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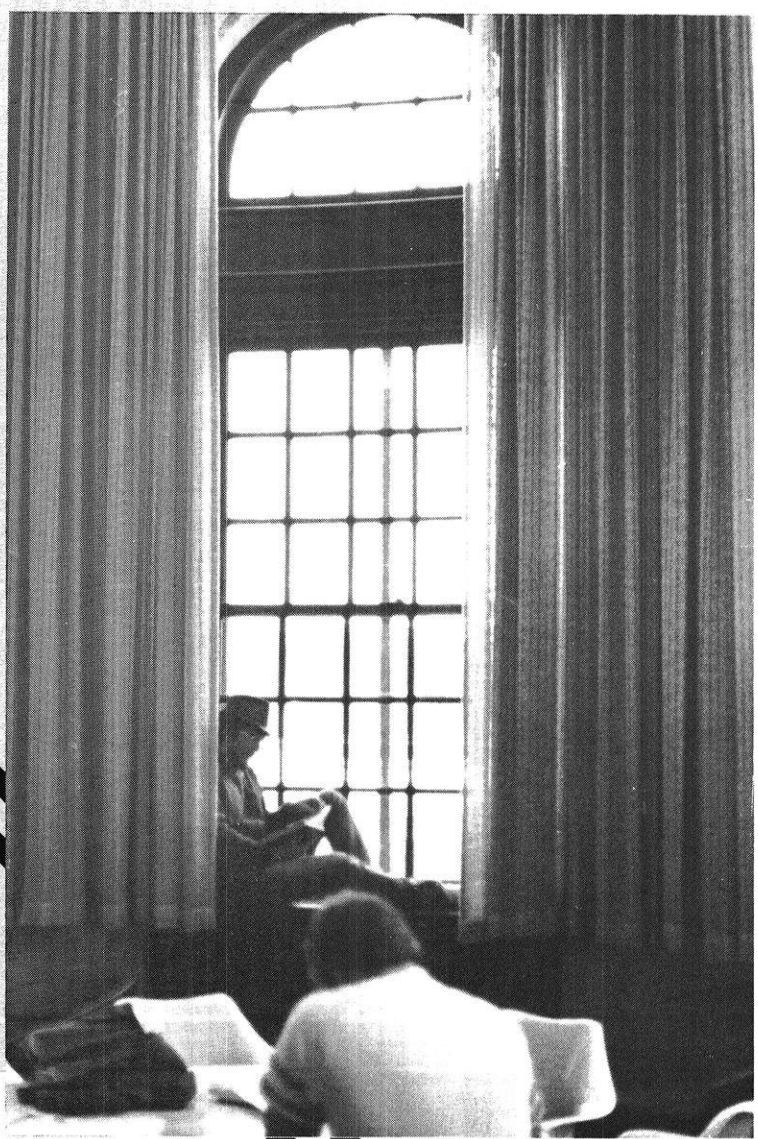
Volume 89, No. 1

October, 1984

wisconsin engineer

Study Strategies Guide



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- How to improve the Engineering College.
- The UW's part of the Space Telescope.
- Who is hiring engineers?

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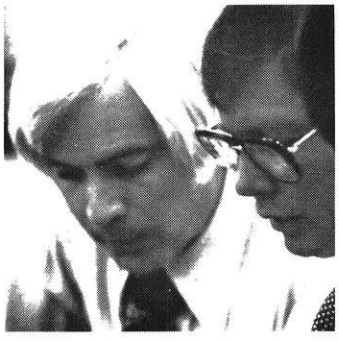

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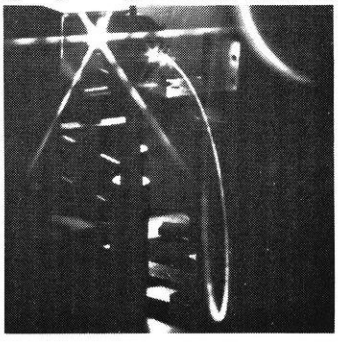

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Columns

Features

Study Strategies Guide

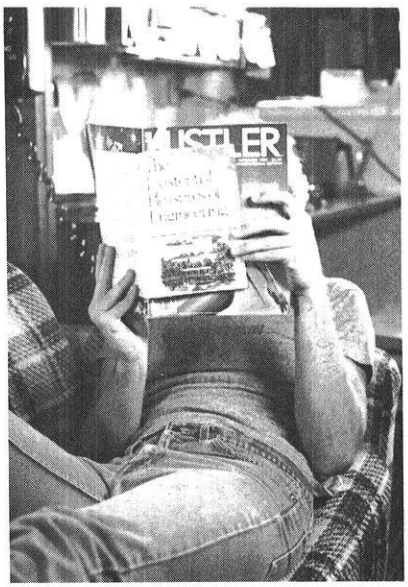

photo by Kurt Worrell

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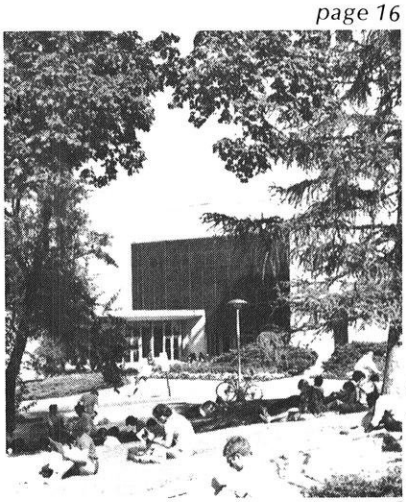

Photo by Ann Schwichtenberg

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The **Wisconsin Engineer Magazine** is published by and for engineering students at UW-Madison. Philosophies and opinions expressed in this magazine do not necessarily reflect those of the College of Engineering. All interested students have an equal opportunity to contribute to this publication. **Charter Member of the Engineering College Magazines Associated. Chairperson:** John N. Clausen, Mechanical Engineering Building, University of Minnesota, Minneapolis, MN 55455. **Publisher's Representatives:** Littell-Murrary-Barnhill, Inc., 1328 Broadway, New York, NY 10001 and 221 North LaSalle Street, Chicago, IL 60601.

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Lake Water

The Three Faces of Failure

by Scott Paul

"I'm in engineering," I said. The girl smiled, took a sip of her beer, and walked away.

It's not easy to be an engineer.

To do particularly well in anything, especially engineering, an individual must be deeply committed to what he is doing. He must be willing to spend a great deal of time to do well at all in school. He must apply himself to his work with great concentration and self-discipline.

The ideal place to do this is in an environment totally free from distractions. UW-Madison could possibly be the most difficult place in the entire world to buckle down in and study hard all the time. There is something fun or something interesting going on all the time. Partaking in all the activities offered at UW-Madison is a very appetizing suggestion--but, like eating poison berries, it could be fatal.

If you run about and get involved in too many activities, go out too many nights, talk to your friends too often and too long, you will fail. You will receive poor grades in your classes. You may be able to squeak into engineering and graduate, but if your grades are marginal when you graduate it will be difficult to get an employer to read past the line that displays your GPA. If you get a job at all it is quite possible that it may be a nowhere job where you are stuck in a career rut for thirty years. Failure.

Now let's look at the graduating superstar. If he graduates with a high enough grade point then he can virtually name his job with the corporation of his choice, work his way up the ladder, and make wheelbarrows full of money. Success.

But at what price was this success purchased. He made his career his life, and as a result was able to become the best at what he did. But when he did this he closed many doors -- left areas of himself unexplored. He sacrificed time, social activities, and more. He may come to deeply regret having cheated himself out of the best years of his life. Failure.

Graphic by Alicia Diehl

No matter what you do or how you do there will always be some people who will look at you and say, "there's a screwed up failure if ever I saw one."

Many students try a path that is more to the middle of the road. They will do as much work as is necessary to get reasonable grades, and then try to enjoy as much time as is left over. This does work for many people, but there are many ways to perceive this. One might say that he has made his college career a compromise, dabbling in many things, becoming a broader person, but excelling at nothing. Failure.

The point of this article is not to encourage you to drop out of college, rather, it is a warning. You are facing a crossroads where you will decide what way your life will turn. You will be thrown into the sink or swim pool that is engineering school. You could sink (go to business school). Or you might survive. But there are many ways to swim. You could race, dog-paddle, or just float there. Each person has his own style.

You will be in an environment where you will be forced to make more important decisions than you have ever made. The work will be harder than any you have ever seen before. It will be the busiest time of your life. And to top it off you have to face more emotional stress than you thought anybody could survive.

Going to college without having a clear idea of what you want to accomplish is a bit like jumping out of an airplane without a parachute. You may have a good time flying around on the way down, but when you hit bottom--that's it.

Most companies have some idea of what they consider to be an ideal student. A person with an ultra-high grade point will usually get hired, but students who have good grades and were involved in one or two significant extracurricular activities are prime choices for employment also.

There is no ideal college career. No matter what you do or how you do there will always be some people who will be able to look at you and say, "There's a screwed up failure if ever I saw one." But you do what you do for yourself. You will not be a failure if you succeed in meeting your personal goals. You must think about this. You must choose your path carefully because the ground around here isn't too solid at times. But choose you must, and you are most likely to make good decisions that you can live with if you take the time to carefully consider what you are going to do here.

First and always, a man must be able to live with himself and what he has done. □

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What Changes Would You Make in the College of Engineering?

by Todd W. Wallinger

How many times have you wished you could make a change in the College of Engineering to improve your education? If you're normal (and who ever said engineers were normal?), you could probably name half a dozen changes you'd like to see. An informal poll of engineering students here at UW-Mad City was taken this summer to determine what changes students felt were the most important. The responses included a wide variety of suggestions, proving once again how different people can be.

