



LIBRARIES

UNIVERSITY OF WISCONSIN-MADISON

Wisconsin engineer. Vol. 73, No. 6 [8] May 1969

Madison, Wisconsin: Wisconsin Engineering Journal Association,
[s.d.]

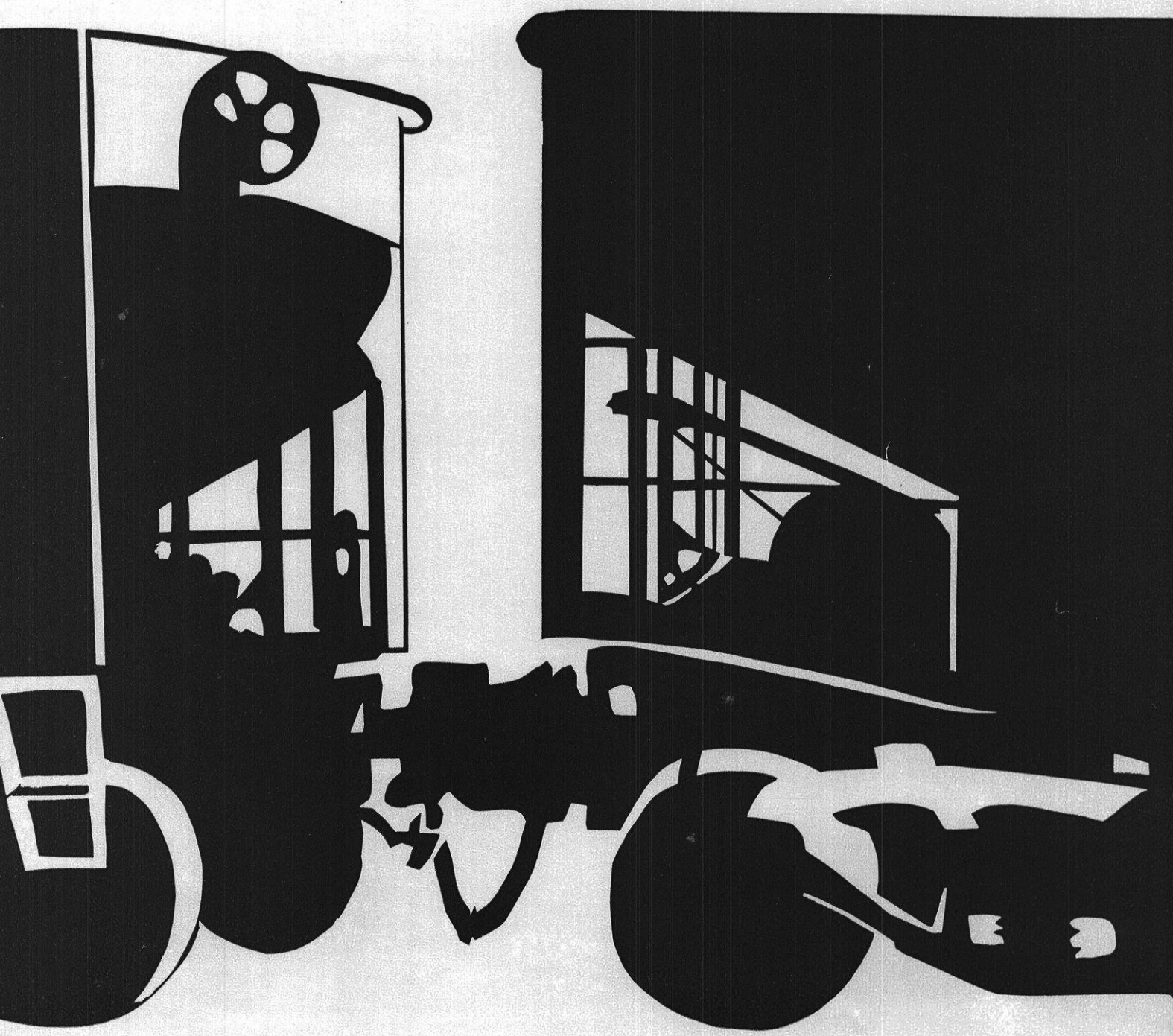
<https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I>

<http://rightsstatements.org/vocab/InC/1.0/>

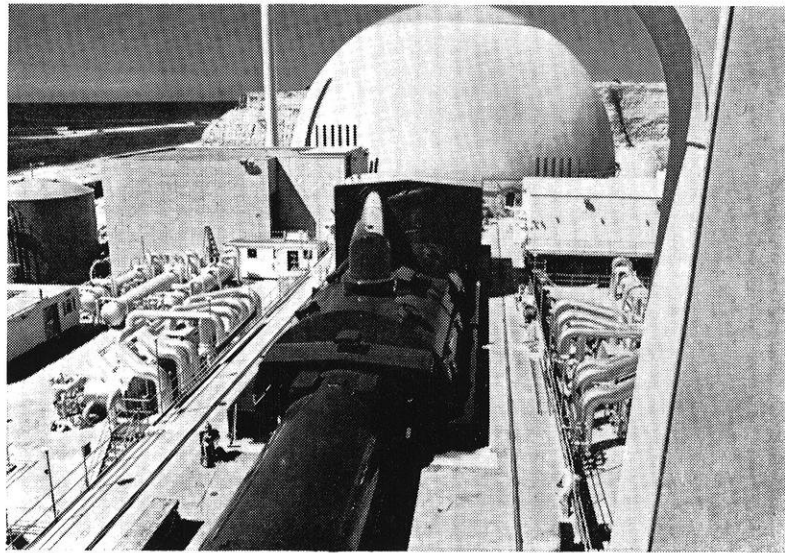
The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

McGraw-Hill engineer



Westinghouse needs engineers who understand this generation



or this generation.



In the next ten years, demand for electricity will double. What's Westinghouse doing about it? Plenty. We're number one in commercial nuclear power. We're working on an advanced breeder reactor. We're spending \$450 million to boost our production capacity.

Okay, that's Westinghouse, the

electric company. What about Westinghouse, the schoolteacher? In its first two years, Westinghouse Learning Corporation had over 60 government and private contracts, including training for the Peace Corps, Job Corps, and private industry.

Which doesn't even start to describe Westinghouse. We're also in

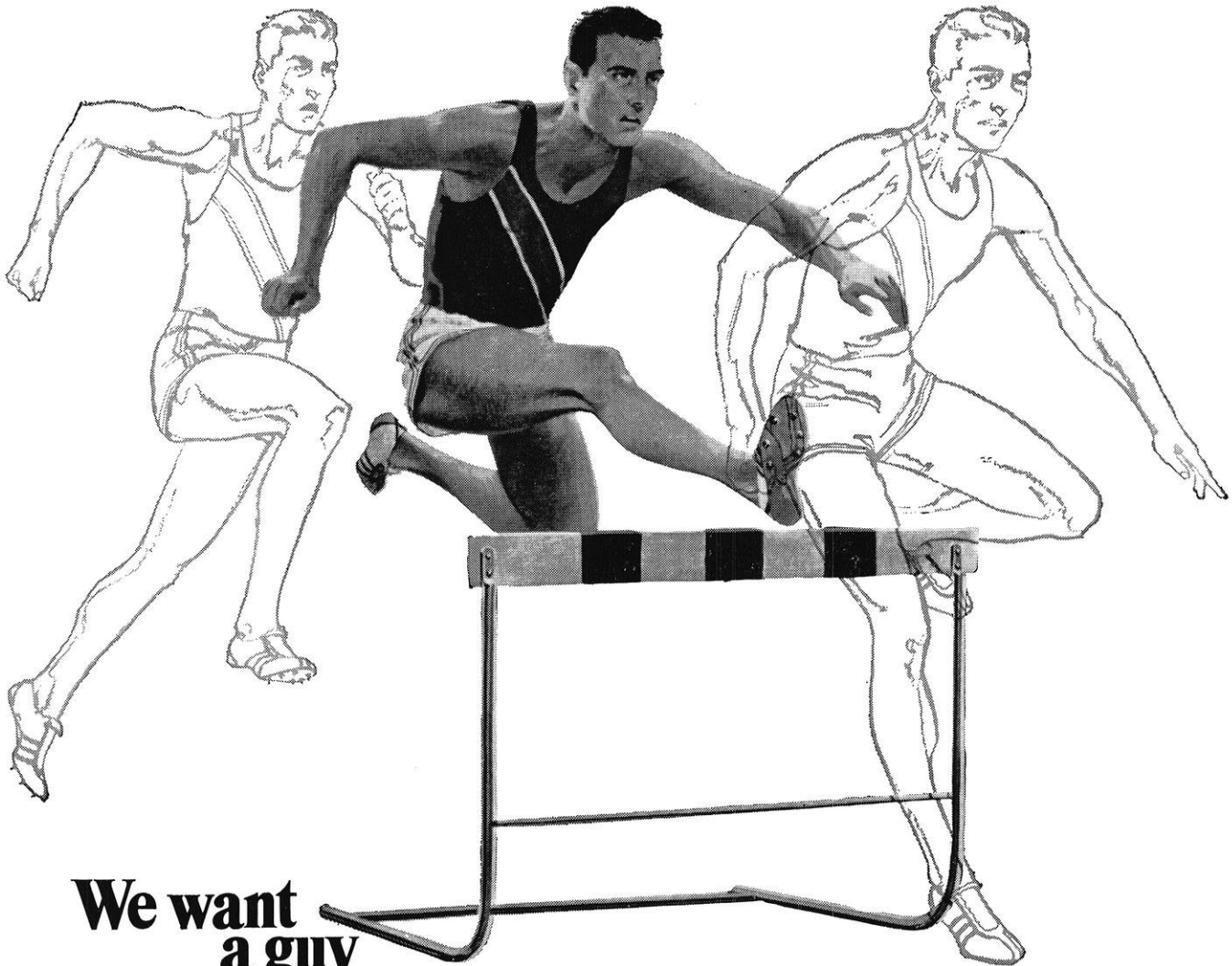
computers, transportation, medical science, air pollution, oceanography, and more. Is that any way to run an electric company?

We think so. If you think so, talk with our campus recruiter, or write Luke Noggle, Westinghouse Education Center, Pittsburgh, Pa. 15221. An equal opportunity employer.

You can be sure...if it's

Westinghouse





**We want
a guy
who keeps a level head.**

Dictionaries define hurdling as jumping over a hurdle in a race.
Obviously, Webster never made the track team.

“A good hurdler never jumps,” the experts tell us. “He tries
to duplicate the movements of sprinting. The head stays level.

It’s never higher over the hurdle than it is between them.”

A level head helps overcome any obstacle. Take bearing problems.
They’re best approached by a person with training, determination
and the ability to think things through.

Are you such a person? When you run up against a tough problem, are you
able to take it in stride? And do you like the challenges of rugged
competition, and the rewards that come from winning?

