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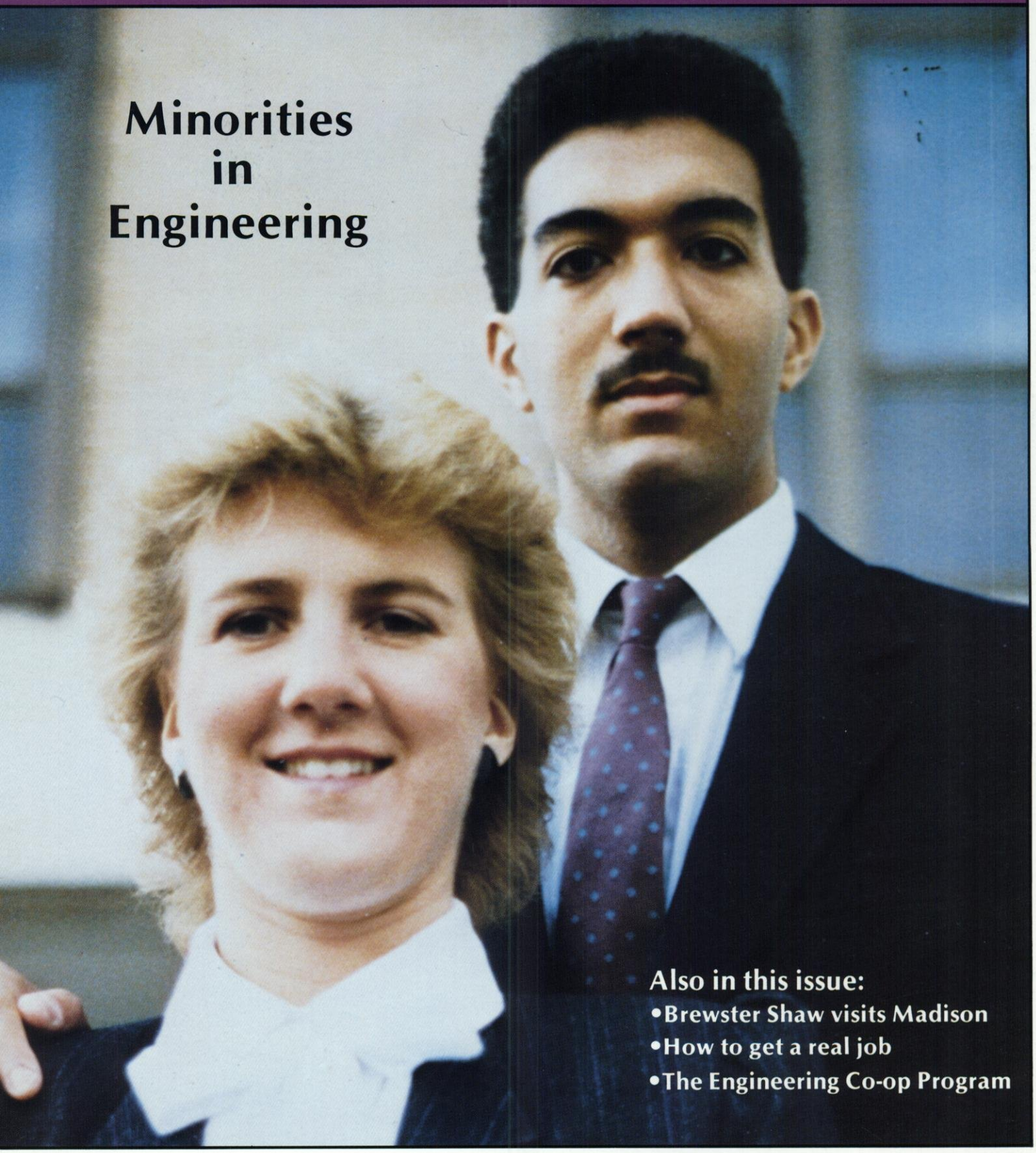

Minorities in Engineering

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- How to get a real job
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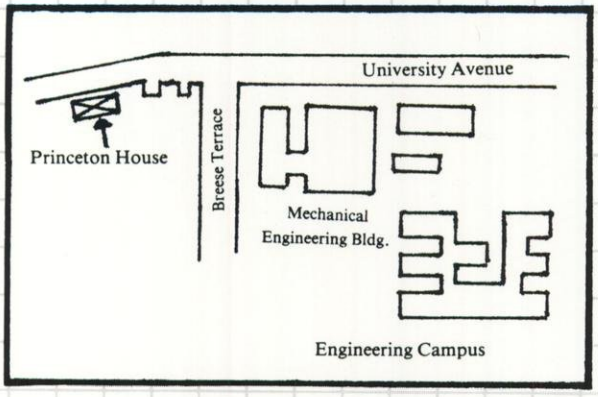

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E is for Effort, Education, Excellence, and Editorial

Guest Editorial

by Scott Paul

One problem of great concern to students is that many of the best instructors are leaving the University of Wisconsin to accept more lucrative offers in industry. It has been proposed that we could reduce this problem by increasing the salary of instructors to a level comparable to other major universities. I have two things to say about this topic. First, a university should treat its instructors fairly and with respect, and it should pay them a fair wage. Second, I do not think that raising the salaries of instructors will stop this problem.

First, we are generally not losing people to other major universities; we are losing them to industry. These firms are often prepared to pay higher salaries than any university is willing to pay. So even if we raise salaries to a level comparable to other major universities, we will not be outbidding private firms who are out to lure away our quality people.

By no means should we then assume that the only people left teaching are substandard. Far from that -- many good people stay with the university, for a variety of reasons. They may like their jobs -- they like to teach, to do research, to have the flexible hours and autonomy. In general, the life of a university professor appeals to them. These people who enjoy teaching make very good instructors and we are actually rather unlikely to lose them -- unless they get fed up with a university that is unwilling to pay them fairly for their talents.

However, we still have a problem. Some of the best people **are** being siphoned off by industry, but there is no effective mechanism in place for siphoning off or improving ineffective instructors. The quality of the teaching staff tends to become more mediocre. If this problem is not addressed then the quality of education here will certainly not improve.

A program dedicated to improving the quality of education at the UW might incorporate some of the following ideas.

Companies sometimes hire some of the university's leading instructors to come to the company on a short-term basis to give seminars or conduct training programs. Similarly, it may be possible to make arrangements with the companies who have hired the leading people in their fields to have those people come to the university to give lectures or to conduct part or all of a particular class. One can often learn more in a single lecture from an expert in a field than one can learn from several lectures from a less talented individual.

Another real and serious problem at this university is that many professors, although they may be renowned experts in their respective fields and may be doing brilliant research, are ineffective communicators. An instructor needs only two qualities to be able to teach well -- he must be able to understand the concepts being taught, and he must be able to convey those ideas clearly to other people. Communications skills should be carefully assessed via student evaluations and/or outside evaluations. The university should offer programs to enhance the skills of the instructors who are not performing well.

The concept of merit pay has always been a touchy issue. It is difficult to state what criteria should be used to evaluate people and who should do the evaluating. Great care must be exercised to insure that such a system is implemented fairly. One possibility that might not cause too great a controversy would be to keep the current pay structure, but to make some additional funds (or a fraction of the salary base) subject to performance criteria. Such a program could be implemented on a trial basis and evaluated to see if it is effective at rewarding superior performance and motivating instructors.

The point is that current efforts to fortify the school's faltering (although still good) academic reputation are aimed at inappropriate targets. For example, the university wants to cut enrollment and hire more instructors in order to reduce the student-to-teacher ratio so that students get more individual attention. Most students don't go to office hours anyway. We would be better off if we were being taught in crowded classrooms by the best professors in the field than if we were receiving individualized attention from someone who has to struggle to communicate his ideas.

If money is spent on poorly thought-out improvement programs that do not offer real solutions, then the quality of education here at the university will most likely continue to decline.□

Dean's Corner

The UW's Minorities Engineering Program

by John G. Bollinger

Since 1972 when my predecessor, Dean Marshall, assembled the first conference on minorities in engineering, the College of Engineering has had a strong commitment to creating opportunities for Blacks, Hispanics, and Native Americans to take a place in the engineering profession. The program began by creating a financial base of state resources and industrial contributions for its support. The goal of the engineering minorities program is to recruit, assist and retain until graduation the greatest number of minority undergraduates possible. As the pool of minority undergraduates has grown in this country, we have added the education of minority graduate students to our mission. We further hope that we will also be able to add minority faculty to our professorial ranks in the near future.

Under the leadership of a very effective staff, our effort has maintained what we believe to be one of the leading engineering programs in the country despite the difficult roadblocks encountered by students such as high grade point admission standards, reductions in financial aids, and growing support systems from alternative opportunities in other schools that have initiated engineering minority programs.

We hope that we will be able to add minority faculty to our professorial ranks in the near future.

To understand the problem, one must realize the strikingly different educational and cultural backgrounds that many of our minority students experience compared to a majority of the students admitted to the University. This is particularly true for students who grow up in the inner core of larger cities. Early in the beginning of the minority program at Wisconsin, it was realized that a form of recruitment was essential to inspire minority high school students to come to Wisconsin from around the United States. A high school student summer program was initiated which has resulted in our College's recognition as a great institution to attend. Many summer program students have characterized our program as demanding, inspiring, rewarding, and just plain great. Evidence of the effectiveness is that 60% of the participants enter a college of engineering. An additional 35% enter some form of higher education including medicine, law and the humanities. Thus 95% of the participants choose to continue their studies in pursuit of a career.

Financial resources are a serious problem for many minority students. We have tried to combat the effect of reduced financial aids by significantly increasing the level of participation of minority students in the co-op education program, industrial scholarships, and student loans. All co-op students achieve a greater level of financial independence through the co-op experience as well as developing greater motivation and inspiration for completing an engineering degree through on-the-job training.

There is no compromise to achieving a sound educational base to practice the profession of engineering.

The College's latest effort to improve the minority population in engineering has been to create a special summer engineering, technology, and industry in-training program for middle school and high school teachers from predominantly minority schools. This program was made possible by grants from the National Science Foundation and the Wisconsin Department of Public instruction, and by cooperation with IBM. In this program, high school teachers come to Madison for a two-week in-training session where they receive an intensive program in technology and engineering issues. We give them class materials that can be used in their programs at home to provide inspiring subject materials to interest students in engineering problem solving. Following the study period, the teachers are employed at IBM plants to gain insight into industrial problems and opportunities. Next year we plan to expand the program to involve more companies in Wisconsin. Our goal is to build a network of high school teachers throughout the state who will identify and inspire young minority students to enter engineering studies within the University of Wisconsin System. To date, the program has received rewarding praise from the teacher participants.

Dean John G. Bollinger

I think you will agree that the College's commitment to minority education is sincere and is leading to action that is productive. We recognize that commitment alone is not sufficient to be successful in solving the long-standing problems in our society. We also recognize that there is no compromise to achieving a sound educational base to practice the profession of engineering. Our contribution will continue to be the operation of creative programs that win the support and enthusiasm of participants, and inspire them to exceptional achievement.□

In the Beginning. . . .

The creation of the Engineering Minorities Program

by Sue Sartain

"Julius Irving is great because he had his hands on a basketball since elementary school. It's the same with minority students; if they had their hands on the necessary study skills since elementary school, they'd also be great,"concluded Willie Nunnery, founder of the College's Minority Engineering Program. The need for better preparation was the primary reason for incorporating the program in 1972 and remains the focus of the Minority Engineering Program today.

The Minority Engineering Program offers assistance to Black, Native American, and Hispanic students through a summer program, financial aid, advising, and tutoring. The Pre-Engineering Summer Orientation, lasting eight weeks, is designed to improve the math and science skills of potential engineering students or to allow them to get a head start on the math and science skills taught at the university level. The goal is "to remove the stumbling blocks and increase the number of minority students,"according to Naomi Walton-Winfield, assistant to the program's director.

