests in real estate; Itel Corporation; Nucorp (subsequently named Capsure), an insurance business; and Delta Queen Steamboat Company (subsequently named American Classic Voyages).

--Deborah Meyers Greene, Engineering Communications

Robert H. Lurie, 1942-1990
At the College of Engineering Alumni Awards Ceremony in October, the IOE Department proudly presented the 1994 IOE Alumni Society Merit Award to Myun W. Lee, a native of South Korea, who came to the University of Michigan after finishing his B.S. in textile engineering at Seoul National University in 1968. He earned the M.S.E. in industrial and operations engineering at the University of Michigan in 1970 and the Ph.D. in 1979.

He is a professor in the Department of Industrial Engineering at Seoul National University and is president of the Korean Institute of Industrial Engineers. He has collaborated with industry and government in both the United States and Korea on numerous research and development projects during the past twenty-four years. He has published more than ninety articles, supervised more than one hundred research contracts, and has registered more than two hundred patents. He is currently conducting research in high-touch product design for the twenty-first century, using neural network theory and ergonomic principles.

He has served as special advisor to the University-Industry Subcommittee of the Presidential Committee on Science and Technology of the government of the Republic of Korea. He is a board member of the Korea Federation of Science and Technology. He is currently vice-president elect of the International Conference on Computers and Industrial Engineering and has served the organization as keynote speaker.

Dr. Lee is the recipient of several awards, including the Academic Achievement Award from Seoul National University this year for his contribution as director of the Research Institute of Engineering Science; the 1993 Sang-Huh Memorial Award from the Sang-Huh Cultural Foundation; Most Distinguished Alumni Award from Kyung-gi High School in 1992; the Academic Achievement Award from the Korean Institute of Industrial Engineers in 1991; and in 1988 was included with fifty other University of Michigan alumni as one of the “Most Distinguished Ph.D. Recipients” from the Horace H. Rackham School of Graduate Studies in honor of the School’s fiftieth anniversary.
Program Updates

Center for Ergonomics

The center continues to be involved with many different organizations. Research is supported by both companies (e.g., Ford, Coca-Cola, Walt Disney World, AMP, Sea River Maritime, Association American Railroads, etc.) as well as various government agencies (eg., NIOSH, NIH and DOT/NFTSA, State of Michigan). The 40 faculty, staff and students associated with the Center continue to study both basic and applied phenomenon that modify human performance in industrial work and vehicle driving activities. Over 1200 practicing professionals have attended short courses (2-5 days) provided by the Center’s faculty, staff and students during the past year to learn about their research findings. In addition, faculty members associated with the Center have advised OSHA and other standards setting groups regarding the scientific foundations for ergonomics standards and guidelines.

Further details are provided in a Center Brochure which can be obtained by calling (313)763-2243.

Program in Occupational Safety Engineering and Ergonomics

A new professional degree, the Master of Engineering in Occupational Ergonomics has been approved by the College of Engineering. This one-year program provides focused training on ergonomics in the work environment, with a special emphasis on preventing musculoskeletal injuries and disorders (e.g., low back pain, carpal tunnel syndrome) in manufacturing and service operations.

The IOE graduate program in Occupational Safety Engineering and Ergonomics has received a grant from the National Institute for Occupational Safety and Health (NIOSH) totaling $150,000 for the 1994-95 academic year. This grant is used to support the training of Masters, Ph.D., and post-

Doctoral students who plan professional or research careers in Occupational Safety and Ergonomics. In addition, the grant supports library and laboratory facilities in the IOE Building.

For additional information on the new Masters of Engineering program and financial aid opportunities for students, contact Professor Monroe Keyserling.

ITS (Intelligent Transportation Systems, formerly IVHS) Research Center of Excellence

Earlier this year, the University of Michigan received one of three national awards from the U.S. Department of Transportation for an ITS Research Center of Excellence (RCE). The objective of the RCE’s is to stimulate academically-based ITS research, development, evaluation, and deployment. ITS is the application of information, control, and communications technologies, technologies that are having impact on virtually every aspect of society, to the surface transportation system. Funding support for the RCE will run for up to five years and requires matching funding from industry and state and local governments. The RCE is a University-wide activity that currently funds 18 R&D projects and involves the College of Engineering (IOE, MEAM, EECS, and CEE), the Business School, the Law School, the School of Urban and Regional Planning, UMTRI (the UM’s Transportation Research Institute), and LS&A (Economics). IOE faculty who have participated, or are currently participating, in the RCE or the related ITS educational program include Yili Liu, Katta Murty, Bob Smith, and Chip White.
Michigan Joint Manufacturing Initiative

This program brings together the strengths of the College of Engineering, Michigan Business School and industry to educate a new manufacturing professional, competent in both engineering and business, and with substantial real industry experience. It coordinates four interdisciplinary degree programs, including the Engineering Global Leadership Program (EGL) housed within IOE. In EGL, honors students take the core of the IOE undergraduate program and add an engineering minor, a business minor, and a cultural core for a region of competitive importance to the US. This includes a foreign language and related history, political science, and other courses. In five to five and a half years they receive a BSIOE and MSIOE. MJMI also includes a joint MBA with concentration in manufacturing/MSIOE. EGL has grown to 25 students, the joint program to 10, and all MJMI to 100 students.

