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Volume 85, No. 2

December 1980—January 1981

wisconsin engineer

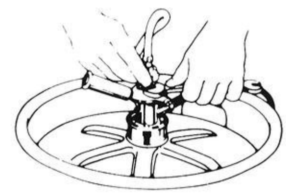
COMMUNICATION

ENGINEERING CAREER OPPORTUNITIES

Does it take an Engineer to tap a keg of beer?

Beer and CO_2 line Connections

1. To connect beer line to tavern head, pull out and depress the tapping handle to locking position (DO NOT attempt to connect beer line to tavern head while it is connected to the Tap-O-Matic keg). Tighten wing nut to hex nut on threaded part of the probe, holding probe in place with 3/4" flat wrench.
2. Connect CO_2 line from regulator to CO_2 inlet valve with clamp (if series tap coupling is used, tail piece and hex nut are used on CO_2 line).

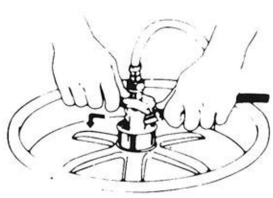


Tapping Procedure

1 With tavern head tapping handle in the UP POSITION, align lug locks on the tavern head with the lug housing on the top of the keg. Insert tavern head.

2 Turn tavern head 1/4 turn clockwise; the tavern head is now secured to the keg.

3 Pull tapping handle out and depress downward to locking position. This will open the beer and CO_2 valves. The keg is now tapped.



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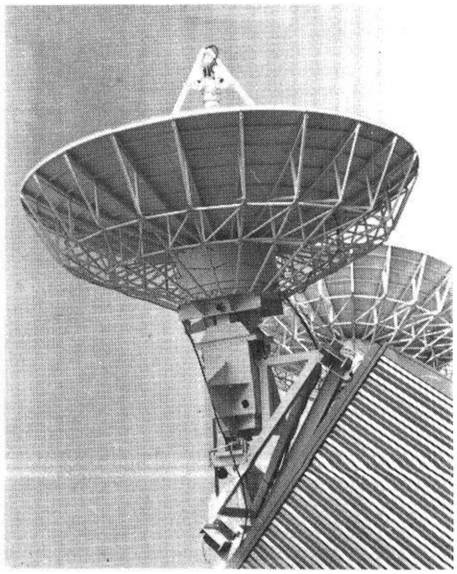
CAMPUS INTERVIEWS February 2nd.

wisconsin engineer

PUBLISHED BY THE ENGINEERING STUDENTS OF THE UNIVERSITY OF WISCONSIN—MADISON , JANUARY 1981

FEATURES



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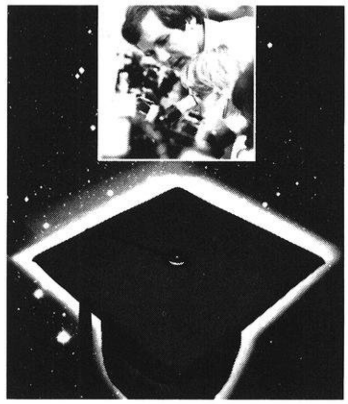

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Faculty perspective

Most students are serious

by David Barnas

The engineering faculty can have a profound effect upon the emphasis placed on teaching students good communication skills. David Barnas talked with engineering professors to get their thoughts on communications and the engineer.

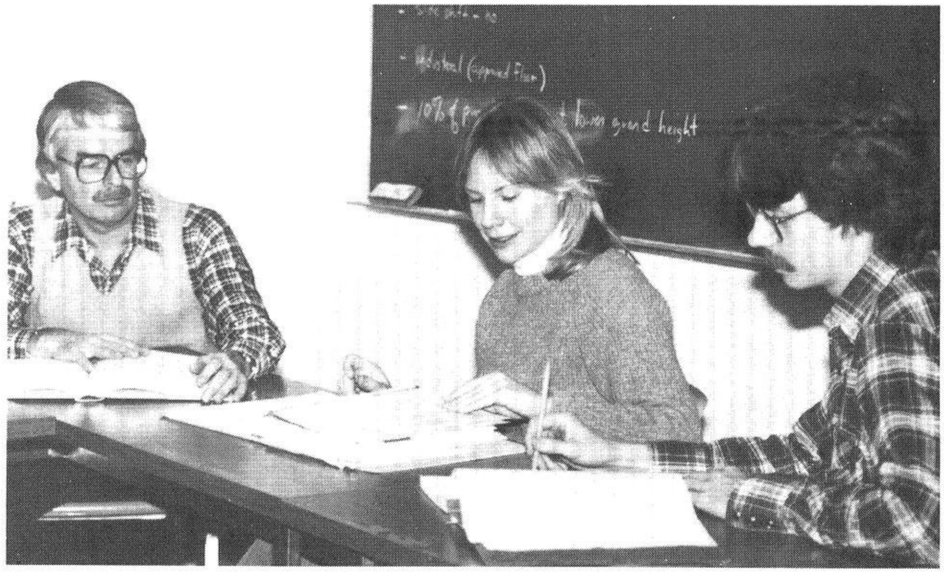
Engineering students learn two fundamental skills that prepare them for a lifetime profession: mathematics and communication. Unfortunately, the average engineering student may lack good communication skills, even after four years of college. Interviewing faculty for their views on engineering students' grasp of communication skills provides interesting insights into the problem.

Some of the faculty indicated that the communications problems stem from a student's pre-college education. Dean Frederick Leidel, Dean of Freshmen Engineers, says that if he were given one test score to predict a student's success in college, it would be the verbal aptitude test score. This test measures how well a person can obtain and process information after completing a primary & secondary education. Professor William Feiereisen, of the Mechanical Engineering Department, also attributes a lack of sound communication skills to poor primary and high school instruction. In addition, he notes, "Too many junior and senior students have remarkably poor grammar and spelling skills. One extreme example is the use of 'gonna' for 'going to' in a report submitted to me."

Professor Hugh Powell, also a

Person to person instruction and communication has advantages over massive lectures. Here, Professor William Saul provides individual attention.

Mechanical Engineering professor, emphasizes that proper communication skills, both written and oral, are the mark of an educated person. Many students, though, feel that the required engineering curriculum does not provide enough opportunities or the development of these skills. Professor William Saul, of Civil and Environmental Engineering, believes that, "Most students are serious enough about their studies to seek out the classes that are most apt to satisfy their educational needs."