The program began in 1972 with 16 students and now consists of more than 132. Even with increasing enrollment, Winfield said that minority students are traditionally not involved in higher education. They lack information and preparatory courses necessary for success. She remarked, "Students live up to expectations. If they know what they have to do, they do it, but it is crucial they have the necessary tools and information. If they have the tools, they succeed."

THE IDEA

The Minorities Engineering Program became a reality in 1972 and the driving force behind it was W. Robert Marshall, former Dean of the College of Engineering. Marshall organized a conference on minorities in engineering in 1972 to find a way "to encourage minority students to get involved and to survive."Before this time, virtually all minority students failed classes in their freshman year. Only a handful had actually graduated in the entire history of the College. Marshall stated, "I tried to give it (the program) leadership. We had a committee, but it wasn't doing a lot. I think the Dean's Office took major leadership."

Marshall was also responsible for bringing the young and energetic Willie Nunnery from the University of Kansas to implement the program. As Assistant to the Dean, Nunnery worked closely with Marshall to determine the program's objectives and sources of funding. The Engineering College Consortium of Minorities was founded by Marshall in 1974. The 12 universities and 6 industries involved sought to sponsor summer programs and implement programs like Wisconsin's at other colleges. Marshall said, "I regard Wisconsin's program as one of the best in the United States. Willie Nunnery has to get a lot of the credit."

THE FOUNDER

Willie Nunnery majored in civil engineering at the University of Kansas. As a student, he persuaded the school to institute a scholarship and grant-in-aid program that increased the black attendance in the engineering school. He also personally raised $75,000 for the program.

Nunnery cited three goals in the implementation of the program which are still the major concerns today. These are increasing minority enrollment, developing a pre-engineering program, and sensitizing the faculty to the needs of minorities and getting them actively involved. Concerning the faculty aspect of the program's goal, Nunnery commented, "I applaud Wisconsin. The faculty has taken a leading role in assisting the program. This isn't true at a lot of universities."

Another unique element of Wisconsin's Minority Engineering Program is that it is separate from all other minority programs. It is the only undergrad minority program housed in the college it serves. "I made sure of this before I took the job,"said Nunnery. From industry, Nunnery raised over $100,000 per year to supplement other state and federal aid. Industry, he said, was very receptive. The minority program became active only a short while after the Civil Rights Act was ratified, and industry was very determined to get minorities into the work force.

Dean W. Robert Marshall

Today a significant amount of funding still comes from industry.

Two large problems have surfaced recently that have had a profound impact on the minority student, according to Nunnery. The first is increased enrollment. Academic standards have risen, and the students on the bottom of the degree-seeking totem poll have no access to engineering. In the 60's and 70's a C average was acceptable, but now each department has adopted different, higher grade point requirements. Because of their poor educational background, minority students are being excluded. Another more complex problem is the disintegration of the black family. In the 1950's only 20% of all black households were headed by a single parent. That figure has jumped to 60% today. Minority students on the whole are also lacking valuable parental guidance and resources.

"The access is there," Nunnery emphasized. "The problem is that you don't have top-notch students ready to get through the Wisconsins of the country." Nunnery, who one summer simultaneously coordinated four other programs in four other states, referred to the job as a "painful process."Yet, the dividends are paying off as, 14 years and 125 graduates later, the Minorities Engineering Program is alive, well and slowly expanding.□

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Back to School

High school teachers experience engineering

by Mary Schultz

Education is the key with which teachers are able to open students' minds to the endless possibilities that await them. With so much power in their hands, who would be better to enlighten students about the many aspects of engineering than teachers? A summer program, sponsored by the National Science Foundation, IBM, the Wisconsin Department of Public Instruction, and the College of Engineering at the University of Wisconsin, equips high school teachers of minority students to educate these students about industry and about the different branches of engineering. This program, the Academic Industrial Training Internship Program (AITIP), consists of two parts: a ten-day engineering awareness program followed by a six-week internship at an IBM site. During the year, teachers are recruited from schools around the nation to participate in AITIP, which has been held at the University of Wisconsin for two summers now.

When July rolls around, everyone gathers in Madison to begin the first part of the program. The teachers attend many sessions daily to give them a taste of the wide array of engineering activities that exist. Sessions scheduled for last summer included a lecture on material science, a tour of the robotics lab, hands-on instruction in basic computer programming, an outdoor lab on land surveying and a tour of the UW nuclear reactor. Participants felt the variety of sessions gave them an invaluable means to help students get in touch with alternative professions available to them. Although the daily schedule is rigorous, time is allotted for more in-depth experimentation in labs during the evenings.

Participants in the 1985 summer program.

At the end of the ten-day session, after all the good-byes have been said and addresses exchanged, the teachers return home for the second part of the program: a six-week internship at IBM.

Upon arrival, teachers are welcomed to their personal module containing the necessities for whatever tasks they will be expected to carry out in their six-week stay. Also, each teacher is assigned a specific manager who is available to answer questions. Carol Welsch, a Madison participant in AITIP from Orchardridge Middle School, pointed out, "They (IBM) really made me feel at home."Welsch relocated to Owego, New York for her internship to work at an IBM site that handles defense contract work. She was quite impressed that even with the confidentiality of the site's undertakings, IBM still provided pictures, slides, and posters for classroom instructional aides prior to her return home.

Carol Welsch feels the entire program gave her a whole new direction to teaching. She can use anecdotes from her experience during lectures and finds that parents are more willing to accept her technical opinions as valid due to her newly acquired experience. The impact of AITIP on Orchardridge Middle School students is twofold. Indirectly, the students are asking more questions about industry and engineering. More directly, as a result of Carol Welsch's sparked interest in this particular session of the program, a tour of the UW robotics lab is now a scheduled field trip for Orchardridge students.

Besides giving teachers the opportunity to earn some money in the summer (participants are payed their regular teacher's salaries for the duration of the program), Welsch feels that AITIP is a great renewal for teachers, who are given the opportunity to work in a new and different subject with adults before returning to kids once again for the school year. "This program is a tremendous boost to a profession (teaching) that loses far too many people to burnout."

If subsequent summer sessions are as successful as in the previous two years, the AITIP will be around to enlighten teachers and their students for many years to come.□

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You've Come a Long Way, Baby

The history of women engineers at UW-Madison

by Bob Wolf

Women in engineering. They are scarce but they do exist; in fact, they've been around longer than most people think. Mildred Wadsworth Cambell, in 1896, became the first woman student enrolled in the College of Engineering. Since then, numbers have increased greatly; today there are 612 women enrolled in engineering out of 7521 students.

Emily Hahn was the first women granted an engineering degree at the University of Wisconsin-Madison. She received her degree in mining engineering in 1925-26. For several years she worked for a mining company in Chicago. However, later she left the field of engineering to pursue an interest in literature, and has taught creative writing at Yale University. She has written several books, including studies of China in the thirties, novels, biographies, and even cookbooks. In 1976, the honorary degree Doctor of Humane Letters was awarded to Emily Hahn by the University of Wisconsin-Madison, which cited her as "a true pioneer in establishing the right of women to have their own careers."

World War II caused the first notable increase in enrollment of women in engineering. The period from 1944-1947 saw 74 women enroll. Previous to this period, the number of women enrolled was seldom more than two per year. In 1948 enrollment dropped again. However, from 1955 to the present the number of undergraduate and graduate women enrolled has been increasing steadily.

The University has attempted to increase the number of women in engineering in a number of ways. Two programs entitled "Expanding Your Horizons" and "Retooling Strategies" help female students visiting the campus to learn more about the college. There are also high school programs where university students from the Society of Women Engineers and Women in Engineering conduct workshops for the students right at their high schools. Once enrolled into the college, women are encouraged to join Women in Engineering and The Society of Women Engineers.

There are several reasons for the increase in enrollment of women, but perhaps the most important factor is society's changing attitudes toward women in engineering. Women in engineering careers -- or in any kind of career -- were regarded with suspicion in the past, as not being 'feminine.' But as as more and more women enter the workplace, the line between 'man's work' and 'women's work' is blurring and disappearing; women now can choose from almost unlimited selection of careers.

Times have certainly changed since Mildred Cambell was enrolled; maybe in another 90 years the percentage of women enrolled will be even greater than it is today.

A blast from the past . . . .

When it comes to women in engineering, you've come a long way, baby. But so has the rest of society. Attitudes towards women with careers have changed dramatically; compare this article, which appeared in the December 1944 issue of the Wisconsin Engineer, with the opinions of today:

"It is beginning to tire me, this continued squabble as to whether or not females should be and can be good engineers. I, personally, think that they shouldn't be, but they do have potentialities as engineers. I believe that most of the fellows agree with me in saying that. We have no resentment toward any females that go into engineering; however, we also agree that though they may be 'lady engineers,' they cannot be truly 'women engineers.'

"I don't think that I've ever heard any of the fellows, when discussing females in engineering say, "She's not so dumb. It's one way to get a man."We don't as a rule, like to think of being married to a woman engineer. We want someone who will be a good, truly feminine, type of wife. This coming home at night and hearing what wifey dear did at the plant today after we have already spent a long hard day there ourselves would really make us down on females in industry.

"In all seriousness, we men engineers do not hold anything against women in engineering. In fact they may make very intelligent ones; however, we do not think it possible for any person, either male or female, to hold down two very important jobs at the same time and be able to make a success of both. We do not believe a women can work hard all day and then come home, clean the house, make a good dinner, etc. It is too much to be expected of any human (or are women engineers human?). Also there remains the very important fact that in any happy family group there must be children and these children must be given a real mother's care. This day care stuff is not very hot stuff when it comes to raising children properly. This is evidenced by today's high juvenile delinquency which is caused in the main part by women in war work not taking care of their children. One of the parents should be home to take care of the child, and I doubt if any man would do that. It isn't natural."□

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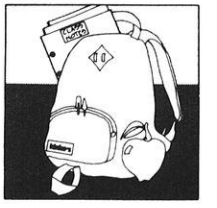

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The Engineering Summer Program

Minority high school students get a taste of college life

by Mike Solomon

Summer. For the undergraduate, it means work or summer courses. For those still in high school, the usual routine is relaxation, with a little work on the side. However, forty-one minority high school students broke that routine this summer. They participated in the Engineering Summer Program, an eight-week session designed to prepare them for enrollment in the College of Engineering at UW-Madison.

"Our office divides our responsibilities into three areas: pre-college, college and post-graduate," said Mr. Al Hampton, Director of Minority Programs at the College of Engineering. "This program falls into the category of pre-college. We take minority high school students, give them a summer of intense instruction in math and science, and encourage them to return to high school and take courses that will give them the background to enter the College of Engineering."

The Engineering Summer Program, ESP, created in the summer of 1972, is geared toward high school minority students who will be entering the eleventh or twelfth grade. It also accepts high school graduates who will enroll as pre-engineering freshman at Madison in the fall. This past summer, seven of the program's forty-one students fell into the latter category.

In past years, as many as 50% of ESP's participants have enrolled in engineering at Madison.

"Since we have two different types of students here--those who will be in college, and those still in high school--our program has two different aims,"continued Hampton. "We hope to prepare the freshman for the rigorous course load he will experience in the fall. With the younger students we stress the basics that will prepare them for college."

"Stressing the basics" is perhaps an understatement; this summer, classes ran from 8 a.m. to 4 p.m., Monday through Friday. Based on math placement test scores, students were assigned to one of two different algebra classes. Those in the lower level also studied chemistry, while those in advanced math took "Statics and Strengths of Materials," a specially prepared high school engineering course taught by Dr. Henry Haslach of the Mechanical Engineering Department. Other classes included writing and communications, computer science, and study skills. Library time was assigned, as was a curfew: in the dorm by 10:30 on weekdays.

"We take minority high school students, give them a summer of intense instruction in math and science, and encourage them to return to high school and take courses that will give them the background to enter the College of Engineering."