Then write The Timken Roller Bearing Company, Canton, Ohio 44706.

Ask our Manager of College Relations to give you a tryout.

An Equal Opportunity Employer.

On your campus...

October 14, 1969

A Timken Company Representative
would like to talk with you!

TIMKEN®

THE TIMKEN COMPANY MANUFACTURES TAPERED ROLLER BEARINGS, FINE ALLOY STEEL AND REMOVABLE ROCK BITS.

LIKE TO POKE HOLES IN ENGINEERING THEORIES?

We're looking for M.E.'s, E.E.'s, and I.E.'s who will come up with something better — like our automatically controlled circuit that monitors the speed of machinery with 800 electronic "pecks" per second.

All kinds of challenges are waiting for you in hydraulics, pneumatics, mechanics, electromechanics, thermodynamics, electronics, fluidics, automated production techniques, instrumentation and controls, manufacturing processes, and materials handling systems.

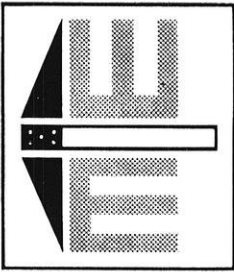
Eaton Yale & Towne manufactures and markets 3,000 products for all kinds of businesses and industries. We're regularly developing new products and processes at 92 plants in 45 cities, 17 states, and 18 nations.

Our rapid growth has created a wide variety of openings for engineers in research, product engineering, manufacturing engineering, and sales/service engineering.

Check your placement office for an interview date or send your resume to Richard S. Potter, Director of Management and Technical Recruitment.



100 ERIEVIEW PLAZA • CLEVELAND, OHIO 44114



CONTENTS:

one, two, three	<i>editorial</i>	5
by Eric Fonstad		
CECIL, Is That You?		6
by Jay Walters		
Dot, Dot, Dot, Done	<i>cover story</i>	8
by Dave Vannes		
Blank		11
by Thomas Harvey Edison Staff		
Expo Review	<i>pictorial</i>	14
by Eric Fonstad		
Polygon Happenings		16
by Jo Ann Albertson		
Metroliners		17
by Bruce Feld		
Internal Study Committee		19
by Steve Smith		
Wisconsin's Finest — Marge Ciucci		20
photos by Bruce Pease		
About a Picnic		22
by Holly Evva Wong		
Jokes		23

wisconsin engineer

EDITORIAL STAFF

Eric Fonstad	Editor	George Zachariasen	Layout and Jokes
Abby Trueblood	Assistant Editor	Manford Rasmussen	Layout and Photos
Dick Wagner	Dept. Research	Massoud Mishouil	Layout
Mary Ingeman	Expo '69 Reports	Bruce Pease	Photos
Dave Stroik	Staff Writer	Dennis Mitchell	Photos
Hugh Wesler	Art	Roy Johnson	Staff
Jim Poehling	Staff		
Mary Fonstad	Puzzles		

BUSINESS STAFF

Dave Vannes	Business Manager	Jeff Crick	Distribution
Carolyn Graff	Circulation	Dave Blumke	Distribution
Don Robinson	Asst. Business Mgr.	Tom Tamms	Distribution
Massoud Mishouil	Advertising Mgr.		

BOARD OF DIRECTORS

Prof. George R. Sell	Chairman
Assoc. Prof. Howard J. Schwebke	Faculty Advisor
Assoc. Prof. C. A. Ranous	Electrical Engineering
Asst. Prof. Raymond B. Esser	Mechanical Engineering
Asst. Prof. R. A. Moll	Minerals & Metals Engineering
Prof. Wayne K. Neill	Chemical Engineering
Prof. Charles G. Salmon	Civil Engineering
Asst. to Dean, Mr. Hosman	Faculty Advisor

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Chairman: PROF. GORDON SMITH, School of Industrial Engineering, Oklahoma State University, Stillwater, Oklahoma 74074.

Publishers Representatives: LITTELL—MURRAY—BARNHALL, INC., 369 Lexington Avenue, New York, New York 10017.

Second Class Postage Paid at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

Published monthly from October to May inclusive by the Wisconsin Engineering Journal Assn., 308 Mechanical Engineering Bldg., Madison, Wis. 53706. Office Phone (608) 262-3494.

All rights reserved. Reproduction in whole or part without written permission is prohibited. Copyright applied for. 1968

Chemical engineers...
Mechanical engineers...

A world in
need of
water is
turning to
Aqua-Chem

shouldn't you?

Permanent positions are now open--in research and development, project engineering, design and service engineering. At Aqua-Chem you'll grow in a field that's young and full of promise --promise that you can help the world realize as you assume increasing responsibility in seawater desalting and pollution control technologies. You'll enjoy personal rewards from the start: top wages, profit sharing, liberal vacation and holiday schedules, generous family insurance protection that includes major medical. The career you want is at Aqua-Chem. Find out about it by contacting Aqua-Chem, Box 421, Milwaukee, Wisconsin 53201.

Aqua-Chem Inc.
EQUAL OPPORTUNITY EMPLOYER



AMPco METAL, INC.

ENGINEERING OPPORTUNITIES

Ampco's world wide reputation lies in its ability to offer engineering counsel for solving problems of wear, corrosion, erosion, cavitation and many other factors that cause metal parts to wear or fail.

Opportunities for the engineer who is not interested in *specialization* but rather in the *broad scope* of metal manufacturing are available in the fields of research and development, industrial and manufacturing engineering and industrial sales.

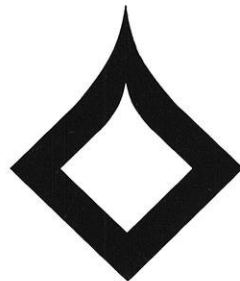
For more information write to:

Ampco Metal, Inc.

Box 2004

Milwaukee, WI. 53201

"An Equal Opportunity Employee"



Investigate
career
engineering
opportunities
at

WISCONSIN GAS COMPANY

626 EAST WISCONSIN AVENUE
MILWAUKEE, WISCONSIN 53201

ENGINEERS:

Mechanical, Civil, Electrical,
Industrial, Architectural

**WILL YOU BE
CHAIR BOUND?
when you
would rather be
AIR BOUND**

After four years with our company, Bob Cassidy, valuation engineer, has been in 37 states, three foreign, countries, four steel and two paper mills, twelve metal working plants, a Chilean copper mine, cheese factory, automobile plant, grain mill, box board plant, textile mill, newspaper plant, CATV system, municipal water works, and 36 other business properties.

He has been describing, analyzing and evaluating machinery, machine connections and foundations, process piping, etc., estimating value to enable client companies to make sound operating, engineering, and financial decisions. Traveling 70% of the time at company expense, Bob has seen a greater variety of engineering applications than most engineers see in a lifetime. Reviewing his field work at the home office in Milwaukee, he had had direct access to top management viewpoint and direction.

Our firm is the world leader in valuation counsel, with offices in Canada, Brazil, France, Italy, Spain and the Philippines. As one of the country's leading newspapers said, we "appraise everything from cattle to coal mines."

For more information or an interview, call or write our - Personnel Director, The American Appraisal Company, 525 East Michigan, Milwaukee, Wisconsin 53201. Phone (414) 271-7240.

We have a real opportunity for the man who is interested in an exciting and challenging career that's different.

**AMERICAN
APPRAISAL**

U.S.A. • CANADA • PHILIPPINES • BRAZIL •
FRANCE • ITALY • SPAIN

one,

two,

three,

four,

five,

six, seven, . . .

. . . eight issues of the *Wisconsin Engineer* have been published since the beginning of the school year. It is a fair question now, at the end of the publishing year, to ask what has been accomplished in those eight issues.

For the national advertisers, who provide the over \$10,000 needed to print the magazine, the *Wisconsin Engineer* has provided a means of presenting their recruiting pitches to student engineers. That is the extent of the magazine's responsibility to those advertisers. The magazine's responsibility to engineering students, as interpreted and implemented by the editor, is less well defined and depends heavily on what the editor sees as the basic purpose of a magazine on the engineering campus.

This past year's purpose has never been stated explicitly in the magazine both because of its simplicity and because of its complexity. Its simplicity of wording would have made it seem trivial and almost corny, while the complexity of the editorial policies involved in stuffing it into the framework of a monthly publication would have been difficult for the reader to appreciate.

Beyond that, it did not seem necessary for the reader to know how that purpose affected him in the same way that a person can fly to New York and constantly be aware of where he is going, what cities he is passing, and how much further he must go, while another person may sleep through the entire journey. Both arrive at the same destination.

The difference is an awareness of destination. Though it probably would have made the trip more interesting for some readers to know the magazine's purposeful destination, others might not have joined the flight in the first place.

To clarify what I mean, here is the statement of purpose for the *Wisconsin Engineer* as of September 1968:

To help the student engineer define what his role should be in society.

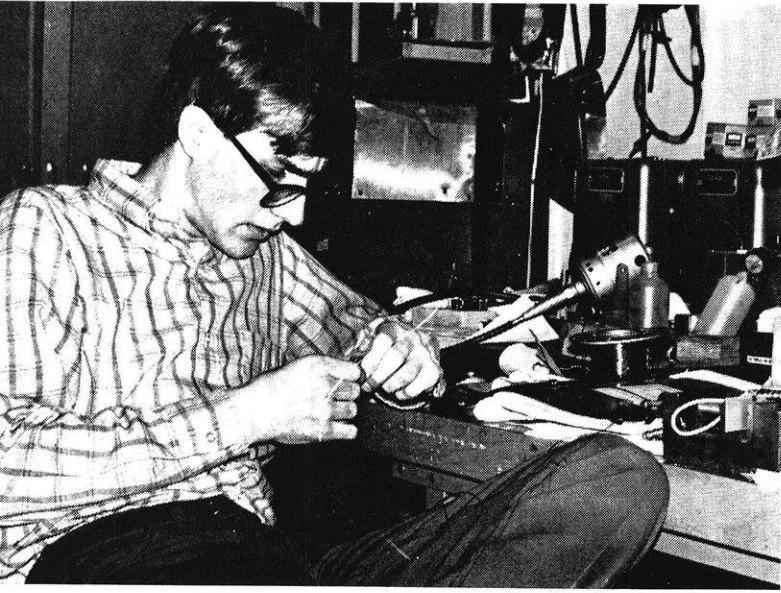
The last word in this statement, society, is where I sense many student engineers would like to get off. They see their education as preparing them for a role in a corporation, in an industry, or in a college. In effect, they only recognize an exclusive corner of society, a corner which, because they are engineers, should be their first concern, but which must be related to the rest of society if they are to be effective engineers.

What the *Wisconsin Engineer* has tried to do is present issues which, though not specifically of an engineering nature, apply directly to the student engineer. That is, pollution, though a social issue, is a very comfortable engineering dilemma once its limits have been defined. Other issues, like student involvement through committees and organizations, student governments, and the mechanisms of changing the College of Engineering, are problems where an engineer's training does not apply, where he is forced to work with people, and where he must look closely at his relationship with those people.