Industrial Engineering professor, Gordon Robinson, confers with students involved in project work.

The emphasis placed on good writing and speaking skills varies between the different departments in engineering. Professor Gordon Robinson, of the Industrial Engineering Department, states, "IE students rely heavily upon oral and written skills". The Industrial Engineering Department offers a senior design course taught by Professor Robert Ratner. His students practice communication skills by working in teams on real-life design projects. He meets with them on a regular basis, but only to guide them through the project. Twice during the course, the students give oral and written reports to practice communciation skills.

Performing welding lab experiments requires constant communication between Professor Braton and his students.

Professor Braton, of the Mechanical Engineering Department, instructs his senior level Manufacturing Process Laboratory with communication in mind. He first introduces a topic, then the students split into groups of three to work on the experiment. The lab report is informal, but at the conclusion of each lab session, time is set aside for the students to evaluate the lab and make an oral presentation.

The Department of Electrical and Computer Engineering offers two courses taught by Professor Charles Ranous. In both the sophomore level Survey and Discussion of Electrial and Computer Engineering and the senior level Professional Expression courses, students are given assignments which emphasize student leadership and participation. "The projects start out a real mess, but improve as the students develop skills: the feedback is from the other students, not professors," says Prof. Ranous. Professor Ranous stresses the importance of experience in becoming a proficient communicator.

All of the engineering faculty members that were interviewed agreed upon one point: engineering students need better communication skills. An engineer must exhibit his mathematical skills through his use of the English language. He cannot merely rely on his use of mathematical formulae to communicate his ideas.

Communications

The road to improvement

by John Wengler

In our society where a person is characterized by his oral, written and vocabulary skills, a "nuts-and-bolts" person may run into problems. His success can often hinge upon an ability to translate principles and methods into the vernacular of both the layman and the lawyer. John Wengler discusses the resources available to the student for development of this ability.

COMMUNICATIONS REQUIREMENTS

	Che	CEE	ECE	EM	IE	ME	MME (Met)	MME (Min)	NE
English 101	This one-semester course is required of all engineering freshmen who do not pass the English Placement Test. Approximately 90 percent of engineering freshmen are exempt from English 101 on the basis of this test.								
Report/Technical Writing	0	0	3	3	3	3	2	2	0
Communications Skills/Arts*	0	3	2	2	3	0	3	3	0

There are few communication requirements for engineering students. Approximately half of the departments require one technical communication or less for graduation.

As another year passes, the undergraduate moves one step closer toward a phenomenon called the "real world." On the technical side, students are told what is and is not applicable. In the process, students are constantly reminded that all engineering efforts will be futile if not communicated effectively. An early question rises: "How does the engineering student learn these skills when his schedule is dominated by math and engineering courses?".

Most engineering departments require credits in communication arts for graduation, but many students find still other routes to communicative maturity. These avenues include daily interaction with peers and involvement in the many communication opportunities offered outside of the engineering curriculum. It is the student's responsibility to seek out resources which he or she can utilize. Otherwise, a student will not leave college with the total education that his time and efforts should have obtained.

Courses in the department of Communication Arts are often recommended by the various engineering departments. Communication Arts 101 and 105 are courses open to all undergraduates. These courses fulfill elective credit requirements and offer the student an initial preparation in oral presentations. The student is expected to write and deliver a speech, and understand why it was good or bad.

The College of Engineering offers similar courses that deal with the presentation of engineering oriented speeches. The student develops a professional quality presentation on a technically oriented subject (usually concerning his major) and is required to understand the merits of good public speaking. Lessons in professional etiquette are also covered. Introduction of speakers and the writing of formal reports are two such concepts. The skills learned in these courses prepare the graduate engineer for entrance into the working world.

Outside of the curriculum, a student can find many organized resources to help him develop his communication skills. A number of professional engineering organizations offer such opportunities. At the meetings of such groups, speakers from different fields offer the student good examples of professional presentations. Also, for students with a greater interest in communications, a number of student publications offer ample opportunity for expression. The Wisconsin Engineer, for example, is staffed by students who are interested in developing their communication skills. The magazine is published five times a year and is always looking for writers.

An education in engineering involves many situations which become valuable practical experience in communications. For example, in a lab where students must work together, good results depend on communication. Each day the student is challenged to develop his skills. Again, it is up to the individual to decide what he must learn before leaving school.

Lastly, while some individuals call for a curriculum increase in communication skills, far too many students neglect the resources at hand. In other words, it's the students responsibility to learn all he can during his stay in Madison. There is a lot more to engineering than just showing up for classes.

Far too many engineering students pass opportunities for communication skill development.

QUALITY OF ENGINEERING EDUCATION AT THE UW

Are you concerned about the quality of your education? Work has begun on a project to evaluate the quality of education on the engineering campus. The project will be coordinated through Polygon and we need you to help us develop a survey. We would like to challenge you to define:

Quality of Engineering Education.

Please submit entries to Polygon in the Polygon Mailbox in the mechanical engineering lobby, or Dave Hasselkus, or Scott Conrad in room 375 ME. Each qualified entry will receive a Union South ice cream cone, so remember to attach a name, phone number, and address.

Entries may be submitted by undergrads, grads, engineering alumni, and professors.

Anyone interested in getting involved in this project, or having an interest in this topic is encouraged to contact Dave Hasselkus (257-0729) or Scott Conrad (233-5927). The address is:

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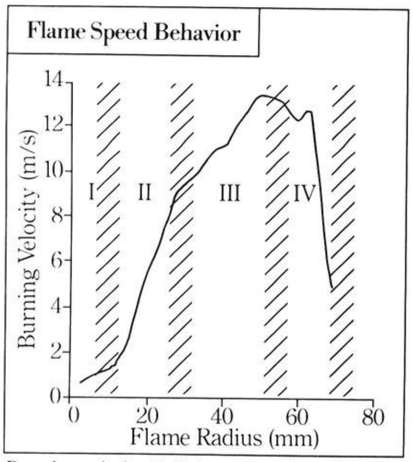
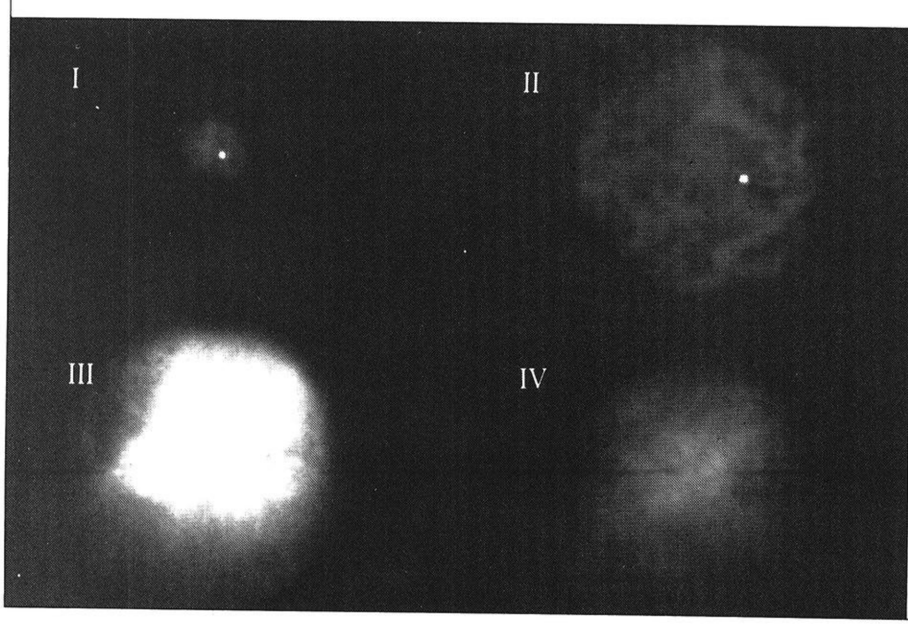
The Turbulence Parameter

Energy-efficient operation of the internal combustion engine requires the highly turbulent movement of fuel and air in the chamber. Recent advances at the General Motors Research Laboratories provide a new basis for determining what degree of turbulence will get the most work from each drop of fuel.



Burning velocity plotted as a function of flame radius. Combustion stages are indicated by roman numerals.



High-speed photographs showing flame evolution (lasting six milliseconds) through four stages: initiation (I); flame growth (II); full development (III); termination (IV).

WITHOUT TURBULENCE, the highly agitated motion of cylinder gases, combustion would take place too slowly for the gasoline engine to function. Predicting combustion behavior in order to design engines with greater fuel efficiency depends upon understanding the relationship between vital, turbulent gas motions and burning rate. The challenge is to quantify this relationship—a complex task made more difficult by the requirements of measuring a transient event occurring in a few milliseconds within a small, confined space.

New knowledge of how turbulence affects flame speed has been revealed in fundamental studies conducted at the General Motors Research Laboratories by Drs. Frederic Matekunas and Edward Groff. Their investigative results have been incorporated into a model that successfully predicts the effect of engine design and operating conditions on power and fuel economy.

The researchers separated their experiments into two phases. In the first phase, they measured turbulence in the engine cylinder; in the second phase, they determined flame speeds over a broad range of operating conditions. Testing took place in a specially designed, single-cylinder engine equipped with a transparent piston to permit high-speed filming of the combustion event.

Hot-wire anemometry was applied to measure the turbulent flows while the engine was operated without combustion. Instantaneous velocities were calculated from the anemometer signals and simultaneous measurements of gas temperature and pressure. More than 400,000 pieces of data were processed for each ten-second measurement period.

The significant measure of turbulence is its "intensity," defined as the fluctuating component of velocity. Because conditions in the cylinder are both transient within cycles and variant between cycles, separating the fluctuating and mean components of velocity is inherently difficult. The researchers overcame this problem by using a probe with two orthogonal wires properly aligned with the direction of the mean flow.

In the combustion phase, tests were performed at over one hundred operating conditions of varied spark timing, spark plug location, engine speed and intake valve geometry. Detailed thermodynamic analyses were applied to the recorded cylinder pressures to calculate flame speeds throughout combustion. High-speed films were analyzed frame by frame to validate flame speeds and to characterize how gas motions influence the initial flame.

The researchers used these measured flame speeds, turbulence intensities, and the conditions under which they occurred to formulate a burning law for engine flames. They divided the combustion event into four stages. The initiation stage begins with ignition and ends as the flame grows to consume one percent of the fuel mass. In the second stage, the flame accelerates and thickens in response to the turbulent field. The third stage exhibits peak flame speed. In the final stage, the thick flame interacts increasingly with the chamber walls and decelerates.

OVER THE RANGE of turbulent intensities encountered in engines, the researchers were able to describe the turbulent burning velocity, S_T, during the critical third stage of combustion with the expression:

$$S_T = 2.0\,S_L + 1.2\,u'\,P_R^{0.82}\,\beta$$

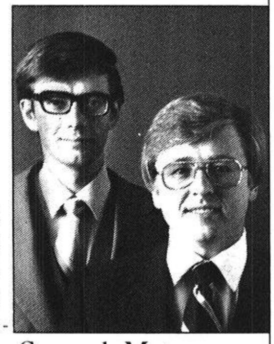
S_L, the laminar flame speed—a known function of pressure, temperature and mixture composition—is the flame speed that would exist without turbulence. The variable u' is the turbulence intensity. P_R represents a pressure ratio accounting for combustion-induced compression of the unburned mixture. The dimensionless factor β accounts for the effect of spark timing on geometric distortion of the flame which occurs during the first combustion stage and persists into the later stages.

The researchers also observed that the burning velocity in the second stage increases in proportion to flame radius, and that in predicting the energy release rate from the burning velocity equation, it is necessary to account for the finite flame-front thickness.

"The form of our burning equation," says Dr. Matekunas, "shows a satisfying resemblance to expressions for non-engine flames. This helps link complex engine combustion phenomena to the existing body of knowledge on turbulent flames."

"We see this extension," adds Dr. Groff, "as a significant step toward optimizing fuel economy in automotive engines."

THE MEN BEHIND THE WORK



Drs. Matekunas and Groff are senior engineers in the Engine Research Department at the General Motors Research Laboratories.

Both researchers hold undergraduate and graduate degrees in the field of mechanical engineering.