The planners of the program realized that the classroom isn't the only place to learn; twice weekly, representatives from different industries spoke on careers in engineering. In addition, the group toured the IBM Marketing Office in Madison and took field trips to industrial plants in Milwaukee and Rockford, Illinois. Eleven students gained hands-on experience in the laboratory with UW-Madison faculty. They were released from afternoon courses to participate in RAP, the Research Apprentice Program, coordinated through the graduate school.

Naturally, weekends meant a break from routine. The program advisors organized picnics and basketball contests while students could choose from all the activities a summer in Madison offers. But, added Hampton, "During the week it was strictly down to business."

Since ESP is academically challenging, admission is a bit selective. "First off, the program is only offered to minority students who will be in the tenth, eleventh, or twelfth grade, or who will be entering the College of Engineering in the fall,"explained Hampton. "We found that students any younger than the tenth grade are lacking in the maturity necessary for this program. The other essential requirement is an interest in engineering. Beyond that, we prefer at least a year of math for tenth and eleventh graders, and two years for those entering twelfth grade. Science is always helpful, and we recommend two years. However, given a motivated student, we have made exceptions to these requirements." Hampton noted that if a student were to be entering Madison in the fall, standards would be much higher: at least two years each of math and science, and preferably three or four years of math.

Faculty for the summer program ranged from undergraduates to graduate students to professors. Two dorm advisors roomed with the forty-one students in Kronshage, one of the Lakeshore dorms. Six student advisors were available as tutors. They also planned recreational activities and aided the class instructors.

The College of Engineering and State of Wisconsin provided the primary funding for ESP, while industry picked up the remainder of the bill. The cost of the program is based on the individual's ability to pay. "We supply monetary grants to reduce the initial cost of $750 if necessary,"said Hampton.

Hampton noted that in past years as many as 50% of ESP's participants have eventually enrolled in engineering at Madison. Roughly 90% go on to some form of higher education. Others choose to join the armed forces. Commented Hampton, "Though we hope many will enter engineering, our primary goal is to give them enough information so that they can make an intelligent career decision."

"Over the years I have seen two extremes of student in this program," continued Hampton. "There are those who have never had things go quite their way in high school. We help to build their confidence. On the other hand, there are those who have breezed through high school. They develop a false sense of security that we work hard to break.

"So even though we push them all summer, we still care about them. While we're preparing them for engineering, we're molding them into better people."□

Professor Janet Ellzey

Bringing diversity to the Mechanical Engineering Department

by Jerry Hill

photo by Pat Phalen

Professor Ellzey: "I thought being an engineer was a step above a plumber."

Mechanical Engineering professor Janet Ellzey knows better than most what it feels like to be in the minority. Ellzey is one of only five female engineering faculty members, while her male counterparts number 200. She is one of only two female professors outside of the General Engineering department.

Professor Ellzey grew up in the town of Alice, Texas. She came to UW-Madison after receiving her Ph.D. from the University of California-Berkeley and completing her undergraduate work at the University of Texas at Austin.

Even though women are a definite minority in the entire field of engineering, UW-Madison has an especially low number of women on the engineering faculty. Ellzey notices this on the job. "Any time you're set apart you're a minority. I certainly don't feel discriminated against," said Ellzey.

Ellzey believes that one reason for the lack of female engineering professors is the great shortage of Ph.Ds among women in engineering. This fact would lead to the conclusion that most graduating women engineers are going into industry. Ellzey feels the decision to teach or to work in industry has a lot to do with the emphasis and environment of a student's particular school. "At Berkeley they stressed academics; other places emphasize industry," said Ellzey.

Another reason for the lack of women in engineering is a misunderstanding of what engineers do and what engineering is about. "When I was an undergraduate in physics, I thought being an engineer was a step above a plumber." Ellzey believes a lot of women who are in engineering come over from the sciences; this makes some engineering departments more popular than others. "Life science and chemistry were the first to open up for women, then came the harder sciences like physics and math," she said. Chemical and electrical engineering are popular among women engineers because many find it natural to go from chemistry to chemical engineering or, to a lesser extent, from physics and math to electrical engineering. Ellzey believes that Mechanical Engineering's lack of popularity among women is due to the fact that it has no counterpart in the sciences.

While Ellzey is in the minority in the college as a whole, she is also a minority of sorts within the Mechanical Engineering department because her research differs from the mainstream of the rest of the department. The emphasis of Ellzey's research is turbulent flow in jet engines, while most of the research in mechanical engineering is centered around internal combustion engines. Ellzey studies fluid dynamics to minimize pollution while increasing fuel efficiency. Her research also focuses on fluid instabilities and how they can be minimized to reduce engine noise, stalling, and other problems.

Ellzey is very much a fundamentalist in her research. She works primarily with simulators in the lab, opting to use an apparatus that would duplicate the desired part of a jet engine to be studied rather than set up a complete, working jet engine.

A new area of study for Ellzey, one a little more in keeping with the rest of the Mechanical Engineering department, is the cause of soot formation in diesel engines.

Professor Ellzey brings diversity to the Mechanical Engineering department with her jet engine research, and at the same time contributes some much-needed diversity to the faculty of the College of Engineering.□

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The Engineering Co-op Program

Expanding its size and services

by John Loehr

The UW's Engineering Cooperative Education Program is continually setting and reaching new goals. The success of the program can be attributed to its director and assistant director, Sandra Arnn and Helen Richardson.

Their present goal is to interest more qualified engineering students and more employers in joining this partnership between industry and the College of Engineering.

Arnn remarked, "The number of women involved in the co-op program is very small; we would like to attract more women."One reason for the low number of women in the program may be a recent decrease in the number of women enrolled in engineering. While the percentage of women involved may be small, the percentage of minorities involved with the program is even smaller. Arnn hopes that more minority students will become candidates in the future. She and Engineering Minorities Director Al Hampton will be working together to attract more minority students to the co-op program.

Although women and minorities are not well-represented, the number of co-op students is on the rise. This past summer, the co-op program placed 156 engineering co-op students with business, government agencies, and industry, compared with 100 during the summer of 1985. Seventy-two students were placed during the spring semester of 1986. During the past year, the total number of co-op placements has increased by 41 percent.

Arnn cites three possible reasons for the overall increase in interest and placement. First, more students are becoming aware of the higher probability of being hired permanently after working as a co-op student. Second, the reduction of financial aid has motivated more engineering students to seek high-paying co-op jobs to help finance their education. Third, the UW's Engineering Co-op Program has attracted many more recruiters for their co-op students. There were twice as many co-op companies recruiting on campus in the spring semester of 1986 as there were the previous spring semester.

In addition to expanding participation, the quality of the program is also on the rise. Arnn explained some policy changes within the co-op program that have made it more accessible. Co-op students are no longer required to work in industry for at least three work periods. Rather, students can decide on the number of work periods they would like to serve, ranging from one to four. A "work period" is designated as either a semester or a summer.

Arnn emphasized that students who limit themselves to fewer co-op work periods also limit the number of recruiters who review their applications, but it is still a good experience. She stated, "I am pleased that a larger number of students are now gaining co-op experience. While it is preferable for students to complete two or three work periods, even one work experience with industry is very beneficial."

One reason that students are no longer required to complete a certain number of work periods is that companies such as IBM and Hewlett Packard generally hire a co-op student for only one work period. Students may reapply for additional terms after completing their first one.

Students who want to work only summer periods are normally directed to the Summer Job Program, located on the fourth floor in Wendt Library. Students may stop by any time after November 10 to obtain information.

Outside the office, Arnn and Richardson spend time at industries, persuading more employers to join the Engineering Co-op Program. Arnn explained that of the sixteen businesses they visited during the past year, ten were located in Wisconsin. She believes that attracting Wisconsin companies to the program offers a student the opportunity to work closer to home and offers the business community and the state the opportunity to keep some of the best engineers in Wisconsin.

Through the efforts of Sandra Arnn and Helen Richardson, the Engineering Cooperative Education Program hopes to continue its trend of increasing student and industry participation while providing ways for potential participants to learn about co-oping. □

The Co-op Student Association

The Co-op Student Association is offering valuable assistance to present co-op students and those students interested in joining the program.

The Association is headed by newly elected officers Chris Crain (President), Tim Conner (Vice President), Steve Loehr (Treasurer) and Mark Shaw (secretary).

Crain said that one of the Association's functions is sending out mailings to all co-op students, to help them find housing near the UW and at the site of co-op work. This is especially beneficial to those students who work the fall semester and may have difficulties arranging housing near the UW for the spring semester. The mailings are also helpful to those who must move to unfamiliar surroundings at their co-op work site.

The Association also compiles a list of those students who have already done co-op work. This list gives future and present co-op students the opportunity to contact these sources and ask questions concerning co-op work at a particular site.

The Association recently invited a recruiter from General Motors to speak on cooperative employment at that company; the Co-op Student Association is planning on scheduling more such speakers this spring.

All engineering students are invited to the Association's meetings and suggestions are welcome. They are not scheduled on a regular basis, so to find the times, contact one of the officers during their posted hours: 1-3 p.m. on Wednesdays and 10-11 a.m., 1-3 p.m. on Thursdays, 407 Wendt Library. You may also contact the Cooperative Education Program office (262-8883).□

Cogeneration

Unlocking the hidden potential of waste heat

by Paula Grgurich

Cogeneration is an old technology that is experiencing an explosive rebirth of interest. Put simply, cogeneration is the production of two different types of useful energy from a common combustion process. In industrial facilities, cogeneration usually means generating electricity directly from what would be waste heat.

A popular approach is to replace the existing boilers an industrial plant uses to produce process steam with a gas turbine. The gas turbine generates electricity with the hot exhaust gases used to produce additional electricity and process steam. Such a system is really a self-contained power plant that generates electricity for the industrial facility's use or sale to a local utility, while at the same time supplying process steam.

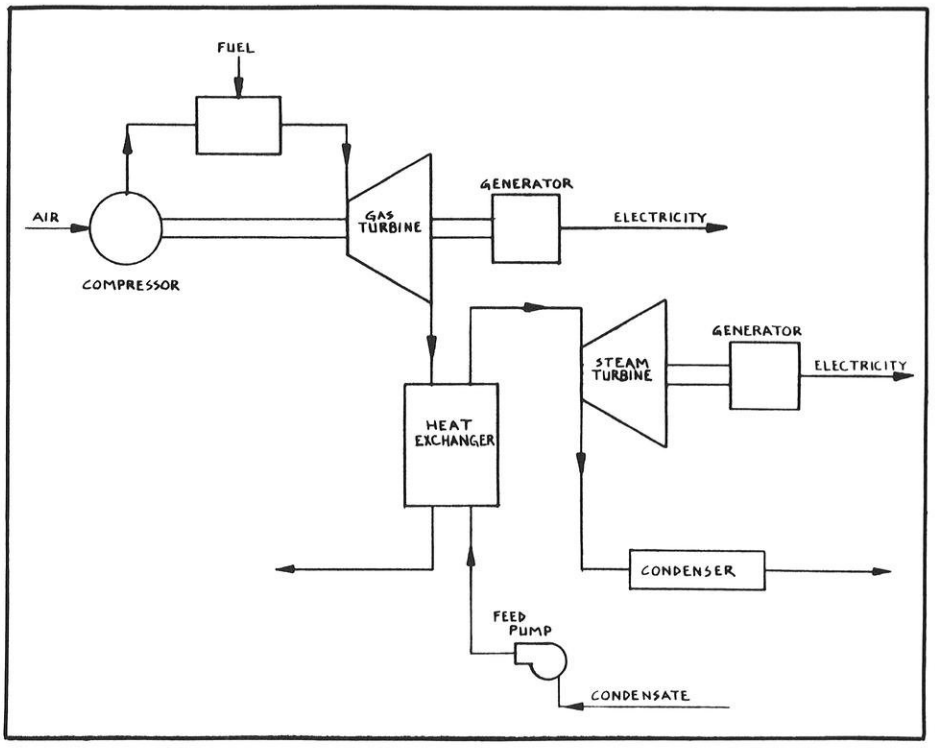
Scale factors make large energy consumers the major targets. The process industries, in particular refinery, chemicals, pulp and paper and food are the primary industries. Municipalities and institutions make up the balance of the market.