Hopefully, through a presentation of this type of question, the individual's role in society will be defined.

Eric Fonstad,
Editor

Cecil, Is That You?



by Jay Walters,
Polygon Engineering Council President

Have you done a single thing for your University this last semester? Without exaggeration it can be said that our campus society is embroiled in a crisis situation. On the one hand, the moral dilemma felt by many students erupted into large scale disruptions; and on the other, a fiscal crisis has been perpetrated by some individuals who at times appear nearly as irresponsible as the student demonstrators. Each of us is very closely connected to all such occurrences — whether or not we actively participate, and each of us must say in the end that we acted responsibly. But what is responsible? Is that person who merely avoided contact with the February disrupters responsible? Is that person who emitted only a sigh when hearing what the Legislature was planning to do to the University a responsible person? Let's not fool ourselves. Being responsible is synonymous with being accountable for something within one's powers. The stage may very well have been set for a play which we much dislike, but while we needn't follow the plot proposed by others, we still must do the acting, and in that way make the scene.

You don't have time to keep up with such things as Black Demands and budget cuts? Of course not, no one does; but then, you won't have time in years to come either. More and more we'll find things being run by people who have no more time than we, but who are taking time anyway. Will we be satisfied with the way they run things? Are you happy with the way things are now?

Okay, so we each decide to spend a few hours a week watching the events around us, and even participating at times. And the best place to start, they say, is in one's own back yard. But don't we have the perfect setup in the College of Engineering? Maybe we do, but look around a little. Everywhere you see engineers sifting and winnowing, actively participating in College affairs, right? Each department in the College is a fine example of participating democracy — students and faculty working together to improve curriculum, teaching, and other matters of mutual concern, right? Is that a resounding no that I hear? Maybe it should be, for if you really stop for a minute to look around you, much of the College of Engineering will more resemble a crusty feudalistic society than our democratic ideal. The professor's door is always open, it's true. If you have the nerve and the stamina to gripe enough some things will eventually change. But griping is undesirable and distasteful to both the griper and the griped out.

We also have a student faculty committee, and another on the way, but however hardworking they may be, they can do no more than lobby for certain changes before the faculty meeting — and their success there has been dismal indeed.

We also have the Polygon Engineering Council. It too is hardworking, and from Jo An Albertson's article in this issue, you can see that it has ac-

completed much in certain areas. But while it can work well in some areas, it can not, and probably should not, be discussing problems on a departmental level.

We have numerous methods of communication, but none designed to allow a student to participate at the level where most of the decisions that affect him are made — the department. The question has thus been resolved to a single key point: do students have any business participating in their department? Or even more basically, what should a department be? Is it nothing more than a group of professors meeting once a month and thereby deciding what will be done in the department? At present, that is exactly to what a department is limited. Despite the fact that we, the students, will soon be sent out to build airplanes and bridges, there is apparently considerable doubt as to whether we can make reasonable comments in regard to our own curriculum. And despite the fact that we've lived this life for from four to six years, there seems to be considerable doubt as to whether we can be rational in discussing improvements in teaching. And so on. This is not to say that our viewpoint is more valuable than a professor's, his training and experience are certainly most needed; but our living-learning reactions to various questions also have a definite value. Isn't there *some place* for the student's voice to be effectively heard at the departmental level?

I hope that the once a semester confrontation sessions presently in existence in a few departments are not proposed as the answer to that plea. Putting some faculty in a room with students once

a semester for the purpose of absorbing a lot of griping is little more than an insult to the students. The student might just as well be an individual griper. Can't a student-faculty committee be formed in each department to discuss rationally, at length, such matters as are of mutual interest to both the students and the faculty? And why can't those same students sit in the departmental meeting itself — except for those times when it is discussing personnel matters? A small group of students, chosen by all the students in the department, would certainly not weigh down the proceedings, and the faculty would almost certainly benefit from the student viewpoint in any number of instances.

The above is just one suggestion for those of you who feel that maybe responsibility goes beyond reading the joke page in this magazine. If you want to do something constructive, something to make this a better University, you might consider pressing for some such changes.

There's a lot besides rioting that a student can do if he will take the responsibility upon himself, and then carve a few hours from his busy schedule to do it. Polygon has been doing many such things — and you don't have to be an elected representative in order to participate. If you're going to be around next year, and want to be able to do something creative, fill out the slip and stick it in campus mail — we guarantee that you'll find something exciting to do.

And, of course, it's not too late this year to set something up in your own department — tell them Polygon sent you.

Yes, I want to work constructively in 1970 for a better University.

Name:

Address:

Phone:

Summer Address:

Possible areas of interest:

Send to: Polygon

1144 Engineering Building
University of Wisconsin
Madison, Wisconsin 53706



“Dot, Dot, Dot. Done!”

by Dane Vannes

“Dot, dot, dot. Done!” This is the message that was flashed from coast to coast on May 10, 1869 when the Golden Spike was driven at Promontory Point, Utah, joining the Central Pacific and the Union Pacific Railroads to form the first transcontinental railroad. The dream of a transcontinental railroad had begun over 30 years before.

The first recorded suggestion of the Pacific Railroad appeared in *The Emigrant* in Ann Arbor, Michigan in 1844. A bill was introduced in Congress in 1848, but not until

1862 was the Pacific Railway Act passed by Congress at the direction of President Lincoln. The Railway Act of 1862 created the Union Pacific Railroad and authorized it to build west from a point on the Missouri River, later chosen to be Omaha, Nebraska. The Act also authorized the Central Pacific, a California railroad, to build eastward from Sacramento, California. Earlier, the construction of the Pacific Railroad was proposed as a national project, but President Lincoln favored private enterprise with government aid. The U. S.

Government granted the railroads right-of-way, plus 10 alternate sections of land per mile on both sides of the track out to a distance of ten miles. The railroads then sold much of this land to help finance construction. In repayment for the land grants, the railroads were required to transport government freight, personnel, military goods and mail at half rate for more than 80 years — after the land had been paid for 9.6 times over, Congress repealed and reduced the rate requirement.

Surveys had been made prior to
THE WISCONSIN ENGINEER

1862 of five practical routes from the Missouri to the Pacific, and the one chosen was the Central route which had been used many years by wagon trains, the Pony Express and the Overland Stage.

The Central Pacific began construction at the foot of "K" street in Sacramento on January 8, 1863, and by 1865 the Central Pacific was grading and laying track east of Sacramento. The railroad experienced labor problems, and eventually Chinese workers were brought by ship from the Orient. They proved to be very fine workers and more than 11,000 helped with the construction. The Central Pacific faced the formidable problem of crossing the Sierra Nevada Mountains which tested the engineering and construction ability of the day. In crossing the Sierra's, 15 tunnels of 6,213 feet total length had been blasted out of solid granite. Another problem was that of deep snow. Thirty-seven miles of snowsheds were constructed to allow winter operation and guard against avalanches. In April of 1868 a total of 157 miles of track had been com-

pleted, and the eastern end of the track then extended to Reno, Nev. Construction materials, rails, and locomotives for the Central Pacific Railroad had to be hauled by ship around Cape Horn before reaching the construction area.

The Union Pacific began building west from Omaha one year later than the Central Pacific, but construction proceeded rapidly and by May of 1868 the railroad extended 537 miles west to Laramie, Wyoming. Construction problems on the plains were not as difficult as in the mountainous areas, but Indians proved to be a problem. The route passed through the hunting grounds of the Pawnee, Arapahoes, Crows, Blackfeet, Cheyenne, Bannock, Snake, Sioux and Shoshone tribes. Indians many times attacked construction workers, especially during 1865 when supply trains were derailed and burned. A battalion of Pawnee Indians were mustered into U. S. service for the purpose of protecting workers against the Sioux and Cheyenne, the Pawnee's most bitter enemies. Most of the workers on the Union

Pacific were veterans of the Union Army, many of these being of Irish origin. Locomotives and supplies had to be hauled overland and across the Missouri River to the railhead at Omaha and ties for track construction had to be hauled across miles of treeless plains.

Despite all the problems faced by the two railroads including the use of only hand tools, black powder, horses, and scrapers, Central Pacific and Union Pacific forged ahead. As the months passed, it became apparent that the rails would meet somewhere in Utah. Each railroad raced to reach Ogden, Utah in order to be the sole railroad to serve the Great Basin. Both railroads enlisted the aid of Brigham Young to provide help in the form of Mormon workers in order to speed construction. Grading was being done far in advance of rail laying, and grading crews actually passed each other, one going east, the other west, only 50 yards apart. In one day Central Pacific crews laid 10 miles of track—a record that has never been broken! Early in

(continued on next page)



Chinese laborers use picks and donkey carts to make an 82 foot fill on the Central Pacific.



A record set by Central Pacific crews that still stands today.

1869. May 10th. 1869.

GREAT EVENT
 Rail Road from the Atlantic to the Pacific
GRAND OPENING

Union Pacific
 RAIL ROAD
PLATTE VALLEY ROUTE
 PASSENGER TRAINS LEAVE

OMAHA
 ON THE ARRIVAL OF TRAINS FROM THE EAST

THROUGH TO SAN FRANCISCO
 In less than Four Days, avoiding the Dangers of the Sea!

Travelers for Pleasure, Health or Business
 will find it to their Advantage to select the Union Pacific

LUXURIOUS CARS & EATING HOUSES
 CAN BE HAD ON THE PLATTE VALLEY ROUTE.

PULLMAN'S PALACE SLEEPING CARS
 THE MOST COMFORTABLE AND PLEASANT SLEEPING CARS.

GOLD, SILVER AND OTHER MINERS!
 Now is the time to go to the Mountains of Colorado, Utah, Nevada, Arizona, Idaho, Montana, Wyoming, Oregon, California, and the Territories.

CHEYENNE for DENVER, CENTRAL CITY & SANTA FE
 BY RAIL AND COACHES FOR DENVER, SALT LAKE CITY, VIRGINIA CITY, SALT LAKE CITY AND ARIZONA.

THROUGH TICKETS FOR SALE AT ALL PRINCIPAL RAILROAD OFFICES.
 Be Sure they Read via Platte Valley or Omaha

Chicago - Office 24 La Salle St. opposite City Hall and Court House Squares, Chicago.
 CHARLES E. JOHNSON, Ticket Agent.

ST. P. ALEX. JOHN P. BERRY A. W. DEN. W. ANSEL.

Advertisement issued by the Union Pacific Railroad proclaiming the "Great Event."

1869 both railroads were working in the Promontory Mountains and in April a decision was reached to join the two railroads at Promontory, Utah.