"The biggest problem I have had as an undergraduate is the feeling that there is no one here who really shows that they care I am here."

The most popular response was to have more individual attention from professors and other instructors, mentioned by 18 of the 90 people (or 20%) in the poll. This included opportunity to speak with professors. Typical answers were: "The biggest problem I have had as an undergraduate is the feeling that there is no one who really shows that they care I am here." "The ability of students to speak directly with a professor will have a great effect on attitude." "It seems easier to get the message if you're closer to the professor."

The second most popular change was to have a more well-rounded curriculum, mentioned by 15 (17%) of the respondents. Emphasis was placed by the majority on classes developing speaking and writing skills. Some comments were: "I would recommend that students take courses from other schools in the university to broaden their education and make them aware of different areas other than engineering." "Courses outside of engineering can break the monotony of technical classes and also provide opportunities to meet people in other disciplines." "The emphasis on technical courses is important, but it seems as though we're forgetting the actual need, as humans, to deal with humans."

Graphic by Margaret Craig

The third most mentioned suggestion was improving the quality of the faculty. Thirteen of the 90 (14%) offered this. Some of the recommended that higher wages for the faculty would help, by enabling the University to attract the best instructors. Others said that getting TA's that spoke better English would be a way to accomplish this, and several thought that putting more emphasis on the teaching functions of professors, as opposed to research, would help. "I believe that the quality of teaching and the availability of classes would greatly improve if the professors were paid a wage comparable to that of other large universities." "There should be more faculty members for most departments with fewer teaching assistants. Most of them know the subject matter but they don't seem to communicate it well enough." "The best advice I could give is to separate a professor's responsibility of research from teaching. Too many times I have had professor's who gave the impression that their students were just another chore and that their research was most important. If the professor has such a negative attitude about the course, it is difficult for the students to be enthusiastic."

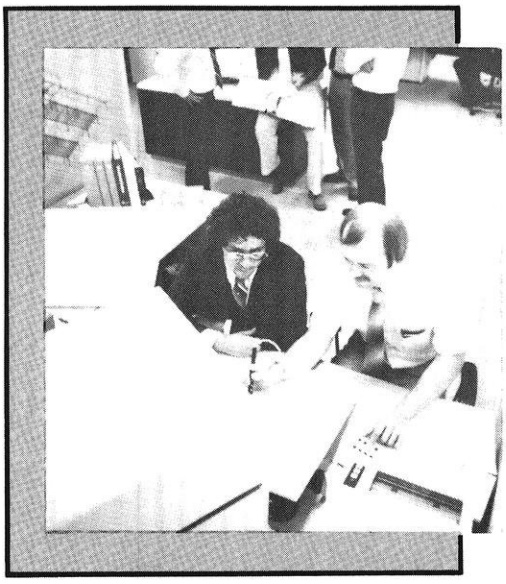
Also a suggestion made by thirteen students was to make engineering education at the UW more practical. This included putting more emphasis on design and applications, having more opportunity for actual engineering experience, and providing more information about the types of work engineers do. "Through my experience, I think that one of the best ways to learn is through hands-on applications work. All of the knowledge that is learned academically is not so easily applied to actual situations. Also, I feel that when a person is doing something himself, he has a better understanding of it than just the vicarious knowledge from a book." "The major problem is the lack of information about the given field among freshmen and high school seniors. They know the job opportunities and the money are there but they know little about the actual work they would be doing or type of courses they would be taking. By presenting the actual job and class description to new freshmen or even high school seniors much of the problem would be eliminated."

Another big complaint was with the current registration system. Five (5%) of the students thought a computerized system would greatly improve registration. "I would change the registration system to a computer system. So often classes fill up and a student has to hassle with scheduling changes. Why not have people register before the professors are assigned to classes?"

Another suggestion (voiced by four of the students) was to improve the fairness of the education, whether by having more consistent exam and grading policies, or by discouraging cheating more. A typical response was: "There seems to be a very large variation in the style of teaching and grading among UW TA's. Individuality is something that can't (and shouldn't) be discouraged, but I think it creates problems when combined with the straight curve employed in the College of Engineering. Drop the straight curve and I believe that such problems as we've all faced can be somewhat alleviated."

(continued on page 20)

"I HAD THIS IDEA..."



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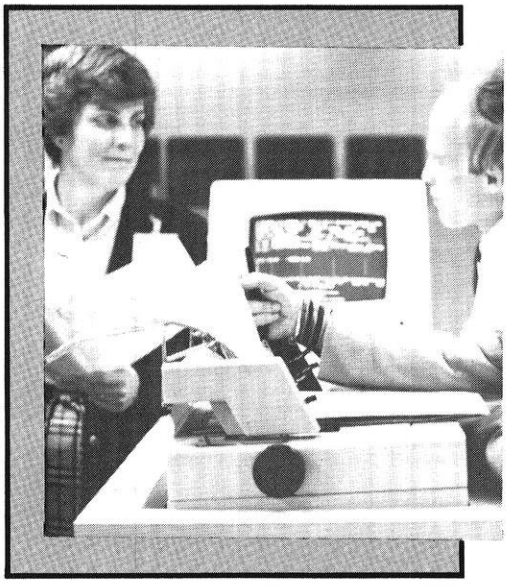

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Recruiting Facts

by Monica Sund

"What are the chances of getting a job through the placement office? What would be the starting salary? Where would I work?" These are just a few of the questions students have pondered momentarily throughout their education.

The Engineering Placement Office on the University of Wisconsin-Madison campus compiles statistics on graduating students and companies that are interviewing. These statistics give past records of companies and graduates so that you can anticipate the future. Here are some statistics from the 1983-84 academic year. We've centered on companies that hired graduates and their needs, and on the graduates of the College of Engineering.

A more stable job market is predicted if Reagan is re-elected in November. If Walter Mondale is elected it is likely businesses will delay hiring until they are certain how the economy will respond.

Many of these graduates, 357 to be exact, accepted employment. 141 of the acceptances were from Electrical Engineering students which was the largest percentage of acceptances considering all the engineering disciplines. Electrical Engineering also had the largest graduating class and it was also the engineering field most requested by companies which seems to support the law of supply and demand.

Mechanical Engineering and Electrical Engineering both have a substantially larger enrollment than the other curriculums. The field that had the most employer requests per graduate was Nuclear Engineering, only 4 graduates with 23 employers requesting this field. Engineering Mechanics, Metallurgical & Mineral, Mechanical and Chemical Engineering had 25% or more of their graduates seeking employment but were without job offers.

Chemical Engineering's high "without offers" percentage can be explained, in part, by the petroleum industry's unsteady economic history. Another reason why some of these people were without offers could be due to gradepoint average. The class might have had an unusually large percentage of low G.P.A. students. Companies at this level of hiring often have nothing else but gradepoint to distinguish one student from another.

Another factor influencing employment opportunity is whether a student has had some work related experience such as in the Co-op program. A study performed by the Detroit Institute of Technology Cooperative Education Research Center from 1964-1974 showed that Co-op student's recruitment yield in terms of persons hired, as a percent of candidates interviewed, was 13 times higher than for recent college graduates.

If a graduate is lucky enough to have more than one job offer, two of the more important considerations are salary and location. The average offer accepted for all engineering departments was $2190/month, or $26,280/year. The highest median offer accepted was in Metallurgical & Mineral Engineering, $2358/month and the lowest was in Civil Engineering at $1955/month.

Some graduates continued their education, receiving masters or doctorates with fairly substantial increases in salary. An engineering student who has received an M.B.A. had an average offer of $2531/month. Referring back to the study by the Detroit Institute, Co-op graduates' starting salaries were 9% higher than for other college graduates.

The other important consideration was location of employment. 66% of the graduates that took jobs stayed in Wisconsin or adjoining states: Illinois, Indiana, Iowa, Michigan and Minnesota. Twenty-eight lucky people moved to California, 19 went to Texas, 13 went to New York and 13 went to Washington. Graduates moved all over the country, but these states had the largest percentages of graduates.

Enough about the people being hired, who's doing the hiring? Last year there were 158 companies that employed 357 graduates. It's interesting that 21% of these newly employed

Chart #1: Recruiting Facts For 1983-84 Academic Year.

	AgE	ChE	CE	EE	EM	IE	ME	M&ME	NE	Summary
# Grads	17	99	84	228	31	59	204	32	4	758
# Accept Employment	4	42	30	141	2	32	103	12	2	368
# Employer Requests	13	110	45	266	44	80	251	44	23	876
# Requests / # Grads	.76	1.11	.54	1.17	1.42	1.35	1.23	1.38	5.75	1.16
Median Offer Accepted	*	2255	1955	2235	*	2100	2173	2358	*	2190
Without Offer	3	27	14	15	11	8	51	8	0	137
# Continue Education In Engineering	3	11	9	23	5	2	14	4	1	72
# Continue Education In Other Field	0	5	4	7	2	2	5	0	0	25

graduates were hired by companies who did not interview on campus.

There were four major campus recruiters: Boeing, General Motors, IBM, and Motorola, that employed 25% of the hired graduates. The kind of work employers requested most were: development, design, research, and manufacturing & production. Other fields of work requested by employers are listed in table #2.

Chart #2:
Employer Requests for Job Types.