Dr. Matekunas (right) received his M.S. and Ph. D. from Purdue University, where he completed graduate work in advanced optics applications.

Dr. Groff (left) received an M.S. from California Institute of Technology and a Ph. D. from The Pennsylvania State University. His doctoral thesis explored the combustion of liquid metals.

General Motors welcomed Dr. Matekunas to its staff in 1973, and Dr. Groff in 1977.

Getting a job

The first test in communicative ability

by Will Kenlaw

Twice a year, more than two hundred and fifty companies make the trip to UW-Madison's College of Engineering Placement Office. Never again will the graduating senior have the opportunity to interview with such a large number of companies at such a low cost. Making the most of this opportunity demands more than simply playing it by ear. Will Kenlaw, a senior in Industrial Engineering, has assembled some facts that may help.

Time and time again the communication skills of an engineer have come under fire. Slowly but surely, these criticisms have extended themselves back to a possible focal point — academia. Many engineering students have acknowledged the communications problem, particularly, when it means obtaining that first job. Perhaps the most sought after job applicant, the engineering student ponders a pressing question: "How can I successfully cash in this ticket to immediate attention?" The answer lies, at least in part, in three major areas: interviewing, resume preparation, and general salesmanship. A recent interview with Professor James A. Marks, Engineering Placement Director, UW-Madison, shed some light on the subject

WE: Professor Marks, let's start with interviewing. Acknowledging that a good introduction is important, what does an interviewer interpret from the handshake?

Marks: It sounds totally weird, but if they get a real limp, dead fish response in the handshake, it just turns them off. It's not right or valid, or anything else, but it gives people the impression that the individual is weak, doesn't have self-confidence, is not an outgoing person. And even a firm handshake that's dripping with nervous perspiration is a turn off. Keep the hands dry.

WE: Should a student be somewhat aggressive during an interview?

Marks: I wouldn't say "aggres-siveness". That can come off as being too pushy. What the interviewer is looking for, is someone that is calm and self-confident, but when explaining what he wants to do or thinks he wants to do, he should be enthusiastic about it. (Enthusiasm as a degree away from being overly aggressive.) Interest and enthusiasm are essential. Certainly, a student should never use aggressiveness like a used car saleman or anything of that sort.

WE: Why shouldn't the student state, "I'm interested in management as a career?" Why is that a no-no?

Marks: Well, the graduating student is looking for an entry-level job. That's also what the recruiter wants to know — what entry-level job is the individual interested in. What students have to concentrate on is entry-level position, nothing more than that. If the interviewer has an entry level job that matches the individual's interests, and it's only to that point (only an entry-level job), then things will go on from there. But if their first is not that mutual interest, then there isn't going to be any other interest. It's a go/no-go situation.

WE: What about the statement, "I want to gain experience."?

Marks: The basic concept is that you don't go to an employer and present yourself in a way that does good things for you. You present yourself to an employer in a way that your talents, background, and interests help the employer. You're going to get experience and training. Therefore, you should approach the interviewer on the basis of what's good for the interviewer and his company. The way to get the job is to convince the employer that you can help him solve his problems.

WE: Interviewers look for what's called a knockout factor. What are some examples?

Marks: The most obvious one of all is grades. But, it can be the simplest thing in the world. If the employer, for example, is interviewing for sales work, a job representing the company, then the individual has to look the typical business part — a normal business suit, no beards, no wild hair, nor anything bizarre. In terms of ap-

Professor Marks provides pointers to an engineering senior. Files of company literature and information line the walls.

pearance, it's the old story — when looking for a job: you shave, you get a short haircut, and you buy a mortician's suit (a conservative suit and a white shirt). After you get the job, six months later if you want to grow your beard again, you write a little memo (stating your desire to do so) and just say, "attached is my first patent application." Then they don't care what you wear.

WE: Should a student ask questions which will stump the interviewer?

Marks: The questions shouldn't stump the interviewer to the point of embarrassment. They should simply make the interviewer aware that you've read their literature.

WE: Turning to resume preparation, for a graduating senior, is a resume (aside from the college interview form) an absolute necessity?

Marks: No. I don't think it's in the least bit necessary. I think our standard college interview form is the way to go. It's standard all over the country. That's its biggest advantage. And for employers, they're use to it. They know where to find what they need on it. Unless a student has an unusual background and a lot of experience, I don't think an additional resume is worth bothering with.

WE: What if the student has summer work experience that he feels is valuable and pertinent?

Marks: Then it might be helpful to have a supplemental sheet to the interview form; in a sense then, a resume with name, address, and phone number. Repeat briefly your job objective, but then spend the bulk of that page elaborating on that summer work experience. You take that to the interview with you and offer it to the interviewer to supplement the interview form. This is the appropriate time to do it. I wouldn't do it before then.

WE: How should written correspondence be handled?

Marks: A common mistake when applying to companies is writing too long a cover letter and submitting a three or four page resume. It simply won't get read. The way to start approaching a company, if you're doing it by mail, is to write a very brief cover letter. State your reason for writing, your job interests, and your level of interest and request for correspondence.

WE: In terms of just salesmanship, what should the students be aware of?

Marks: Students should realize that the interview form does nothing more than start the interview. That's all it's intended to do. Once you get in the interview itself, you're going to sell yourself to an employer on the basis of what you know about the company and what you know about your own background that's going to fit that company. If that doesn't happen, then the employer isn't going to be particularly interested.

In addition, Professor Marks encourages enrollment in his career counseling course, Professional Orientation, offered by the College of Engineering. He also recommends that students utilize all relevant literature as sources of aid in career planning and determination. At least two sources of written information, *The Graduating Engineer* and *Engineering Careers* (College Edition), are readily available to the UW engineering student. The former contains articles on five basic topics: Careers, Women, Management, Science and Technology, and Jobs. The latter, as the name suggests, primarily contains articles on career options. Both magazines can be picked up, free of charge, at the College of Engineering Placement Office. Also, both offer resume forwarding services.

The three-part answer (interviewing, resume preparation, and salesmanship) translates into three rules of thumb for communicative success: 1) good appearance and a confident sell, 2) the college interview form as a basic resume, and 3) knowledge of the company, your personal skills, and how these skills can solve an employer's problems.