Core to MJMI are the summer projects in which teams of MBA, Master of Engineering in Manufacturing and EGL students go on-site for four months to tackle problems important to an industrial sponsor. They have faculty advisors from each the College of Engineering and Michigan Business School. In summer 1994, there were 14 projects including Advanced Micro Devices in California, Leybold in Germany, Gelman Sciences in Ann Arbor, and Revlon in North Carolina. The projects saved millions of dollars for the sponsors and gave great experiences to the students. Next summer we are planning 30 projects and have 70 requests from companies to date.

On the research front, MJMI will fund a number of Faculty Fellows. Awards are for pairs of faculty, one each from engineering and business, to develop close relationships with specific companies while doing coordinated research.

Program Updates

As a multidisciplinary and university-industry cooperative program MJMI early on decided to have co-directors representing various perspectives as leaders. The co-directors are Professor James Bean of IOE, Professor Brian Talbot of Business Administration, and Craig Marks who is currently in the IOE department and formerly Vice President of Technology at Allied Signal.

Program in Manufacturing (PIM)

The Program in Manufacturing (PIM) is a multi-disciplinary program established by the College of Engineering. Its director is Prof. Galip Ulsoy from the Mechanical Engineering and Applied Mechanics department. Yavuz Bozer from IOE will serve as Interim Director in 1995. PIM students take a variety of courses from various engineering departments and the business school to earn the Master of Engineering degree in Manufacturing. The curriculum is designed to expose students to all aspects of manufacturing including design, processes, quality, materials, and management. Industrial experience is a requirement for admission. Please contact Ms. Henia Kamil at (313) 764-3312 for further details regarding admission and degree requirements.

Conference Update

John Birge and Katta Murty were organizers of the 15th International Symposium on Mathematical Programming held at the central campus of the University of Michigan, Ann Arbor, during 14-19 August 1994. This conference that kept several IOE faculty, staff, and graduate students very busy for most of the year, turned out very well. About a thousand research seminars were presented over the 5 days of the symposium, and it attracted over 1100 registered participants from all over the world.
Program Update: Japan Technology Management Program

The Japan Technology Management Program is now in its fourth year. JTMP is an interdisciplinary program cutting across engineering, business, and the Center for Japanese Studies. The program is directed by Jeffrey Liker of IOE. The co-directors are John Campbell of political science, Brian Talbot of Business Administration, and John Shook of IOE.

JTMP continues to have four major thrusts: Faculty/student research on JTM topics, student internships in Japan, fellowships for technically-oriented students to study Japanese, and continuing education for industry.

In its first year JTMP touched many people. As a result of the program, 75 faculty/students had experiences in Japan, 118 students took Japanese language or business courses, and almost 1500 people attended short courses. The research has been published in academic and professional journals. A compendium of the research sponsored by this program will come out next summer. Look for:


This Fall we have added a new, more intensified outreach service in lean manufacturing. The goal is to help bring the best of lean manufacturing methods, often associated with Toyota, directly to U.S. companies. Short-courses held at the University are of limited power in helping companies to implement these manufacturing methods. More powerful are on-site workshops involving analysis and redesign right on the shopfloor. Two IOE faculty, Jeffrey Liker and Walton Hancock, are involved in this effort. In addition two other half-time staff were added to participate in this outreach effort. A brief description of each follows:

Mike Rother has worked with over 75 small manufacturing companies over the last 5 years helping them to implement continuous improvement and lean manufacturing methods. With colleagues he developed the concept of Continuous Improvement User Groups (CIUG) which meet monthly on the shopfloors of each member company on a rotating basis (typically 4-6 plants are in a group) to learn about CI and try what they learn by analyzing pilot areas on the shopfloor.

John Shook worked for Toyota for about 10 years. He was the first American to work at Toyota in Japan and very rapidly became a manager in Japan. He then developed and delivered training for the GM/Toyota joint venture in California (NUMMI) and later helped in the planning and start-up of the Toyota, Georgetown plant. He most recently helped develop a Toyota center in Kentucky to help suppliers implement the Toyota Production System.

