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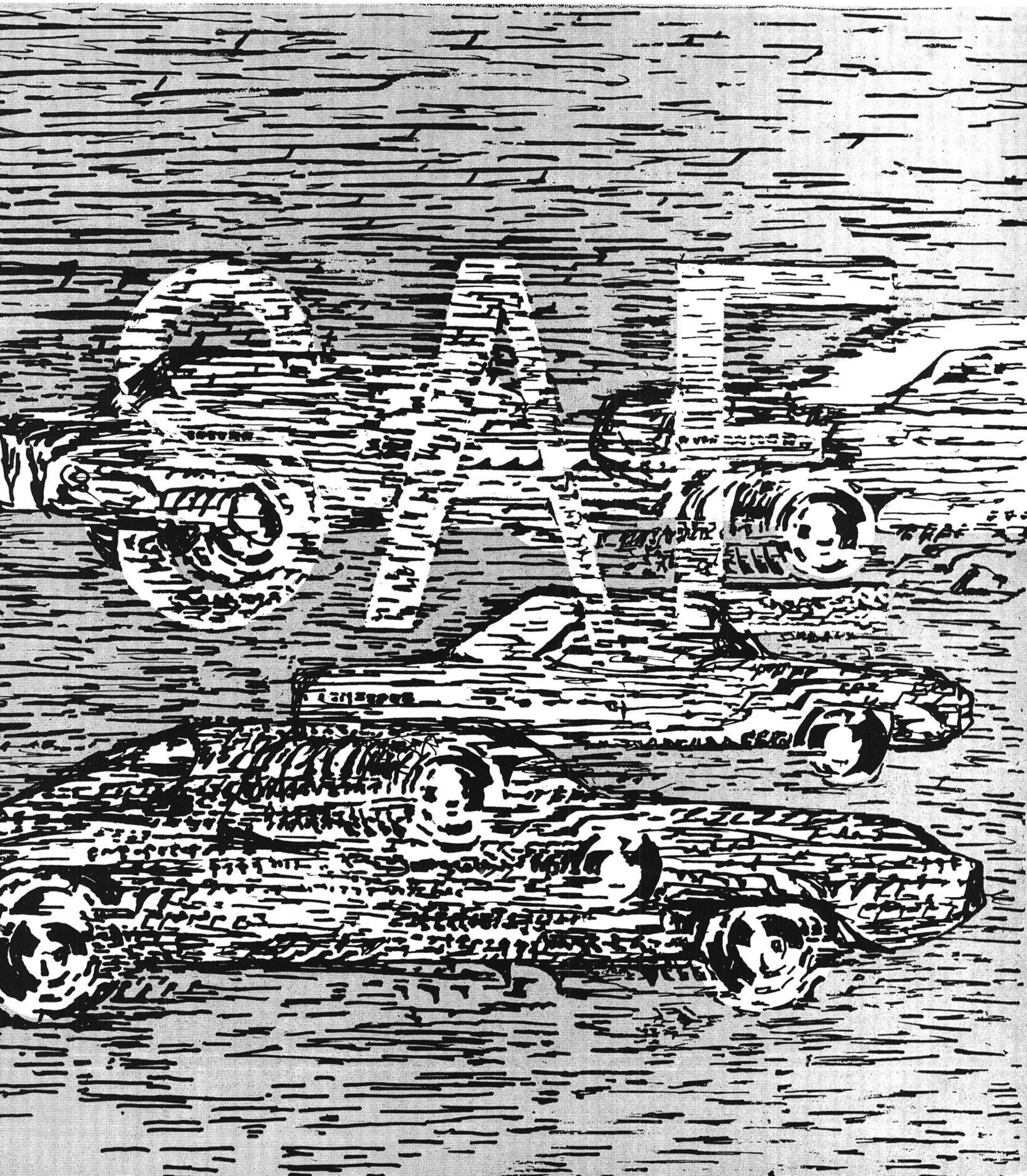
wisconsin engineer

AD RALLYING • Engineering in the Peace Corps • Olympic Free-Rifle Shooting • Jokes



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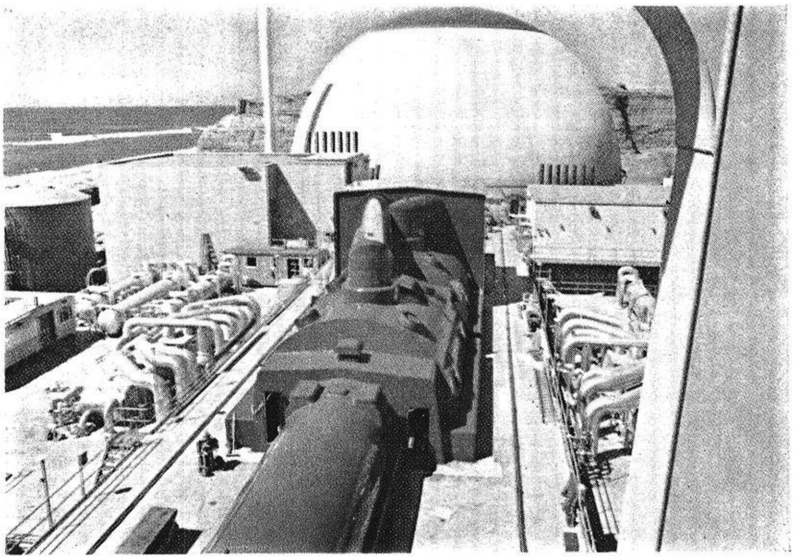

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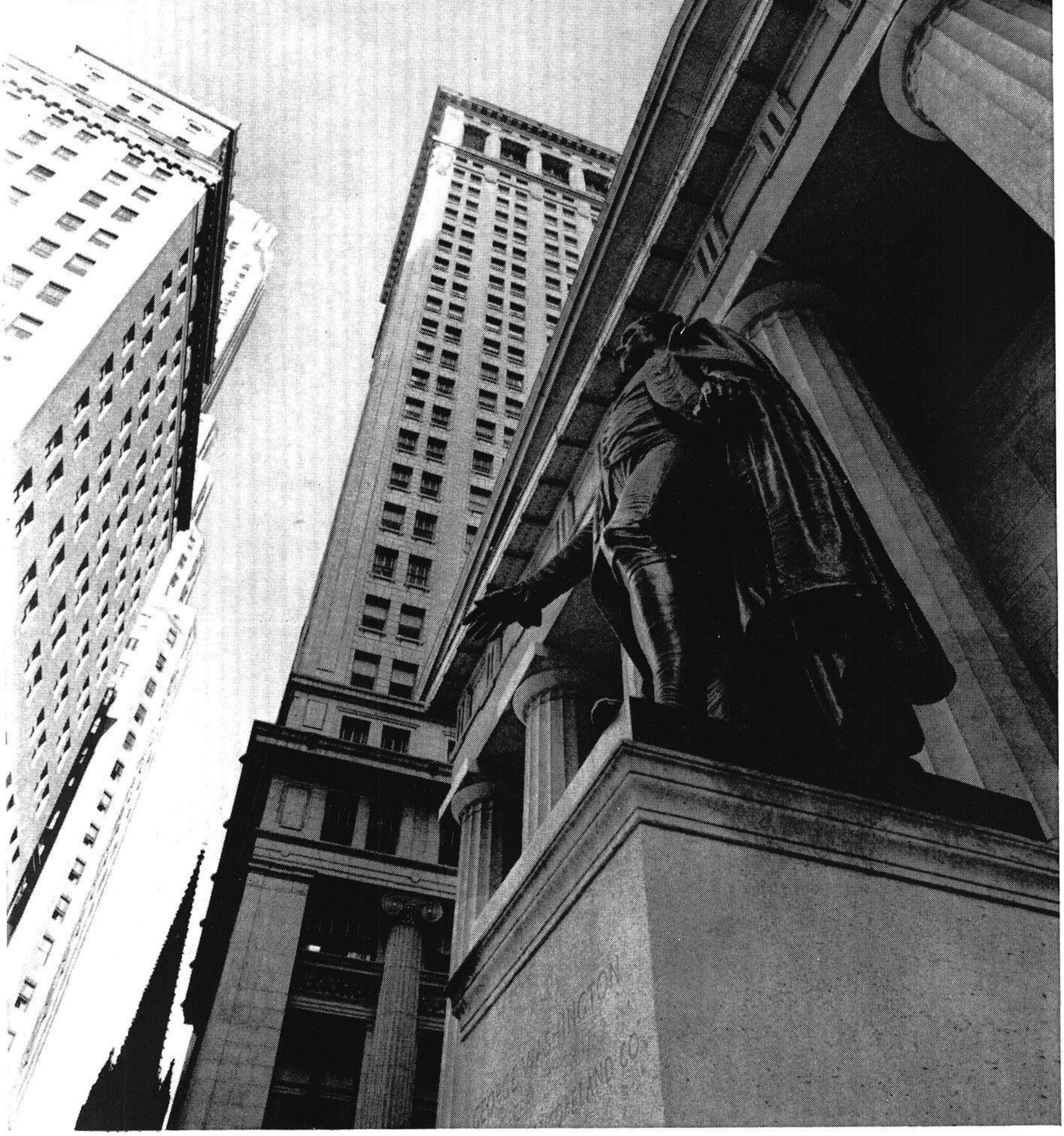