EXPO 81

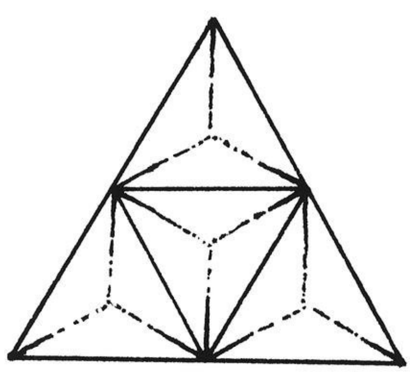
Engineering — foundations for the future

history of expo

A biennial event which began in 1940, the Exposition is entirely student run and student organized.

The first Exposition was the result of an annual feud between the lawyers and engineers. Before 1940, St. Patrick's Day never existed without a parade up State Street by the engineers, in honor of their patron saint. Unfortunately, the lawyers also claimed that St. Patrick was their patron saint. This led to continuous bickering which reached its peak on St. Patrick's Day. Year after year, the bickering became more spirited until it burst into open warfare on St. Patrick's Day, 1938.

This episode marked the birth of the Engineering Exposition. With the help of the engineering faculty, engineers decided to celebrate St. Pat's Day without a parade and instead focus their attention on events of a more constructive nature — an engineering exposition.



April 10, 11 & 12, 1981
10 a.m. to 8 p.m.

what is expo?

EXPO '81 is a biennial College of Engineering event which features student, government, and industrial exhibits.

"Engineering — Foundations for the Future" is the theme of EXPO '81, to be held on the engineering campus on April 10, 11 and 12, 1981.

The thirteenth Exposition since the event began in 1940, EXPO '81 will feature over 140 exhibits.

contacts

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Monday through Friday

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ADDRESS: 1415 W. Johnson Drive
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Student viewpoints

Joint responsibility is the key

by Glenda Henning

Identification of student opinions, concerns, and suggestions proved to be a challenge for one of the Wisconsin Engineer's newest contributors. A native of Milwaukee and a senior in industrial engineering, Glenda Henning captures student impressions.

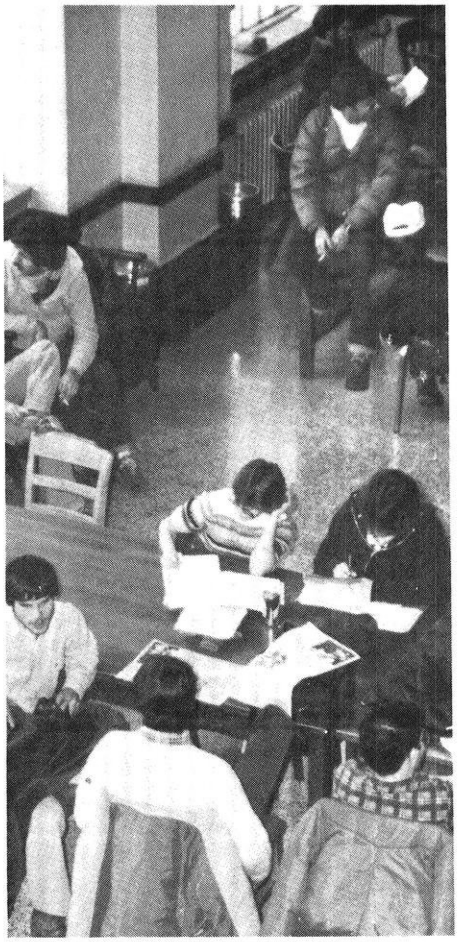
The Wisconsin Engineer recently took a random poll to assess student opinion concerning communications skills. A number of senior engineering students expressed their concern about the problem of communications skills in the engineering curriculum.

Mechanical Engineering Student: "I believe that because of the lack of practice in communication skills we, the students, will have problems (after graduation) expressing our ideas to other engineers and non-engineers."

Chemical Engineering Student: "I don't see how the problem can be solved without expanding the curriculum, which means extending the number of years in school, which most students might be against."

Electrical Engineering Student: "Yes, there does exist a problem which both students and administration should work on because it is necessary to be able to get your point across to others in the working world."

One student's statement accurately sums up these feelings: "We do need more emphasis on communications skills in the engineering school, but if more and more written and oral reports are required and if the curriculum continues to expand, then the number of years required to complete the undergraduate degree will increase along with the cost of getting that degree."



WE writer Glenda Henning interviewed engineering students at random as they gathered in the Mechanical Engineering lobby.

What the group of students is referring to is the growing awareness of the importance of communication skills for engineers. As industrial engineering students emphasized in the interviews, "Your practical knowledge of engineering is worthless unless you are able to communicate that knowledge either orally or in report form to a non-engineer client."

Currently, most engineering students put off taking the required engineering communications courses or are unable to register for required courses until their junior or senior year. This practice causes some problems.

First, the courses are more difficult because many students have had little if any experience in developing communications skills. Second, those students who have enjoyed any introduction to communications skills have done so under the auspices of communications arts courses where the emphasis is on non-engineering topics. Third, most engineering students avoid taking human values electives which require papers or oral presentations because of both time and work-load pressures.

The most common suggestion given by the students was to add an extra course to the technical writing and oral presentation course taken in the junior or senior year. This supplementary course would cover topics relating to both engineering and non-engineering fields.