At last the day had finally arrived when the Pacific Railroad was to be completed, May 10, 1869. The Union Pacific's locomotive Number 119 and the Central Pacific's Jupiter had pulled special trains half way across the continent carrying railroad officials and other dignitaries. The locomotives pulled within 50 feet of each other. The last two rails were laid and all were awaiting the driving of the last spike. A specially prepared and polished cross-tie of California laurel wood was set into place. Silver spikes were donated by Idaho, Montana, and Nevada, and a gold, iron, and silver alloy spike by the Arizona Territory, but the most famous was the Gold Spike from California.

The gold spike was made with \$400 worth of gold by a California jeweler engraved at a cost of \$25.24 with the following inscription:

"The Last Spike—The Pacific Railroad, ground broken January 8, 1863; completed May 10, 1869." Another side read: "May God continue the unity of our Country as this railroad unites two great oceans of the World." On the tip of the spike was a gold nugget, almost as large as the spike itself, which was later broken off and used to make watch fobs and rings for President Grant, Sec. of State William Seward and other officials.

In preparation for the driving of the last spike, the first nation-wide telegraph link up had been arranged so the whole country would know when the last spike was driven. A prayer was offered by Reverend John Todd of Pittsfield, Massachusetts, and telegrapher W. N. Schilling sent the following: "Almost ready; hats off, prayers being offered." Then speeches were made by Governor Stanford of the Central Pacific and General Dodge of the Union Pacific and the silver spikes were driven. At 12:47 p.m. Promontory time, Leland Stanford swung at the last spike, which he reportedly missed on the first swing, and the telegraph key clicked "Dot - dot - dot. Done." President Grant was sent the following message: "Promontory, Utah — May 10. The last rail is laid! The last spike is driven! The Pacific Railroad is completed! The point of junction is 1,086 miles west of the Missouri River and 690 miles east of Sacramento City. Leland Stanford / T. C. Durant."

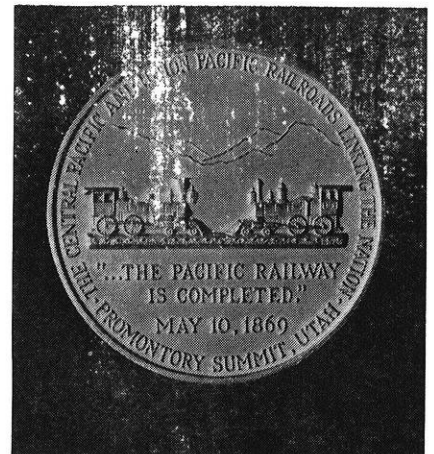
The two engines then moved forward and touched pilots, and a bottle of wine was poured over the last rail.

A reenactment of the Golden Spike ceremony will take place on May 10, 1969. A Golden Spike Centennial Celebration Commission was authorized by Congress and appointed by President Johnson to plan and coordinate activities for the Centennial year. The original gold spike and silver maul will be used on May 10. Daily reenactments will take place June 1 through Labor Day. Special trains from New York and California will

converge at Ogden for the celebration. A steam engine of the Union Pacific Railroad will haul passengers between Salt Lake City and Ogden.

The American Society of Civil Engineers will present a plaque designating the Rail Joining site a National Historical Civil Engineering Landmark, as the Central Pacific was recently designated a National Civil Engineering Landmark. Previous to the Central Pacific designation, only four other such landmarks had been named. Theodore Judah, who organized and located the route of the Central Pacific Railroad, was a noted civil engineer of the day and also a member of the American Society of Civil Engineers.

Congress has authorized the U.S. Mint at Philadelphia to strike special commemorative medallions. These are available exclusively from the Golden Spike Centennial Celebration Commission, 2419 Federal Bldg., Ogden, Utah.



Commemorative medallions struck by the U. S. mint.

On May 10, 1969 we will celebrate a day that changed the course of the country 100 years ago and the results are very much in evidence today. The day is deserving of all the recognition it receives, for it has already taken its place in the history of the United States.

Information for this article was supplied by the Golden Spike Centennial Celebration Commission and The Association of American Railroads.

Research opportunities in highway engineering

The Asphalt Institute suggests projects in five vital areas

Phenomenal advances in roadbuilding techniques during the past decade have made it clear that continued highway research is essential.

Here are five important areas of highway design and construction that America's roadbuilders need to know more about:

1. Rational pavement thickness design and materials evaluation. Research is needed in areas of Asphalt rheology, behavior mechanisms of individual and combined layers of pavement structure, stage construction and pavement strengthening by Asphalt overlays.

Traffic evaluation, essential for thickness design, requires improved procedures for predicting future amounts and loads.

Evaluation of climatic effects on the performance of the pavement structure also is an important area for research.

2. Materials specifications and construction quality-control. Needed are more scientific methods of writing specifications, particularly acceptance and rejection criteria. Additionally, faster methods for quality-control tests at construction sites are needed.

3. Drainage of pavement structures. More should be known about the need for sub-surface drainage of Asphalt pavement structures. Limited information indicates that untreated granular bases often accumulate moisture rather than facilitate drainage. Also, indications are that Full-Depth Asphalt bases resting directly on impermeable subgrades may not require sub-surface drainage.

4. Compaction and thickness measurements of pavements. The recent use of much thicker lifts in Asphalt pavement construction suggests the need for new studies to develop and refine rapid techniques for measuring compaction and layer thickness.

5. Conservation and beneficiation of aggregates. More study is needed on beneficiation of lower-quality base-course aggregates by mixing them with Asphalt.

For background information on Asphalt construction and technology, send in the coupon.

OFFER OPEN TO CIVIL ENGINEERING STUDENTS AND PROFESSORS

THE ASPHALT INSTITUTE
College Park, Maryland 20740

Gentlemen: Please send me your free library on Asphalt Construction and Technology.

Name _____ Class or rank _____

School _____

Address _____

City _____ State _____ Zip Code _____

The Asphalt Institute

College Park, Maryland 20740



BOSTROM DIVISION
Milwaukee, Wis.

Built on Engineering Innovations for the Automotive, Earth-moving, Farm Tractor and Material Handling Industries.

A good place for people with ideas to work and grow.

For employment opportunities, send resume or contact:

Director of Employee Relations
UOP-Bostrom Division
133 W. Oregon Street
Milwaukee, Wis. 53201

Subscription Blank

wisconsin engineer

Name _____
Please Print (Last) (First) (Initial)

Mailing Address _____
(Street)

(City) (State) (Zip Code)

\$2.00 - 1 year (8 issues) \$5.25 - 3 years

\$3.25 - 2 years \$6.00 - 4 years

\$ _____ payment enclosed please bill me later

Send to: WISCONSIN ENGINEER
308 Mechanical Engineering Bldg.
Madison, Wisconsin 53706

**Your money
and
your life.**



PHOTO: ERNEST BRAUN



You're living dangerously, and you love it.

You fought the professor all semester, and got an A in spite of it.

The girl you've been eyeing likes your style.

It's spring. That's dangerous.

But the one place where you shouldn't have to live quite on the edge is on the road. Now you don't, thanks to new safety features in cars . . . and the remarkable radial tire.

Radials are a marvelous invention in rubber and rayon cord. They last twice as long as regular tires, and even give you better gas mileage. On wet, slippery pavements, they grip like fly paper.

A point of interest—The Dynacor[®] rayon cord in radial tires is made by FMC Corporation, the same company that makes rayon for the "throwaway bikini" your date is working up courage to wear.

This same company that builds egg handling systems also builds fire engines.

Each day you see FMC products around and you've never known it.

FMC also makes petrochemicals, pumps, freeze dry equipment, practically anything dealing with food growing machinery and industrial chemicals, and more. We are one of the country's top 60 corporations.

FMC is a creative company that's making an impact on the American way of life. Perhaps you'd like to help. For more information, write for our descriptive brochure, "Careers with FMC." FMC Corporation, Box 760, San Jose, California 95106. We are an equal opportunity employer.



FMC CORPORATION

Putting ideas to work in Machinery,
Chemicals, Defense, Fibers & Films

EXPO

● 1969 COLLEGE OF ENGINEERING EXPOSITION

by Eric Fonstad

"Unbelievable" was the term used more than once to describe the success of the 1969 Engineering Exposition. With the official attendance for the three-day event set at 21,954 and total ticket receipts fully three times higher than those of the previous Exposition, the 1969 Exposition was truly an unbelievable success.

Thursday, the day before the Exposition, saw rain come down in sheets, submerging the engineering

campus ankle deep in muddy water and bringing with it a wind that threatened to make the outdoor exhibits tent the spring's largest kite. Through it all, crews tried frantically to set up the exhibits.

By late afternoon, the weather cleared to remain sunny and dry throughout the entire weekend.

As soon as the gates were opened Friday morning, it was apparent that the fifteen months of preparation would be rewarded as an antici-

pated crowd of 4,500 high school students swelled to almost 6,000 within the first two hours of the show. The busloads from as far away as Superior (330 miles) stayed all day with many of the students returning on Saturday to finish viewing the exhibits.

The crowds never dwindled after that, with the line waiting to enter often extending far down University Avenue.

It was unbelievable.

TOUGHNESS

One of the outstanding advantages of Malleable Iron Castings.

Toughness is the ability of a material to withstand impact or repeated loading.

Any material will fail. The key in Malleable is that it will not fail suddenly. Under severe impact, Malleable will bend or stretch before fracture occurs.

Malleable's impact strength is illustrated in this test by a truck manufacturer. To be absolutely sure

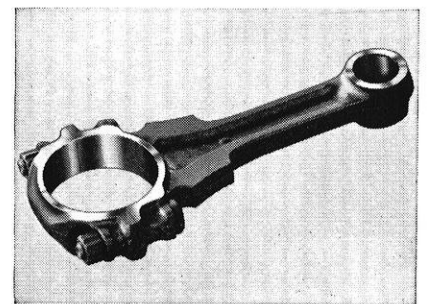


of the strength of many components in the cab, including the Malleable iron cab support hinges, the truck was crashed at high speed into a barricade of ice. Although the cab itself was battered beyond repair, there was no damage to the Malleable parts, proof of the outstanding impact resistance of this material.

Another facet of toughness is a material's ability to withstand repeated loads of low magnitude. Failures of this type are due to fatigue, and usually start with the appearance of a crack at the stressed area which progresses through the part until fracture occurs.