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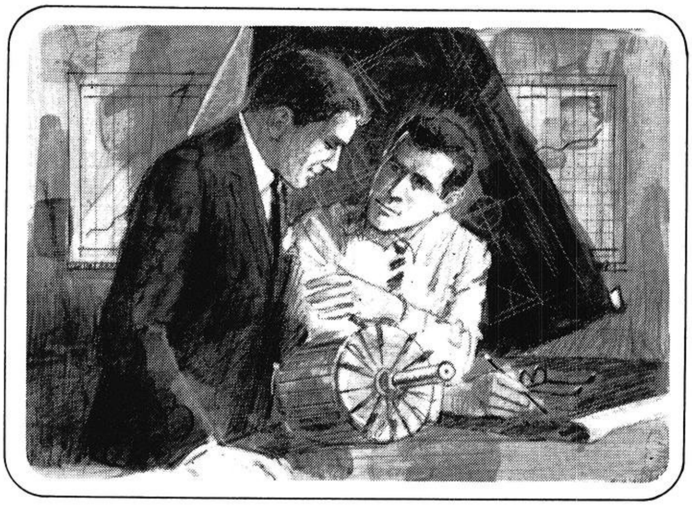

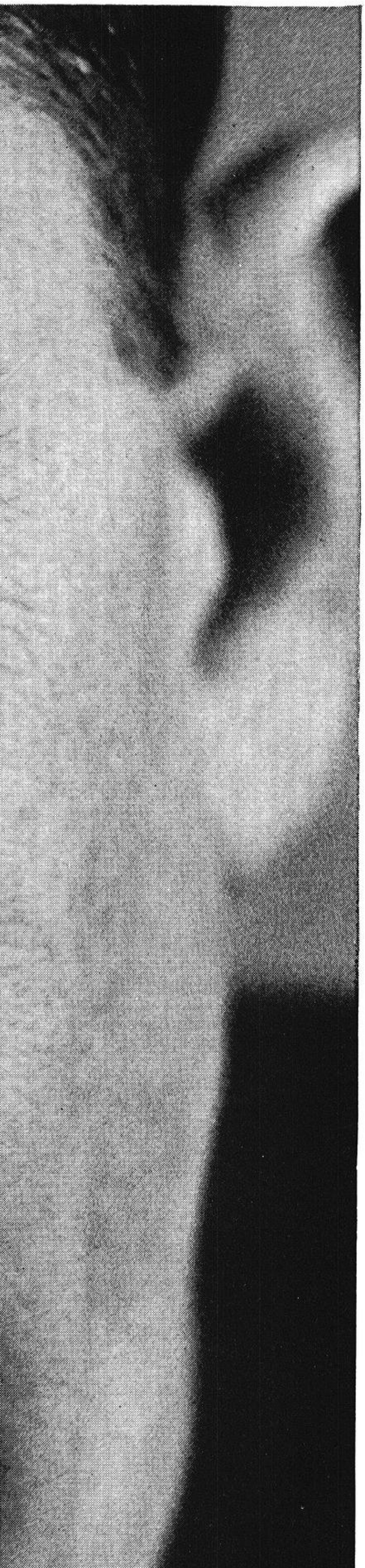

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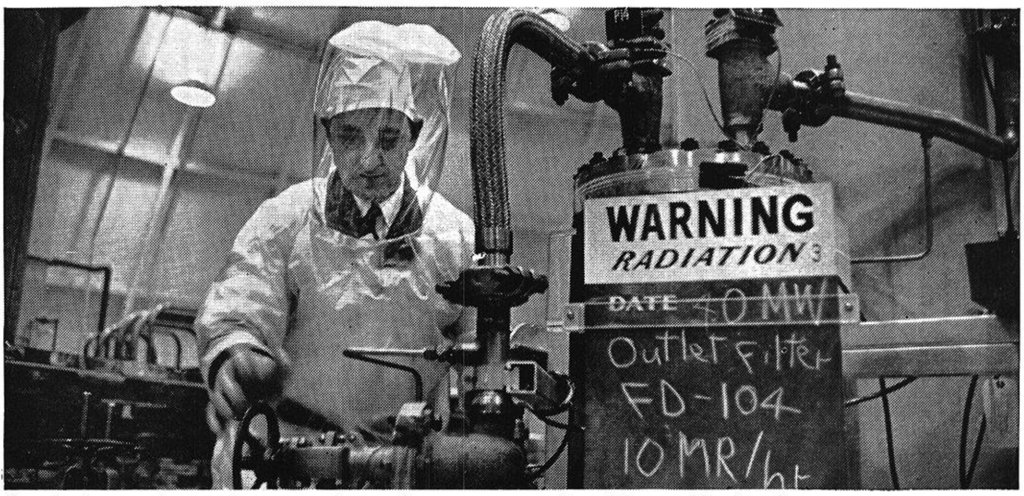
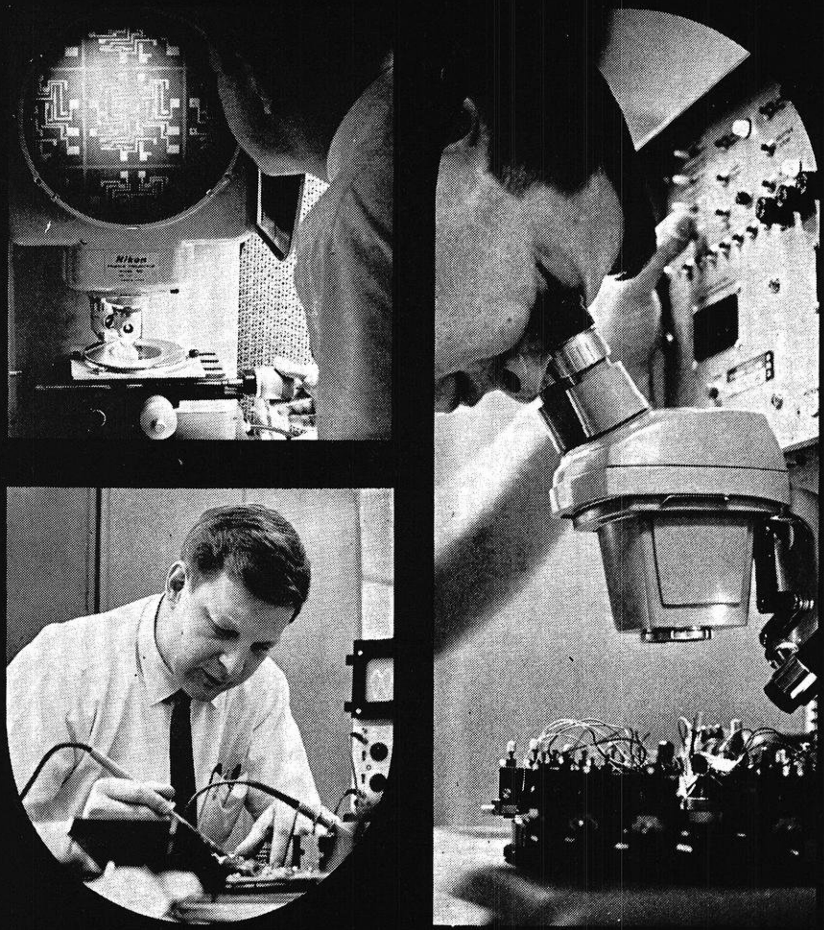


Cordovi on an inspection tour of a nuclear reactor at Brookhaven National Laboratory. He spent 10 years there as a consultant on materials for various nuclear projects.