Together with Mike and John we will offer services (for fees) to companies interested in learning about and implementing lean methods. We will involve students in the programs, conduct research into lean methods, and bring what we learn back to the classroom. John Shook is teaching a course this winter called “Manufacturing Strategies.” Those interested in learning more about JTMP or the manufacturing outreach program should contact JTMP Director, Jeffrey Liker at (313) 763-0166.
In last year's IOE Newsletter, we provided aggregate results for 200 of the 1000 completed alumni surveys. The aggregate results for all 1000 responses differ little from the initial sample of 200. We were, however, able to identify trends across graduation years. We have used these results as part of a project with Andy Crawford and the IOE Alumni Academy to identify career paths for IOE graduates and a set of core skills that IOE graduates will need to compete in the career marketplace of the future. This project will help us inform our undergraduates about their employment opportunities throughout a career. We will use our next survey to sharpen our results and give us input into a review of the entire IOE and College of Engineering curriculum.

In assessing career paths, we begin by looking at the industries in which our graduates find jobs: grouped generally as manufacturing or service. The results by years since graduation appear in Figure 1.

![Industry Comparison](image)

Figure 1. Industry Sector Comparisons

Note in Figure 1 that the fraction in manufacturing has been fairly constant around 40% for graduates since 1950. Our earliest graduates (when IE was part of Mechanical Engineering) are the only group with more than 50% employment in manufacturing.

As another serial comparison, we examined the jobs of our alumni in broad terms: engineering, management and other professions (university, law, medicine). These results appear in Figure 2.
Figure 2. Position Functions.

In this graph, the trend toward management is fairly pronounced. Shortly after graduation, over 60% of our graduates serve in engineering with under 20% in management. For alumni beyond 25 years since graduation, management positions dominate with almost 70% of the total while alumni in engineering functions constitute only 15% of the total. Of the 70% in management in the 1960-1969 cohort, two thirds report themselves as "corporate executives." Our next survey will seek to understand in greater detail the career paths leading to these positions.

Another factor of interest to our current students is the progression of salaries through a career. While JOE students have a lower initial salary than some other engineering departments after the Bachelor’s degree (the median was approximately $36,000 in 1993-1994), our Master’s graduates (1993-4 median =$45,000) experience the greatest increase relative to Bachelor’s salaries among major engineering departments. A continued trend of fairly rapid increases with additional experience and education is demonstrated in our survey results. Fractions in salary categories, below $50,000, $50-$80,000, $80-100,000, and above $100,000, are shown in Figure 3.

The median salary rises from below $50,000 for the most recent graduates to just under $120,000 for the graduates from the 1960s. (Some salary reductions occur for graduates from the 1950s and 1940s due to retirements.)

Our current students are also often interested in the relative annual salaries of alumni with various terminal degrees. For each cohort of IOE graduates, we found fractions in each of the salary categories and calculated median salaries. The salary distribution for 1970s IOE graduates by last degree appears in Figure 4. In this group, the median salaries increase steadily from B.S. only graduates to M.S. graduates, M.B.A., J.D., Ph.D. and M.D. In this cohort, median salaries increase $15,000 from B.S. to M.S., $10,000 from M.S. to M.B.A., $5,000 from M.B.A. to J.D., $5,000 from J.D. to Ph.D., and over $40,000 from Ph.D. to M.D. (Of 3 M.D.’s in this cohort, the median salary was above $140,000.)
1993 Survey Follow-up continued

Salaries over Time

<table>
<thead>
<tr>
<th>Years since Graduation</th>
<th>&lt; $50,000</th>
<th>$50-$80,000</th>
<th>$80-$100,000</th>
<th>&gt; $100,000</th>
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<tr>
<td>&lt; 5</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>5-10</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>10-15</td>
<td>60</td>
<td>40</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>15-25</td>
<td>50</td>
<td>30</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>25-35</td>
<td>40</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 3. Salary Comparisons.

Income by Last Degree

<table>
<thead>
<tr>
<th>Last Degree Obtained</th>
<th>&lt; $50,000</th>
<th>$50-$80,000</th>
<th>$80-$100,000</th>
<th>&gt; $100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.S.</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>M.S.</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>M.B.A.</td>
<td>60</td>
<td>40</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>J.D.</td>
<td>40</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M.D.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 4. Income for 1970s IOE Graduates.
Differences in salaries varied somewhat across graduation year cohorts. The differences in median salaries among the main groups, B.S., M.S., M.B.A., and Ph.D., are shown in Figure 5 (approximated to the nearest $5000). The trend over time may give our current students some indication of future earnings based on their education.