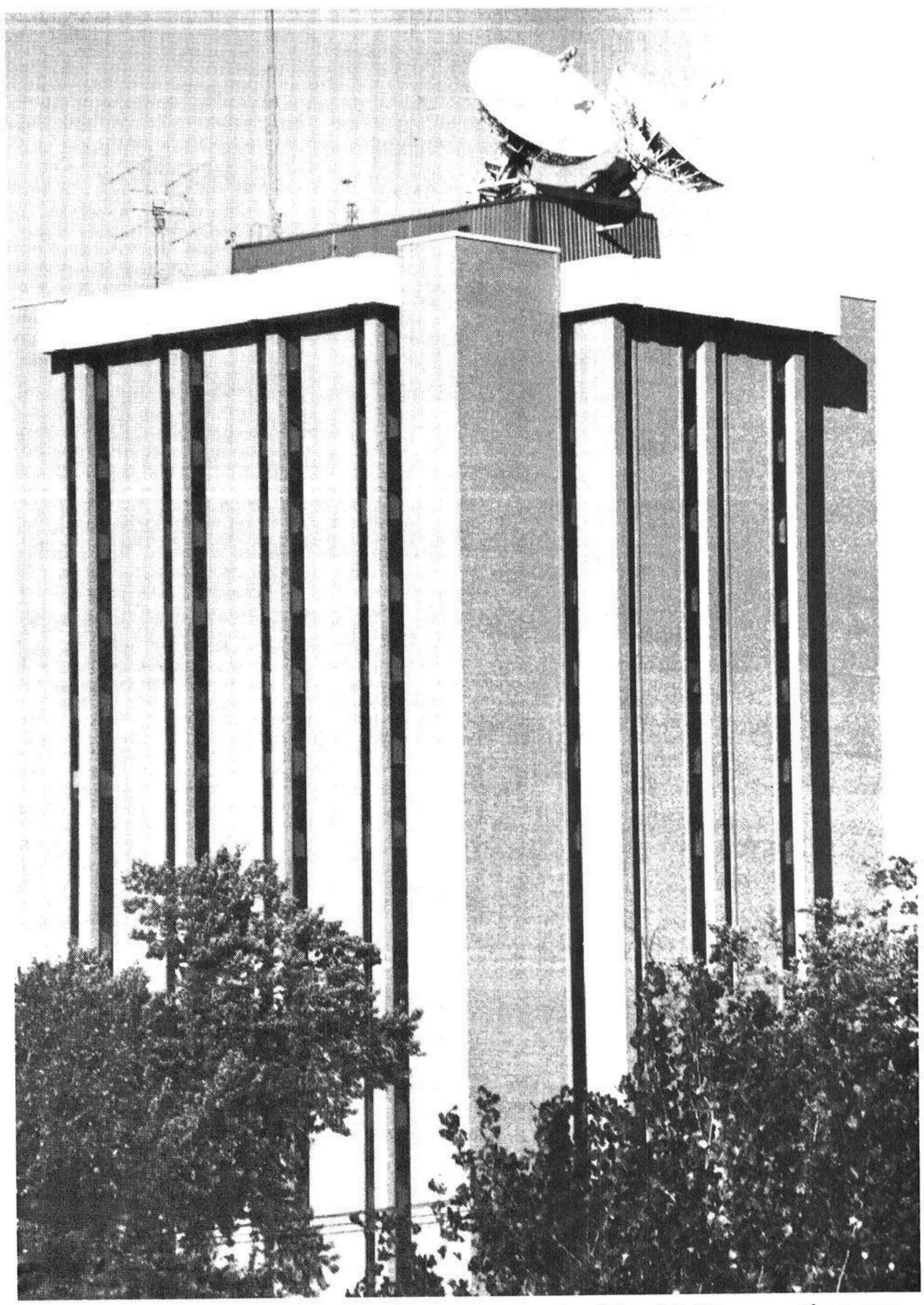
Students seem to realize that a communcations skills problem does exist and should be worked on by both students and administration. The future careers of these students depend upon their ability to communicate effectively.

McIdas

The missing link

by Russel Poeppel

Speedy and accurate communication is of paramount importance in the transmittal of weather data. Russel Poeppel (with the help of Joe Sayrs from the UW-Madison News Service) explored the facts behind a new system, developed at the UW-Madison campus, for weather data research.

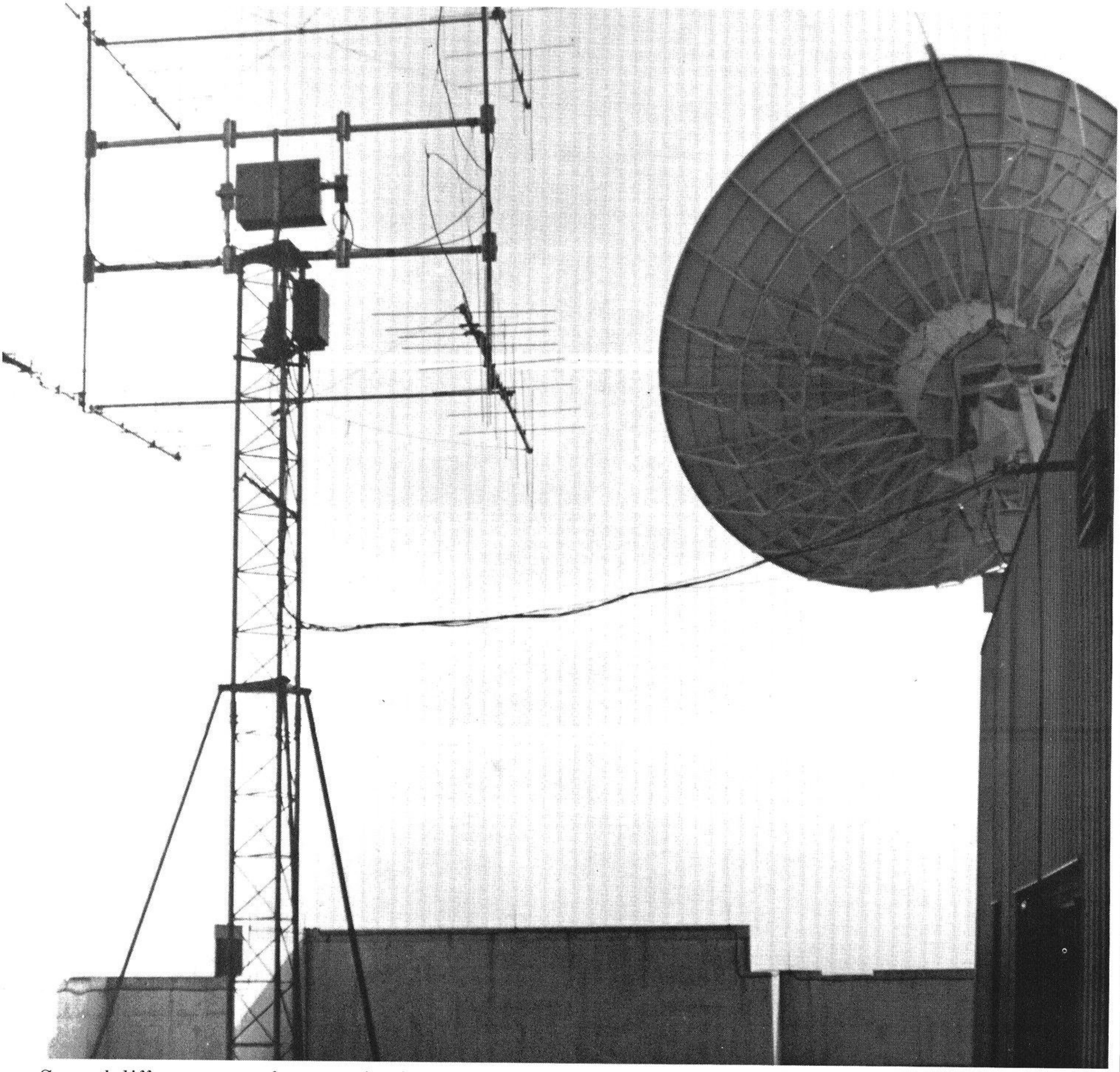


The huge disc antennae are major components of the McIdas weather communication system.