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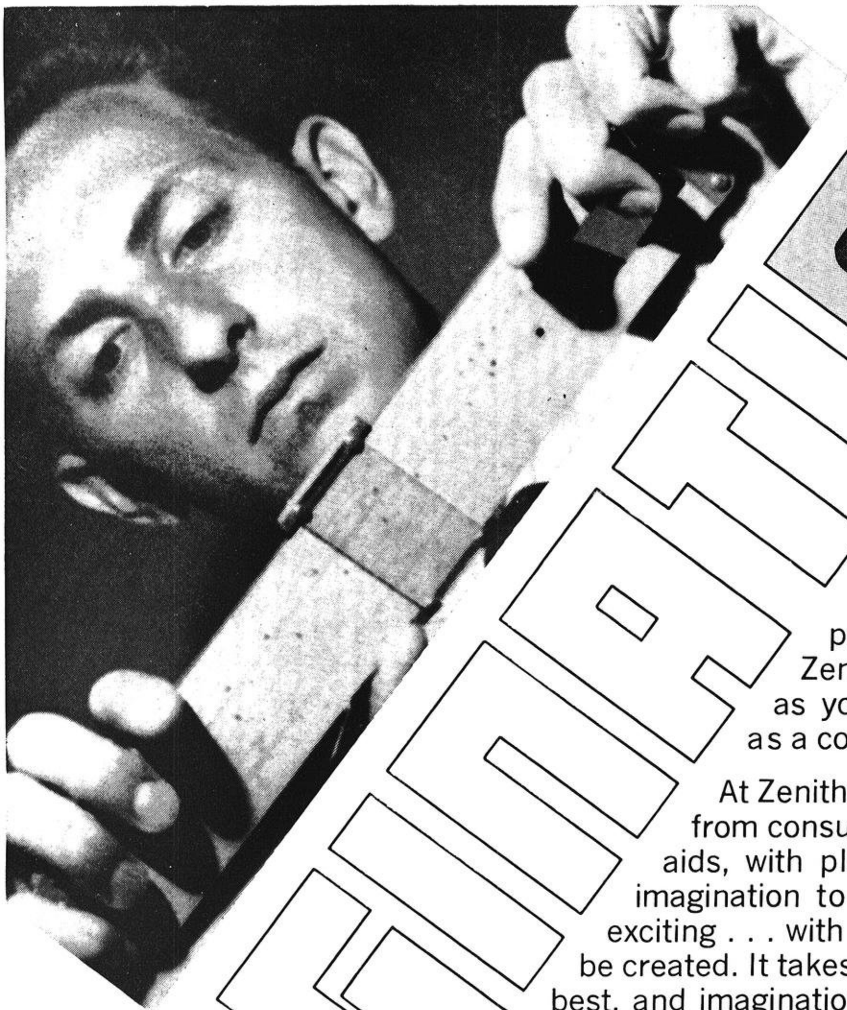

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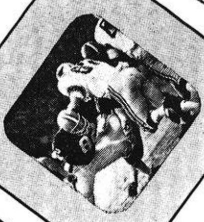

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Sports Car Road Rallying

by Al Zwicky

Sports car road rallying is a sport that challenges a person's driving and navigational ability. It can be enjoyed by almost anyone because it requires no special physical skill. It is more a game of intellect. Each rally team consists of two people — a driver and a navigator — who must work closely together. Rallying as practiced at the University of Wisconsin is sponsored by the student chapter of the Society of Automotive Engineers. Two rallies are held each year and are very popular events. The most recent of these SAE biannual rallies was held October 20, 1968. Another is scheduled for May, 1969.

Twice each year, the University of Wisconsin student chapter of the Society of Automotive Engineers sponsors a sports car road rally. One is held in early October and the other in early May of each year. These have been held now for the past six years and have become social events eagerly anticipated by many people in the community. It seems road rallying has become quite a popular recreational event in this area and throughout the country. The many sporty American cars now being produced have, no doubt, helped bring this about. It is the purpose of this article to acquaint its readers with rallying, the organizing of a rally, the competition involved, and to encourage participation in future events. Special thanks must be given to Prof. G. L. Borman for the photographs.

What Is a Rally?

Your First Rally Experience

It's about noon on a Sunday afternoon in early October and you're driving along University Bay Drive. You glance toward lot 60. There seems to be an unusually large number of cars there for a Sunday. You look again and notice that most of them are foreign cars and sporty American cars. They all seem to be moving in some kind of order. Upon closer examination you see numbers on the windows. People are milling around and some seem to be inspecting the cars. You see some of the cars parked in a line facing an exit of the parking lot. The first thought that pops into your head is a race. But wait, they don't seem to be in a hurry. They're leaving one at a time and are traveling well within the speed limit. What then is happening?

The TSD Rally

What you've just been witnessing is the start of an SAE road rally. You are right in assuming it is not a race and that the cars are being inspected. This is all part of a rally. A road rally is a contest held on public roads, in which the contestants attempt to travel an unknown distance at a given average speed. They are given a set of instructions, just prior to starting the rally, which tells them the route they are to follow, but in a very indirect way. These instructions often turn out to be just hints and clues whose purpose is also to confuse the rallyists. As if that is not enough, the contestants must try to "stay on time," that is, to travel at the given average speed. The speeds are well within the speed limit and can be easily adhered to if one doesn't get lost. However,

(continued on next page)

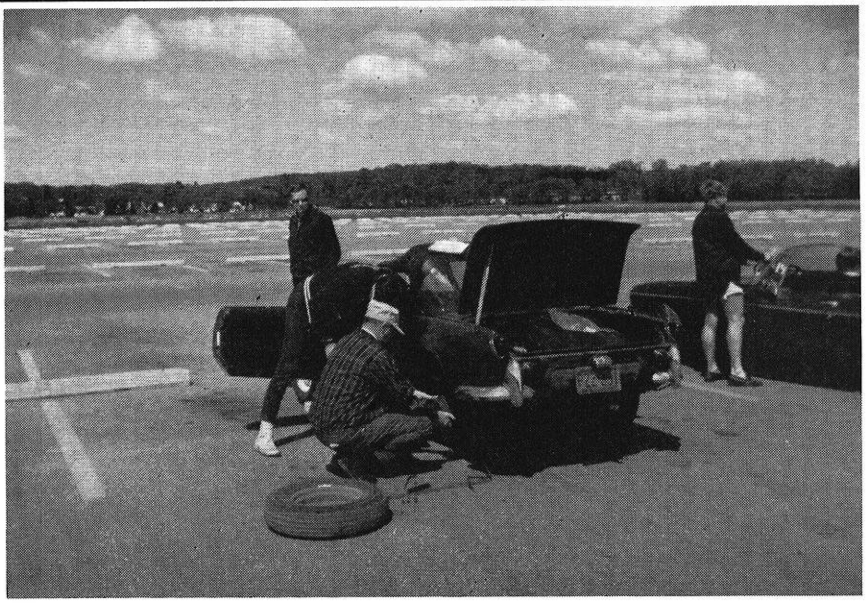
once off course the rallyists must first decide they are off course, then get back on course, and finally figure out how much time they have lost.

Two people are allowed in each car, a driver and a navigator. Needless to say, they have to work together quite closely, which can be straining at times. The route is usually designed to cover paved country roads as much as possible, thereby avoiding heavily traveled highways. Scenic and curvy roads make the rally interesting. Every so often the rallyists come across a "checkpoint." This is a place along the route where the rallyists are timed in order to find out how close they are to the time it would have taken them if they had maintained the given speed. The difference between these two times provides the basis for determining the contestant's score. There can be any number of checkpoints along the route and the distances between them are called "legs."

Now all this may sound quite complicated, and to some extent it is. However, there are certain specific rules that must be followed to the letter by both the designer of the rally, called the rallymaster, and the rallyists. These rules are usually handed out prior to the event so that the contestants can study them. Some of the main rules for the SAE rallies are as follows:

1. Stay on the road you are on until explicitly told by an instruction to leave it.
2. Only one instruction can be used per intersection and each instruction can be used only once.
3. Each instruction has to take you off the road you are on.
4. Definitions of terms such as right turn, acute right turn, bear left, straight, T-shaped intersection, Y-shaped intersection, etc., are given.
5. Dead-end roads and driveways do not count as roads.
6. Execute instructions sequentially.

The type of rally described above is called a "TSD" rally which stands for time-speed-distance. This, of course, refers to the basic equation for determining times and speeds.



Both braking systems (parking and pedal) must work if a car is to compete.

Speed — Distance Time

Gimmick Rallies

All SAE rallies here at the University are TSD rallies because the TSD seems to be the most popular kind in this area. However, there are other kinds and many sports car groups intersperse these with their TSD events for variety. These other kinds of rallies can all be grouped under the broad heading of Gimmick Rallies. In one type, the rallyists try to finish as much of the rally as possible. The instructions usually contain questions and the contestants with the most correct answers win. Another type of gimmick rally is the Scavenger Hunt. Here the contestants who complete the list in the shortest mileage win. Still another type is the Hare and Hounds Rally. Here the contestants make a guess at each intersection as to which way to go. If they guess right, they find a marker and proceed on, if not they must go back and try again.

A driver's-eye view of the line-up of cars before the start of the rally.

Here again the least odometer mileage wins. As can be seen, gimmick rallies are often based on tricks, guesses, and luck, and as such, can be of very wide variety. A high degree of navigational skill is not needed as they are run just for fun.

Why People Rally

Most people rally just for the fun of it. They like sports cars, sports car activities, and just plain driving. Rallying is driving, but it's more than that. It is driving with a purpose, driving in answer to a challenge, and driving in competition. It gives one a chance to display his proficiency in handling his car, in finding his way, and in working as part of a team. Rallying takes two people — it's too big a job for one — and both must work together. The importance of the navigator cannot be overestimated. He (she) is responsible for driving in the sense that he (she) tells the driver where to turn and whether to speed up or slow down. It's the navigator who must calculate, interpret the instructions, and keep track of the time. The driver's job is to watch for landmarks, maintain the proper speed, call off odometer readings, and, of course, watch the road. The importance of teamwork also cannot be stressed too much, nor that of practice. The winningest rally teams are those that have developed effective techniques through teamwork and continuous effort. There is one other thing. That is: a very necessary characteristic for a rallyist to possess is an even disposition, for disputes will arise between you and your partner over the meaning of an instruction, or as the result of a mistake one of you made. However, there is no time for arguments because you will be losing valuable time. You must concentrate on recovery and forget about the disagreements in order to be successful.