![Salary Differences over Time by Last Degree](image)

**Figure 5. Differences in Median Salaries by Last Degree.**

Using these estimates, I estimated the relative net present values of pursuing each degree. In addition to the median differences in Figure 5, I assumed the following:

(i) nonresident tuition payments at UM;
(ii) 1 year post-B.S. for M.S.;
(iii) 2 years post-B.S. for M.B.A.;
(iv) 4 years post-B.S. for Ph.D.;
(v) Ph.D. study includes $15,000 annual stipend and tuition allowance;
(vi) an annual discount rate of 8% (e.g., the average real rate of increase for stocks);
(vii) average tax consequences for a single individual with no significant deductions.

Based on these observations, I found the following net present values:

(i) M.S. over B.S.: $60,000;
(ii) M.B.A. over M.S.: $3,500;
(iii) Ph.D. over M.B.A.: $40,000 (but this positive NPV disappears if a student must pay for Ph.D. tuition and does not earn a stipend).
From the survey, the J.D. had no positive net present value over the M.B.A. Based on the limited survey data, the M.D. appeared to have a $15,000 net present value over the Ph.D. (This figure is, however, especially sensitive to the discount rate assumption since M.D. earnings are postponed longer than any of the other categories.)

In addition to salary, JOE graduates appear increasingly satisfied with their careers. The mean satisfaction with career advancement climbs with each decade since graduation from 3.6 (on a 5-point scale where 5 was "extremely satisfied") for the most recent graduates to 4.1 for alumni from the 1940s and 1950s. Satisfaction with the IOE degree remains fairly constant over time at a mean level of 3.7 to 3.8. Judgment of the quality of the IOE program also remains fairly constant over time with two thirds rating the program "Exceptional" or "The Best" and 95% giving ratings of "Good" or better.

The survey also shows general consistency in choices about which topics have proven most useful to alumni and in which areas alumni wished to have had more coursework. The areas of greatest utility are consistently information systems, engineering economics and capital budgeting, organizational management, and business electives. The areas of more desired coursework are consistently business electives, information systems and engineering economics. Part of our curriculum focus in the next survey will concentrate on breaking these general areas down into more specific topics.

Desired goals for the department show some change over time as years since graduation increase. Providing a well-rounded education and state-of-the-art knowledge are consistently among the highest ranked goals in all graduation year cohorts. Long-term information and immediately applicable job skills are also among leading goals, but, not unexpectedly, their relative priorities change as time since graduation increases. More recent graduates rank immediate skills equally with long-term information. The relative priority for IOE to provide immediate skills decreases continuously while the priority for long-term skills increase. For graduates before 1950, providing long-term skills becomes the highest priority (with a mean rank of 4.3 on a 5 point scale) for the department while providing immediately applicable skills ranks as a medium priority (mean=3.2/5).

These results may be consistent with a shift in the view of theory/application emphasis in the department. More recent graduates tend to view the balance in the IOE department as too theoretical for them professionally with a mean of 2.4 where 1="Much too theoretical" and 5="Much too applied" while graduates from earlier years tend to view the program as closer to the "right balance" (mean=2.8 where 3="right balance").

The IOE department appreciates your participation in this survey. We look forward to your participating in our next survey as we refine our questions on career progression and core skill areas for our curriculum. We also welcome any other comments you may have on the survey and these results.

--John R. Birge, IOE Department Chair
IOE Student Organizations

Note: The student groups are always interested in having alums return to campus and present a short luncheon topic about their company or current topic in the area. Any alumni wishing to contact the student organizations may do so through Jolene Glaspie at (313) 763-1332.

Alpha Pi Mu

Alpha Pi Mu kicked off the 1994-95 school year with the traditional picnic for new initiates on the steps of the Graduate Library. As always, this year we will continue to promote the education of industrial engineers both in and out of the classroom through activities within industry, the University, and the surrounding community, via continued participation in philanthropic events, events sponsored by the College of Engineering, and joint events with IIE. These activities are an effort to join together the IOE students, faculty, and staff, and others that may wish to participate in order to promote the field of industrial engineering.

This year's activities have included several jointly sponsored social events between Alpha Pi Mu and IIE that were very successful in drawing students, faculty, and staff together. In addition, we participated in a day of community service called "Into the Streets" sponsored by Project SERVE. This entailed spending a Saturday canoeing down the Huron and cleaning up the river. In addition, Alpha Pi Mu participated in Tech Day, an activity sponsored by the College of Engineering for high school students to explore the different engineering disciplines. We were very pleased to have a record breaking crowd at IOE Options Night, an annual activity at which seniors and graduate students in IOE give advice on 400-level IOE classes to younger students. Currently, we are busy setting up presentations by guest speakers, working on this year's fundraiser, providing tutoring services for 300-level IOE classes, publishing the Industrial Blueprint, and as always, planning great social activities.