Field of Work	# Employer Requests
Development	137 (62%)
Design	123 (55%)
Research	106 (48%)
Manufacturing & Prod.	75 (34%)
Process Engineering	64 (29%)
Product Engineering	59 (27%)
Project Engineering	60 (27%)
Plant Engineering	41 (18%)
Applications/Field Service	37 (17%)
Systems Analysis/Design	38 (17%)
Sales/Technical Marketing	35 (16%)
Quality Control	31 (14%)
Maintenance	23 (10%)
Construction	13 (6%)
Data Processing	13 (6%)
Consulting	13 (6%)
Other	38 (17%)

Predictions for the number of graduates in the 1984-85 academic year will be comparable to the 1983-84 total of 758; thus one might use these statistics as a general guide to what the future may hold, but they can't be a completely trustworthy indicator. This is because the future of the business climate is not easily predicted.

A significant factor influencing the future economy is the presidential election in November. A more stable job market is predicted if President Reagan is re-elected because business knows what to expect. If Walter Mondale is elected, business will be uncertain about how the economy will respond. It follows that business will delay hiring until the situation is more certain. Presently, the Placement Office staff says that the recruiting program for this fall looks good. There have been no cancellations by companies and the amount of hiring has been substantial. □

Helpful Resources

by Jim Casey

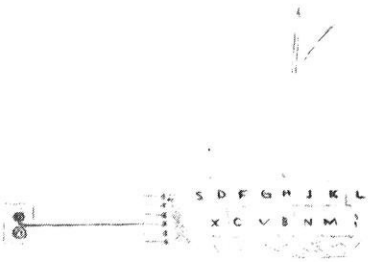
As a new student at Madison, I found it useful to collect information on the various educational resources on campus. One of the great assets this campus has going for it is the GUTS/HASH tutorial program. This program is a combination of the Greater University Tutoring Service and Help at Student Housing. It is the largest tutorial program in the country. Students needing help in almost any area of study can use this service free of any charge. This service has three options for students needing help:

1. The Open Hours Study Lounges, which have tutors available with backgrounds in math, sciences, engineering and some foreign languages. The lounges are located at several libraries and at the Living/Learning Centers.
2. Individual tutors who are assigned to students for help in a specific subject.
3. Study groups of more than five people.

For more information on locations and times of Open Hours Lounges and other general information, the GUTS/HASH tutorial office is located at 303 Union South Building.

If you are having academic or personal problems, the University Counseling Service is staffed by professional counselors, psychologists, social workers, and advanced trainees. They help with study skills, test anxiety, and career planning groups that meet for 1½ or 2 hour sessions. As for personal problems, a dealing with depression group is offered along with various other groups. There is a small fee for participating in these groups. The University Counseling Service is located on 905 University Ave., Rm. 401.

Another great asset to this University are the services it offers to disabled students. The McBurney Resource Center assists disabled students in many ways. The center pre-registers disabled students in order to assure conveniently located classes, and the McBurney staff can assist visually and learning disabled students in obtaining taped textbooks and braille textbooks. Specialized study equipment such as variable speed tape recorders and visualteks are provided in libraries throughout the campus. The McBurney Resource center provides many other services as well. It is located at 905 University Ave., Rm. 416.



Graphic by Jeaneen Haley

Every student should become acquainted with computers, and can easily become acquainted with computers at the Madison Academic Computing Center. The Academic Computing Center is Madison's main instructional and research computer facility. MACC offers short courses and workshops throughout the year to help you make the best use of the computer facility. The topics include major languages, use of the various operating systems, application areas, and new developments in hardware and software at MACC.

Several of the short courses and workshops are available on videotape. These can be viewed free at the Audio Visual Service on the third floor of the Wendt Engineering Library. The computer center also has free videotapes available in room B119 of the MACC that can be checked out. These presentations introduce you to the center and to computing in general. The center is located on the south side of Campus, 1210 W. Dayton St.

Actually, these are just a few major resources, there is much more available to the student on this diverse campus. One simply has to pick up a copy of the Wheat and Chaff or go to the Campus Assistance Center to find out more. □

Maximize Your Learning Efficiency

Study Strategies: A Guide to Self-discipline in Learning

by Jeff Everts

The time invested in studying by an undergraduate student amounts to about 6000 hours.* Few students have taken as little as 1% of their study time to consider developing efficient study habits and study techniques. Examination of your study habits and techniques is worth-while and can usually increase learning efficiency by 5% to 15%.* Even a small increase in learning efficiency can save hundreds of otherwise required study hours.

The learning process involves two steps: comprehension and recall. Comprehension, or understanding of a new idea requires a motivation and a desire to learn. It requires an adequate background of related knowledge and usually the student's undivided attention. Once the material is understood, the student must demonstrate his or her competence with it. This is where recall, or remembering the material, is required. He or she must be able to recall the material on examinations and put it to use in project work, advanced studies, and after graduation.

The starting point in increasing your learning efficiency is a self-evaluation of our study conditions and work behavior. Evaluation of each of the following may help to reveal areas needing development or change.

Study Conditions

- auditory distractions in room
- visual distractions in room
- personal worries and interests that distract
- auditory distractions in library
- visual distractions in library
- constancy of study conditions to stimulate study
- posture while studying
- adequacy of lighting
- adequacy of work space
- adequacy of materials

Work Behavior

- motivation
- study techniques:
  - —reading
  - —note taking
  - —problem drilling
  - —time management
  - —review techniques
  - —examinations
  - —use of resources (lib., prof., etc.)

If we look at our list of study conditions we see that first, distractions are to minimized. Be aware of yourself. Do you enter into conversations, aimlessly look around or leaf through books, watch others, or daydream? What about other distracting conditions: pictures posted above the study area, clutered desk; post cards, pens, pencils, souvenirs, football schedules, material of several subjects on the desk at once; audible radio or music playing (studies show that music is tiring) unsatisfactorily distributed lighting (a good idea is to reflect light from the ceiling off a white sheet of paper onto your desk) noisy overhead fans; wobbly or squeeky chairs; insufficient leg room; or too high a desk or table.

Your own physical and mental conditions contribute significantly to your ability to concentrate, comprehend, and remember. Are you getting enough sleep (6½ to 9 hours per 24 hour day)? What is your level of exercise? (Exercising helps develop a good attitude towards oneself. It stimulates and heightens awareness.)

Many students are unaware of their diet. All carbohydrates yesterday? "Only McD. for me!"? A balanced and

Graphic by Margaret Craig

nutritious diet of fruits, vegetables, proteins, breads, cereals, and milk are required to keep the mind quick and clear and the body healthy and full of vitality.

Be aware that mental burdens, such as problems of health, finances, family, acceptance by professors or students, male-female relationships, or other problems can taunt your mind and decrease your learning efficiency; give yourself some peace of mind by recognizing that you have little control over these things.

Do you enter into conversations, aimlessly look around or leaf through books, watch others or daydream?

The second list we consider shows that work behavior has two main groups: motivation and study techniques. The first, motivation, includes preparation, attitude, and stimulation.

Making the right vocational choice is the initial step in preparation. Am I a "CE" student because of family pressure, because of the lack of openings available in the field I would much rather be in, or does the school or university have a limited curriculum in my field of interest? Clearly defining your vocational choice will motivate you to excel, and apply yourself in that area.

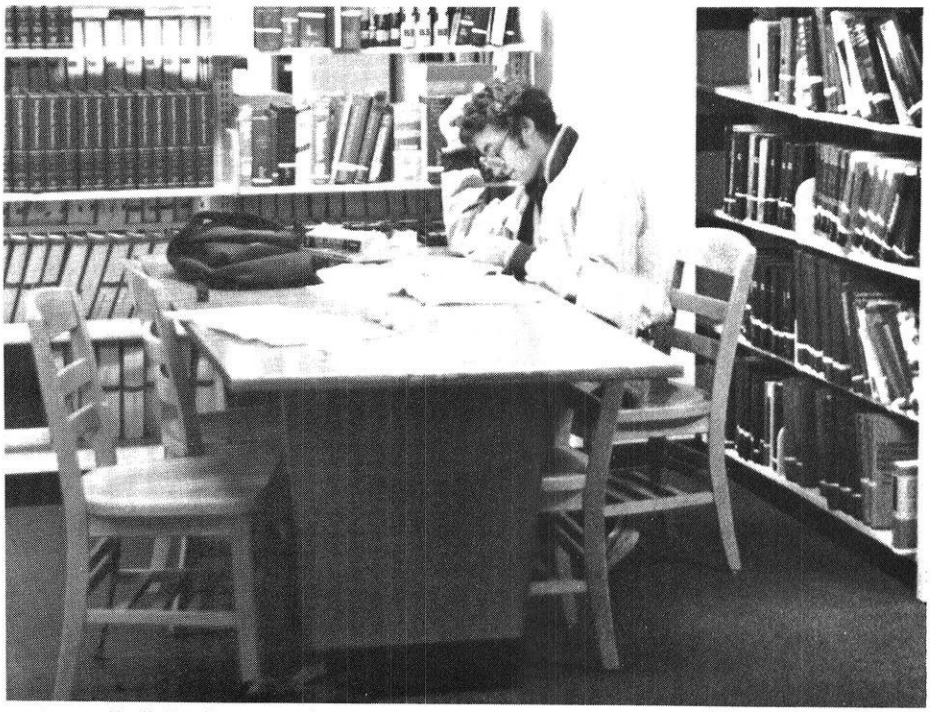
Do you have the prerequisites or background knowledge to be able to perform proficiently in the courses enrolled in? If not, the material will quickly become too difficult to understand and the assignments too time consuming.