The two large disc antennae on top of the UW-Madison Space Science and Engineering Building are visible from miles away. These antennae, each one ten meters in diameter, are part of the Man-Computer Interactive Data Access System, better known as the McIdas System. This weather research tool, developed at UW-Madison, points the way to faster and more precise forecasts of severe storms and tornadoes, say officials of the National Severe Storms Forecast Center in Kansas City, Missouri.

McIdas was put into operation in 1973 and is the largest weather research system of its type on the world. The Man-Computer Interactive Data Access System is, as its name implies, a link between the scientist and the data which he requires. The system pulls together weather satellite images and normal earthbound readings, and can display combinations of the information on a color video screen. This ability to pull the information together into a meaningful pattern is what makes McIdas so valuable to a forecaster sitting in front of its screen and keyboards.

McIdas receives and stores weather data from a number of dif-



Several different types of communication equipment are assembled on top of the UW-Madison Space Science and Engineering Building.

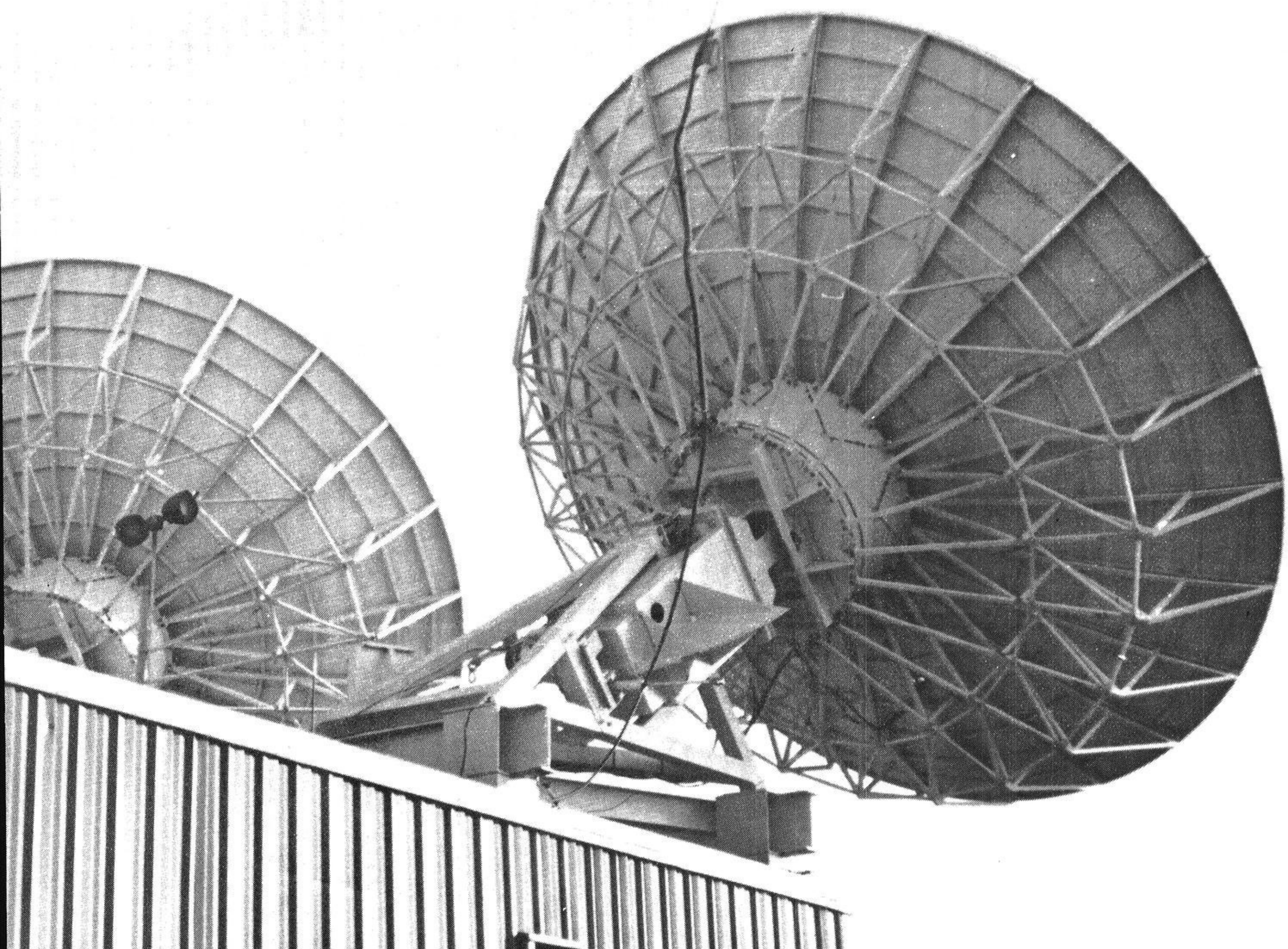
ferent sources from satellite transmissions to conventional weather service reports. McIdas' satellite information is received 24 minutes faster and shows more detail than the present pictures relayed through Washington, D.C. This allows faster evaluation of more current data.

The data is stored in the Data and Archive facility, which is also housed in the Space Science and Engineering Building. Detailed weather data, dating back five years is stored here, making it the largest library of weather data in the world.

When a scientist needs access to the stored data, he prints a format for the required information and the data appears before him, usually in the form of a video image.