The cogeneration market will continue to be driven by economic and public policy trends, some well-established and others just now emerging. Principal among these are:

Cogeneration produces two different types of useful energy from a common combustion process.

economic expansion and electric power demand growth, rising fuel costs, rising retail electric power rates, decline in electric utility capability for raising new construction capital, and favorable tax laws and the 1978 Public Utility Regulatory Policy Act (PURPA) regulation.

The trends toward growth in demand for electric power, increased fuel costs, rising retail electric power rates, and inability of some utilities to raise capital are fairly well-known in the power industry. However, tax incentives to cogeneration investors and the PURPA regulation requirements are less well understood.



graphic by Gary Webster

A combined-cycle cogeneration plant.

First of all, the characteristics of the cogeneration market and the timing of its resurgence have been significantly influenced by tax incentives available for investors in cogeneration projects. In particular, tax incentives have accelerated market growth and created third-party projects with 'over-the-fence' sale of electricity and steam by investors who finance building of the new generators and can maximize utilization of tax credits.

Secondly, cogenerators do not have to be concerned about finding a buyer for excess power generated or installing costly back-up systems. PURPA requires that utilities purchase power form qualified cogeneration facilities at their avoided cost of production and provide back-up power to the utilities.

The result: a new technology in which an old technology, cogeneration, is applied to a wide range of clients to reduce fuel costs through improved efficiency.

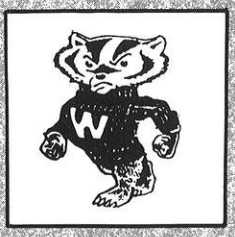
In business, companies very often have 'skunkworks' where a few individuals work outside the mainstream of the company. They work toward a vision of a new business or product. If not encouraged, they are at least condoned and allowed to succeed or fail. The cogeneration group of my co-op company provides an excellent example.

Developing business contacts and making client contacts to understand more about the cogeneration market, they worked within very difficult constraints. They remained billed, operated with minimal resources and worked tremendous personal overtime. But their success (3 major contracts, including the just completed University of California-Berkeley Project) exemplifies how well entrepreneurship can work within a company.

Cogeneration will supply most electrical capacity added in the next decade. In a time when we have to get all we can from our limited resources, cogeneration offers a way to make good use of energy that would otherwise be wasted.□

Engineering Briefs

by Brett Bridgham



Chemical Engineering

The Chemical Engineering department welcomes two new additions to the staff this semester. The new members are Thatcher W. Root and Douglas C. Cameron.

Assistant Professor Root just completed a two-year postdoctoral appointment at AT&T Bell Laboratories and arrived at UW-Madison in October. Root's main area of research is developing an understanding on a microscopic level of surface reactions through the use of solid-state nuclear magnetic resonance (NMR) spectroscopy. The use of NMR in conjunction with other catalyst characterization techniques creates a powerful tool for approaching problems in surface chemistry.

Assistant Professor Cameron will arrive on the UW campus in December. The main area of Cameron's research is the investigation of using biotechnology for the large-scale production of chirons. Chirons are small enantiomerically pure chiral building blocks that are used in the synthesis of selective enantiomers (pairs of crystals the are mirror images of each other). These selective compounds are commercially important to the pharmaceutical and pesticide industries.

Mechanical Engineering

The Mechanical Engineering department is undergoing a modernization period. In conjunction with the campus-wide laboratory modernization project, the Mechanical Engineering department is designing a fully equipped computer-aided design (CAD) system that will allow students to apply design techniques similar to those used in todays industry.

A similar project is being undertaken in the shop facility of the ME department. The overhauling of the shop, along with the introduction of the CAD system, will comprise a computer aided manufacturing lab. This "factory of the future" concept will provide a lab for undergraduate mechanical engineers as well as the manufacturing systems engineers.

Two major research projects within the Mechanical Engineering department are the Space Commercialization project and the Internal Combustion project.

The Space Commercialization project, under the direction of Professor Ravani, consists of three major aspects. They are 1) how to grow food in space, 2) how to mine fuel from the moon, and 3) the study and application of robotics to assist in the commercialization process. One can imagine the impact this particular project has on the future.

The research of internal combustion is under the direction of Professor Borman. The main thrust of this research is to study advanced propulsion concepts through analysis of basic combustion. This analysis incorporates combustion principals applied to all types of engines.

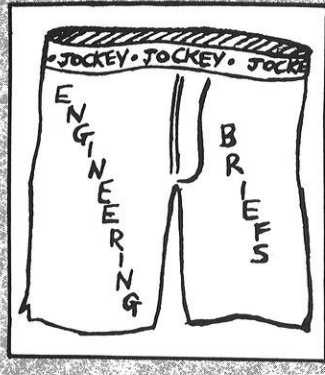
Industrial Engineering

Members of the Industrial Engineering department are recognized for their accomplishments in the field.

Assistant Professor Bill England received the Robert Wood Johnson Foundation Fellowship. He will be working with the federal government in Washington. The fellowship, one of only six given out annually, lasts for one year and is organized to establish health policies.

Assistant Professor Gregg Vanderheiden, Director of the Trace Research Center, has been asked to serve on the National Advisory Board for "Technology and the Disabled." The board analyzes the role that computers play in assisting the disabled to help them function more effectively. Vanderheiden developed a word processing system for victims of cerebral palsy which allows them to use word processors at a reasonably fast rate. Some variations of the system have strong implications for word processing in general.

Francois Sainfort, a Ph.D. student in Industrial Engineering, was the recipient of the first annual Roland E. Stoelting award. Stoelting, a past Director of Public Works in Milwaukee, donated the money to establish the annual award.



Wisconsin Engineer

General Engineering

The General Engineering department is now providing scholarships for incoming freshmen. The program, run on a trial basis last year, now provides up to $2500 for those students who have attained high academic standing in their high school curriculum. For students to become eligible for these awards, they must score highly on the SAT or ACT scholastic aptitude tests and be in the upper 5% of their high school graduating class. The students must also receive a recommendation from their high schools' science or math departments.

The General Engineering department, in cooperation with IBM, The National Science Foundation, and The Wisconsin Department of Public Instruction, is involved in a pre-engineering program designed to educate high school science teachers who teach classes made up of predominantly minority students. For more information on this program, see the related article "Back to School" in this issue.

American Society of Engineering Educators

"I thought we had outstanding plenary sessions. I was also favorably impressed by the computer demonstrations," said Dean Donald Dietmeyer, referring to the annual meeting of the North Midwest chapter of the American Society of Engineering Educators (ASEE). Dietmeyer was responsible for organizing the convention which was held October 5-7 on the UW-Madison campus.

The plenary session included addresses by Gordon Geiger, President Elect of the Accreditation Board of Engineering and Technology (ABET), who urged educators to emphasize design more in every engineering curriculum. Steve Bomba, Vice President of Corporate Technology, also spoke and reiterated that need, adding that engineering education is not providing industry with "real" engineers--those who have the vast knowledge required to design consumer products better than German or Japanese engineers. Bomba criticized grade point requirements as a criteria for admitting students to engineering and cited research that shows there is no correlation between grade point average and creative capacity.

Other highlights included panel discussions on legal issues pertaining to faculty, increasing minority graduates, personal productivity, improving the quality of teaching and improving engineering design courses.

ASEE's mission is to improve engineering education by networking concerned professionals from both education and industry.

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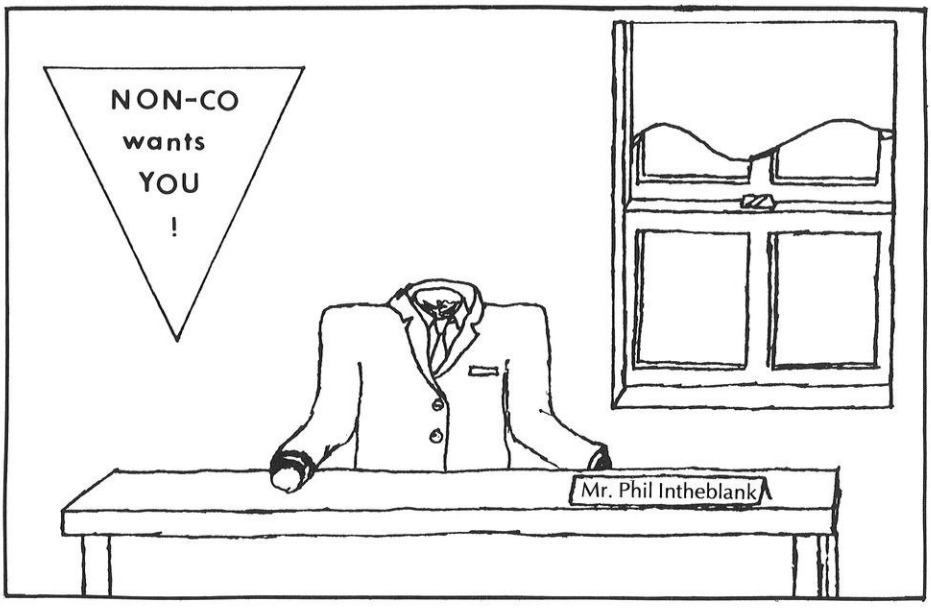
How to Get a Real Job

A guide to gaining the ultimate employment

by Scott Paul



graphic by Charles Spengler

Your interview?

Too many students mess up their career search by not taking it seriously enough. The job market **is** competitive. Some students will not get jobs; others may be forced to accept jobs that do not make full use of their capabilities. You've worked very hard to make it this far--it would be a mistake to risk blowing a potential career by taking it for granted that you will get a job when you graduate. Here are some tips that may help your career search be a successful one:

Don't rely entirely on the placement office.

A great many companies do come to campus via the placement office, and it is an excellent place to find out about companies and set up interviews. However, not all companies come to campus. Use all the resources that you can get your hands on. Find the trade journals where companies you might be interested in advertise, talk to professors, dig. If a company does not come to campus then you are on your own to contact that company.

Write a resume.

The placement office people will tell you that your College Interview Form (CIF) is an adequate substitute for a resume. The CIF is convenient for employers because it makes it easy to sift through candidates. They read the job description paragraph and look at the grade graph on the back. The CIF reduces the student to a standard format.

However, you want the employer to notice you. If you write a resume, then you package your skills, strengths, and experience in order to present yourself in as favorable light as possible. For example, the CIF places a heavy emphasis on grades. The whole back of the form is devoted to class grades and the grade graph. If your grades are poor, or if you would really like to emphasize your experience or activities, then it is really in your best interest to write a resume.

It is even a good idea to mail your resume to companies that are coming to campus and will see your CIF. They will see your CIF as one form out of several similar forms. You can send a resume well before the interview date, and in your cover letter you can request that they send you a priority letter. By proceeding this way you can have them evaluate you by looking at your skills instead of by comparing you to the other sheets of paper that are all stapled together in the CIF book. By all means do fill out a CIF and be included in the placement office process. But sending a resume in addition to the CIF may call additional attention to your name when it comes time to send out priority letters.

Another advantage of using a resume is that you can then use a cover letter to state your career interest in the company. The CIF has you write a job interest paragraph. Most students I know would be willing to accept a variety of different jobs. The most effective way to proceed would be to find out what type of jobs a company has available; if one of those jobs appeals to you, then you should write a targeted job letter that really goes after that particular job. If you write a general CIF paragraph, companies might pass you over for students who wrote more specific paragraphs matching the job available. On the other hand, if you write a targeted, specific CIF paragraph then you run the risk of removing yourself from serious consideration from a different sort of job that you might really have enjoyed.