Fatigue strength is a major factor in design of automotive connecting rods. The loads on these parts alternate between tension and compression of varying magnitudes. In de-

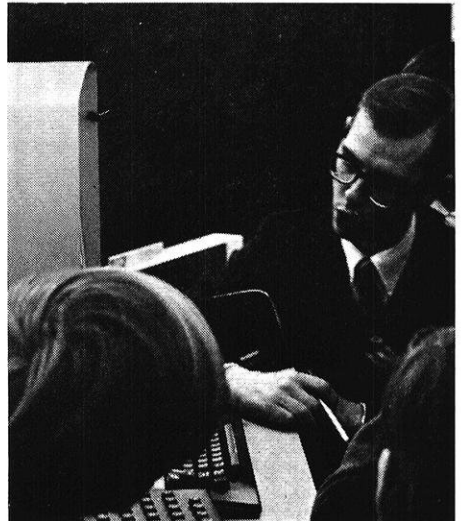
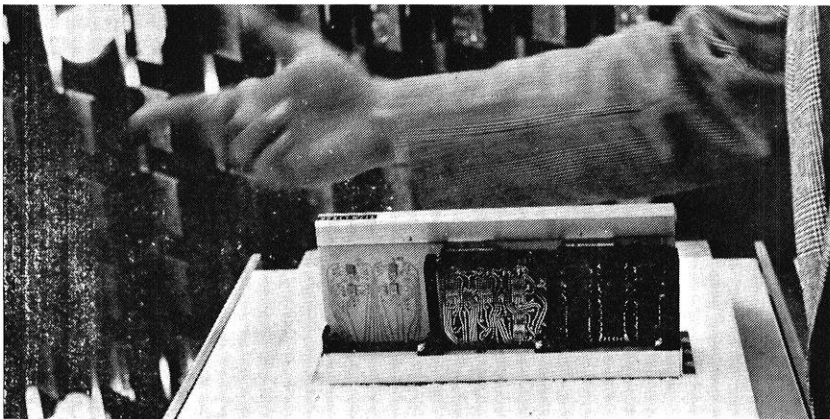
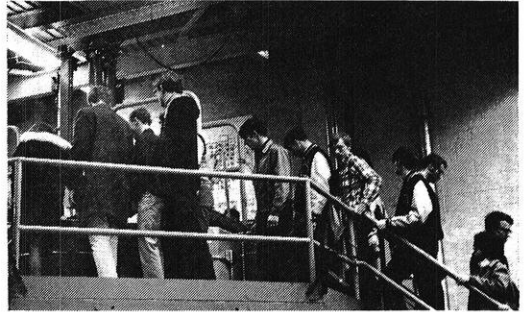
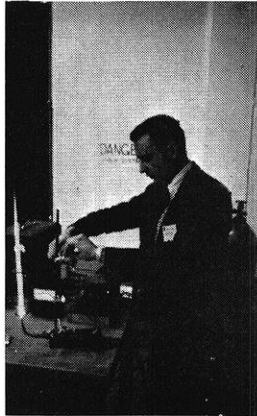
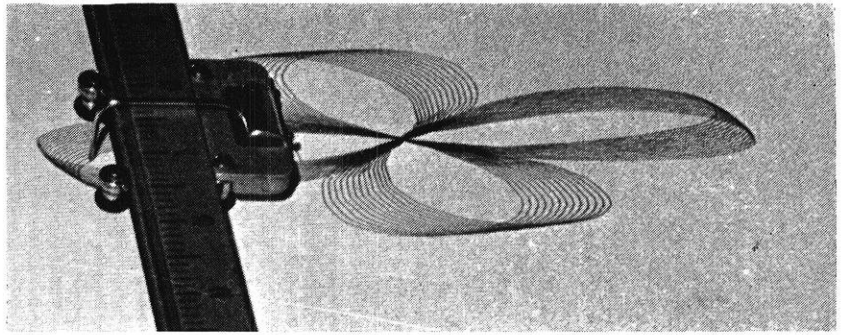
signing a Pearlitic Malleable iron connecting rod, a thorough series of experiments was conducted which



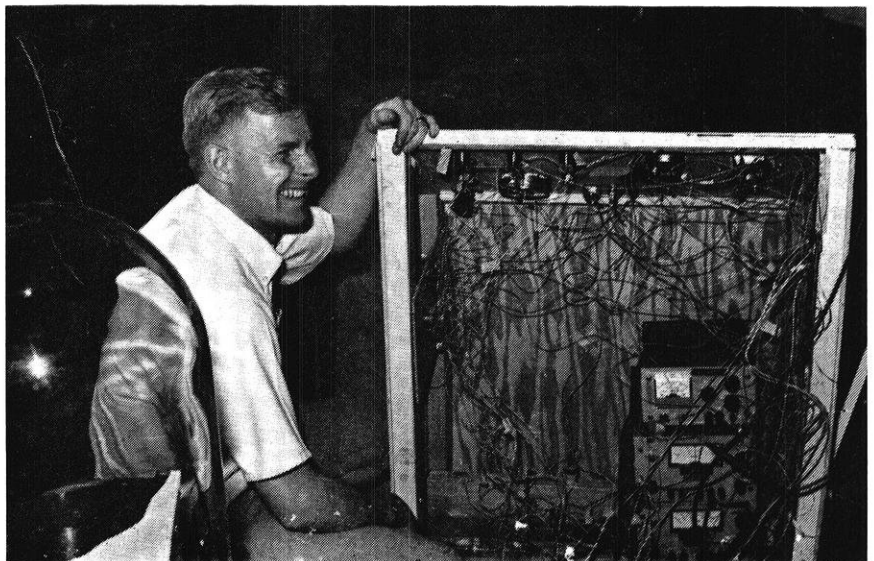
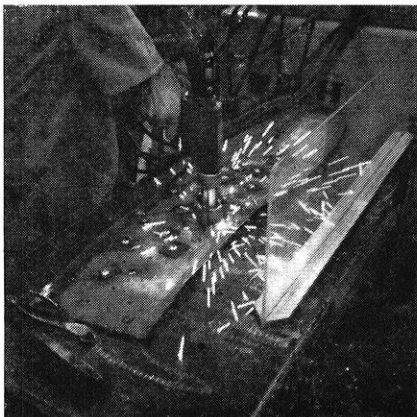
demonstrated that the castings have fatigue properties which exceed the performance requirements of modern automobile engines.



**MALLEABLE FOUNDERS SOCIETY
UNION COMMERCE BUILDING
CLEVELAND, OHIO 44115**



Photos by: Mickey Pflieger
Mark VanSusteren
Manford Rasmussen
Tim Odell



Polygon Happenings

by Jo Ann Albertson

Polygon Engineering Council has spent an unusually busy semester. This article will be just a short survey of what we've done, what we've tried to do, and a look to the future of engineering students at the UW.

Early in this semester the University was faced with the Black strike and subsequent National Guard callup. Polygon, thru Pres. Jay Walters and his staff, spent many hours talking to strike leaders, consulting with University administrators, and generally keeping close watch on the campus situation. A number of times the Council issued statements to inform the public of the general Engineering Council feeling on the matter.

The Executive Board has also kept in close touch with the activities of the State Legislature's Joint Finance Committee. At least twice during the semester they sent letters to the Legislative committee suggesting that various budget cuts not be made. Many of the Legislators replied, and seemed to appreciate Polygon's interest in these matters.

Back on campus, Polygon has been working closely with the Internal Studies Committee to integrate students into departmental meetings and to encourage closer relations between students and faculty. The Polygon President's assistants, George Doremus and Mishouil Massoud, spent many hours visiting departmental offices, speaking to professors, and encouraging the departments to invite students to departmental meetings. Due to their efforts, many departments are presently meeting with students to discuss the integration of students into the departmental structure.

Bob Lorenz, as chairman of the Student-Faculty Interactions Committee, has spent time during the semester visiting professors and encouraging them to participate more in student activities — professional societies, fraternities, picnics, etc. His committee hopes to encourage a more viable student-faculty relationship.

Polygon's big social event of the semester was the annual St. Pat's celebration. Chairman Tom Jensen and his committee did a commendable job in pulling off another successful St. Pat's. As usual, the buttons got lost enroute to Madison, but arrived on time anyway. This year saw the revitalization of the old Blarney Stone Hunt — with the added incentive of a quarter barrel of beer to the finders. The annual dance was enlivened by the White Trash Blues Band and nickel beer. All in all, the celebration was a complete success.

During the recent WSA spring elections Poly-

gon's Student Relations Committee, with Gary Suhm as chairman, sent questionnaires to the candidates requesting their opinions on major campus issues. The committee then posted the replies in the engineering buildings to give the engineers an idea of the thoughts of their candidates. Many candidates expressed the feeling that these questionnaires were an excellent method of informing the student body.

The biennial Engineering Exposition highlighted the semester. Gary Mitchell, chosen by Polygon back in 1967 to head this year's Expo, took the reins and produced what has unquestionably been the best Expo ever.

Working closely with WSA, Polygon is lending support to this semester's Course Evaluation. After the poor returns of last semester, the committee (under George Doremus) has personally contacted the entire engineering faculty, and forms were handed out and collected in most classes by the professors themselves. The results of the all-campus evaluation were published in the Cardinal prior to pre-registration in May.

Polygon voted to sponsor departmental outstanding instructor awards each spring. Most departments are selecting their best instructor, and he will be honored at Polygon's spring banquet. This is part of Polygon's effort to encourage more emphasis on teaching ability in the College of Engineering.

Another annual award of Polygon — the Outstanding Senior Award — this year goes to Mr. Gary Mitchell. Mr. Mitchell has an outstanding scholastic record, and has served the College in many ways. He served as vice-president and later president of ASME, and was general chairman of the 1969 Engineering and Science Exposition. Polygon extends its congratulations to Mr. Mitchell.

This gives the highlights of a very busy semester for Polygon Engineering Council. But there is much that can still be done. There have been suggestions to re-structure Polygon to make it more representative of all engineering students. More work is necessary to improve communication lines between students and faculty. Something needs to be done to involve more students in college life other than classes. And, of course, improvements in course-instructor evaluation must be carried on in future semesters.

Much has been done, but Polygon Engineering Council, composed entirely of students, depends on a continued influx of vigorous new members for the continuation and expansion of its projects. We're looking at you.

METROLINER:

A Logical Response to the Transportation Crisis.

by Bruce Feld

Not all American railroads have put their passenger business on the spur track. Most eminent among them is the Penn Central which on January 15, 1969, highballed the new Metroliner between New York and Washington D.C. with speed approaching Japan's Tokaido Express and comfort exceeding that of any jet.

The pressing problem of increased transportation demand and traffic congestion, particularly in the crowded Northeast corridor of the United States, has made alternatives to the automobile a necessity. In response, the Penn Central has invested 45 million dollars, and the government 11 million dollars in the development of the Metroliner.

What is different about this train? The Metroliner is the fastest machine ever set to rails in this country. It has a potential maximum speed of 160 mph, its average initial acceleration is 1.2 mphps, and can travel 2.2 miles in 120 seconds. Presently the train operates at a maximum speed of 110 mph.

Safety features include an alertor device requiring the operator to move at short predetermined intervals. Each car has a low center of gravity permitting higher speed on curves. Furthermore, the train cannot be operated unless all doors are closed.