This year's committees are focused on Academics, Activites, the Blueprint, Fundraising, and UMEC Representation. Each committee is responsible for providing ideas and support for their different areas. Some of the upcoming events that the committees have planned include a "Master's Degree vs. Working" night, where a panel will answer students' questions related to the decision of working prior to obtaining a master's degree, or going directly to graduate school; a special resume preparation workshop, to help students prepare for summer or permanent job hunts; an Alpha Pi Mu resume book compilation, to assemble members' resumes for recruiters; a mentorship program, to pair older and younger engineering students; ice-skating nights at Yost Ice Arena; student, faculty, and staff mixers; the Professor and T.A. of the Year selections; and of course the most exciting event, initiate induction, to be held at a very secret location.

As always we are very busy upholding the traditional activities and roles of Alpha Pi Mu and trying to incorporate new ideas and activities into the school year. We always appreciate any opportunity to listen to IOE alumni speak about what they are doing with their industrial engineering degree today. Please contact us if you have any interest in this. We appreciate any suggestions that you might have for future activities.

--Laura Drake, President

Institute of Industrial Engineers

The student chapter of the Institute of Industrial Engineers (IIE) is in the middle of a busy school year. The primary goals of this year's officers have been to increase IOE student participation in IIE, and to facilitate student, faculty, and staff interaction outside of the classroom.
The year's activities began with a mass meeting, to let students know about the many opportunities available through IIE. We have already added over 40 new members to our roster this year. The annual IOE Student-Faculty-Staff Barbecue was also held in September. The attendance at the barbecue was so phenomenal that additional food had to be purchased on a "Just-In-Time" basis! Another popular activity this year has been the Alpha Pi Mu/IIE Happy Hours held one Friday each month at local establishments. For Halloween, IIE sponsored another Student-Faculty-Staff mixer. In keeping with the season, it was an afternoon "Cider And Doughnuts" social. In November, IIE participated in the College of Engineering's Society Information Fair, which was another opportunity for us to get new students involved. Another ongoing activity has been the monthly publication of the Industrial Blueprint, the IOE student newsletter. Additionally, the preparation for the annual IOE Yearbook, which will be published in the spring, is well underway.

On the "professional" side of IIE activities, we were pleased to welcome Kerry Wood from General Motors, who spoke about industrial engineering careers at an evening luncheon in November. In December, we had the opportunity to see all sorts of real-life industrial engineering concepts in a visit to Ford's Dearborn Glass Plant. These luncheons and plant trips are very popular and educational events, and we hope to have many more yet this year. If you are interested in coming to speak about your experiences, or in giving a tour of your workplace, please contact us. There is a great deal of student interest in the variety of careers available with an industrial engineering degree, and we would love to hear what you've done with yours.

--Tom Hemr, President
Alumni Teach Students

Over the years we have had the opportunity to connect our current students with our alumni in a very close up and intense way: by arranging for alumni to teach regular IOE courses. These alumni “professors” do not always have a Ph.D. What they have is energy and enthusiasm about passing on some of the lessons they have learned through years of practice. And we have been fortunate in getting some naturally gifted teachers in the classroom. Two of these alumni are highlighted in this special section of the newsletter. In both cases they approached the department, very persistently, asking to teach undergraduate courses. Both individuals have been successful in running their own companies and have a passion for sharing some of their experiences and knowledge with students. Both consistently receive high course evaluations from the students and their courses draw large enrollments. Steve Rasch has taught IOE 451, Engineering Economics, for the last three years. Andy Crawford first introduced a course on Entrepreneurship in 1987, which he has taught each year, and recently introduced a new course on Project Management.

Steve Rasch Teaches Engineering Economics

I became involved with teaching this course because of my own experiences at the University of Michigan. I graduated from UM in 1978 with a BSCE and began working as a research and design engineer for Bechtel Power Corporation. While working for Bechtel in Ann Arbor, I completed a MSCE at UM in 1981, and, subsequently, became a registered professional engineer in the State of Michigan. During this part of my professional career I realized that while being a good engineer was important, it was equally important to understand the financial implications of engineering-based decisions. In 1984 I completed an MBA at the University of Chicago and began a career in management consulting. Currently, I am President of the Ann Arbor Consulting Group, Inc. and am completing my Ph.D. in Industrial and Operations Engineering at UM.

Strictly speaking, the course can be described by citing an excerpt from my class syllabus:

“Engineering economics considers the logic of economic decision making, capital allocation theory, and industrial management. This course is concerned with the problem of allocating limited financial resources among competing investment alternatives. The theory and methods presented in this course are appropriate for investment decisions of private firms, government agencies, and individual investors. The techniques covered in this course focus on the use of economic information that can assist in the capital allocation and decision-making process.”

However, IOE 451 encompasses much more than homework assignments and tests dealing with economic analysis. Whenever possible I include my own professional knowledge from my consulting practice and real world experience dealing with leaders of industry. I try to integrate economic theory with real world applications and give students first hand examples of how businesses use financial theory for capital allocation and financial decision-making. The students have fun applying course concepts to actual business situations.