Your resume is probably the single most important paper you will ever write--do it right. There are plenty of resources available to you. There are dozens of books and articles on how to write resumes and cover letters; look at examples. It would also be a good idea to have a technical writing instructor in the General Engineering building review your resume before you begin sending it out.

Send thank-you letters.

This is a matter of common courtesy, but some students forget to do it. The students who send them have the advantage over students who don't. In addition to reminding the recruiter of your qualifications, it shows the recruiter that you are sincerely interested in the job. Thank-you letters should be sent as soon as possible after the interview. And if you were interviewed by more than one person then it is a good idea to send letters to each of the people you spoke with.

Use the phone.

Resumes get lost more often than you would think possible. Recruiters may not be planning to begin interviewing people until after you graduate. In any case, it never hurts to use the phone, and your career is worth the long distance expense--even if you can't afford it. You can call to explore opportunities, to see if the company has received your resume, to request a priority letter or interview, to follow up on leads. It is the one way to be

(continued on page 17)

Is There Life After College?

James Bailey: a winner's philosophy

by Pete Steinhoff

James Bailey received his degree in Mechanical Engineering from UW-Madison in 1981. He is now employed at Procter & Gamble Paper Products Company in Green Bay, Wisconsin. After James spoke at a meeting for the Wisconsin Black Engineering Student Society at Union South, I talked with him about his work and what it is like to be a minority in industry.

Q. James, what do you do for P&G?

A. I am a process area manager within our plant engineering module. This module is primarily responsible for all utilities and energy management for the three plants which make up the Green Bay division of the Procter and Gamble Paper Products Company. These utilities include: steam production, water treatment, compressed air production, management of electricity rates and consumption, waste fuel burning, and city water use.

I manage two of these processes. The water treatment facility processes river water for use on all paper machines, and a fluidized "bed bark boiler" uses bark instead of natural gas for heating ambient air to dry the paper. I also manage the people (coaching, training, etc.), set and manage the budgets, and establish operation direction and technology improvements.

Q. How did you prepare for your interview with P&G?

A. I did my homework. I went beyond the company's annual report and literature supplied to the placement office. I researched the company's history, their headlines in newspapers during the previous five years, talked to students who worked summers at P&G, and recalled much information I learned during a tour sponsored by the company while I was a high school student in the Minority Engineering Summer Program at UW-Madison in 1976. I was well-versed on P&G and was impressed with how the company could meet my career interests. There was a match between our interests from the start. The interviewer was impressed with my knowledge of their problems and processes, my accomplishments at UW-Madison, communication skills and ability to work with and lead people effectively. My skills in communication were a great asset during my plant visit. The company was very impressed with the five-year career plan I unfolded before them, which was actually the product of Professor Mark's Professional Orientation assignment. My career with P&G was launched!

Q. Do you think that companies actively recruit minorities in industry?

A. During my time at UW-Madison, yes. I can't speak for industry as a whole, but there are a good number of Fortune 500 companies who realize the value of diverse work groups. Diverse work groups spawn creativity, challenge the status quo, and cause a company to really see other possible ways of doing business that they never considered before. The competition is fierce for the small number of individuals in the minority pool.

Q. How is the work place conducive to diverse work groups?

A. Companies prohibit racist and sexist behavior. Racist behavior is still perceived, however. It is very covert and it cannot be proven. An example of such covert behavior could be when a black group leader does not recognize a white group member during a meeting. The group's morale, efficiency, and productivity are less than what would be expected if this behavior was not present. By enforcing policies that prohibit such behavior, companies can provide an environment which is conducive to diverse work groups.

Q. What is it like to be a minority manager in a field where other managers are predominantly white?

A. It is a challenge. I feel the situation will not change within the next ten or fifteen years, so I take the attitude that I'm as qualified as the fellow engineer and I'm damn good. This is what my fellow managers will see.

Q. How do you feel other managers react to you as a minority manager?

A. The majority of the white managers I have encountered react to me the same as other managers in the workplace. Outside the workplace can be a different story. People tend to go their separate ways. But the challenge is to initiate the after-work networking yourself and not wait for it to happen, or wait until someone eventually feels comfortable enough to ask you to get involved. This works very well if the person has no hang-ups. If they do, you'll know it very quickly. The person can't hide it; it'll show.

Further, networking is a two-way street. If they don't initiate, you do. Everyone likes a winner. Your behavior and mannerisms of confidence can be contagious.

Q. What advice would you give to students who are about to graduate?

A. Develop your oral communication skills, both oral presentation and one-on-one communication. For example, the volume you use when you speak will make a difference in how much impact your words will have. Impact demonstrates confidence and a winner's philosophy.

Develop your writing skills so you can convey your messages clearly.

Develop your career goals by taking Professor Mark's Professional Orientation class in the spring semester of your junior year. Understand what makes you tick, what motivates you to do your best. Take a look at your past accomplishments that made you feel good about yourself, starting as early as childhood. Look for trends and common themes. These are the kinds of things that will help you be successful in launching your career.□

Success Through Involvement

Minority and female student groups promote participation

by Dave Hazenaw

Most engineering students attending the University of Wisconsin will say their areas of specialty are enough to worry about without any outside pressures. But for those who are also minority engineering students, the pressures can be even greater.

Three student minority groups on the engineering campus are reaching out to help other students deal with problems and decisions about their careers. These groups are the Society of Women Engineers (SWE), the Wisconsin Black Engineering Student Society (WBESS), and the Hispanic Organization for Preprofessional Engineers (HOPPE).

SWE, under the supervision of faculty advisor Lois Greenfield, is a 100-member group that serves female engineering students.

"We are part of the national SWE organization, which includes both student and professional branches," said Lyn Borner, president of the UW chapter. Borner is a junior majoring in Engineering Mechanics.

One of the main activities of SWE is informing potential engineers about the various areas of study. "We provide an outreach program to promote engineering to women in high school," Borner said. The group also sponsors other activities and services throughout the year, including a Big Sister/Little Sister program, resume workshops, a Christmas party, and an evening with industry.

The group helps students meet with representatives of various industries like McDonell Douglass, Hewlett Packard, and Proctor and Gamble about possible career moves. "We also have company presentations--at least three or four a month," Borner said.

SWE meetings are held once a month, and membership fees are $10, with $8 going to the national headquarters. Borner said she is happy with the progress of the society, and she looks forward to upcoming activities.

WBESS works toward some of the same goals as SWE, but it stresses retention and attrition of black students as its major concerns.

"Our attrition and retention rates are very bad," said Leah Newman, president of WBESS. "We're not able to pull in the freshmen and sophomores to replace students lost by graduation." As a result, WBESS is attempting to start an outreach program similar to the one provided by SWE. This program, according to Newman, would be part of a region-wide circuit of colleges from the Midwest.

Beside the problem of retaining a good student network, WBESS also suffers from sporadic participation. Newman added, "Sometimes people won't participate because they have work to do." The group does become closer after major workshops or conferences, like the group's regional conference in Chicago. "When we go to conferences and get a chance to intermingle with other students, the group grows closer--like a family," she said.

In addition to regional conferences, WBESS participates in the Engineering Exposition as well as holding biweekly meetings. The organization is currently trying to establish an alumni society which will bring graduates back to the University to help current engineering students.

Three student minority groups are reaching out to help other students deal with problems and decisions about their careers.

WBESS is part of the National Society of Black Engineers. Membership fees are $5, all of which go to the national headquarters.

Sometimes it is difficult to find enough time to join an established student society. Imagine trying to start one from the ground up. Javier Font Rodriguez, a senior mechanical engineering student, has experienced just that. Rodriguez is the founder and driving force behind HOPPE, the Hispanic Organization of Preprofessional Engineers.

Rodriguez got the idea for an Hispanic group in 1984. "I was a transfer student from pre-medicine to engineering, and I saw how hard it was for minorities, and so I established this program," he said.

The group, a member of the Society of Hispanic Professional Engineers, is having some trouble getting off the ground. "It has been a very rocky start for HOPPE," he said. One possible cause is that many Hispanic groups form cliques, resulting in a lack of fellowship between the cliques.

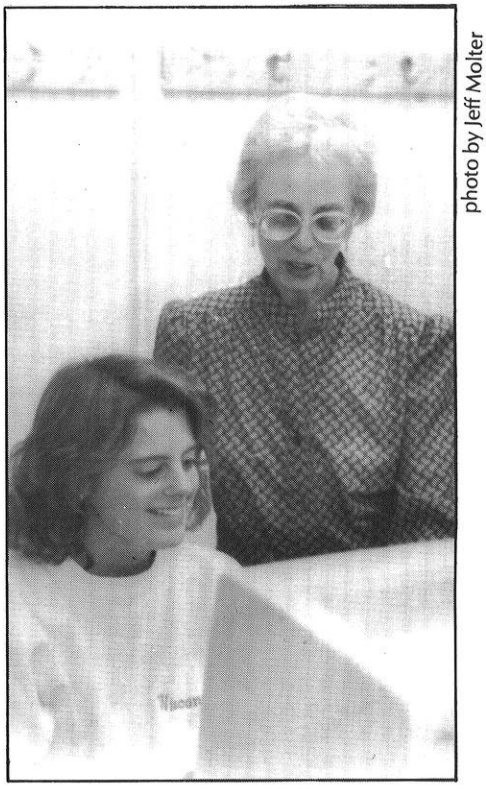


photo by Jeff Molter

Professor Lois Greenfield, advisor for SWE, assists a student.

"You have to make an impact on students and show them you have something to offer."

The goals of the group include providing funding for Hispanic students interested in engineering, getting various Hispanic groups to interact, and promoting a sense of pride among Hispanic students at the University, according to Rodriguez.

Services and activities provided by the organization include job fairs and tutoring. At present, Rodriguez is in the process of establishing an Hispanic Council which would help to strengthen ties between minorities at the University.

"Being founder takes a lot of my time," he said. "Right now I am trying to get a strong base of freshmen and sophomores to make it (HOPPE) a big voice for Hispanics." Rodriguez noted that only about five of the group's 20 members have already transferred from pre-engineering into their majors.

Regular meetings and activities have recently gone by the wayside as Rodriguez works on the Hispanic Council. "We will be starting meetings again in about two weeks." he said. "I want to gather about ten people for the Hispanic Council. We will hit on exposure of what the organization has to offer for all Hispanics."

Exposure is a key element to the future success of HOPPE. "You have to make an impact on students and show them you have something to offer."Rodriguez said. Eventually, Rodriguez would like to expand HOPPE to other universities, but first he will concentrate on working with other student groups such as SWE and WBESS to help him develop a core upon which he and the group can build on. "Next semester we'll go full tilt to promote HOPPE.

"The toughest part is to get individuals involved who know what they are doing," he said. "Involvement is the key to success."

Those interested in finding out more about HOPPE or the other minority student engineering groups can call the Minority Engineering Office at 262-7764.□

How to Get a Real Job

(continued from page 14)

sure that you have gotten through to the appropriate person.

Don't procrastinate.

Interviewing and pursuing job leads takes up a lot of time. Most students do have to take classes their last semester and may find themselves too bogged down in work to do a good job of job hunting. If you hit it hard at the beginning of the semester (finding out about companies and mailing out letters and resumes) then the rest of the time during the semester would be spent mainly following up on leads, setting up interviews, and writing thank-you letters. It will still be a hectic semester but you will be able to conduct your career search in a more professional manner if you get started early.

Progressive aggressiveness.

I would like to end with a personal philosophy that worked well for me. The key is to get a yes or no answer from each company that you are interested in. I approached each company by first mailing a letter and resume. Most companies responded within two to four weeks. I took appropriate action on any positive responses (most were negative so don't get discouraged easily). After a month I still hadn't heard from about half of the companies I had sent resumes to. I then began a campaign of follow-up calls to confirm that my resume had been received and then pressed them to find out the status of my application. Sometimes they would say that they weren't hiring people. This was discouraging, but it narrowed down my prospects, and so I concentrated my efforts accordingly, discussing opportunities and requesting interviews from the people who hadn't rejected my application outright.