Be prepared before the school term begins. Have your text books and foreseen supplies purchased and your living situation secured. Do not find yourself in the situation of trying to find an apartment or a roommate when courses start to demand study time or that the bookstores are all out of a text book and the next reorder shipment will not be in for 2½ weeks.

Come to class prepared with materials read and reviewed if needed. This increases comprehension, understanding, and memory retention of new material presented through the foundation of understanding and knowledge established by the old material.

A mature attitude will help motivate you to learn. Develop a confident attitude about yourself in every aspect of the course including getting to know and feeling at ease with your instructor.

Allow yourself to be challenged by professors who do not give you the answers. They are promoting and developing your ability to think creatively and to research diligently by making your comprehension "go the extra mile." Professors who just give the answers to your questions and do not ask you questions as they proceed are weakening your ability to rely upon yourself when learning, recalling, or thinking creatively. If a professor asks questions, he or she is trying to pattern and guide your thinking so you are able to, on your own, tackle a similar or an analogous problem.



Even a small increase in learning efficiency can save hundreds of otherwise wasted hours.

But part of a mature attitude is learning self-motivation. Get more immediate or progressive goals. The knowledge of your progress will make work much more interesting. Compete against yourself. "The next exam score will be higher than the last one." "I will study more effectively this time" will help to develop an attitude of motivation toward success. Warnings: do not compete against others. This is self-destructive and can affect your confidence, self-esteem, and introduce undue worry and mental fatigue. There will always be those who know the material in their sleep. Do not let your perception of them shake you that you can not perform to your ability and thereby make them look all the better.

One final method to increase motivation is to tutor others. Being a tutor develops confidence in yourself by reinforcing previously learned material or refreshing forgotten material or concepts. Both stimulate motivation. Having field-related work experience will also promote a higher level of motivation toward your academic education in that area.

The second category of work behavior is study techniques. Many hours of study are spent reading so read quickly, at a speed which you can maintain sentence comprehension and master key terms. The use of a pen/pencil or color importance scale will make reviewing much quicker and simple, and will indicate the relative importance of the ideas presented in the text, enabling you to concentrate on the more important ideas if review time is short. An example follows.

no marks: no need to review
pencil underline: just skim
pen underline: more important
colored marker: very important; know!
stars in margins: DO NOT FORGET!

Another study technique is note taking. Each student develops their own style so I will mention some possible enhancements: leave margins free for additional notes when reviewing; leave every other line blank; use a number of different colored pens to highlight important ideas, distinguish between quantities, or separate distinct steps of a problem; mark portions of the text that are not understood and circle the page numbers so you can find them later when seeking help.

Problem drilling is another effective technique on our list. Make up your own problems; then suggest solutions and solve them. This increases your interest and motivation while ensuring your comprehension of the material. Generate day-to-day examples of engineering principles so that you can identify with. An example of Newton's law, F=ma, could be a person having a mass of 75 KG bouncing off a diving board into a swimming pool. Study with others, mutually working problems together (if allowed) and discussion is important.

Increasing your learning efficiency through improving techniques will also require you to organize and manage your time well. Scheduling of classes plays an important part in time management and the attitude developed toward classes. Allow time to be properly prepared for the next class having 1) reviewed previously presented material and 2) developed an enthusiastic attitude toward the next class. Leave blank periods before classes that may have in-class exams or quizzes. (This will give you time to do any last minute preparation and focus your mind on the subject matter to be examined.) Students should extend their time table to include mornings (before 9:00 a.m.), evenings (after 5:00 p.m.), and weekends. Plan in ourly periods (This helps make the gap periods useful to the student since universities usually have courses scheduled in hourly units.) and eliminate wasted periods. Allow breaks to eat, relax, and socialize. Plan and schedule non-study activities such as volunteer work, recreation, or going to a football game.

Plan realistically (and I will star this one)!! Organize your time so as to start assignments immediately and get them done early. Avoid the rush to get help from the professor or teaching assistant or the heavy use of computing facilities.

Further evaluation of our study techniques involves looking at our review techniques: study with others and quiz each other; write down key points from the text or the class notes; make use of the "importance scale" implemented when the text book was read the first time, skipping unimportant material; write marginal notes; highlight the instructor's lecture notes; attend review sessions; predict exam questions; work old exams (usually libraries or fraternities keep an exam file); find out what type of questions will be on the exam (short answer, numerical, etc.); and review returned exams.

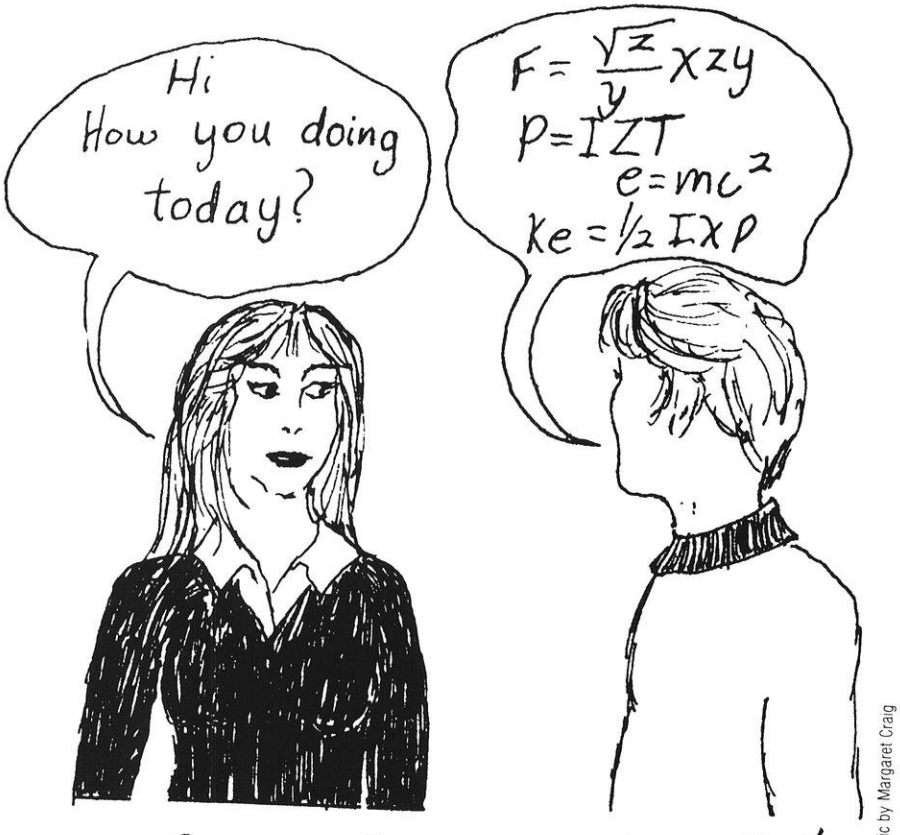
Individuals each require their own special atmosphere for effective study.

Another study technique that is very helpful in increasing your learning efficiency is using other resources that are available to you as a student. Keep a list of questions and page numbers of uncomprehended ideas from the text and have them answered by your professor or teaching assistant during their office hours. Libraries are another source. Many books, magazines and audio/visual materials related to your courses can be found. They will aid you in your comprehension and recall of a course's subject matter. Some libraries offer writing laboratories where students can get help with style, punctuation, and even proofreading in the writing of papers or reports.

The final subtopic of work behavior is exam taking and as far as that is concerned, make sure you have had adequate rest and go into the exam with confidence, being fully convinced that you have studied the material thoroughly and that you will do well.