We also play a stock market game in which groups of students get $100,000 on paper at the beginning of the semester and are encouraged to invest in stocks, bonds, options, and futures. Each week they can keep their current holdings or buy and sell securities in an effort to maximize the value of their portfolio. At the end of the term, the group
of students with the most money receives an award. I feel that this part of the course encourages team building, class participation, and healthy competition. It also provides students with a framework for learning and participating in the financial markets without actually losing money.

It is truly a pleasure to watch students learn and to know that you are instrumental in contributing to their professional future. Often students contact me after graduation to tell me how they have used what they have learned on the job or in their personal investments. Some call and ask for advice on everything from career choices to investment strategies. I enjoy teaching JOE 451 and strongly recommend that other alumni get involved in a teaching effort in their community.

Andy Crawford Teaches Project Management

I spent seven years after school ('64 BSIE, '66 Harvard MBA) working as a project manager and as director of operations. For the last 20 years I have been president of Ascott Corporation, an Ann Arbor t-shirt printing firm. Ascott has focused its energy on developing digital technology in an industry that is primarily old mechanical technology. Over the last 8 years I have taught courses in Entrepreneurship and Leadership in the College of Engineering.

IOE 491, Project Management, is focused on teaching the major skills that an engineer needs to successfully run a project. We identify these skills as:

1) Setting goals, building plans, and subdividing plans by tasks.
2) Scheduling and budgeting, using the computer programs MacProject and Excel.
3) Working as part of a team; running meetings.
4) Team building and leadership.
5) Negotiating.
6) Report writing skills and oral communication.
7) Dealing with stress and ethics issues.

The students are assigned to teams that develop a plan for a real project. In the Fall 1994 term, the project was a fast track construction project in Ann Arbor. The students met with the key players, gathered the information they needed, built a plan for how to organize and manage the project, and presented this plan to the owners of the building. Half of their grade is based on the plan and presentation.

The engineering curriculum does a good job at teaching students how to solve specific and complex problems. We also need to give them experience in dealing with broad, unstructured problems and working through a complete solution. This course requires the student to deal with busy people outside the college. They have to face problems that are intentionally left very open. The amount of work required is too much for any one individual to accomplish. In the end, they have to satisfy an outsider who is largely an unknown factor. All of this has to be done as a group.

The Michigan Engineering students really are the leaders and best. They will accomplish wonderful things in their careers and lives. They are searching for a focus in their careers and to understand the skills they need to succeed. It is very satisfying to bring 30 years of experiences and stories to the classroom to contribute to this process. The students also force us as professors to think through our assumptions about how the world works. It is very rewarding work.
Faculty Focus

James Bean continues work as co-director of the Michigan Joint Manufacturing Initiative. His research in genetic algorithms for scheduling and integer programming is funded by NSF. He is also NSF funded, with post-doc Nejat Karabakal, to investigate replacement of asset portfolios where capital budgets are enforced. An example is vehicle fleet replacement.

John Birge continues work on National Science Foundation projects on modeling global CO2 emissions, constructing new computational methods for stochastic programs, and intelligent methods for unit commitment problems in power systems. He also has support from the Electric Power Research Institute and has begun a study with Izak Duenyas on evaluating flexible capacity planning with Ford Motor Company. He was General Chair of the 15th International Symposium on Mathematical Programming (p. 5) held in August 1994. He also became Editor-in-Chief of Mathematical Programming, Series B. Within the university, he is a member of the Provost’s team to implement a new financial and management system, called Responsibility Center Management.

Yavuz Bozer was on sabbatical during the Winter 94 semester. Through the support of the Japan Technology Management program, Prof. Bozer traveled to Japan and Korea to visit numerous distribution centers, manufacturing facilities, and material handling vendors. Starting in January 1995, Prof. Bozer will serve as the Acting Director of the Program in Manufacturing while Prof. Ulsoy (from MEAM) is on sabbatical.

This year has been one of national recognition for Professor Don B. Chaffin. The American Industrial Hygiene Association (with 11,000 members) elected him a Fellow, and bestowed on him the Edward J. Baier Award for outstanding technical contributions to industrial hygiene. Chaffin also was elected Fellow status in the American Institute of Medicine and Biological Engineering, and to membership in the very prestigious National Academy of Engineering. He also was asked to present the opening address at the 3rd Pan-Pacific Conference on Occupational Ergonomics in Seoul, Korea, and presented seminars to Samsung and Goldstar managers. Professor Chaffin’s research continues to emphasize biomechanical modeling of heavy physical exertions, and computer simulation of normal human postures during performance of common tasks.