A Simple Method for Maintaining a Given Speed

A team starting out on their first rally should not attempt any involved calculations. They should be going on the rally just for the fun of it and to learn what it's all about. There are only two things that rallyists must try to accomplish.

1. Following the route
2. Maintaining certain stated average speeds

Following the route is by far the most important and the novice rallyists must concentrate mainly on this. Now if this does not seem too difficult and you would like to try to do some calculating to check your speeds, there is an easy way — and that is just this. Every six minutes you can tell exactly what your odometer **should** read. Six minutes is one-tenth of an hour, therefore in six minutes you should travel a distance equal to one-tenth of your stated average speed. As an illustration, assume your average speed is 20 mph. This means at the end of six minutes, your odometer should read two miles; at the end of twelve minutes, your odometer should read four miles and so on. This will give you at least an idea of how far along you should be at any time. Remember, do this only if you think you can follow the route with no trouble. After having run a few rallies you will find that you can develop your own method of staying on time, with much greater accuracy, and hopefully you will be competitive with the winners. Of course, the better you do, the more fun you will have.

Organizing the Rally

Route Set-up

Organizing a rally is a very big job as there are so many things that must be taken into account. Usually this job is done by a committee. Such a committee is assembled to organize the SAE rally. They start planning months in advance. The first thing they do is assign an approximate length and time to the rally and, of course, pick the date on which it is to be held. Then the geographical area which the route will cover is chosen according to the variety of the roads and the scenery. Next the checkpoints are located. This is very important in that these areas must be able to accommodate many cars with off road parking. They should be visible for as short a distance as possible to the approaching rallyists. It is nice if there is plenty of room for the rallyists to leave their cars, relax, eat lunch, and make any necessary "pit stops." Once the checkpoints are determined, the route is completed simply by connecting the check points in what seems to be the most interesting way according to county maps. Then the route is driven just to get an overall feel and to eliminate any objectionable roads or hazards not shown on the maps. The instructions are written and rewritten on succeeding trips.

A county map is essential.

Then come the route checks. Committee members make several trips checking and rechecking the route and the instructions until they feel they are clear and contain no mistakes. Finally, the average speeds are set to match the type of roads covered, and the necessary mileages are measured. A mileage check approximately ten miles from the start, is given in the instructions so that the rallyists can correct their odometers to the one used to measure the official mileages. This is most important. On the morning of the rally, it is run once more for a final check to see that signs and other things that apply to instructions have not been removed or tampered with. This completes the route set up, but there is still much to do.

Technical Inspection

On the day of the rally an area of lot 60 is set aside for the technical inspection of the competing cars. A brake test area is chosen and covered with sand in order to test the cars' stopping ability. Both braking systems (parking and pedal) must work if a car is to compete. Because there are so many cars to be inspected, they are moved along in an assembly line fashion. The cars are then lined up at a parking lot exit and a starter sends them off one at a time.

Scoring

The correct times are calculated between the checkpoints from the given average speeds and the measured mileages. One point is deducted for each second a rallyist differs from the correct time and, of course, the lowest score wins. There is a maximum penalty of 1800 points per leg which amounts to 30 minutes. A "panic envelope" is handed out at each checkpoint. This envelope gives the location of the next checkpoint and is to be opened **only** if a person is completely lost or more than 30 minutes behind time. It is to be handed in at the next checkpoint if unopened. If opened it means an 1800 point penalty.

Personnel

The committee must recruit enough people to work on the rally to ensure that it runs smoothly. It takes a minimum of three people to handle timing chores at each checkpoint. The technical inspection and start require a minimum of five. A meeting is held to explain checkpoint procedure, to tell the checkpoint locations, and to ensure that all workers have transportation to their checkpoint.

Pre-rally registration by Committee

The committee has many small jobs to do in advance of the rally. The responsibility of each job is given to a committee member. The rally is advertised by means of posters in the Mechanical Engineering and Engineering buildings, and notices posted on many campus bulletin boards. It is also announced at the monthly SAE meetings. The next job is the reproduction of the instruction, plus the maps for the panic envelopes. The rally is then registered with both the University police and the Union Activities Committee. Finally the trophies are ordered and the dash plaques, two per car, are designed and ordered. The timing equipment, consisting of stop watches, is secured and synchronized. An odometer reading to the nearest hundredths of a mile is also secured to measure the official rally mileages.

Pre-rally Preparation by Rallyists

The rallyists also have a couple of things to do before they make an attempt at rallying. First they must sign up and pay the entrance fee. This is done at a booth in the Mechanical Engineering lobby that is staffed by SAE members and open throughout the week just preceding the rally. The contestants must also obtain proof that they are insured. This proof can be either an insurance service card or a copy of the policy itself and is to be shown to rally officials at the start. Although it is not necessary to have any additional equipment except an automobile, most rallyists have at least a stop watch and county maps. Rally tables and a slide rule can come in mighty handy. From here on, most additional equipment is rather expensive. Electric odometers, small mechanical computers, and shortwave radios for determining exact time of day are such devices and are used by only the most serious rallyists.

The author (with his back to the driver's seat) and his car at the final checkpoint of 1968 spring rally.

The 1968 Fall Rally

The Start

October 20 was the date for the 1968 Fall Rally and it dawned sunny and clear, perfect weather for a rally. The technical inspection began shortly after 10:00 A.M. at lot 60. After the cars were inspected and numbered they were lined up at the rear exit of the lot for the start. Each car received its instructions two minutes before its departure time. The first car to leave was car number 2 which left at 11:04, right on schedule, followed by another car two minutes later and so on.

The Route

The route, concocted by rallymasters Tom Jensen and Guy Winoradsky, wound through a good portion of western Dane County. It led out University Avenue to Old Middleton Road. From there it followed Old Sauk Road, which took the rallyists out of the city. It then headed northwest to the first checkpoint just south of Springfield Corners. This checkpoint also happened to be right in the middle of a motorcycle rally and between the rally cars and bikes passing through, it turned out to be an extremely busy place. However, aside from a few puzzled looks by both sides, everything ran quite smoothly. All cars made it through this first leg successfully as no one needed his panic envelope. From here the rally made a big loop and headed south to the second checkpoint located just west of Cross Plains. This leg must have been a bit more difficult as there were quite a few panics and two dropouts. The third and last leg led west again to the rally's end, just south of Black Earth. Four more cars did not finish this leg. The total distance covered was about 75 miles with a driving time of about two and one half hours. The winning car was an Opel driven by Mr. and Mrs. Fred Rosevear and their winning score was 147 points.

The advisors to the SAE student group, Professors A. H. Easton and G. L. Borman provided valuable assistance in preparing the Fall Rally. Also, many thanks are due to the rally workers who gave freely of their time and talents to make the rally a success.

1968 SAE FALL RALLY TROPHY WINNERS

Place	Driver	Navigator	Leg 1	Leg 2	Leg 3	Total
1	Joyce Rosevear	Fred Rosevear	1	45	101	147
2	John Erjavec	Tom Henson	2	183	112	297
3	Dick Goddard	R. A. Greiner	2	204	132	338
4	Bruce Unterman	Linda Dolcott	62	289	17	368
5	Ron Mabie	Dan Witz	32	741	134	907
6	Robert Gross	Richard Stiphout	88	745	125	958

See You in May

Road rallying is fun as evidenced by the increasing popularity of the sport. Sports car and rally enthusiasts are active all over the country. Rallying is not a spectator sport but strictly a participatory one and, after some experience, any intelligent driver-navigator team should be able to place in an event and, in so doing, bring home a trophy. While winning a trophy is certainly not the sole reason for participating, it does increase the incentive. The SAE rallies are designed with the novice rallyist in mind and, therefore, provide a good chance for such people to get acquainted with the sport. Remember, the next SAE rally will be held in early May, 1969. Be sure and watch for it, give it a try, and we'll see you there.

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Obstruct! Resist! Unite! Abstain!

by Dave Stroik

Once again this year we find the same demon rearing its ugly head. Namely, Roll-Good Bearing, Inc. is again recruiting on campus. Roll-Good Bearing is an immoral institution, and as moral human beings, we have no choice but to impede the actions of this company on every level.

It is Roll-Good Bearing that is the sole producer of cotter pins for Geyser Jeep. And it was in a Geyser Jeep, on a brisk October evening, that Delmer Doolittle took certain liberties with Pansy Wholesome. If it hadn't been for Delmer's incompetence, she could easily have been another casualty of the moral decay in our society. It is this very moral decay that we condone when we allow Roll-Good Bearings to recruit on campus. That is why we have chosen Roll-Good Bearings as the target of our protest.