More than just a display unit, McIdas can use the raw information to calculate tables, graphs, contour lines and wind speeds. These images can then be evaluated through the use of three unique features of the McIdas System.

The first of these features is the system's ability to transform a black and white image into a color



A close-up view of the antennae reveals the complexity of their construction.

mage. This is done through a process which assigns a particular colr to each of 64 different darkness evels.

The system also has the ability to ombine a number of different imges simultaneously on the same creen. It can overlay the images in single, multi-colored picture — uperimposing, for example, high ltitude temperature readings on a ive, infra-red satellite image. This apability facilitates the researchr's work by allowing him to comare and relate images more quicky than ever before possible.

Most importantly, the McIdas ystem has the capacity to make irect contacts between satellites nd broadcasting networks. Through the use of this link, networks are able to transmit up-to-the-minute satellite images to video screens across the world.

Edward W. Ferguson, manager of the Satellite Field Service Station in Kansas City, praised the ability of McIdas to fill the gaps between weather station reports with calculations and satellite information. "What we did before in our minds," he noted, "we do at the touch of a button."

The move to test McIdas' abilities came from the Weather Service's knowledge of how the system has developed and from a Texas tornado which slammed into Wichita Falls with scant warning last year. McIdas videotapes indicated that the warning time might have been increased with a system like McIdas. Representatives of both the federal government and UW-Madison stress that McIdas is not being used as an "operational" system — it's just an experiment to show what can be done.

The McIdas System is one of the many systems which have been developed by scientists and engineers to allow instantaneous communication from one media to another. It provides a necessary communication link between satellites, the broadcasting networks, the computer's stored data, the scientist and finally the public.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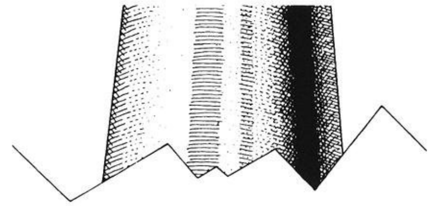
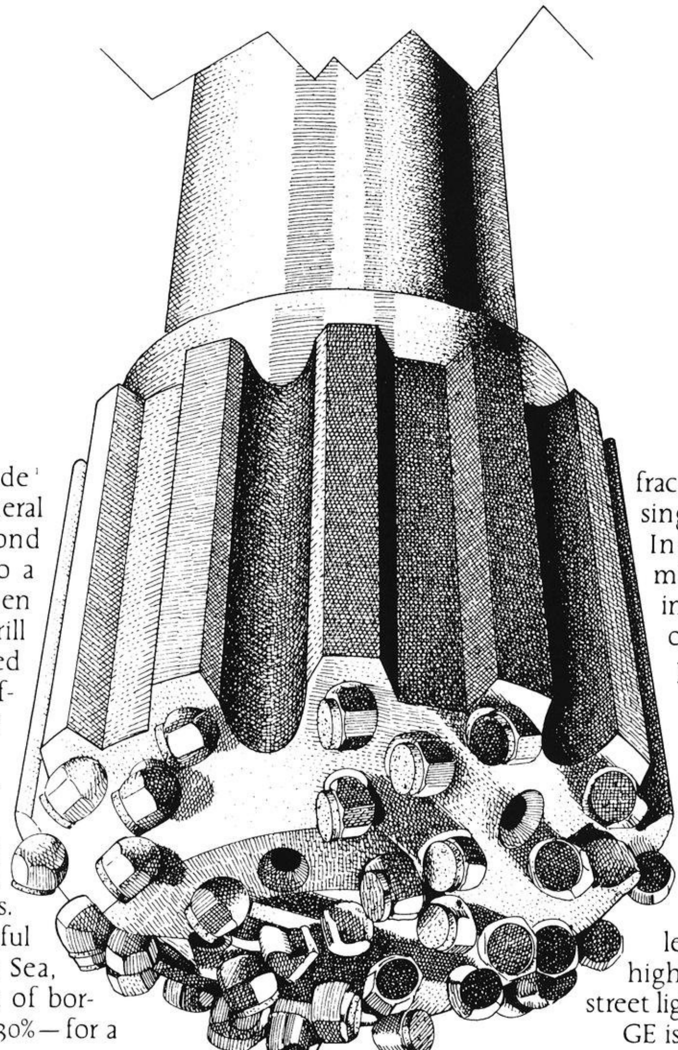


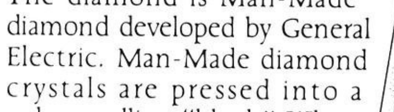
With this drill bit, GE is putting diamonds back into the earth.



The diamond is Man-Made® diamond developed by General Electric. Man-Made diamond crystals are pressed into a polycrystalline "blank." When this blank is attached to drill bits like the one pictured here, it provides a highly efficient cutting tool to probe deep into the earth.

Drill bits which include diamond blanks can as much as double the penetration rates of steel bits in drilling for oil and gas. In one of the most successful applications in the North Sea, these drill bits cut the cost of boring through shale by nearly 30%—for a total saving of close to $300,000.

Two remarkable engineering breakthroughs were required for the development of these drill bits.



The polycrystalline diamond blank microfractures because of its structure. Natural cleavage planes of mined diamond (right) cause it to break off in larger pieces.

First came the synthesis by GE of Man-Made diamond itself. Pioneering the technology of heating and pressurizing carbon established GE as a leader in superpressure science.

Then GE invented the technology which compacts the small, powdery Man-Made diamond into far larger disks (as large as 12 mm. in diameter by as much as 1 mm. thick). Since these disks are composed of many nonaligned crystals, they resist the massive destructive fracturing which occurs in large, single-crystal natural diamond. Instead, these disks tend to microfracture, constantly exposing new cutting edges without destroying the diamond product.

Creating new engineered materials is an important example of research in progress at GE. Recent developments include a proprietary epoxy catalyst that's cured by ultraviolet light. GE work in ceramics led to the Lucalox® lamp—a highly energy-efficient form of street lighting.

GE is constantly investigating new technologies and innovative applications for existing technologies—in such areas as electrical distribution systems, electronic components, environmental systems. This takes talent—engineering talent—not just in research and development, but in design and manufacturing, application and sales.

If you are interested in engineering opportunities at GE, check your Placement Office or write to: Engineering, Bldg. 36, General Electric, Schenectady, New York 12345.

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