Gary Herrin will be on sabbatical from January to August 1995. He won the Outstanding Teaching Award this past year awarded by Alpha Pi Mu. He continues to teach popular courses in “Statistical Quality Control” and “Operations Management” with enrollments averaging over 100 each per term. He is active in research with 5 current doctoral candidates on topics related to reliability and warrantee prediction, chemical process control, optimal experiments for robust engineering design of climate control systems, estimating process capabilities with censored data, and multivariate control of auto body-on-white. He supervises student projects with Chrysler, Ford, and GM as part of the MJMI program and as a principal investigator on a project with Focus Hope (with Prof Hancock). He is coordinating the development of a new masters degree program in “Quality Engineering” which should be available in the next year.

Jeffrey Liker has been active as Director of the Japan Technology Management Program (see article in this issue). A recent article based on research from this program appeared in the Nov.-December, 1994 issue of Harvard Business Review (“A second look at Japanese Product Development”). Last summer he organized a two-day course on “Integrated Product-Process Development: Design through the supply chain”
Monroe Keyserling received the Liberty Mutual Best Paper Award for his 1993 contribution to the International Journal of Industrial Ergonomics titled “The effectiveness of a joint labor-management program in controlling awkward postures of the trunk neck and shoulders.” This award was presented during the Human Factors and Ergonomics Society’s annual meeting in Nashville. Co-authored with Barbara Silverstein and Milton Brouwer (a current Ph.D. student), this paper reported the results of a three-year ergonomics intervention study sponsored by the United Auto Workers and General Motors Corporation.

Keyserling is currently performing research with Ford Motor Company and the Walt Disney Company to develop improved methods of ergonomic job analysis. Results of this work were reported at the American Industrial Hygiene Conference in Anaheim and the International Ergonomics Association Triennial Meeting in Toronto.

Keyserling continues to serve as the IOE Graduate Program Advisor and reports that our graduate enrollment now exceeds 200 Masters and Ph.D. students. He also is serving as an advisor to the U.S. Occupational Safety and Health Administration.

Tava Lennon has joined the University of Michigan as Assistant Professor in Industrial and Operations Engineering. Professor Lennon received the B.Sc. (honours) in Mathematics in 1989 from the University of Auckland, New Zealand. She then received from Stanford University both the M.S. in Statistics in 1992 and the Ph.D. in Operations Research in September 1994.

Professor Lennon teaches courses in simulation and stochastic processes. Her research interests include the stochastic modeling of manufacturing systems, queueing systems and applied probability. Her current research activities focus on the scheduling and analysis of multi-class queueing models with significant setup times. She is particularly interested in studying systems that arise from within actual manufacturing companies.

Katta Murty published his first undergraduate text book this year. This 581 page Prentice Hall book with the title “Operations Research: Deterministic Optimization Models” is the final version of a manuscript that has been used as a coursepack for IOE-310 over several years.

Vijay Nair received a three-year grant from the National Science Foundation to do research in the areas of experimental design and reliability. He is continuing his research on these and other statistical methods in quality improvement, including Taguchi’s robust design, yield improvement in IC fabrication, process control, and Bayesian inference from mixture models.

He is working with several IOE students on an investigative project on quality issues at Chrysler.

Chelsea C. White, III’s current professional involvement is primarily focused on transportation and includes Director of the University-wide Intelligent Transportation Systems (ITS) Research Center of Excellence, chair of the Rackham Transportation Studies Program Committee, member of the Board of Directors of the ITS World Congress, chair of the IEEE Institute-wide ITS Committee, and member of the ITS America
Committee on Public-Private Partnerships. He will be chairing a College-wide committee to study the development of a College-wide program in transportation engineering. His current transportation-related research interests include studying the impact of information technologies on the efficiency of commercial vehicle operations, the interrelationship between ITS and the National Information Infrastructure, the development of a Southeast Michigan testbed for ITS products and services, and the development of routing and scheduling algorithms for intermodal public transportation.

Rachel Zhang has joined the University of Michigan as assistant professor in Industrial and Operations Engineering. Dr. Zhang received her B.S. in Applied Mathematics from Zhengzhou Institute of Technology, People’s Republic of China and her Ph. D. in Industrial Engineering from Northwestern University. She had taught mathematics for five years before starting graduate school.

Professor Zhang teaches courses in Operations Management, and Production and Inventory Control. Her research interests lie in the application of optimization methods and stochastic analysis to manufacturing and inventory control systems. Her recent research activities include developing easily implementable policies for multi-echelon spare parts inventory systems and scheduling in manufacturing systems.

Visitors

Dr. Dayong Li, from the Electric Power Research Institute in Beijing, China, is visiting the IOE department during the 1994-5 academic year. In China, he built an artificial intelligence model for predicting electric power usage across China and for optimizing the locations of new generators and transmission lines. At UM, his research concentrates on real-time forecasting capabilities in power systems.