Do not leave any stone unturned in your quest for the ideal career. Use all the resources at your disposal. Don't abandon leads until you get a yes or no answer. Do a professional job of career-hunting and you will have the best possible chance of finding a professional career.□

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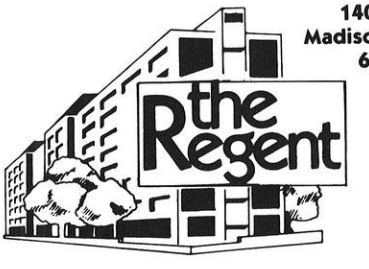

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Alma Mater of an Astronaut

Brewster Shaw: shuttle pilot and Wisconsin engineer

by Wayne Bauer

Hundreds of people returned to Madison this October for Homecoming weekend. Some had not been back for many years; some had travelled thousands of miles to be here. But there was one among them who had travelled farther than any other--in fact, more than 4 million miles. For the University of Wisconsin-Madison is alma mater to its very own astronaut: Lt. Col. Brewster Shaw.

Shaw graduated from the University in 1968 with a bachelor's degree in engineering mechanics and received his master's degree from the same department in 1969. He returned in 1986 to receive the Service Award from the College of Engineering at the Engineers Day Dinner.

How does one become an astronaut? In Shaw's case, it was determination, hard work and incredible skill in flight. After graduating from the University, Colonel Shaw joined the Air Force where he logged 644 hours of combat time flying in F-100 and F-4 aircraft in Vietnam. During this time he received many honors including the Air Force Distinguished Flying Cross, Air Force Outstanding Unit Award, and National Defense Service Medal. His numerous Air Force flying awards include the F-4 Top Gun Award and the Top Formation Pilot Award.

After returning from Vietnam in 1975, Shaw went to Edwards Air Force Base where he was a test pilot. From 1977 to 1978 he served as an instructor at the U.S. Air Force test pilot school. In all Shaw logged 4,200 hours flying time in over 30 types of aircraft.

Brewster Shaw made his first flight into space on November 28, 1983 as the pilot of the space shuttle Columbia. The Columbia's six-man crew (including Dr. Robert Parker, an astronomy professor from UW-Madison) was the largest ever launched on one mission and they set a new record for length of time in space -- ten days. They carried the scientific module STS-9 Spacelab 1 with them and conducted 70 scientific and technical investigations designed by researchers from 14 different countries.

The experiments conducted aboard the Columbia flight were the most advanced and diversified up to that date.

photo by Gary Webster

Astronaut Brewster Shaw at a press conference in Madison.

Measurements were taken of the sun's energy output, the solar wind, atmospheric gases, and the effects of weightlessness on the human body and on plant growth. Experiments were conducted to see how microgravity techniques for processing materials could produce purer substances than can be made on earth.

Shaw brought the shuttle down safely on December 8, 1983 at Edwards Air Force Base in California. It landed with a record high ship weight of 110 tons and covered a record distance of 4 million miles.

His next mission was aboard the space shuttle Atlantis where he served as the commander. It was launched on November 26, 1985 from John F. Kennedy Space Center, Florida. The purposes of this seven day mission were to deploy three communications satellites and to perform a number of tests and experiments.

In addition to an RCA satellite for the United States, a Mexican and an Australian communication satellite were also deployed. The experiments conducted on the mission included working with a continuous flow electrophoresis system and a system used in diffusive mixing of organic solids. The most dangerous part of the mission involved two of the astronauts, Sherwood Spring and Jerry Ross, constructing an erectable space structure outside of the shuttle. Due to the pressure of the space gloves it was as if they were working with balloons on their hands, yet they successfully connected the entire structure.

During Shaw's visit to Madison he showed a film of the Atlantis flight to Professor Bud Schlack's Advanced Dynamics class. On the film, viewers could see what the inside of the cabin looked like and observe the astronauts both working on experiments. The astronauts also took time away from their work to have some fun; the dynamics class was amused to see the Atlantis crew playing a game of follow the leader around the orbiter in zero gravity, which resembled a group of scuba divers making their way through the ocean. Near the end of the film the class observed the Atlantis' descent back to earth and its perfect landing. The orbit was never more then 150 miles above the earth; land formations and even oil tankers were clearly visible on the film.

The next item on Brewster Shaw's agenda was to speak at Professor Ron Thompson's Design Problems class. Here he answered a series of questions put to him in a letter from graduate student. One such question was about the possibility of aborting a Shuttle mission after take-off, but while still within the earth's atmosphere. Colonel Shaw explained different ways to conduct this. One such case involving a certain angle of incidence of the nose of the Space Shuttle would require a full trip in the shuttle around the earth from Florida and a landing somewhere in North Africa.

Another student asked about different possibilities for commercial ventures in space involving the processing of products, and why they would be more efficient and cost effective in space than here on Earth. He gave two examples. One involved growing crystals in space; they would not be exposed to any contaminants and zero gravity would allow for quicker, easier growth. Another example was the processing of pharmaceutical products in space. Since most pharmaceutical products involve the mixing and joining of several materials for processing, it is easier to do this with zero gravity to allow for purer mixtures with no foreign materials absorbed.

Brewster Shaw's Homecoming weekend would not have been complete without a press conference, which he gave on that Friday morning. The first question posed to Colonel Shaw dealt with the importance of having people in space verses having unmanned missions. Mr. Shaw replied that it is very important to have people in space since there is much that machines cannot do themselves. He gave an example of how a piece of Skylab had ripped off in the 1970's and how humans were needed to fix it. If people hadn't repaired it Skylab would have been lost, wasting a great deal of money and opportunity for scientific research.

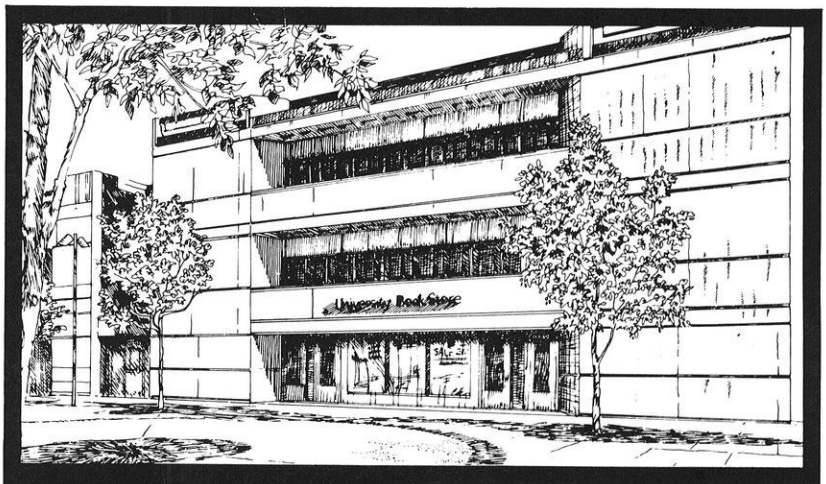
The next question, which was bound to come up, asked what was being done to fix the problems that caused the disaster of the space shuttle Challenger. Shaw said that the joints of the solid rocket motors were the problem. A "tiger team,"led by himself, was formed to solve the problem. They have been and will be spending much time at the Rockwell Corporation, Kennedy Space Center, and Johnson Space Center to fix the solid rockets. There are two lines, seventeen inches in diameter, that come into the bottom of the orbiter from external tanks containing liquid hydrogen and liquid oxygen said Shaw. On each side of the interface between the orbiter and the external tank there are four big valves. They must be closed before separation from the tank or else they will cause propulsive venting and damage the tank. They are "butterfly valves" which, when closed, will close off a cavity to prevent a flow stream. One of these valves between the orbiter and the fuel tank could also close during powered flight which would cause the three engines to blow up. These valves must be redesigned so they do not sit on top of the flow stream. This, said Shaw, is the number one priority.

"Getting people into space will always be a risky business; people must accept and minimize the risks."

Shaw believed that competent NASA engineers relied too heavily on theoretical models of solid rocket motor joint seals rather than thoroughly testing them. In practice the unplanned flow of gasses destroyed the seals and led to the Challenger's destruction.

Finally, when asked if anyone should go into space, Brewster Shaw replied that they should be able to, but that they must understand the risks. After 24 successful missions it seemed like a piece of cake to him, but "getting people into space will always be a risky business. People must accept and minimize the risks."

Professor Philip Kessel, Shaw's college advisor almost twenty years ago, said, "Brewster was an exceptionally good student. In fact, he was one of the best students I've ever had. He always said he'd be an astronaut. It was his dream." Men like Brewster Shaw bring pride to this University and encourage the dreams of students here that they can achieve the same level of success.□



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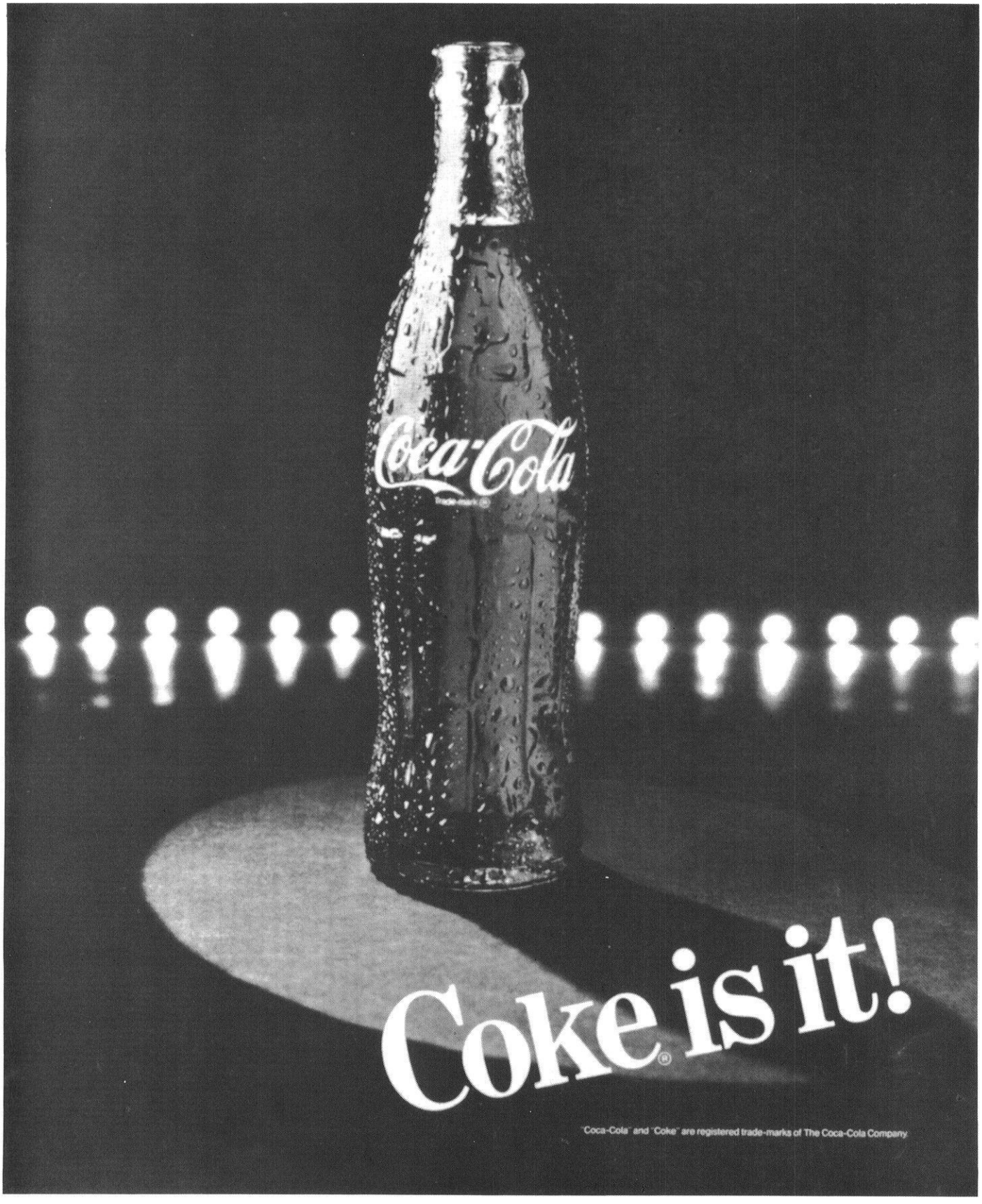
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From the Far East to the Midwest

A Chinese student adjusts to American life

by Steve Green

Tai-Son Ku is a twenty-eight-year-old, fifth year graduate student in Mechanical Engineering. He is a native of the People's Republic of China, a member of a minority group that, in engineering, isn't really a minority group; Asian students are well represented on this side of campus.