In addition to the four metroliners running the 226 miles between New York and Washington and stopping at Newark, Trenton, Philadelphia, Wilmington and Baltimore (at a running time of 2 hrs, 59 min.) Penn Central has added two Metroliner express trains running non-stop New York to Washington in 2 hrs, 30 min. When all



A Metroliner operating at high speed between New York and Washington.

50 cars are built for the PC, hourly service is planned over the entire route.

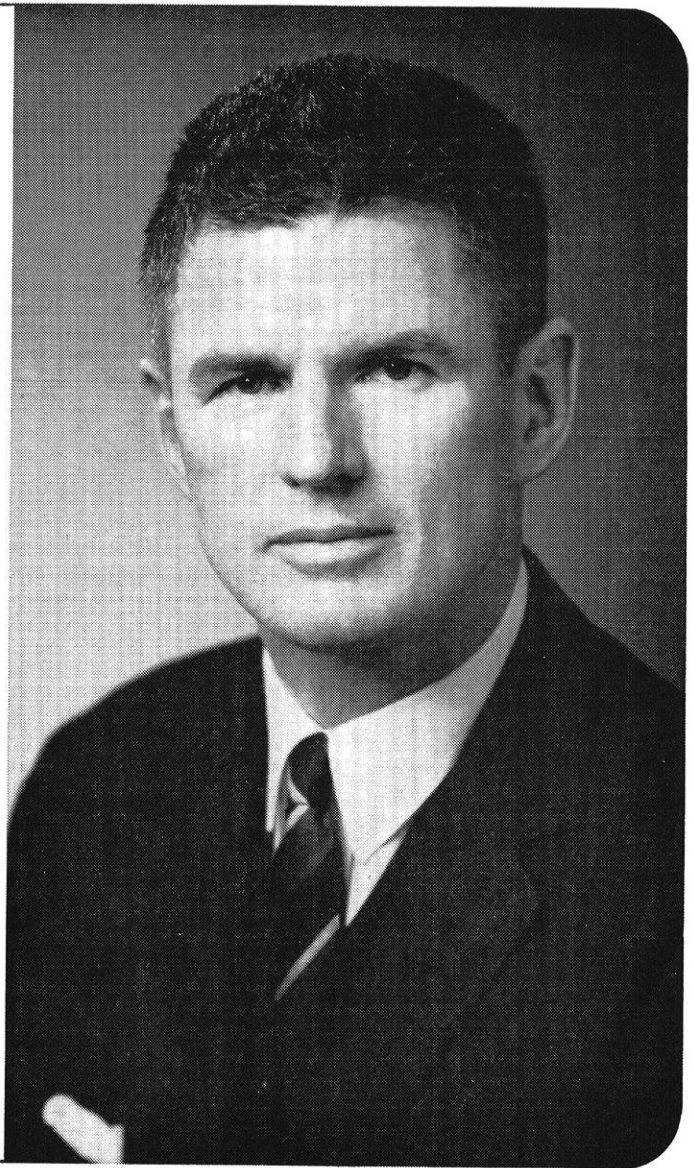
The cars are stainless steel, have fluorescent lighting, wall to wall carpeting, and very roomy seating. The air conditioning system provides an individual exhaust at each seat, thereby eliminating discomforting fumes from a neighboring smoker. Special thermal and acoustic insulation throughout the car bodies render the interior exceptionally quiet. A snack bar coach and reserved seat Metroclub car

where meals are served to you at your seat are both a part of the metro's regular consist. Each of these cars has a transmitter telephone from which any passenger can place or receive telephone calls anywhere in the country. A public address system on the train permits the paging of those people receiving phone calls, and may also be used for taped music.

Service is another singular asset of the Metroliner. A program to retrain 3,000 people was undertaken (continued on page 24)

“Mining
has a
challenging
future for
men with
the desire
to be
challenged.”

Lawrason Riggs III,
President



“The ‘pick and mule’ days of mining are gone. We in the minerals and metals industry are using many highly sophisticated production tools in our enterprises, and it is a fact that this great basic industry has introduced automation and computerization in every area from planning and production, to marketing and sales. At St. Joe we take special pride in having developed, with our own engineers, one of the most modern mines and mills in the world — our Fletcher facility in Missouri. We constantly seek, moreover, new and better ways to make older mines more productive and efficient in this era of increased competition. Added to this is St. Joe’s

continuing exploration program carried on both here and abroad, seeking new deposits of lead, zinc, and other minerals to meet the demands of an expanding international market. Wherever you look — in our mines and mills, our research and development laboratories—there are challenges for young engineers with imagination and enthusiasm. Whatever your field of interest, be it civil, electrical, mining, metallurgical or chemical engineering —at St. Joe there’s an opportunity to use your talents and imagination, and to work with men with the knowledge and experience that have made St. Joe a leading member of the mining and metals industry.”

ST. JOE

Producers and Marketers of Lead, Zinc, Zinc Oxide, Iron Ore Pellets, Iron Oxide, Agricultural Limestone, Cadmium, Copper Concentrates, Silver and Sulphuric Acid.

ST. JOSEPH LEAD CO., 250 Park Avenue, New York, New York 10017

SJ-354

The Internal Study Committee

by Steve Smith

The College of Engineering Internal Study Committee (ISC) was originally established (there was one such committee in each college) to respond to 8 questions posed by then Chancellor Fleming. These questions dealt with issues such as consideration of teaching ability in faculty promotion, improvement of undergraduate instruction, possibilities for curriculum and grading flexibility (eg. pass-fail), and student participation in academic affairs.

The committee worked on these questions during the 1966-67 and 1967-68 school years and submitted 33 recommendations to the College of Engineering faculty for consideration.

Somewhat to the surprise of the committee members (especially the chairman, Prof. Novotny), Dean Wendt reappointed the committee for the 1968-69 school year and indicated that its work would continue indefinitely. ISC has the responsibility of studying any problem in the College of Engineering and proposing solutions. (Most of our time has been spent on undergraduate education.)

This year ISC has 8 faculty and 6 (voting) student members.

ISC's first order of business for this year was the official establishment of the Committee on Engineering Education (COEE). Several recommendations in the original ISC report dealt with the desirability of a committee whose responsibility it would be to implement the other ISC recommendations and to work generally for the improvement of the quality of (primarily undergraduate) education.

ISC decided to push for faculty approval of COEE as a student-

faculty committee. This job absorbed almost all of our time first semester. After lengthy debate ("lengthy debate" is redundant!) in numerous college faculty meetings, a much amended version of the ISC was approved at the January meeting:

"A student-faculty committee on Engineering Education should be established in the College of Engineering to seek effective ways to improve engineering education. In general, this committee should make every effort to enhance the educational experiences offered students in the College of Engineering by encour-

aging outstanding teaching, flexibility of instruction, and continued self-evaluation. The committee shall report periodically to the faculty of the College."

Six student members of COEE for next year were recommended by Polygon and appointed by the Dean this April. They will meet for the balance of this year with an ad hoc version of COEE appointed by the Dean for this year in the absence of faculty action on the ISC motion.

Meanwhile, subcommittees of ISC considered other problems. One subcommittee studied possible (continued on page 24)

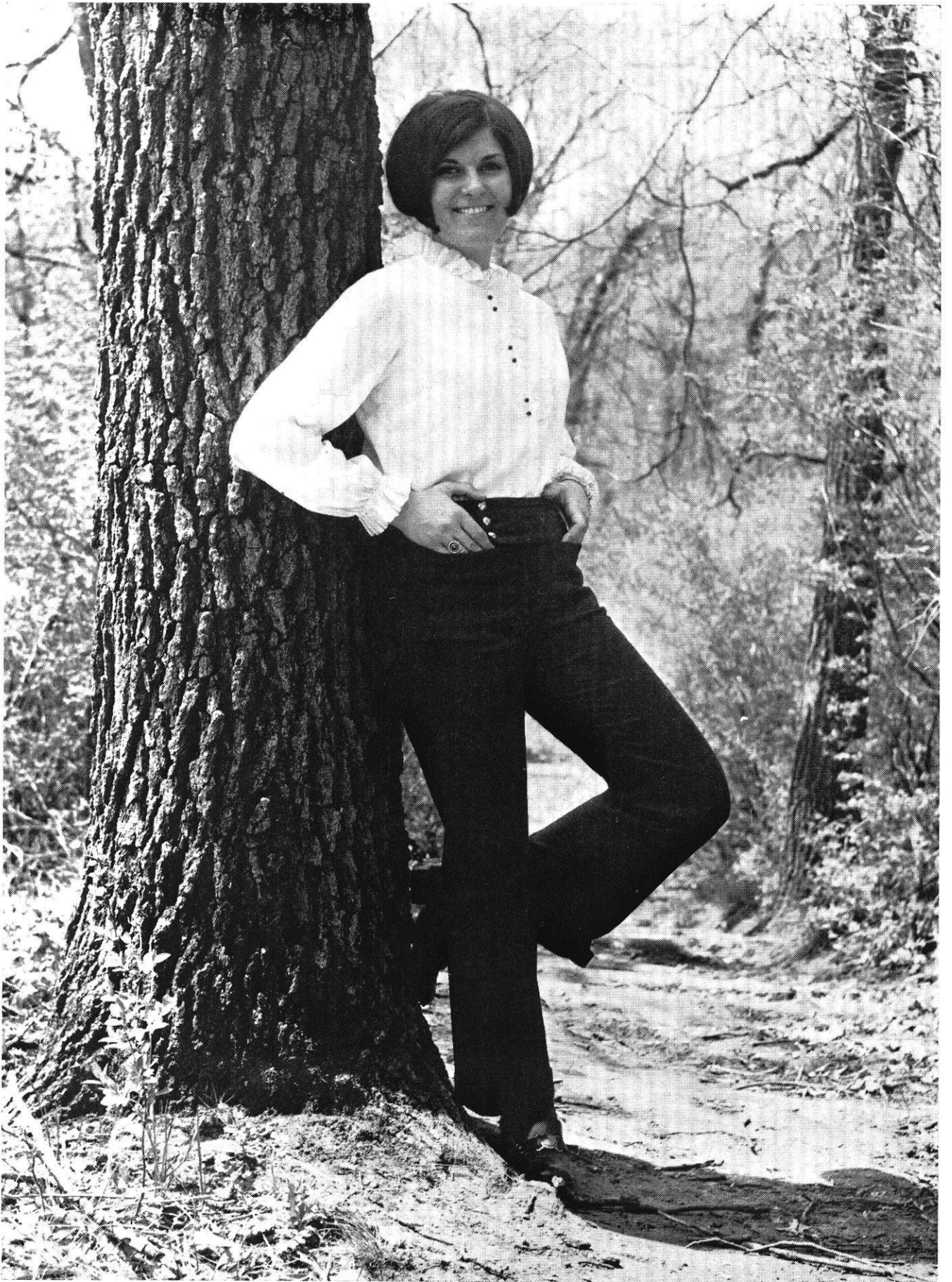
ISC MEMBERSHIP 1968-69

Faculty:

Mrs. Lois Greenfield, Admin.
Prof. R. A. Greiner, EE
Prof. Philip Kessel, EM
Prof. Herman Kuhn, CE
Prof. Richard Moll, ME
Prof. William Moy, IE
Prof. D. W. Novotny, EE
(Chairman)
Prof. Glenn Sather, ChE

Students

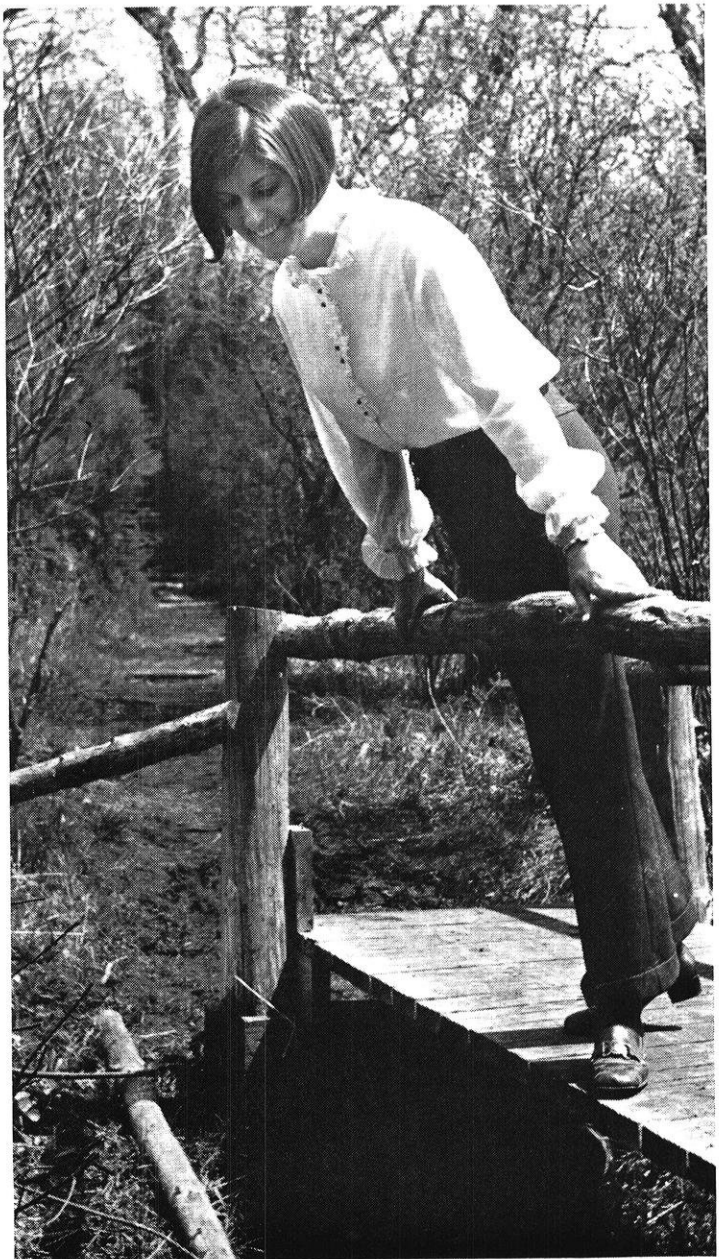
JoAnn Albertson, NE4
George Doremus, E5
John Heilman, CiE4
Geoffrey Jackson, ME4
J. A. Niemeyer, E5
(1st semester)
Steve Smith, EE4
Jay Walters, NE3
(2nd semester)



Wisconsin's Finest, Marge Ciucci

As pretty as a flower in May, Marge Ciucci is our Wisconsin's Finest. Marge recently transferred from Mount Mary's College in Milwaukee and is now majoring in Sociology here at Wisconsin. She has also pledged Alpha Xi Delta sorority this semester. Eventually Marge would like to be a college counselor or work with Mexican Americans. Marge developed a strong interest in the Mexican people when she worked in Mexico with them two years ago under the direction of the Conference for Inter-American Student Projects.

She loves to be active outdoors and likes horseback riding most of all. During the cooler months, Marge stays in shape by bowling and sewing many of her own highly fashionable clothes. Thank you Marge, for adding a sweet touch of Spring to our magazine.



photos by Bruce Pease

About a Picnic

by Holly Evva Wong

Every spring everyone has a banquet. The Wisconsin Engineer Staff has a banquet and Polygon has a banquet. The Students Who Study in the ME Lobby on Wednesday Mornings (SWSIMELOWM) are even having a banquet. I know because as secretary-treasurer of SWSIMELOWM I am helping to organize it. We are planning a banquet to outbanquet all banquets—a banquet with soul. We have never had a banquet before; we used to have an annual picnic instead. After what happened last year, though, the members decided that a banquet would be better.

Last year from the very beginning, things went wrong. We had three different ways to get to the picnic site: bus, hopping a train from behind the computer center, or riding on the handlebars of my little brother Sheldon Wong's tricycle. We were all to meet at the lobby and depart from there. Because I didn't want any one means of transportation to become overcrowded, I numbered the people as they came into the lobby 0, 1, 2, 3, 4, . . . I then told numbers 0, 3, 6, 8, and 9 to go by train; 1, 4, 7, 11, and 14 to go by trike and 2, 5, 10, 12, 13 to go by bus. We were all set to leave when three more members arrived, numbers 15, 16, and 17. I had to decide how they should travel to the picnic. How did I tell each to go and why?

That wasn't the only problem. When I arrived at the picnic ground, lot 62, I found that someone had consumed the refreshments for the picnic the night before. There I stood in the middle of lot 62 with 35 peanut butter sandwiches and a number of cans of

root beer equal to the number of elements in a set S , the set of integers x and a such that $x^2 = 11a + 2$. I was mad. I cornered the first five people I saw and began to ask questions. "Who took the root beer?"

Al said, "Chuck and Don are lying."

Bob said, "Al and Ed are lying."

Chuck said, "Bob and Don are lying."

Don said, "Chuck and Ed are lying."

Ed said, "Al and Bob are lying."

I said, "Somebody is lying, now who took the root beer?"

I finally found out who the root beer robber was and what had happened. It seems that he and four of his friends had gone to buy the brew the afternoon before and after packing away their purchases, were exhausted and all fell asleep. In a couple of hours, one of the rootbeer robbers woke up and for fear that he would sleep right through the picnic, decided to have his share right then. He divided the root beer cans into five piles. The one left over he gave to his dog Manfred. He hid his share of the root beer, put the rest back in the refrigerator, and went back to sleep. A little while later a second root beer robber awoke and set to work with the same idea. He divided the root beer into five equal parts, fed the one extra can to his faithful dog Epic, and replacing the rest, hid his share and went back to sleep. The same ritual was followed again with the third, fourth and fifth thief.

In the morning all five woke up and divided the root beer left in the refrigerator into five equal parts

(continued on page 24)

HARLEY-DAVIDSON

**MEANS
CHALLENGE
OPPORTUNITY
RECOGNITION**

Creative talent and design ability are given early recognition in our Engineering Department. Our diversified, exciting products include motorcycles, golf cars, commercial cars, and new experimental vehicles. Inquire about our comprehensive training program open to select graduates in mechanical engineering. Our young engineers assist a Senior Project Engineer with all phases of development from original design through performance testing. For more information, write, enclosing a description of your education and biographical history to

**PERSONNEL SUPERVISOR
HARLEY-DAVIDSON MOTOR CO.**
P.O. Box 653
Milwaukee, Wisconsin 53201

An Equal Opportunity Employer



Are you interested in starting a training program which will lead to becoming a contracting engineer for Wisconsin's largest Mechanical Contractor? If so, the Paul J. Grunau Company offers challenging positions to graduating Mechanical and Civil Engineering students.

We specialize in heating, air conditioning, sheet metal, plumbing and fire protection work, and we rank 49th in a listing of 200 top Mechanical Contractors in the nation as prepared by Domestic Engineering in their "Book of Giants". For a personal interview, contact

**Paul E. Grunau
Paul J. Grunau Company
307 West Layton Ave.
Milwaukee, Wisconsin 53207**



JOKES

From the Wisconsin Engineer file.

C. E. 612
University of Wisconsin —
College of Engineering

All parts are closed book and must be completed in the allotted time.

Part I—2 hours—True or False

1. Bubble-cap condenser plates are very effective.
2. The Hopeman building was the realization of a dream come true of George Eastman.
3. Titanium does not react well with oil of vitriol in a vacuum due to the presence of a frabbing zone.
4. An IBM 7070 computer will use 7129 core storage spaces in finding the height of a tower using the Sorel method. Hint — Try applying the collapsing hypercycloid analogy.
5. Entropy is time's arrow.

Give your opinion on the following:

1. There should be a men's room on the second floor of T24.
2. All exams should be taken using the buddy system.
3. Chemical engineering is impractical in most cases.
4. Reactions go much quicker when one exerts more force.
5. Crankshafts should be designed so that they are more pleasing to the eye.

Part II—45 minutes—Answer any 3 of the following:

1. Give a complete description of all the work done on boundary-layer theory starting with the work done by Hermann Schlichting.
2. Describe how things are manufactured.

A man was perched atop one of Atlanta's highest buildings, contemplating suicide, and a policeman had made his way to the roof to try and persuade the man not to jump. "Think of your mother and father," pleaded the officer.

"Haven't any."

"Think of your wife and children."

"Haven't any."

"Well, think of what your girl friend might think."

"I hate women."

"All right, think of Robert E. Lee."

"Who's he?"

"Go ahead and jump, you damn Yankee!"

A drunk who had been wandering around Times Square finally went down into the subway at 42nd Street. About half an hour later he emerged at 44th Street, and bumped into a friend who had been looking for him.

"Where on earth have you been all this time?" the friend asked.

"Down in some guy's cellar," the drunk said, "and, boy, you should see the set of trains he has!"

Two Engineers were sitting in the Library, one deeply interested in a book he was holding. "What's that you're reading?" asked the other.

"It's called *What Millions of Women Want*" was the reply.

"Lemme see that," said the questioner, "I wanna see if they spelled my name right."

Something to look forward to—women's wigs with built-in brains.

"I see," said the blind carpenter as he picked up his hammer and saw.

Helen: "Does your husband talk in his sleep?"

Mary: "No, and it's terribly exasperating. He just grins."

The neighbors were coming home from the funeral. "I'm sorry for Mary," said one. "It's tough to be left a widow with three small children."

"It is," replied another, "but what could she expect? She knew he was a pedestrian when she married him."

"I was so cold last night I couldn't sleep. I just lay there and shivered."

"Did your teeth chatter?"

"I dunno. We don't sleep together."

"What's your name?"

"Thomas Jefferson."