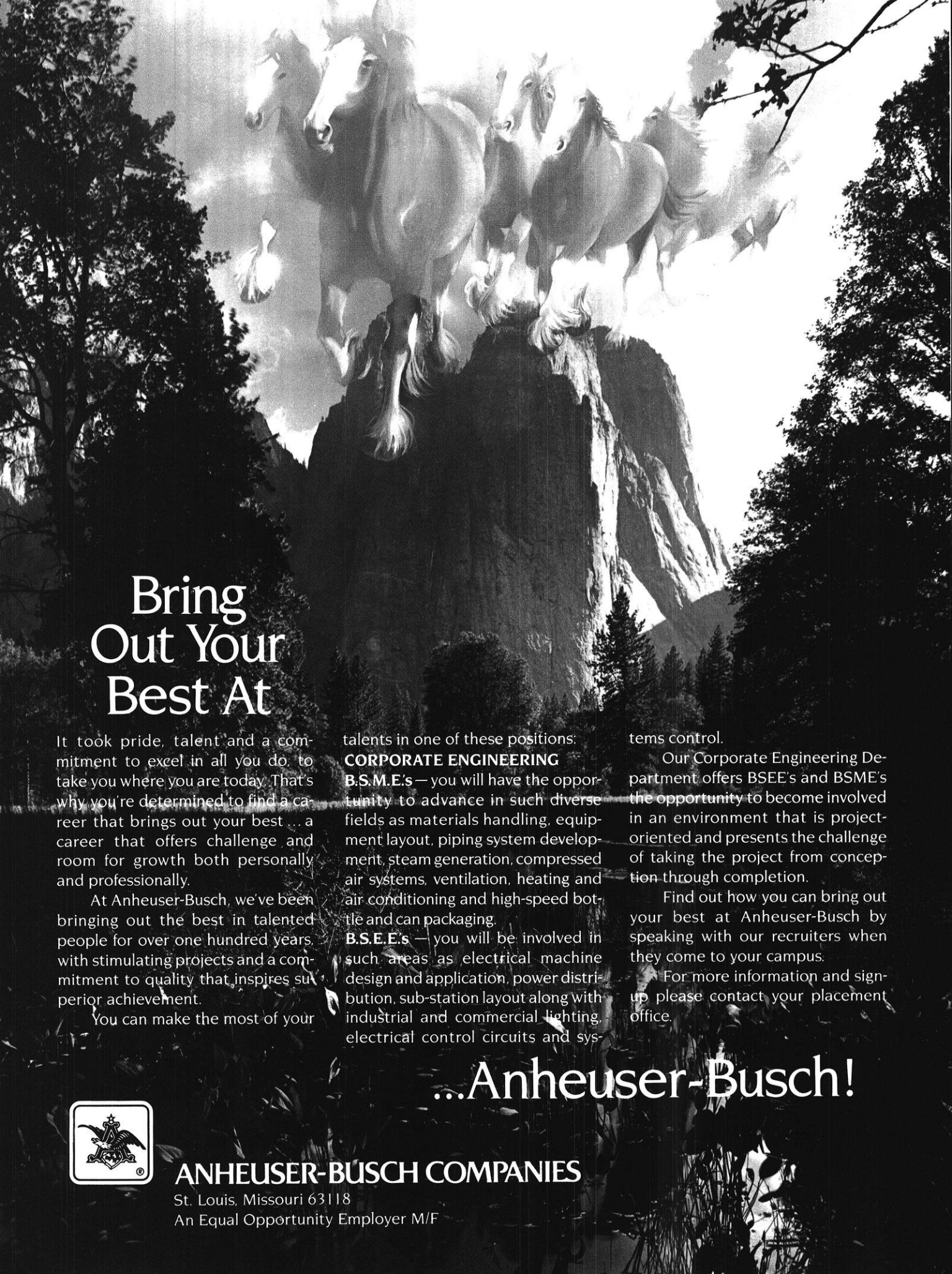
We have examined our study conditions and work behavior in an attempt to improve our learning efficiency. To this end we need to keep physically fit, mentally fit, and apply ourselves diligently, remembering that increasing our learning efficiency is also a learning process. □

*"You and Your Students", prepared by a Faculty Committee, Massachusetts Institute of Technology.



Some Communication Skills

Graphic by Margaret Craig



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Alternatives to Library Study

by Ann Schwichtenberg

Photo by Ann Schwichtenberg

Information inundation. It seems to set in earlier every year. We've all met up with the game already this semester. So you thought you couldn't get behind in your classes in just a few weeks - hah! What are the rules of this game? How can we win?

The game of information inundation is played by most students twice a year. It's one of the Wisconsin traditions sends many collegiates scurrying for cover and often leaves them with sordid memories of a game in which the prowess required is for organization, communication and memorization.

'Studying', of course, is the term we've all chosen to collectively describe these skills, and we've all had a chance to learn that it is a very psychological activity. Individuals each require their own special atmosphere for effective study. Unfortunately, we've each had the chance to experience the hassles which erupt when a roommates study habits vary markedly from our own, "Geez, do we need to listen to DEVO at that volume? I've got an exam tomorrow. My grade, my degree, my life depends on it!" And, of course, there's always the discouraging reply, "I can't study any other way!"

You don't need to be sucked into the library zone unwillingly.

It is often these conflicts over study atmosphere which eventually drives one's roommate out the door and into the streets in search of the perfect study niche. These wayward players of the information game might often set off for the nearest library, but, for some, libraries are much too constrained and staid. What if crypt-like silence makes the hair on one's neck stand straight? Certainly that isn't conducive to concentrated study. Where do we find study niches with just our type of pizazz? Here are a few suggestions:

1. **Gilman Lounge** — found on the first floor of Bascom Hall, right across from the Commerce building. Here's the place to go if you're in search of an atmosphere which is fairly quiet and away from the usual engineering haunts. You won't see a belt suspending a calculator in this bunch (basic black calculator cases clash with argyle).
2. **Rathskeller** — we all know where that is. Not much can be written here which hasn't already been written about this campus legend. Again, this is a place where you can get away from the ordinary engineering crowd and into the land of political controversy and purple hair. Here's a place of diversity where an engineer can study and still absorb the pros and cons of Reaganomics. Take note of the art majors' drawing pads - we could fit an entire thermodynamics problem on one of those pages!
3. **Cole Beach** — found near the Cole-Sullivan dorms on Lakeshore. Cole Beach is fairly close to the engineering campus and the perfect place to crack a book and catch a few rays. While the weather is warm, you'll also be able to enjoy the sounds of tennis and softball. Watch out for the frisbees.
4. **The Pub** — the one and only on State Street. A study niche which might be described as earthy and spacious? The atmosphere is set by the sound of video games in the background and mugs sliding across the bar. Get there early in the

day for a window seat, you'll be able to practice your rate-on-sight skills there. This is also a place where those forty pages of the problem set you are finishing won't get shuffled off the table...they'll stick tight.

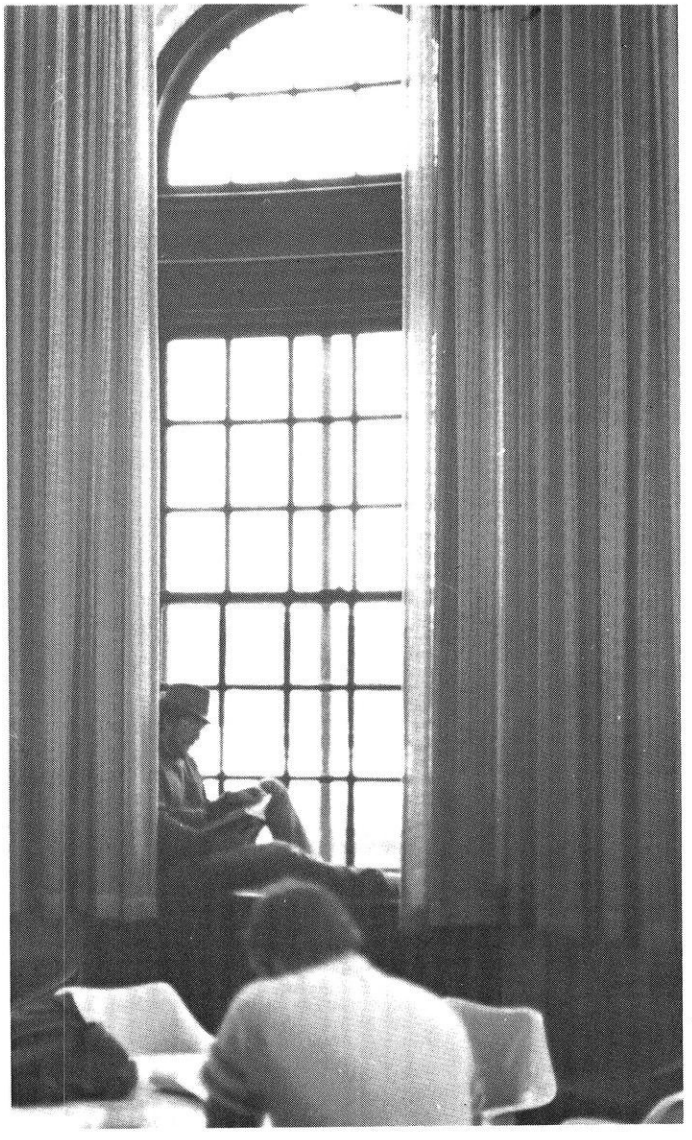

Photo by Kurt Worrell

5. **Library Mall** — found outside Memorial Library. If you like to study outside and in the midst of a kaleidoscope of sights and sounds, this is your niche and it definitely has pizazz! Bands, jugglers, venders, politicians, preachers; they're all right there. You've seen the mall before, but next time you're there take a closer look around, some people actually are studying though they aren't the ones immediately obvious to the casual observer. You may want to exercise your mechanical pencil here.

Although the few places described barely even represent a cross-section of the 'off beat' study niches on campus, perhaps it will give you the motivation to look for your own niche. Take time to examine where you study both efficiently and happily. You don't need to be sucked into the library zone unwillingly. You'll be spending much of your time in study here at the University of Wisconsin - do it right! Good Luck digging out the game of information inundation! □

Space Telescope

A breakthrough in astronomy

by Christoper Olson

The year 1986 is eagerly anticipated by the entire scientific community because it is the time scheduled by NASA for placing the Space Telescope into orbit.

In 1610, the Italian scientist Galileo Galilei used his telescope to catch man's first glimpse of what was really out there. Over 350 years passed before we made our second major step into the universe. Spacecraft, carrying arrays of scientific instruments, computers, and radios, were launched past the filtering effects of the atmosphere to photograph and sample worlds other than our own. And now, the Space Telescope promises to be the next step in man's conquest for knowledge beyond the earth.

The Space Telescope will be able to view a volume of space 350 times larger than is now possible.

Observing through the atmosphere into space, even with our most sophisticated telescopes, is a problem-ridden enterprise. Even under the most ideal viewing conditions, which only occur a few times a year, only certain wavelengths of the electromagnetic spectrum will ever reach the ground. Looking out through the atmospheric envelope that surrounds the earth is like looking up from the bottom of a pond. The light becomes distorted and causes us to see blurred images. The Space Telescope won't encounter such difficulties from its orbit 500 km above the earth. As a result the instrument will be able to detect objects 50 times dimmer than any of its predecessors, and will be able to operate for a full 40% of the day on average.