Most American students notice the Asian students, but do they stop to wonder about the great obstacles these students have overcome by succeeding in a foreign college with a foreign language? My goals in my interview with Tai-Son were to give other students a better perception of their foreign colleagues.

Tai-Son has been in Madison since 1982. He came to the University of Wisconsin after doing his undergraduate work at the University of Taiwan, and serving a mandatory two-year stint in the Chinese Army. My interview with Tai-Son took place in his "office," one desk among a dozen clustered in a room in the Mechanical Engineering Building.

Q. Why did you choose the United States to study in?

A. America is a big country so students can see and do a lot. Chinese students, in particular, are very accustomed to the American lifestyle and culture. English is, for many Chinese, especially those in Taiwan, a second language. Also, foreign degrees will help to get better jobs.

Q. How did you end up at the University of Wisconsin-Madison?

A. I applied to ten schools; the first thing I did was read a published rating of college mechanical engineering schools. Wisconsin was the first to give me a good response, so I came here. I received my master's in 1983, and have been doing research since.

Q. What are some differences you see between the Chinese and American classroom and education?

A. For one thing, in China, you never eat, drink or leave without notice in the classroom. Here, students are much more casual. In China, the student acts only as a receiver, and no creative ideas or opinions are expressed in class. Here students can disagree with the professor; students have many questions, and are free to ask them. You can see that Chinese students here don't talk much--it's not because they don't have questions, it's because they are disciplined not to.

I think that the American college environment is better, and the teaching is very good. In my own country, the teaching and education is good, but at the UW, the professors have funds to push students into research. The equipment and services available are also much better.

Q. How do you see the Chinese student as different from the American student on campus?

A. For the American student, his studies are only a part of his life. Girlfriends, social life and parties are all part of college life for the American students. The American student wants to enjoy life. But, most Chinese students are graduate students and must study more. Money is also a problem because school is expensive, and so foreign students want to finish quickly.

Asian students also appear quieter. This is because they are shy and afraid to ask for help. Their English is usually just good enough to discuss problems, but not debate over projects.

Q. Do you think language is a problem for Asian students?

A. Yes, but I think that much of learning the language depends on how aggressive the student is. There are many chances to speak English, such as group research projects and classroom interaction. I think that at first the language is a problem. Students take English tests when they first come here. My test score was okay, so I did not have to take an English class. But a friend tested low and he had to take English classes. I think it would do good for each student if they were to take such classes.

Q. Is the textbook English more difficult than English used in daily conversation?

A. No, reading the books is easy because I've been taught from English engineering books in China. When there is a joke in the classroom though, you can see everyone laugh, except for the Asian students. Daily conversation is hard, because there is a lot of slang.

Q. Do you feel a sense of community with the other Chinese students on campus?

A. No, I actually don't, because there are so many Chinese students here. I recognize and spend time with Chinese students in the same department as myself, and also those working on research projects with me. I really only pay attention to students from my hometown, Taiwan. I don't have many American friends either, except those I'm working with.

Q. What are your plans after school? Do you want to return home and work?

A. I would like to find a job in the United States, and get experience working within industry. Working in America, I have more access to technology. I feel I can gain a lot from working in industry, and then maybe, go home. I don't know now if I'll return to China to work or not.

Q. Do you feel you've abandoned you native culture at all?

A. Somewhat, but I don't really think about it. For myself, because I am studying in America, I must think American, and adopt all American culture. Because of school, food and friends I am very much an American, but really I am still Chinese.□

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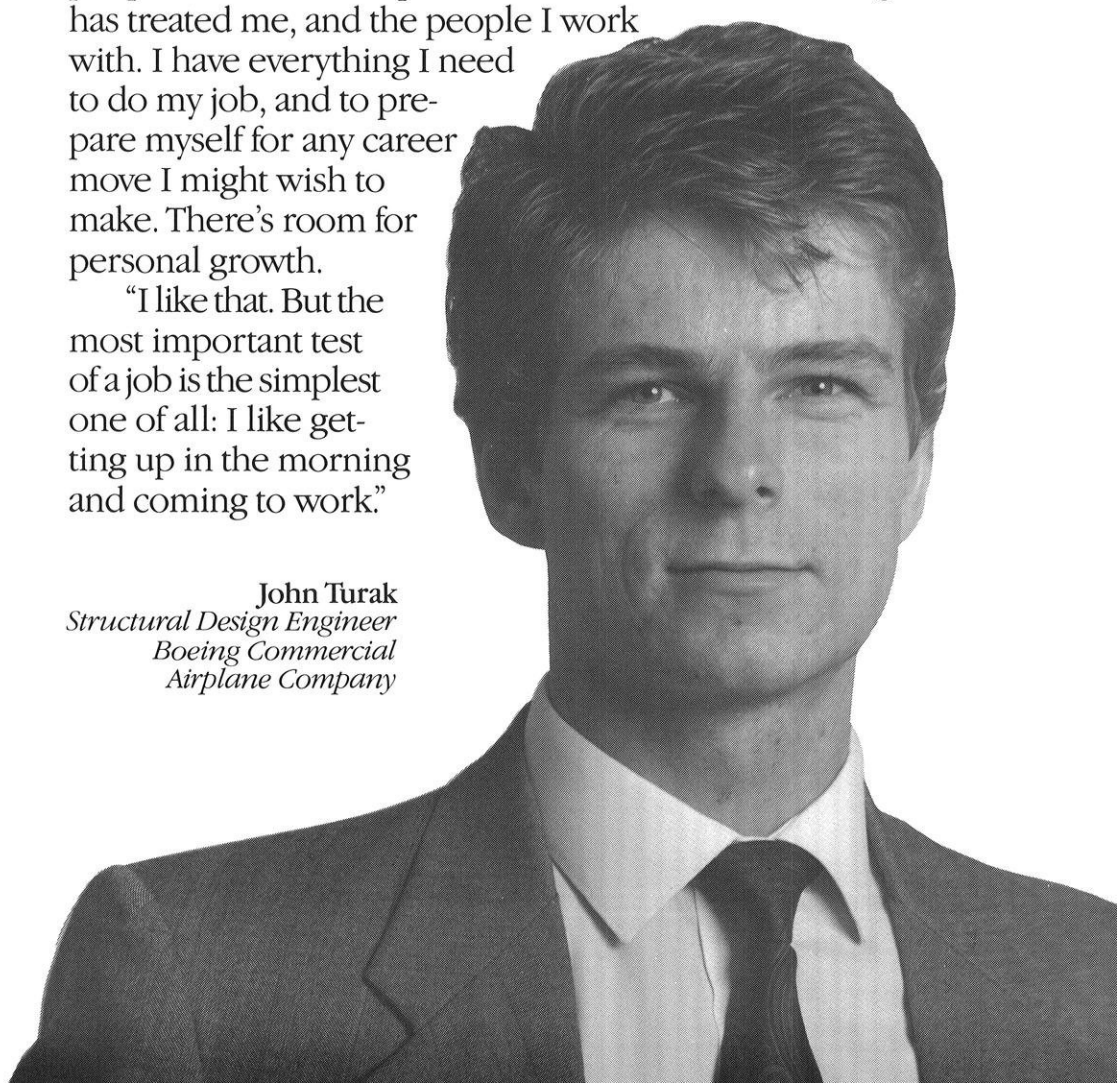

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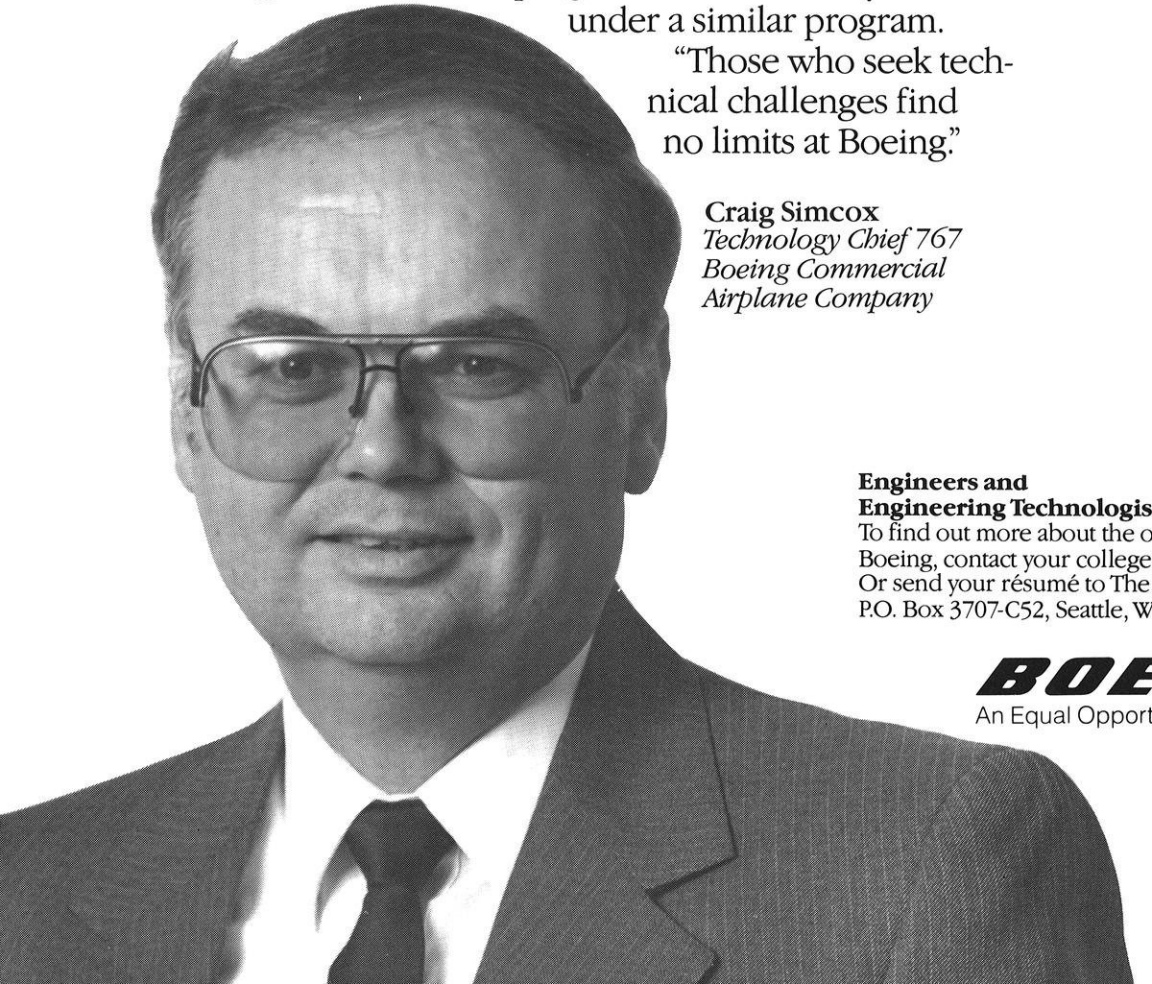