To make our point felt by the majority, who, blinded by their apathy, stumble toward destruction, we plan on seizing a campus building. Our executive committee, chosen unanimously just last night at a rally on the Library Mall, has selected the Poultry Research Building for seizure. This is a wise choice for at least three reasons. First, we expect much support from the Agriculture students at this University. Their undying fundamental morality has always been a guiding light in time of crisis. Second, there is a large supply of rotten eggs behind the Poultry Research Building, which, when packed into paper bags, will serve as an appropriate confrontation with reality for the apathetic passer-by.

Our most important reason is that it is only proper and fitting that the actions of the Poultry Research Building be stopped. After all, what is more promiscuous than a flock of young maiden hens locked in a small pen with one male. This is wrong. And why is this situation permitted to continue? So that the average apathetic middle class man may have his egg in the morning. Fellow students, the course is clear. Poultry Research must be taken!

Join our Potpourri Protest this Saturday! Recognizing that ours is not the only worthwhile cause on campus, we are inviting those of you with any legitimate gripe to bring yourself and your sign to Bascom Hill this Saturday afternoon. Thus far we plan to hit upon the following basic areas: sexual promiscuity, the war, the draft, poverty, discrimination, automation, hunger, and hemorrhoids. (Note: You may be either for or against any of the above to be eligible for our protest.) Make it a study break before exams. Bring your girl. Coffee and doughnuts will be served immediately following with music courtesy of Concertina Fritz and Accordion Gino.

Development of a Prosthetic Heart Valve

by Prof. R. J. Harker

Of the entire population of the United States, about ten per cent have some form of heart disease, with nearly 600,000 deaths each year caused by heart attacks. A significant number of this group, numbering thousands per year, will require some type of surgery if their lives are to be extended.

To this end, the heart transplant and the artificial heart have received much publicity during the past several years; however, the former is a very drastic approach with obvious limitations. The latter is a formidable technical challenge, apparently not realizable in the near future.

In many patients the principal heart defect concerns malfunctioning valves, of which there are four. Those which are most commonly involved are the mitral (entrance) and the aortic (exit) valves of the left ventrical, or pumping chamber. These are basically check valves which permit flow in one direction only. Although some valve defects are correctable surgically, many require a complete prosthetic replacement in which the natural valve is removed and an artificial valve implanted.

Prosthetic valves have been under development for nearly a decade, with many configurations proposed. The requirements of such a device are so severe, however, that the prosthetic valve is still in an evolutionary stage in spite of remarkable progress made thus far.

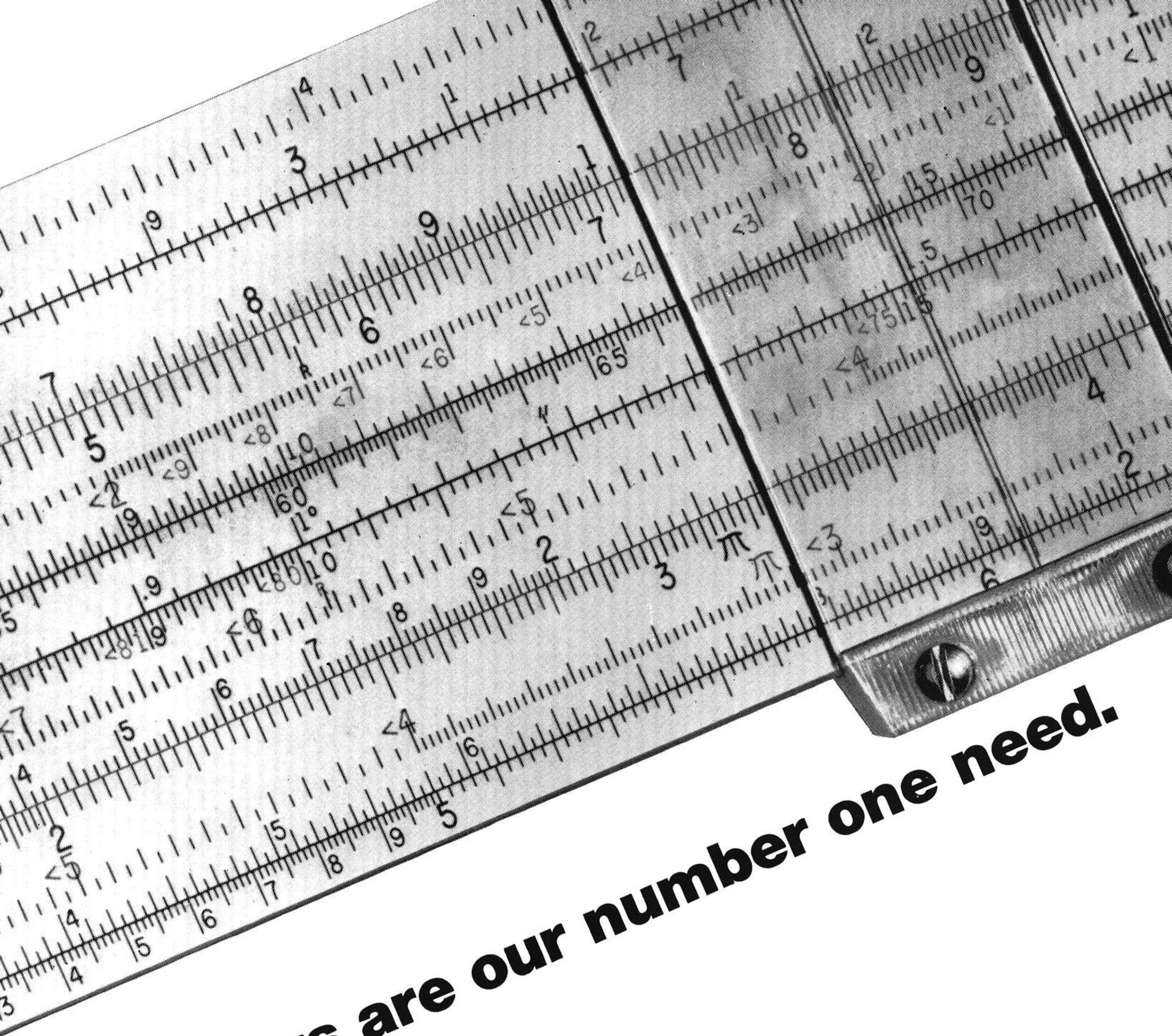
Briefly, the prosthetic valves must have low flow resistance, rapid response, zero leakage, and should not produce stagnation zones. The material must be inert with respect to the body tissue and the bloodstream, yet of sufficient strength to provide a fatigue life in excess of 200,000,000 cycles. The valve should produce minimum impact at closure, and should have a low profile to avoid interference with the heart. The valve body must have provision for suturing, as well as a contact material which will react with the tissue to provide permanent anchoring by means of tissue ingrowth.

The chief biological difficulty stems from the clotting mechanism of the blood. Thrombus formation tends to occur in regions of tissue damage or of excessive turbulence. In addition, the blood tends to be damaged by repeated impact at contact areas of the valve if the action is too severe.

Currently the valve configuration under development at the University of Wisconsin involves a plastic body with a spherical seat and a movable disk which mates with the body to form a circular seal. The disk is pivoted on two tapered pins to provide a differential action during opening and closing; that is, the pivot is eccentric with respect to the center of the disk so that the large segment forces the smaller against the flow forces during operation. However, when completely closed the blade becomes simply supported by the spherical body providing a continuous seal on the lower face of the disk.

Although clinical testing in animals is still in the early stages, the valve shows considerable promise. It has very low flow resistance, is quiet in operation, and is readily sutured by the surgeon using the wound dacron tissue between the outer flanges. The critical question pertaining to clot formation is as yet unanswered, as the stationary pins and the pivot holes may provide the focus for such formations.

This project is a joint effort by the Mechanical Engineering Department of the College of Engineering and the Cardio-vascular Research Laboratory of the University of Wisconsin Medical Center. The valve design and construction is under the supervision of Prof. R. J. Harker, with Robert L. Beran as the Research Assistant. Clinical testing and surface treatment of the valve is provided by Dr. J. D. Whiffen.