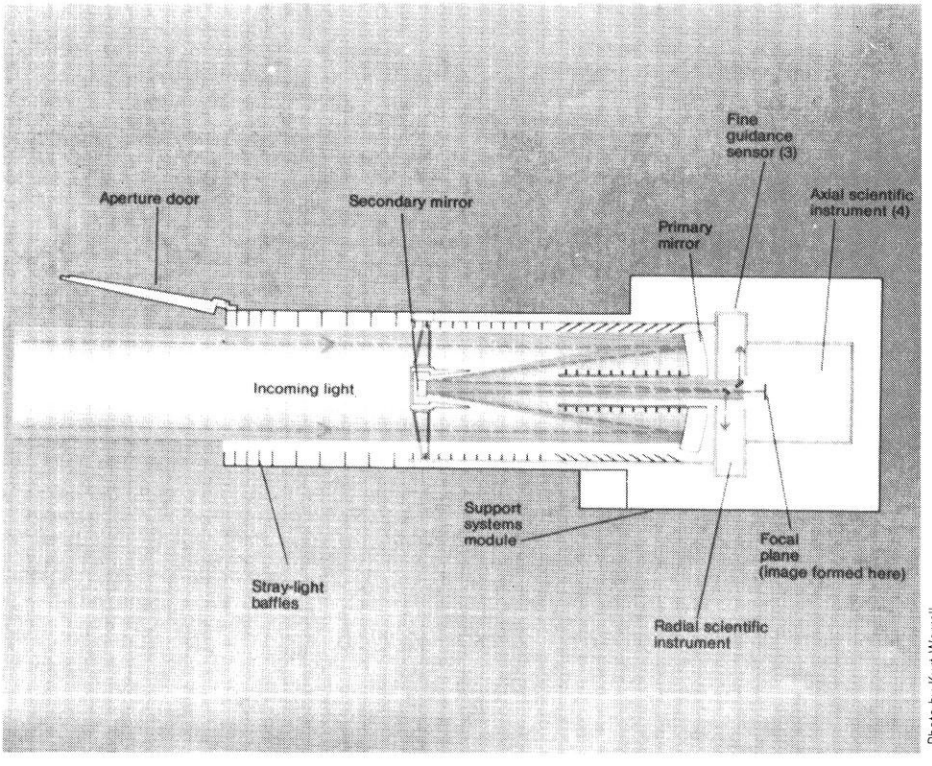

Photo by Kurt Worrell

A basic diagram of the construction of the Space Telescope.

This new observational tool may open a door that is now barely ajar. When the Space Telescope is fully operational we may see, among other wonders, the universe as it was much earlier in its history. It may even be possible to view the period just after the formation of the universe, an estimated 15 billion years ago! From its perch above the earth we will be able to make observations at a distance nearly seven times greater, translating to a volume of space 350 times larger than we are now capable of viewing.

As a whole, these quantum leaps for astronomy will be marvelous once the telescope is in orbit, but without excellent supporting systems the effort would all be for naught. The station itself will have a launch weight of 25,000 lbs., a length of 43.5 ft., and a diameter of 14 ft. Power for the system will be supplied by two large solar panels that will supply a minimum of 2400 watts. This payload will be transported by one of the 1986 shuttle missions which will be able to place the load no higher than 515 km above the earth. Pictures and other scientific data will be converted to electronic signals and then transmitted via high-gain antenna at a rate of one megabit per second. This data is received on earth from Tracking and Data Relay Satellities in geosychronous orbits 35,680 km over the Atlantic and Pacific Oceans.

What else besides the billion-plus tag makes the Space Telescope so special? Five scientific instruments, four U.S. and one European, will be housed behind the primary mirror. The **Wide Field/Planetary Camera** has a complex grouping of instrumentation and mirrors; it will split the field of view into four separate portions. A part of

the image is received on each target plate and is then subdivided into 640,000 pixels (picture elements). The two main functions of the camera are to permit examination of large areas of space for special plotting purposes, and to provide planetary observations comparable to those provided by the two Voyager spacecraft. The **Faint Object Spectrograph** is a versatile instrument that can obtain the spectra of extremely faint astronomical objects over a wide range of wavelengths. By carefully studying the emission spectra of stars it will be possible for us to learn more about the chemical composition of the universe. The **High Resolution Spectrograph** will be able to use the full resolving capability of the telescope to see much dimmer objects than previous spaceborne instruments. This extremely fine resolution means that individual stars in crowded fields will easily stand out, the binary stars will be able to be differentiated so that each star can be studied separately. The **Faint Object Camera,** built by the European Space Agency, is capable of photographing stars of the 28th magnitude, four orders of magnitude dimmer than any other device has ever been able to observe. (The human eye can barely detect 6th magnitude stars, and the brightest star has magnitude 1.) The exposure time for the dimmest objects might be as long as 10 hours, not possible from a ground-based telescope.

The fifth scientific instrument is of particular interest to us here at the UW. The **High Speed Photometer** is being built, with funding from NASA, here at the university. Professor Bless, with the Space Astronomy Lab and the Space Science and Engineering Center, are the principal parties involved on the project. The HSP is designed to provide accurate observatons of the total amount of light from an object in space, note any fluctuations in brightness on a time scale down to a microsecond, and to detail any fine shapes or structures associated with the light source. The instrument will be especially valuable to astronomers for establishing calibration standards for faint stellar objects. Because the brightness of objects will be ascertained in fine detail, the relation of stars to each other and their distances from the earth will be established much more precisely than at present.

The design and construction of such a complex instrument requires a coordinated effort from people with widely varying areas of expertise. Professor Bless has overall responsibility for design, construction, performance evaluation, and testing the Madison-made device. However, the detailed design and construction was carried out by a group of engineers and technicians headed by Evan Richards at the Space Science and Engineering Center and by the Astronomy Department's Space Astronomy Laboratory. Since the Project began six years ago, approximately 50 studens have worked on the project with nearly 35 faculty currently associated with it. Funding for the work being done here comes directly from NASA's budget allocation.

Photo by Kurt Worrell

Why was Wisconsin selected over so many other institutions? The main reason is because the University of Wisconsin is so prominent in the field of space astronomy. In the late 1950's, about the same time NASA was formed, the astronomy department became a pioneer in research and development of new observational equipment. The Washburn Observatory was the first to develop photoelectric techniques for viewing our universe, another example of this was the first stellar space observatory, the Orbiting Astronomical Observatory built by the UW Space Astronomy Lab. This tradition lives on today with Professors Bless, Code, and Savage working on the Space Telescope, Professor Nordsieck working on Wisconsin Ultraviolet Photo Polarization Experiment, and Professor Anderson working on still another telescope, for the shuttle. Wisconsin's climate is less than ideal for land-based astronomical observations. Therefore, our professors have the choice of either working on space projects or traveling great distances to a more suitable climates for astronomy.

Looking past our campus, the Space Telescope project has come under heavy fire from groups both inside and out of the scientific community. After 18 months, some $400 million in cost overruns, and a heroic engineering effort by NASA, the problems which have delayed the Space Telescope have been largely overcome. In the aftermath of the development crisis, NASA, Congress, and the astronomical community have been taking their first hard look at the agency's plan for such mundane essentials as spare parts, maintenance, and refurbishment. All of the Space Telescope's most critical components are designed to be replaced by astronauts, with visits only when something goes wrong. In practice, it raises the vision of failed instruments, interrupted or lost science, emergency flights, and urgent supplemental budget requests. Especially disturbing is the fact that there are no backups whatsoever for the scientific instruments. If one should fail, the station would have to be brought back to Earth to be repaired and the returned. This extra trip alone would add millions onto the replacement cost of the failed device. Quite aside from the cost of the shuttle flight are the problems posed by landing 25,000 pounds of exquisitely aligned optics. Finally, with the suttle only able to raise the telescope to 515 km, atmospheric drag will require it to be reboosted approximately every nine months. Will the Space Telescope produce all that expected from it? Will the staggering costs of building what is hoped to be the most advanced "astronomical laboratory" known to man pay off? By mid 1986 the world will decide as Space Telescope assumes its lofty perch high above. □

A Perilous Homecoming

by Charles Spengler

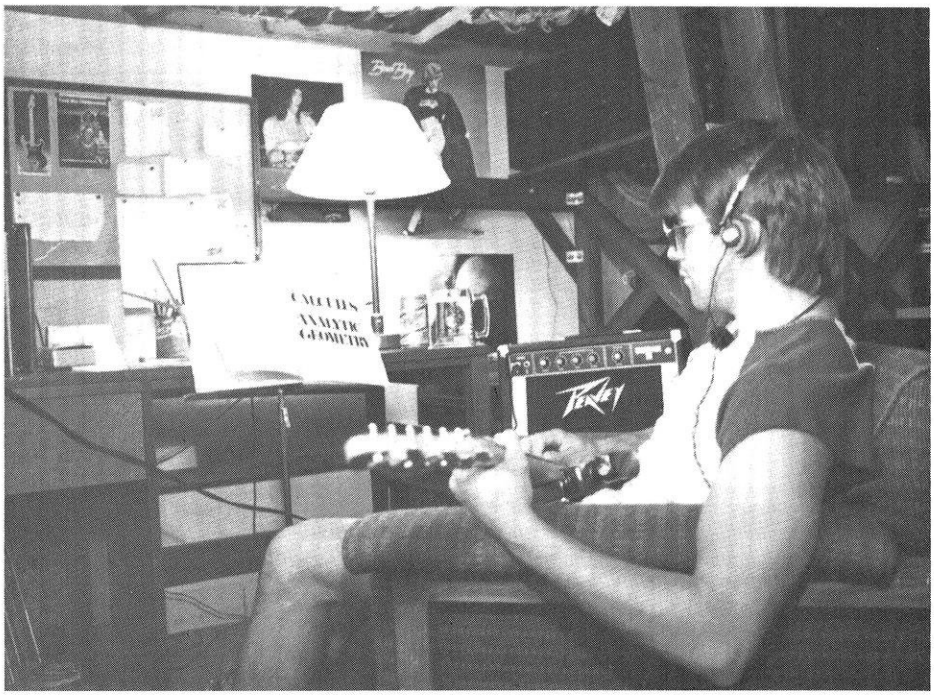

Photo by Kurt Worrell

You're in college, your parents want to see you. They miss you. Can you blame them? You say to yourself, "I've got the time, I've got the bucks, why not?" So there you are, Friday at 3:00 with your backpack full of books and your garbage bag full of clothes. Wait a moment—books? That's right, no matter what happens, you've got homework to do.