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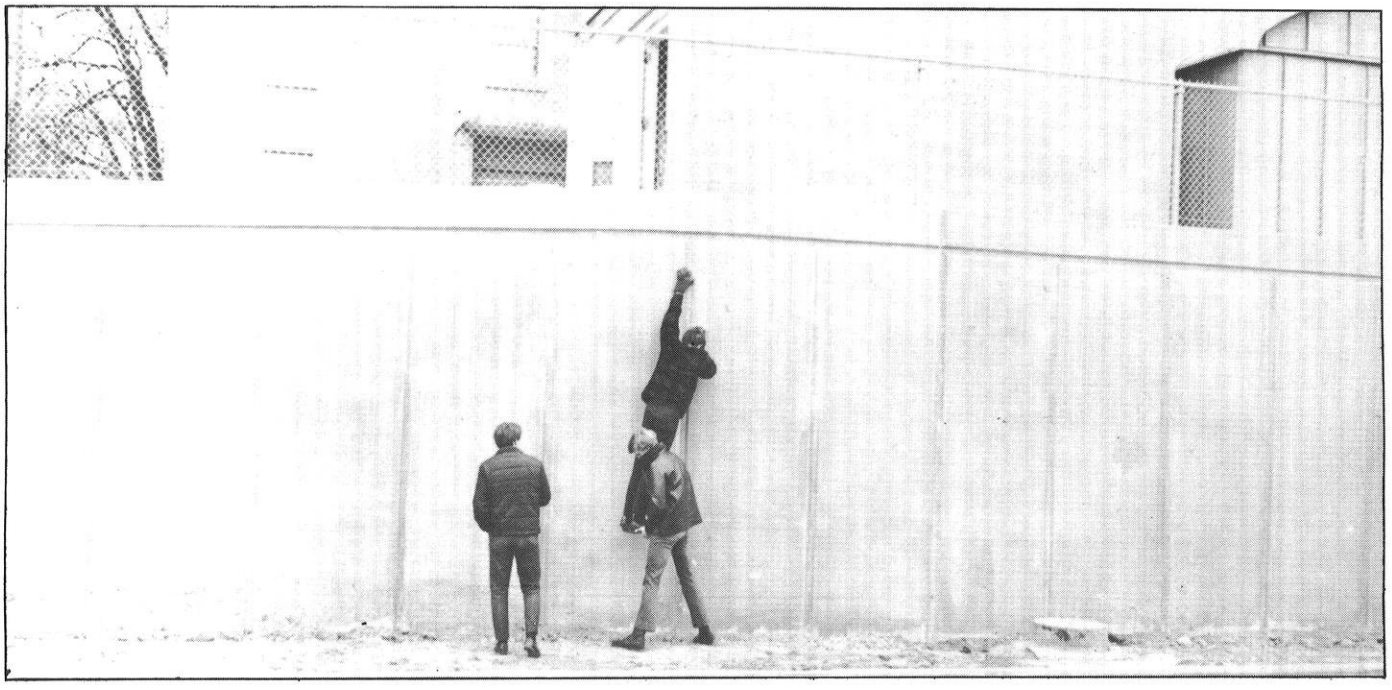
The Great Wall of Engineering: Chapter 2

by Gary Webster



And now, the continuing saga of the UW engineering campus and the Great Wall of China. If you recall, at last writing the College of Engineering had purchased a section of the Great Wall and was reconstructing it around the engineering campus, giving some concrete evidence to support the theory that engineers have no social life. Shown here is the newly rebuilt wall. The engineering students are obviously very fond of this new structure.

And how are the engineering students reacting to the lack of social life? Well, on Friday afternoons, scenes like this are typical inside the engineering campus.

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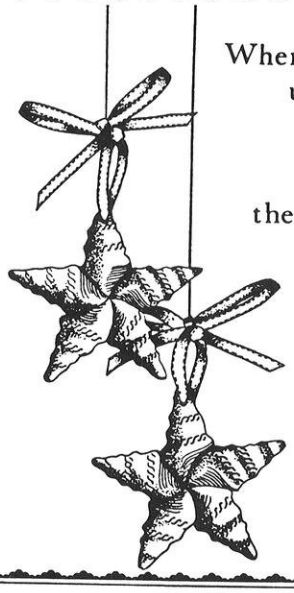

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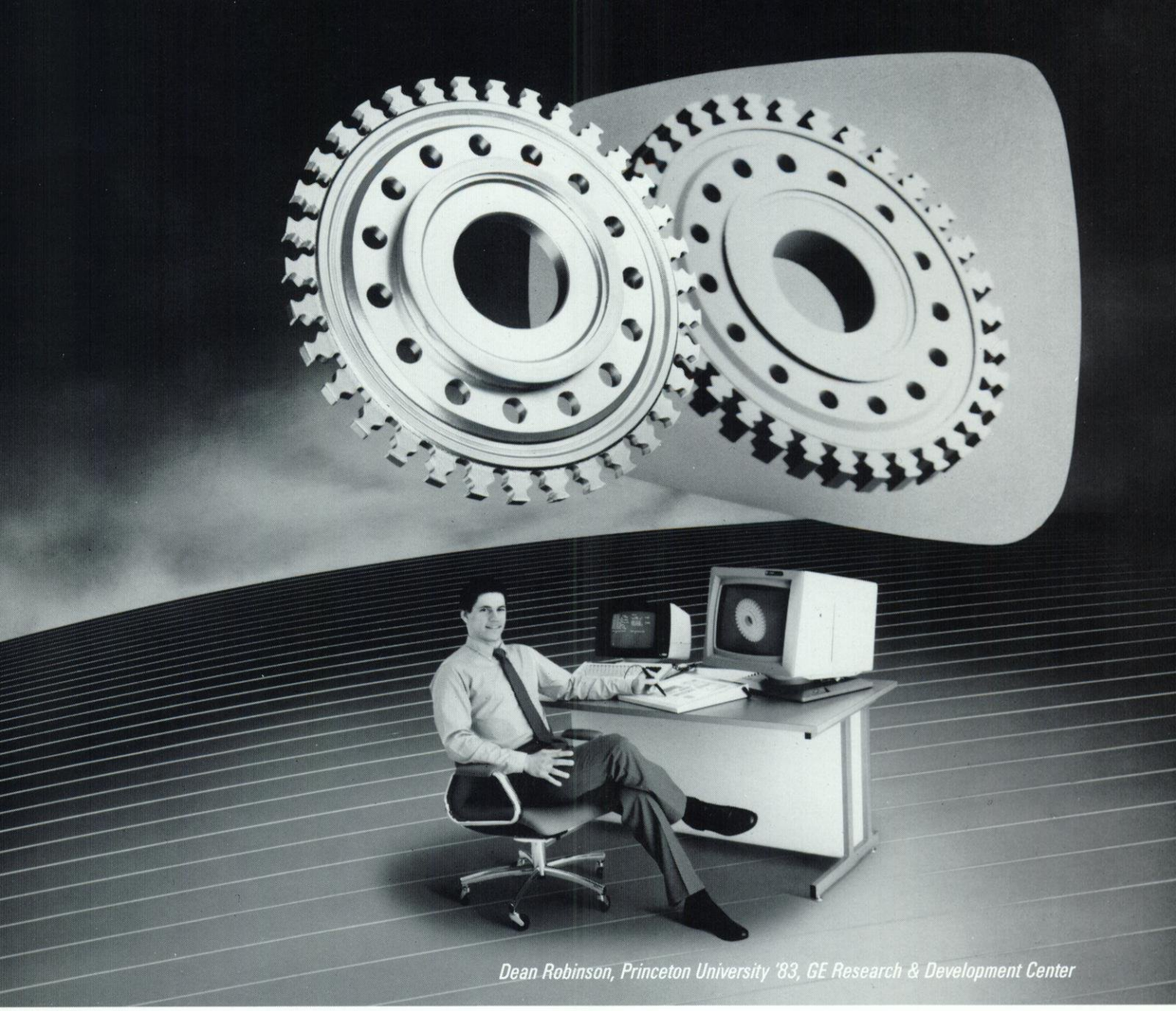

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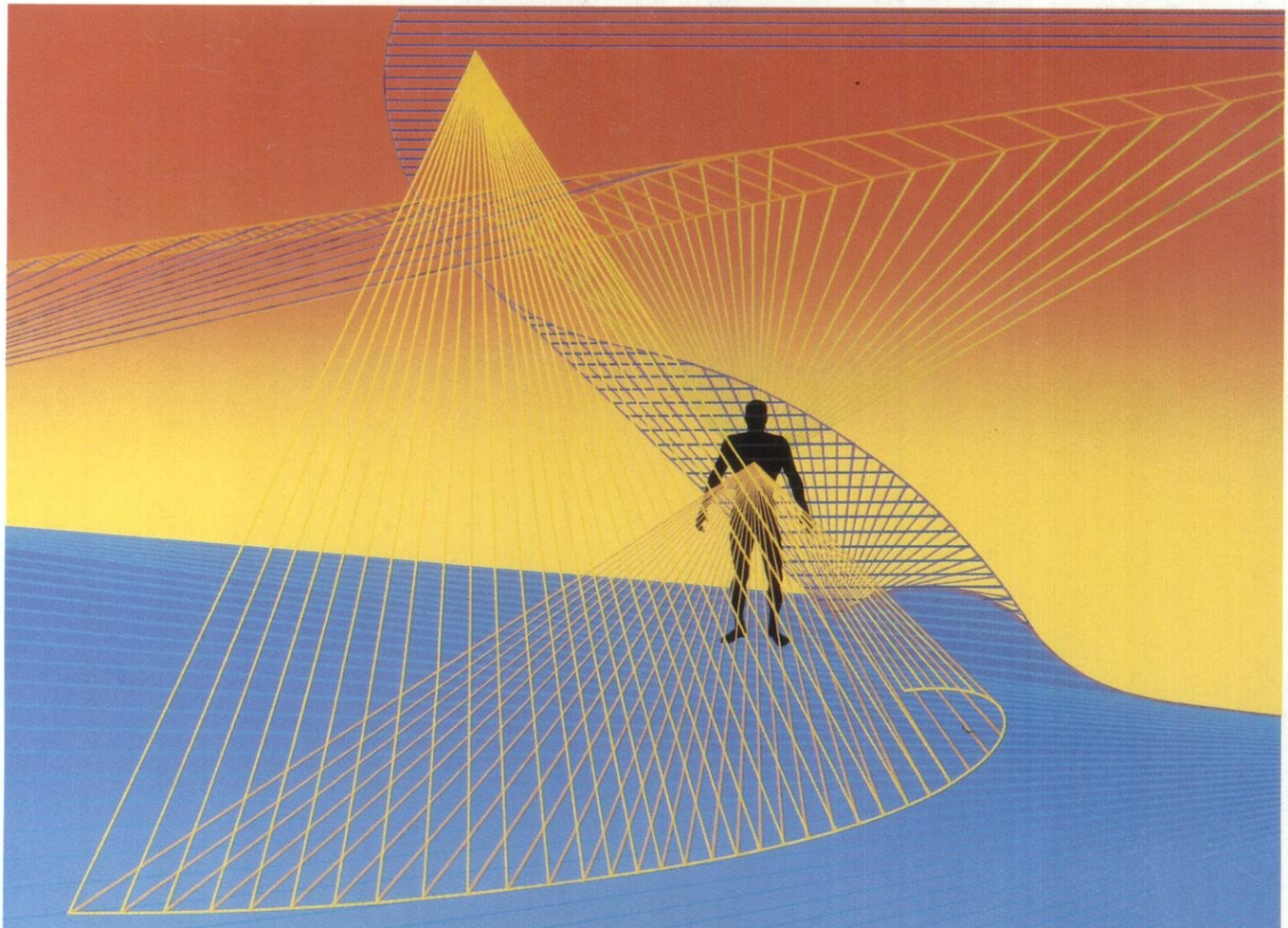

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