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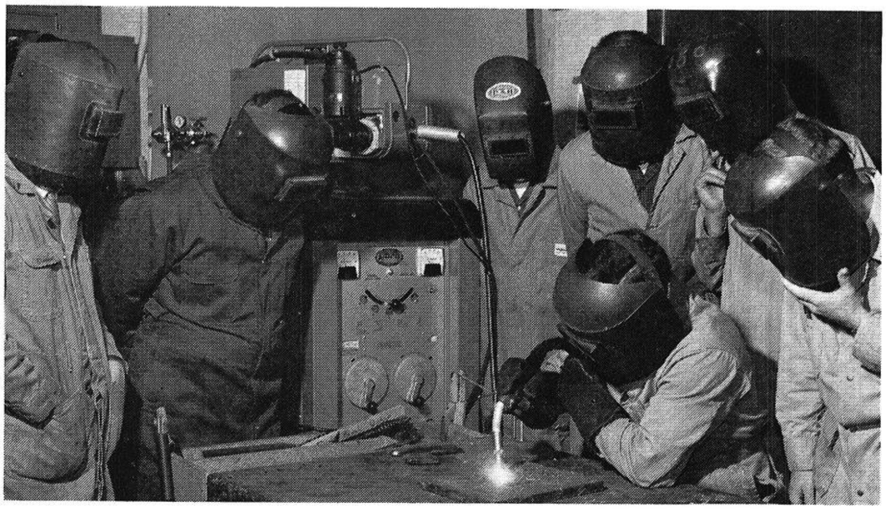
Welding: Research Goals at Wisconsin

by Prof. Norm Braton

Welding is currently passing through a transition period. Until recently it has almost always been thought of as an art. With the coming of the space age and later marine science it became apparent that it was necessary to better understand the nature of the problems long hidden in the shell of science. The universities now realize the first step in this direction is the necessity to change the image of welding from the "black helmet and lots of sparks" to a scientific approach of an engineering pre-evaluation of a weldment.



Above: Black helmets and lots of smoke and sparks is no longer the image of Welding Engineering at Wisconsin.

Below: Welding Engineering may study the effects an arc has on a base material. This photograph is of the interface area between ductile cast iron base metal and nickel weld metal.

Industry has been slow in recognizing the need for this change, therefore the struggle by the universities to attract financial support from industry has retarded research growth in this area. It appears the "Welding Vane" is gradually "pointing" in a direction indicating the need for engineers specifically trained in the area of "Welding Physics." Recruiters are increasingly in search for engineers with MS and PhD studies in this area.

The welding program at Wisconsin, unlike that of Ohio State University, does not offer a degree in welding engineering. Ohio State has the only ECPD accredited welding department in the United States. Instead of a welding department, Wisconsin believes that welding is much boarder than a single department and its goals can be achieved only when it becomes interdisciplinary and an all college endeaver. For example, when a student is interested in welding metallurgy he may choose his major professor from the College of Engineering Metallurgy Department. If the student's interest lies in the physics of weld metal transfer or power sources he may choose his major professor from the Electrical Engineering Department and the same holds true for any of the other many departments of engineering. Each engineering department has something to contribute to the field of welding.

Therefore, it appears welding should be interdisciplinary rather than confining it to a single department. With this approach the most knowledgeable authorities on the subject can usually be located on a single campus.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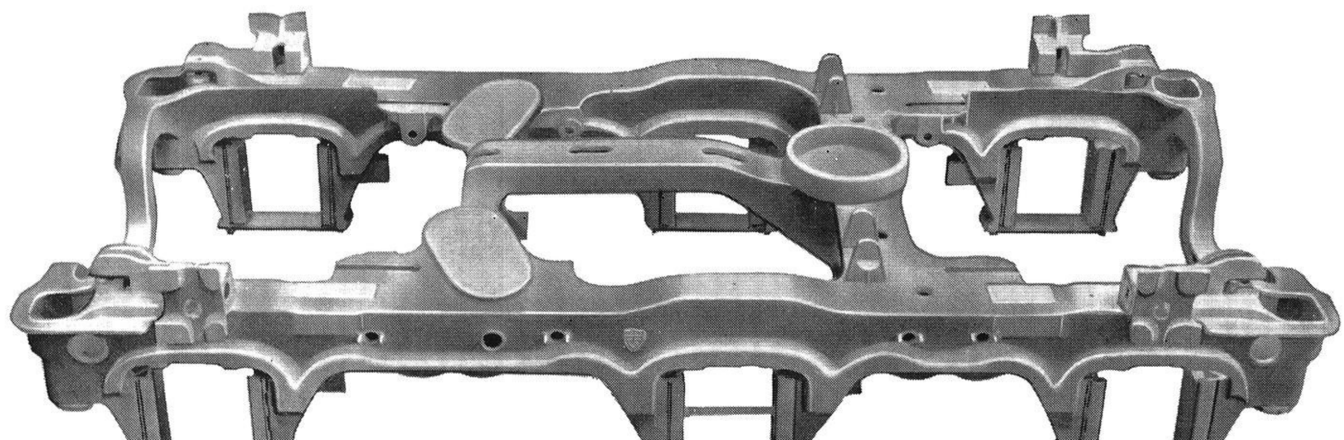

Cast-Steel for Engineering Flexibility

ENGINEERING IN THE PEACE CORPS

by John Tucker

To begin, let me put my project in perspective. I entered training in July, 1966, in Boston. Our group consisted of 49 men with business and engineering backgrounds. About half of these people were recent graduates, like myself, and the other half were people with between two and twenty-five years' experience. We spent three months studying at the Harvard Business School. Our teachers were not only recognized in the American business community, but each had also spent at least three years consulting and teaching in India. They taught us business practices, not as they applied to American industry, but as they applied to the Indian situation. I will go into some of the Indian business practices and their differences in relation to American techniques later.

One question that you may have is: why did the engineers study business practices rather than get more technical training? To begin with we were going to be working not only as engineers, but also as consultants in the broader sense. Our job was first to evaluate the major problem in a factory. That could be one of finance, marketing, quality control, or technical expertise. If we could handle it we solved the problem ourselves. If it was a purely business matter, we would call in the appropriate business person. In many cases we worked as teams. We were then required to do our own cost analysis for whatever project we undertook. Secondly, additional technical training wouldn't have been beneficial since we were going to be assigned on a district basis, and we might be working on any number of technical problems in that district. Thus it was impossible to predict what kind of expertise we would need.

After three months of business, language, and cultural training I left with 17 other volunteers for Kerala, South India. I spent my first four weeks touring factories, trying to recognize the common problems of the industrialists in the district. Several major ones were obvious. Sporadic supply of electricity was one of the most acute. Here, when we turn the switch, the light comes on. In India when you turn the switch, you may have to build a dam, install generators, and then distribute the power, before the light comes on. This is true of many things in India. This electricity problem necessitated the installation of an auxiliary diesel generator in most factories. The greater cost drove up the initial as well as the operating cost.

Lack of raw materials was also a problem. Since some resources, particularly coal and iron, were scarce, their cost was quite high. The government tried to set up controls to channel these materials into production of priority items, but the enforcement of these rules was impossible. Consequent to this large demand for consumer goods and the scarcity of materials to make them, the public would buy whatever was on the market, regardless of quality. Situations like this made us lower our standards for quality goods.

Another factor that affected our work was a law implemented in 1957 after the first Communist Government was elected. The legislature passed a Land Reform Law that limited the size of land holdings to 15 acres per individual. Thus the large land owners, after giving 15 acres to each family member, were forced to sell the rest. In turn they were left with large amounts of capital. Many of them went into retail business, but it became a status symbol to own a factory. So when I arrived in 1966 the industries were still relatively new, that is, less than ten years old. Therefore I was dealing with industrialists not only inexperienced, but in many cases concerned with their factories mainly as status symbols. However, there were exceptions to this general rule, and our first job was to evaluate the motivation of the owner and/or manager of a factory. Learning to judge motivation takes more than technical expertise. It demands that you understand a man's background and cultural values. It took us several months to be able to do this, but eventually we learned to look for one of three types of individuals or situations. The first was a man with an innate business sense and drive. There were a few of them and they were the easiest to work with. The second type was the business man who did not have an agricultural income. If his factory was his only income, he was interested in making it profitable. The third type was the man who had gone into business for status reasons, but whose factory was losing so much money that he had to start improving it. The State Government had invited us to solve these motivational as well as technical problems. Our immediate supervisor was the District Industries Officer, not the Peace Corps.

However, we weren't sent there just to recognize problems; we were sent to solve them. What did I do as an engineer? My first project was the design and construction of a dryer to dry pineapple waste. Like most of the companies in the area this one was about ten years old. Initially the factory canned about a ton and a half of pineapples a day. Since 50 percent of a pineapple is waste, this meant that about three thousand pounds of waste a day was buried behind the factory. However, as the factory frew, the problem grew. When I arrived they were canning 15 tons of pineapple a day. Since there was no space to bury it, they were paying a man to haul it away. The cost for this ran a hundred rupees a day. Considering the factory worked about 200 days a year, this was the equivalent of spending about $20,000 a year in the U.S., just to remove the waste.

It may seem strange that an Electrical Engineer would be designing a dryer. Drying is primarily a chemical problem, with a few mechanical and fluid aspects thrown in. But I was sent there to solve the problems which presented themselves.

My approach to solving the drying problem demanded discussion with other people. I went to the local Engineering College and by talking with the professors and reading the books in the library, I learned about drying. I discussed the problem with the Mechanical Engineer with whom I was living. I wrote to the Volunteers for International Technical Assistance, a group of engineers here that helps solve problems in developing countries. I went to the Food Research Institute in my town and discussed the drying problem with the personnel there. Then with the information I gathered, I priced equipment, and designed the dryer. But this was not my only project. I also designed an electrical brake for a large centrifuge used to extract pineapple juice from the waste. I set up a quality control system at a mattress factory, and I trained automobile mechanics in the use of timing lights and compression gauges. Since in solving these problems I had to rely on information from Indian sources, I began to realize that the expertise, although not the lines of communications, was available locally to solve most of the technical problems of the locality. My major project with the industrialists, the engineering schools, and the State Industries Department. I was able to initiate a start on this project, although the outcome is still uncertain.