"That's a pretty well known name."

"It ought to be. I've delivered milk in this town for three years!"

A man wandered into the B.T. and proceeded to order a drink. While consuming his liquid refreshment, he looked around the room, and noticed a woman in her late twenties seated at a booth in the rear, and with her, a large white duck. After a few minutes, he found himself unable to resist any longer and walked over to the booth and spoke. "Excuse me," he said, "but I just can't help but wondering—what are you doing with that pig?" The young woman looked at him coldly, and replied, "Pig? Are you blind or something? This isn't a pig—it's a duck." Our hero then returned her icy look tenfold, and replied in his most lofty manner, "I was *talking* to the duck."

(it came out even that time) and each taking his share left. As far as the root beer robbers are concerned, the episode is finished. However as secretary-treasurer of SWS-IMELOWM it is my duty to collect for the missing root beer. At 10c a can, how much will that be?

There I stood in the middle of lot 62, peanut butter, and root beer, when off in the distance came my unfavorable person. Straight toward me he came and although I tried my best to look like the shrubbery, he saw me, smiled and waved frantically.

"Holly, do you think I could say that every tree on campus has at least one squirrel?" He was serious.

"Yes, at least," I replied with equal seriousness.

"If there are more trees," he said, "than there are squirrels on any one tree, then there are at least two trees with the same number of squirrels. Can that be true?"

This year we are having a banquet.

to give friendly and efficient service to the public, something unheard of for a long time on many passenger trains. Attractive Metromissesses outfitted in orange skirts and black blouses enhance the scenery and service aboard the train.

Other innovations related to the Metroliner include the installation of continuous welded rail, yielding a smoother ride, the construction of high level station platforms to eliminate steps while boarding and leaving trains, and the realignment of curves to permit higher train speeds.

All these service improvements lead to an increase in traffic volume and consequently the benefit of lower ticket rates (within the ICC minimum rate limits.) A coach fare from Washington to New York costs \$13.75 — \$4.15 less than the lowest airline fair, but with more comfort and room than any airliner. And because the trip is from center-city to center-city, the passenger does not have the problem of fighting auto traffic to and from

an airport, and thus may reach his destination faster than by plane.

On board expenses, such as meals or telephone service also prove quite economical. Prices are \$1.25 for a continental breakfast, \$3.25 for a full-course dinner. Phone calls to location along the route are approximately \$1.00.

The real significance of this train may not be obvious. Increased use of electrical trains will, in the long run reduce air pollution which would accompany mass auto transit. Moreover, from a macroeconomic view, this mode means moving large numbers of people with minimal motor power and fuel expense because one can always add on another passenger car at a low marginal cost. Trains have great economies of scale and utilization. The most important aspect of the metroliner, however, remains the new attitudes and hopes it has generated towards rail passenger service as the answer to the transport dilemma.

INTERNAL STUDY COMMITTEE continued from page 19

bilities of course and teacher evaluation. It was decided that a student-operated program would be most effective — ISC gave its support to Polygon efforts in this vital area.

Student-faculty interaction at social and professional levels was also discussed. Social interaction — while desirable — was felt to be best left up to individual initiative. As for professional interaction, in view of highly successful experiments with student participation on the Electrical Engineering Curriculum Committee, ISC decided to suggest that other departments try similar programs. ISC sent a delegation to an Executive Committee meeting (made up of the Deans and Department Chairmen) to present the case for student participation. In response to this and efforts by Polygon, several departments are contemplating forming student-faculty committees.

Feedback from students in service causes may also be valuable. EE may ask for comments from

students in the EE service courses this semester. If that works out, ISC will probably suggest this be done in other departments as well.

The major ISC effort for second semester has been a proposed change in the college pass-fail regulations.

Present regulations are college-wide and permit Juniors and Seniors (in good standing) to take a maximum of 2 pass-fail courses in elective subjects with one course per semester.

ISC feels that this regulation is too restrictive. Students are limited to 2 pass-fail courses and this does not permit enough freedom to try different areas of study.

Departments are prevented from experimentation in different methods of grading and are not allowed necessary flexibility to set their own curricula.

ISC has proposed a regulation which would permit departments to allow Sophomores, Juniors, and Seniors to take a maximum of 2 pass-fail courses per year. Fresh-

men with a GPA of 2.5 would be allowed 1 pass-fail course, and anyone could take a course pass-fail if it were in excess of degree requirements.

Eta Kappa Nu, IEEE, and Polygon have all distributed letters to the faculty indicating support of this legislation.

Amendments at the April 28 faculty meeting all but destroyed the intended flexibility of the ISC proposal. The modified version will probably pass at the May meeting of the college faculty.

During second semester, ISC has also discussed possible need for an ombudsman (an article on this by Prof. Moll appeared in a previous *Engineer*), the ESSR statement on Engineering Education, and course credit for student members of student-faculty committees. If time permits, we will also consider the WSA Academic Reform Report.

For next year, the possibilities are unlimited. If *you* know of a problem that should be tackled, bring it to ISC.

The blood you give today could save your great-great grandson's life.

Science fiction? Not at all. For authorities believe that blood—or its red cells—can now be stored for a century or more and remain as good as the day when taken from a donor.

This revolutionary prospect comes from advances in the new science of extreme cold, called cryogenics, pioneered by Union Carbide.

Until recently, blood's red cells could be kept only 21 days under ordinary refrigeration. But when frozen instantly and refrigerated with the unearthly cold of liquid nitrogen (-320 degrees F.), red cells retain their life-saving properties

indefinitely.

This breakthrough makes possible the storage of vast supplies of blood so that even the rarest and most desperately needed types need never again be in short supply.

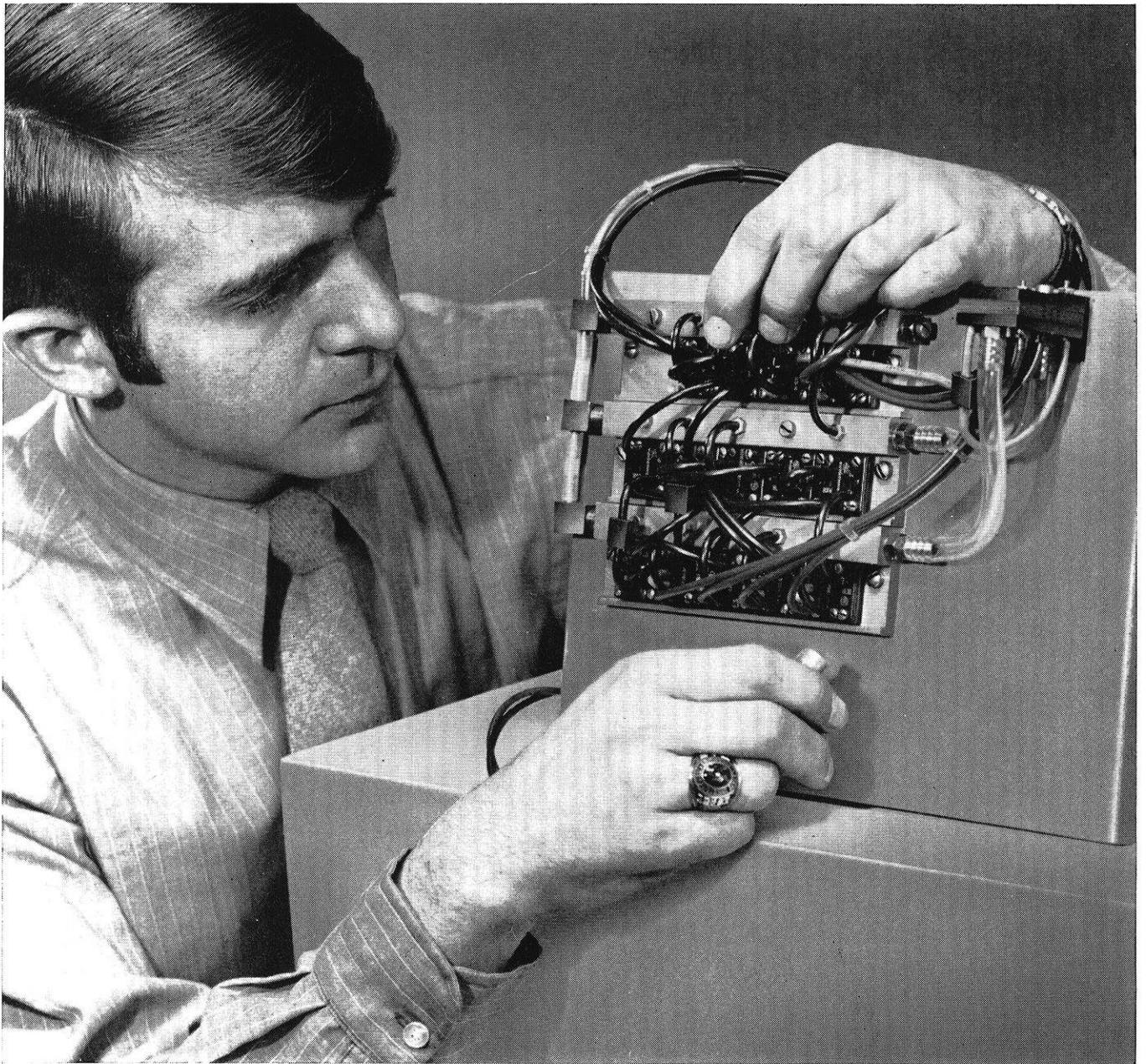
Union Carbide helped perfect the equipment and procedures for blood preservation by cryogenics. We've also developed many other uses for this new science. But none is more rewarding than keeping blood in readiness for today's needs. Or perhaps those of a century from now.



For further information on our activities, write Union Carbide Corporation, 270 Park Avenue, New York, New York 10017. An equal opportunity employer.

**UNION
CARBIDE**

THE DISCOVERY COMPANY



Jim Brix is helping raise an infant technology

As an undergraduate Jim Brix recognized the potential of an infant technology known as fluidics.

Now, after a BSEE degree from South Dakota State University '67, Jim's devoting full-time at General Electric to solving some uniquely difficult control system problems.

By combining the use of fluid flow and the interaction of forces, fluidic circuits can perform logic, amplification and control system functions. The absence of moving parts promises almost indefinite operating life, with improved safety and reliability. These advantages can push back frontiers in space exploration, manufacturing, transportation, and medicine, to mention only a few.

With this potential, fluidics is almost certain to have a technological impact similar to the one solid-state devices made recently in electronics.

Fluidics is one of many fledgling technologies General Electric people are pursuing to improve man's life in and beyond the 70's. If you'd like to know more about fluidics or another area of technology, write and tell us of your interests. General Electric Company, Dept. 801R, 570 Lexington Avenue, New York, N. Y. 10022.

GENERAL  **ELECTRIC**

699-27

AN EQUAL OPPORTUNITY EMPLOYER (M/F)