After an exhausting bus ride you walk across town to the yard and house that you call home. Everything still looks the same.

There is a large dog staring up at you with a toothy grin ready to slobber all over you. You're thinking, "we don't own a dog," and it's thinking, "I know the smell, but can't place the face." The dog decides to take a closer look. Paws on shoulders, it gives you a sizing up. You wonder when the dog will remove your head. The dog's verdict is "O.K." and signals it with a hearty tongue shake. Thoroughly drenched, you stumble through the door into your mother's arms.

Well, not exactly into mom's arms. You sort of hunt around the house for her, then she hugs you and strains three ribs. Mom is really glad to see you. She loads you down with the ton of questions she always asks. "How are your classes? Have you been eating all of your broccoli and chewing it completely (as opposed to swallowing it whole)? Have you met any new girls (or boys) that you like? Have you been changing your underwear regularly?" And finally, "have you been staying awake in your lectures and have you been doing your homework?" You "yes mom" your way through this line of inquiry until you hit the word "homework." You falter, but are saved by your little sister.

Your little sister runs in and gives you a hug that would take out a high school J.V. linebacker, smothers you with kisses, (assuming you were on her good side when you left) and strains three more ribs. Sister isn't so little anymore. She tells you how her school is going and how she got an "A" in her Comparative Realities class. She tells you about her new boyfriend and the Rush concert she went to. She asks what you've been doing, and you have to answer "homework." Finally all the questions have been answered, you find yourself alone and hypnotized by the pile of books in front of you. You feel yourself beginning to panic.

Clausen's Rule states that music styles should match the concepts and content of the material being studied.

Don't panic.

There are ways to enjoy the comforts of home while studying. The few pitfalls can easily be avoided by following a few easy rules and practicing a few clever tricks.

First, under no circumstances should you listen to music without using headphones. The logic behind this is that if your mother hears the music she will automatically assume that you are available to mow the lawn or perform some other mundane chore. Another aspect of this rule is to always store your provisions in your room ahead of time. If you're in the kitchen you're live bait for mom. Be grateful this doesn't also apply to the bathroom.

The second rule that comes to mind is Clausen's rule. Clausen's rule states that music styles should match the concepts and content of the material being studied. A prime example of this is that heavy metal doesn't go well with any math above 221. The reason is that upper level math classes are full of intricate and complex concepts best suited to classical piano concertos. On the other hand, heavy metal is a brutally to-the-point style that is more fitting for math 99-114. Another example is that Chemistry does not go with funk. The rationale is that Chem. is a very formal science, but funk is a very loose and informal art form. Funk is perfect for Physics.

Another thing to consider while at home is that your family will want you

(continued on page 20)

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Engineer's Library

The Existential Pleasures of Engineering

by Hassan Syed

A new philosophy has been gaining currency since the mid-1960's. It holds technology to be the root of all the problems our society faces today. Jacques Ellul, the founding father of the anti-technology movement, claims that technique and technology have become monsters that cannot be controlled. Ellul's definition of technique includes not only the machines, but all efficiency and organization. According to Ellul the search for efficiency has become an end in itself. After establishing technology as an evil force, the antitechnologists go on to depict the average citizen as a helpless slave who is forced to perform work he detests, and driven by the evil forces to consume things he does not want.

Engineers, as proponents of technology, have taken much of the criticism directed towards technology. Samuel Florman, an engineer, has set out to absolve the engineers from these allegations in his book "The Existential Pleasure of Engineering." Florman has forcefully and passionately tried to convince readers that one single group, such as engineers, should not be held responsible for all the problems created by technological movement. Rather, he states, society as a whole, is responsible for the consequences that resulted from its use of technology.

Florman vehemently opposes the view that technology is something that has escaped human control. He describes technology as one of the activities people engage in. He supports his viewpoint by quoting philosopher Daniel Callahan who said that "man is, by nature, a technological animal; to be human is to be technological." However, Florman does concede that technological advancement appears to be independent of human direction and it is so because technology is deterministic. It causes other things to happen that cannot be predicted in advance. Still, he argues that it is not technology but human impulse that precedes and underlies each technological development.

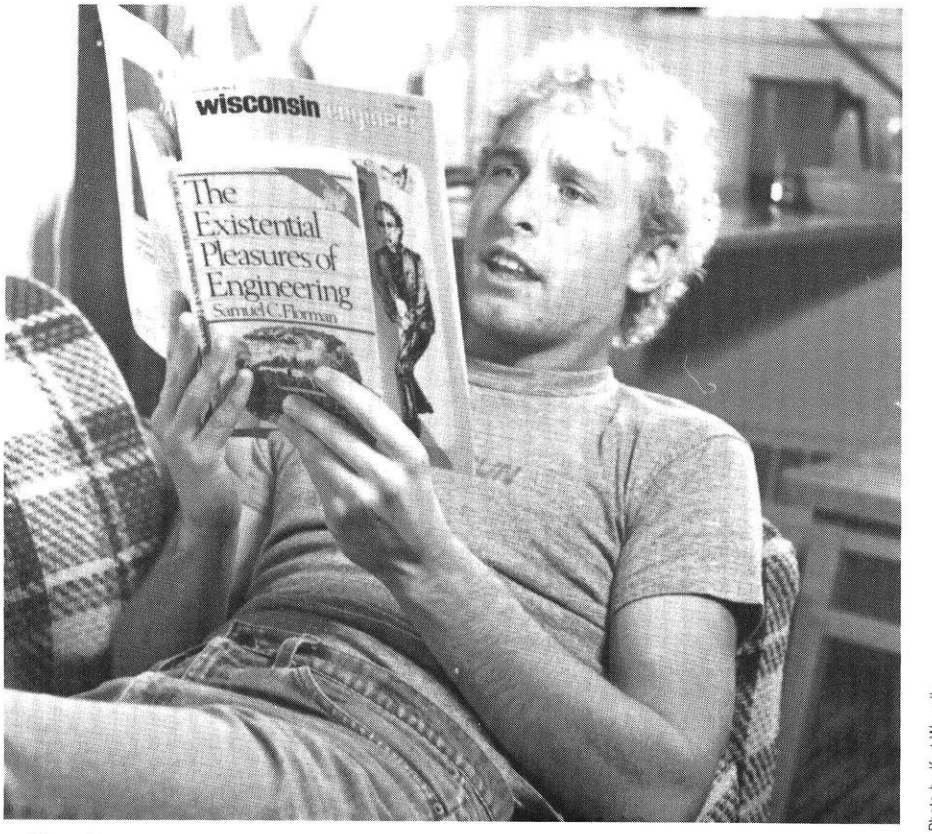

Photo by Kurt Worrell

There's more than one way to enjoy the existential pleasures of engineering.

Florman refutes the antitechnologist's claim that exploitation of masses has increased because of technology. He denies the argument that decisions are made by technocrats who are safely insulated from popular sentiments by pointing to changes in legislation concerning abortion, divorce, and pornography. According to Florman, the world today is moving away from rigid class structure of olden days. The slaves are free, and those who were disenfranchised can now vote. We only have to look at the underdeveloped nations to see that exploitation is not proportionate to technological advance. If anything, the opposite is true.

Recently, the emerging train of thought has been that if the engineers were more moral, problems such as environmental crises, would never occur. However, the proponents of improved morality in engineering are silent about government agencies. In Samuel Florman's opinion it is not only impossible, but also dangerous to formulate a moral code for engineers. He asserts that the vagueness of terms such as "public interest" and "moral judgment" have made it difficult to define ethical behavior. Also it is not difficult to find experts with differing opinions on virtually every technical issue. According to Florman, an engineer cannot do his best work if he is excessively apprehensive and anxious about the ethical value of his every

(continued on page 20)

How to pick an engineering career

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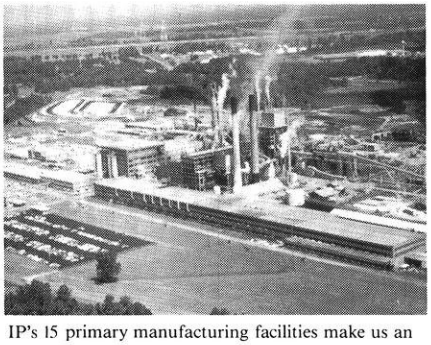

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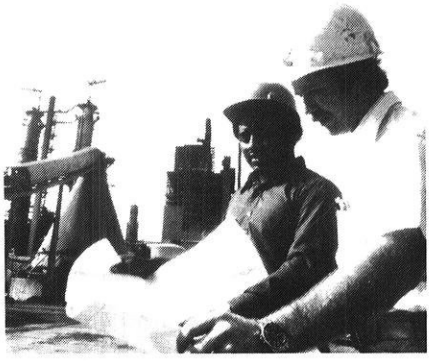

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(continued from page 16)

to have dinner with them. That's okay; or is it? You've developed completely different eating habits and table manners. You must remember to leave the silverware at the table instead of pocketing it. The same goes for glasses, plates, bowls, and serving utensils. Also, don't go looking for a cashier to turn the television to your favorite soaps; your house probably doesn't have a TV in the kitchen, let alone a cashier. Remember-eat slowly, it may be awhile before you get another good home-cooked meal.