What did the other people in my program do? Half of them were assigned to Northern India and not being familiar with their work, I'll concentrate on the 17 volunteers with whom I was assigned in Kerala. They helped set up new industries. Shrimp canning, water meter manufacturing, and car trailer manufacturing companies. One volunteer even helped set up a malleable casting foundry. They expanded a mattress factory, three foundries, and a pineapple canning company in competition with the one for which I was working. On Engineering

Physics volunteer, after doing a financial analysis of an entrepreneur's two factories, suggested that he sell one of them to maximize the profits in the second.

What specifically did the engineers do? They designed an electrical counter, a water cooling system for the shrimp cannery, a dryer for match splints, a die for retreading tires, and one engineer is still there training people in malleable casting techniques.

We had our mishaps and failures. The dryer I designed was never installed because priorities at the company changed, although the design was later used for the match splint dryer. Sometimes we mis-evaluated the motivation of owners. Sometimes we didn't put suggestions in the context of Indian cultural values. But it is significant that after the election in 1967, only the industries program was allowed to remain by the newly elected Communist Government. In North India the state government asked for a replacement group for the engineers there.

I have dealt primarily with my own project. There are many other projects open to engineers: Architects for Tunisia, Electrical Engineers for the electrification program in Ecuador, Civil Engineers for Nepal, and City Planners for Afghanistan.

If Peace Corps is going to answer these calls for aid, where will they get the engineers? One source is recent graduates. However, we know that the more experience a person has, the more effective he will probably be overseas. So we hope that as the opportunities for engineers get better publicity, the number of experienced engineers in Peace Corps will increase. Perhaps the greatest source of untapped talent is retired engineers. They have the combination of experience, maturity, and time that no other group in the U.S. has. Peace Corps offers the retired engineer an unusual opportunity to use his background for the good of others. Also, retired people are always stationed near adequate medical facilities.

I hope that in the future there will be much more contact between Professional Groups of this type and returned Peace Corps volunteers.

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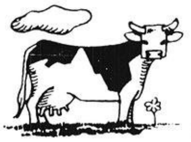

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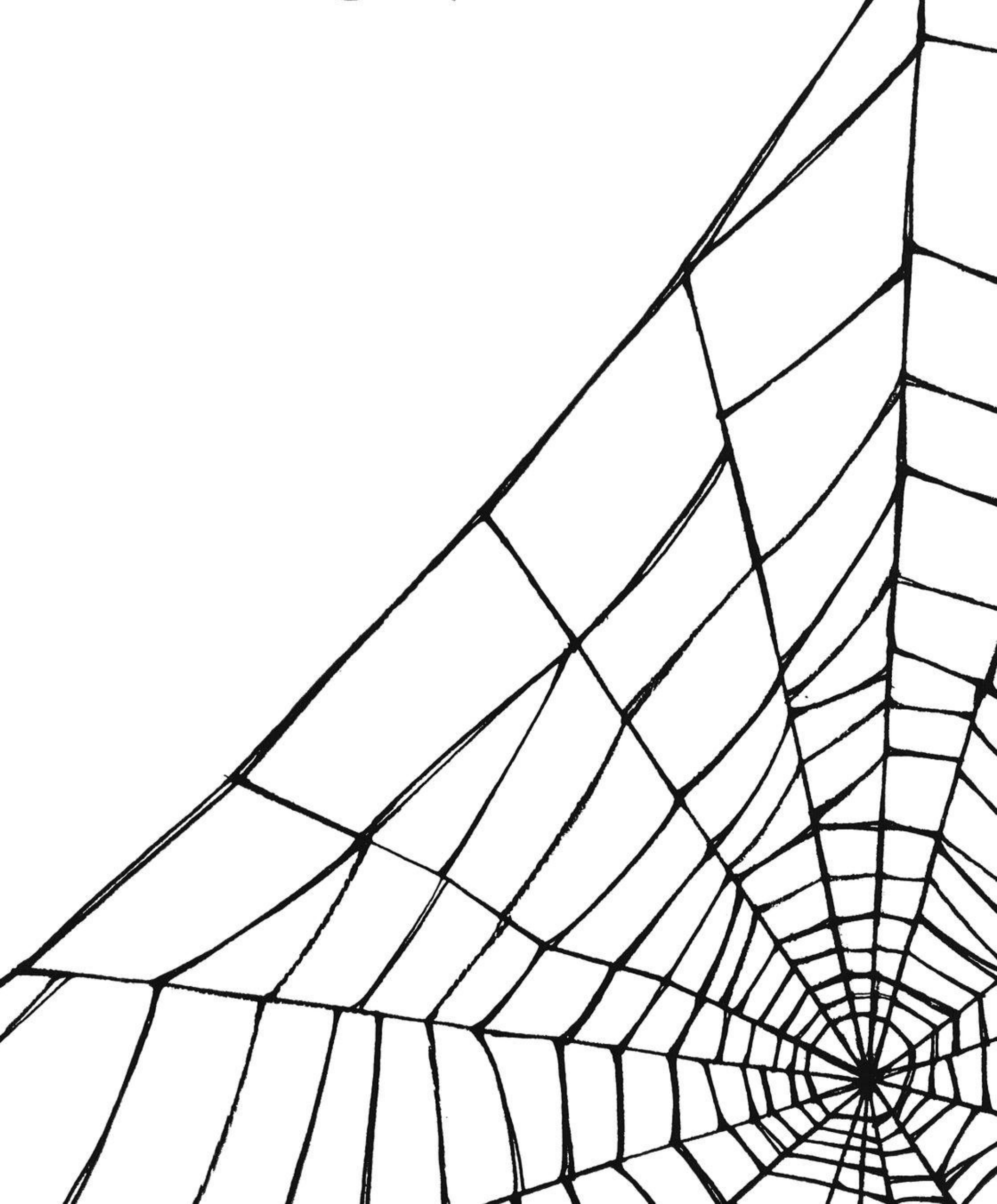
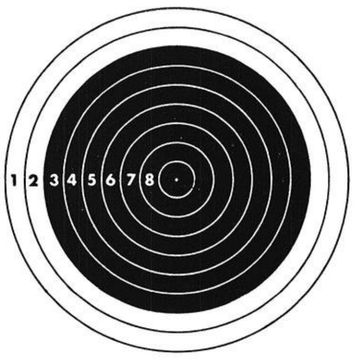


Olympic Free Rifle Shooting at Wisconsin

by Tom Schoenleben

Olympic free-rifle shooting is one of the fastest growing, most physically and mentally demanding sports to be initiated at the collegiate level in many years.

This sport is internationally renowned — enjoying greater popularity in Europe than in the United States. Lately, free-rifle shooting has grown in popularity here, especially on the collegiate level. The University of Wisconsin rifle team this year is a prime example and may be in line for national honors.



50 foot free-rifle target.

What Is Free-Rifle Shooting?

One of the newest, fastest growing and most precision sports to be introduced at the collegiate level of late is International, or Olympic, free-rifle shooting. This sport has enjoyed great success for many years in the Europenan countries — with Germany and the Soviet Union its initial strongholds. It hasn't been until the past two Olympic games that the United States has begun to dominate the competition. The reasons for our new-found success lie in our training and Olympic tryout program conducted primarily in the universities, and our increased technical knowledge which we have applied to the rifles themselves.

Very simply, the object in free-rifle shooting, is to hit the center of a target placed 50 feet from you with the aid of a $300, 17-pound rifle. The center in question measures .008 inch in diameter.

Little known to most students, free-rifle shooting is a varsity sport at Wisconsin. Though at present the sport is not lettered here, it is at other Big 10 universities. All competitors are governed by Western Conference rules. They shoot locally in the Big 10 Conference and nationally in sectional and national competitions.

This year the University of Wisconsin team is expecting by far its best year with four men returning from last year's final six-man team. Of added interest, five of the six men are engineering majors, the highest such percentage of the technical fields in any sport.

With this basic concept and background in mind, let's examine Olympic free-rifle shooting by first viewing the human, then the mechanical aspects involved.