Charitable Contributions

As mentioned in the lead article in this newsletter, we are all quite grateful to your support of our development efforts, in particular, for the IOE building retrofitting. We reached our initial goal of securing enough funds for the most essential renovations of the building such as the relocation of the department administrative offices, general upgrade of facilities, and construction of a modern computer laboratory. We were not, however, able to raise sufficient funds to equip a vibration laboratory which would be a university resource for studying the effects of mechanical stimuli on human performance.

Other department needs are ongoing. Some critical examples are:

- student support - As you all know, the costs of education have grown faster than inflation in recent years. In Michigan, these increases have been amplified by reduced (in real terms) state support. Fellowship contributions are needed and welcome at any time.

- equipment - the retrofitting project has sufficient funds for construction and basic furniture but our needs for specialized equipment, particularly computer hardware and software, extend beyond our current capabilities. Again, your contributions are needed to keep us competitive.

In considering a contribution, remember some of the key points stressed in last year’s newsletter:

- full-market value deductibility for appreciated assets;
- ability to designate “I.O.E.” or “Industrial and Operations Engineering” on the donation form under “Other” designation.
- availability of matching funds in many corporations.
This news is from alumni responses to the Fall 1993 Newsletter.

Lotfi Baccouche (BSE '85, MEng '87 — Cornell) is a manager at Citibank NA in Tunis, Tunisia with responsibilities that include managing an offshore unit. Lotfi writes, “Planning a trip to Tunisia? Call on me!”

Andy Bressler (BSE '87, MSE '88, MBA — U of North Carolina) is now Director of Policy and Research at the National Institute for Health Care Management in Washington, D.C. His responsibilities include conducting public policy and strategic management research in the managed care industry.

David Chan (BSE '92) is now employed at the Catholic Medical Center in New York. David is the Assistant Corporate Director of Quality Assurance. His responsibilities include patient satisfaction, re-engineering of physician support services, regulator relations, and database manipulation.

Adam Chaskin (BSE '92) is the Chairman of Advanced Systems Group Marketing at Vanguard Research, Inc in Virginia. Among other duties, Adam is working with European scientists to develop environmentally safe products.

Kevin Gilligan (BSE '88, MBA '92 — Indiana University) is completing a management rotation program at H.B. Fuller Company in Minnesota, and will take a management position at one of Fuller’s plants. Prior to starting work at Fuller, he was involved in business development with the MBA Enterprise Corps. in Krakow, Poland. The MBA Enterprise Corps. is a post MBA volunteer organization in which selected participants assist an Eastern European firm transition into the new market economy.

Eric Haan (BSE '92) is employed as an Applications Engineer at Production Modeling Corporation in Dearborn, MI. His work primarily involves discrete event manufacturing simulation.

Scott Horvarter (BSE '85, MBA '92 — University of Denver) is a Senior Engineer in Proposal Management/Business Development at Martin Marietta Space Launch Systems in Denver. Scott writes, “Anyone in Denver should look me up!”

Robert F. Mull (BSE '71) was appointed Director of the New Generation of Vehicles Program at Ford Motor Company in October 1993. As director, he will create and manage the framework of Ford’s participation in the government/industry research initiative. Mull will also work with the company’s research scientists and engineers to develop and coordinate programs attempting to reach the partnership’s ambitious goals — including the possible development of a revolutionary early 21st century “Super Car” aimed at tripling the fuel economy of a typical family-sized car without sacrificing affordability, performance or safety.

Jerry Rattenbury (BSE '87, MBA '93 — U of Dallas) is a Methods Engineer at Texas Instruments in Dallas, Texas. His responsibilities include improving assembly, inspection, and testing methods in the Defense Electronics Printed Circuit Board Shop. In October 1993, he married Kathy Blueming, a native of Pittsburgh, Pennsylvania.

Marc Resnick (MSE '90, Ph.D. '93) is an Assistant Professor and Director of the Human Factors/Ergonomics Laboratory at Florida International University.

Jeffery B. Sidney (BA '64 — Yale, MA '65, M.Sc. '66, Ph.D. '70) is now a professor of Administration at the University of Ottawa.

John J. Skrbina (BSEME '51, MBA '61, MSE '66) is now retired from Ford Motor Company where he last served as an Engineering Supervisor in Chassis Design.
Construction of the new Integrated Technology Instruction Center (ITIC) is rapidly progressing, as seen in this photo of the North Campus Diag taken from the north.

As seen from the east, the new Engineering Center Building will connect the IOE Building (left), the Cooley Building and the Lay Automotive Laboratory. It will house the College of Engineering administrative offices and provide additional space for the IOE Department.