Here are a few additional points to remember:

1. Don't listen to Twisted Sister while graphing things; it will warp your lines and straighten your curves.
2. Always teeter on your chair to give you the proper perspective while reading Poe.
3. Pizza should not be eaten while studying Poli. Sci.; you may start to think about Italy's government instead of your assignment.
4. Don't eat or drink anything when doing Econ. problems; you may become to preoccupied with the flavor of your supplies and ignore the demands of your homework.
5. Don't read Botany texts in the presence of plants. Would you want to be around when someone was looking at cross-sections of the human body?
6. Always listen to the Dead Kennedys when reading assignments for Lit. classes so that you don't fall asleep.

In conclusion, studying at home can be a breeze if you take precautions and follow the rules. If you do this as soon as you get home you will have plenty of time to spend with the family and/or that special someone you left behind. Remember, all study and no play will drive you off the deep end, so have fun. □

(continued from page 4)

Better advising procedures were recommended by three of the students. "Strive for and require better, more frequent and more helpful consulting and advising sessions between engineering students and their faculty advisor. Students don't seem to take as much advantage of their advisor's knowledge as they should. Maybe requiring a certain amount each semester would help. I wish I had done that!"

Another opinion, expressed by three of the respondents, was to lower the grade point admissions requirement. "The required GPA's to get into engineering are outrageous since they prohibit many very capable students from pursuing the career of their choice."

Recommendations made by two students each included: making engineering education more technical, and having the curriculum be more individualized, so that each student could take whatever classes he feels would most benefit himself.

Many improvements were suggested by only one student each. One Wisconsinite thought that out-of-state enrollment should be decreased, while another student thought that all enrollment should be decreased. Greater funding for the departments was suggested as a way to provide more and better equipment and facilities for classes, especially labs. Other recommendations were: making non-engineers take more engineering classes, decreasing the amount of material covered in each class, putting less emphasis on grades and more on learning, having one big library containing all materials needed in engineering, combining mineral engineering with civil engineering because of the similarity in classes, and making the engineering program five years long (isn't it already?). One hostile non-Greek declared, "Kick out the frat boys!" And someone else (who obviously hasn't been here long) said that no change is needed, since everything in the College of Engineering is just fine.

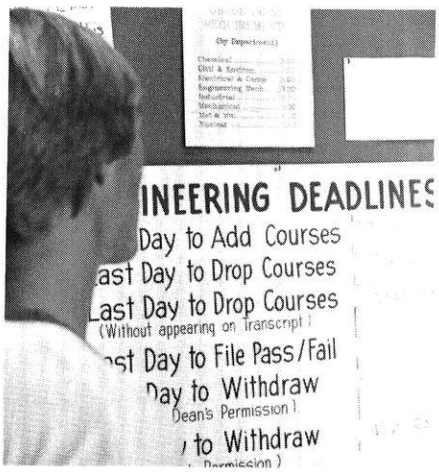

Photo by Ann Schwichtenberg

Most people, however, would agree that there are steps that can be taken to make the UW a better place to get a good education. If changes are ever to be made people are going to have to make their suggestions and ideas clear to the people who can do something about the problems. □

(continued from page 18)

move. He argues that we cannot expect the engineer to do an environmental impact study for each assignment he receives. However, we can subject him to work under guidelines established by public agencies and monitored by the engineers employed by the public.

Technology and ultimately the engineers are blamed for the environmental crisis that is upon us. In fact, environmental crises did not occur from technological neglect, but because nobody looked at the total picture. Environmental problems resulted from an accumulation of apparently error-free decisions. Nature has enough resilence to cope with pollution caused by small sources. This capacity of nature to absorb and cleanse is assumed as a given prameter in engineering design. It is the accumulation of thousands of such sources that results in a major crisis. Therefore, the engineering profession should not be put on trial; rather, it should be the politicians, and government who have failed to do long range planning. If the government had asked the engineers to do long range planning to avoid pollution they would have done so happily. But in the absence of such request, relating environmental crisis to engineering error seems unjustified.

"It is not only impossible, but also dangerous to formulate a moral code for engineers."

Florman proclaims that in a world dominated by subtle and devious politicians and entreprenuers, the engineers have been too honest and sincere to function effectively. It's time for engineers to become a bit more savvy and aggressive, to have more say in the way things are handled. He claims that if engineers could move away from their drafting tables to infiltrate society as leaders of corporations, universities, governmental agencies, and community groups, society's chances of coping with its problems would be markedly enhanced.

Samuel Florman has done a great service for the engineering profession by standing up against the anathema of antitechnology. It is about time engineers' voices be heard in the upper echelons of society. In Florman's words, "it is time for the engineering profession to grow up. Its problem is not lack of morality, but rather lack of maturity." □

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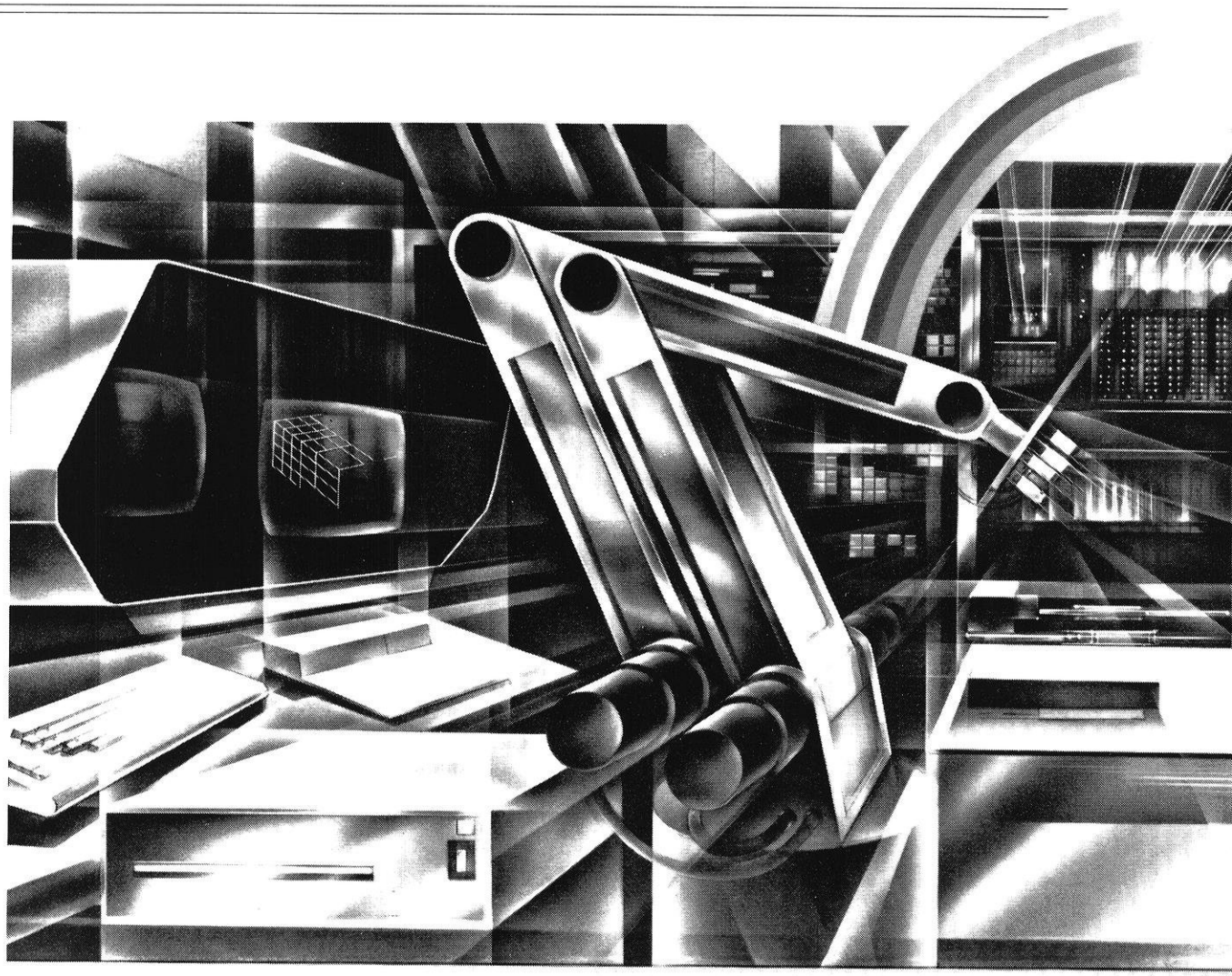

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