The Man and the Tasks Before Him

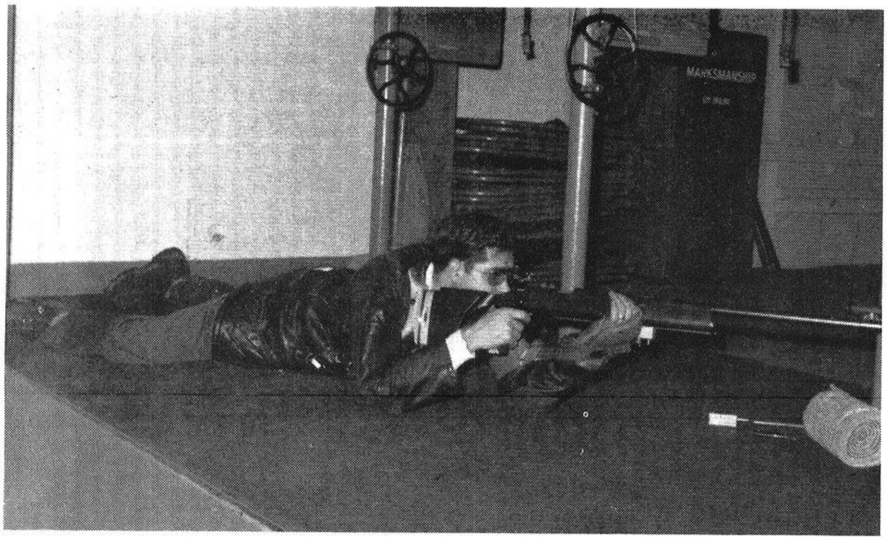
At present free-rifle shooting falls under the ISU (International Shooters Union) rules. These rules place restrictions on both the shooter and his equipment. They also establish a "course of fire" under which all matches are conducted and establish the legal positions which each competitor must use in his allotted time. A full match consists of 120 record shots, totalling a possible 1200 points per man. Time allotted to such a match is just over four and one-half hours.

To get a better picture of what is involved here, let's assume that an average competitor lifts his 17-pound rifle 150 times during a match; average lift about three feet. Multiplying the three together (3 feet x 17 lbs. x 150 shots), the work output by the competitor is 7,650 foot pounds per match. This is approximately equal to the work required to unload by hand one 4 cubic yard truck filled with gravel.

For this reason physical fitness is stressed, with emphasis on running and weight lifting.

Mental fatigue is another problem which most competitors face. To remain competitive over the 4.5 hour match it is essential that one never let down, to do so even momentarily often costs valuable points. The best way to build up mental endurance is simply to shoot, preferably for long periods of time, under match conditions. This is often difficult, and the competitor runs the risk of over-practicing and going into a slump. Since the collegiate free-rifle season runs from November through April over-practice, or peaking out too soon, is a very real problem.

Looking more closely now at a match itself, each competitor must complete three stages: prone, kneeling and standing. Each stage is worth 400 points, with the prone



Above: Fig. 1 The prone position.

Below: Fig. 2 The standing and kneeling positions.

stage generally yielding the highest total score due to the great degree of stability achieved in this position.

In the prone position, the competitor lies on his chest and left side, supporting his body with his elbows and right knee as seen in Figure 1. The rifle is suported with the sling and left hand while the right hand is devoted to firing the weapon. The major movement encountered in this position, when properly learned, is only that of the competitor's pulse, and even this can be controlled.

The second required position, and second in its degree of stability is kneeling.

To achieve this position, the competitor kneels on his right knee, placing a "kneeling pad or roll" under his right instep as in Figure 2. The left arm is placed on the left knee and as the competitor sits back on his right foot, he forms a sort of tripod with his body with which he can support the rifle. Again the riflle is supported with the left hand and sling, while the right hand controls the trigger. While shooting kneeling, there are several factors which must be kept in mind. For instance, an increased pulse beat must be reckoned with, and the right leg always seems to "fall asleep" at the wrong time, a very painful sensation.

The last, and most difficult position to be fired is standing, or offhand, as it is known. Again the competitor must hit the same .008 inch dot, now, however, while standing and holding his unsupported, 17-pound rifle. To find a position of optimum stability, the 1968 Olympic team, working out of Ft. Benning, analyzed the various positions that they tried for maximum stability and bone support. They found that by bending backward, thus placing the rifle's center of gravity between the feet, good stability was attained. Further, by twisting the body to the left, thus easing the tension of the back muscles, great stability is achieved. This combination coupled with a mechanical palm rest on the rifle eventually led into today's accepted standing position as seen in Figure 2.

A few of the trouble spots characterized by the standing position are again the increased pulse rate, the rapid fatiguing of the back and stomach muscles, and the overall unsteadiness of the position itself. Any of the above points, if not checked, can account for a poorly placed shot.

While firing in any of the positions mentioned, there are certain factors which can limit the competitor's effectiveness. Some of these are: eyesight, oxygen consumption and nervousness.

As all free-rifle shooting is done without the aid of a magnifying sight, the human eye becomes very important. Like any muscle, the eye, too, fatigues. Though there is little to be done for this condition, the competitor must be able to recognize and allow for the effects of eye fatigue.

Because each shot is fired while holding one's breath, a low oxygen consumption or high oxygen efficiency is preferred. Though it is true that one can hold his breath for minutes if necessary, he will begin to encounter dizziness and other adverse effects much sooner. One of the more serious of these effects is the loss of visual acuteness. This happens to the average person at ten to twelve seconds. To increase this time, many competitors are trying various exercises conducive to building the wind, or increasing the oxygen efficiency. Captain Gary Anderson, twice gold medal winner at Tokyo and Mexico City, reportedly runs up to 14 miles a day while perparing for a match.

A final point which merits attention here is that of simple nervousness. Unlike the football or hockey player, the rifleman cannot take his emotions out on an opposing team, nor can he vent them on himself, or the result is an increased pulse rate and general frustration. The only recourse left is to stifle his emotions; to compete effectively, each competitor must have himself under control at all times. Furthermore, he must maintain a degree of mental alertness throughout, judging each shot to thousandths of an inch visually before any and each one is fired.

Perhaps I've pictured the free-rifle shooter as a man faced by an insurmountable task; this really isn't the case, though at times it feels that way. The primary things a competitor has going for him are his equipment and the design behind it. Let's examine now what the equipment must do and what it really is capable of.

The Target and Rifle

The target, which is sealed down for use at 50 feet instead of its intended 50 meters, measures 1.796 inches in diameter. It is divided down into ten scoring rings, point value ranging from 1 to 10. Each division is .100 inch wide with the center scoring ring appearing as a dot, .008 inch in diameter. The greater part of the target is black to aid the vision and is intended strictly for indoor use with a .22 caliber rifle.

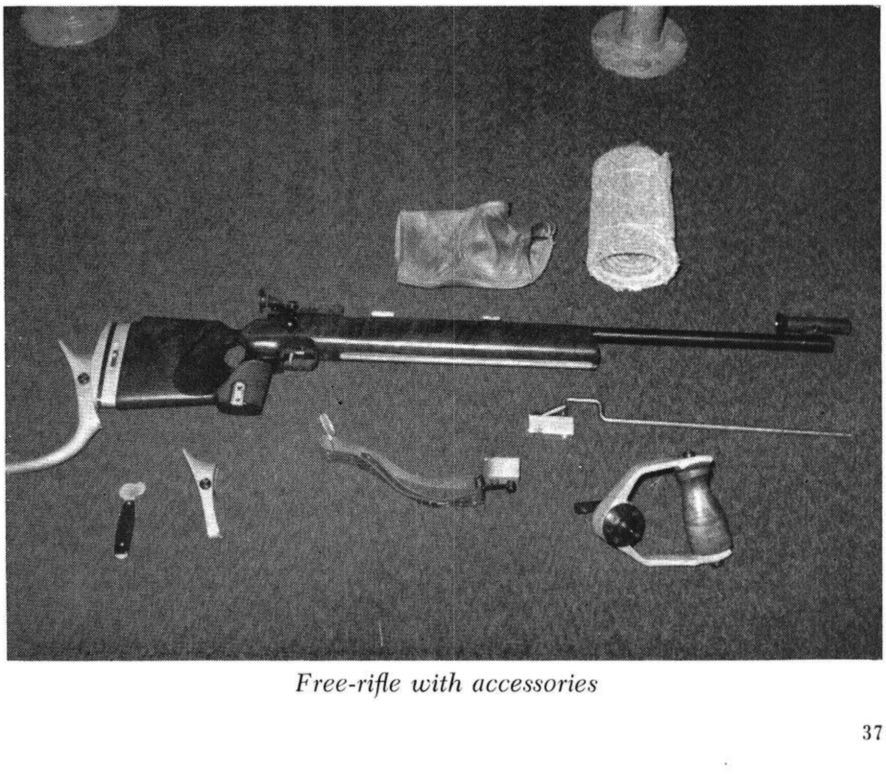
With the target and distance already fixed, the remaining trick is to design a .22 caliber rifle capable of consistently shooting with the necessary accuracy to obliterate that .008 inch dot each time the trigger is released. In order to simplify the discussion, let's lump the parameters of target size and distance into minutes of angle which a rifle must be capable of shooting within. It works out that a good rifle must be able to hold a maximum of one minute from its farthest shots in any given group. Generally, a ten shot test group is fired. Therefore, a little mental arithmetic shows that at 50 feet, all bullets must pass virtually through the same hole. At 50 meters the entire ten shot group should be easily covered with a dime. To give a relative example of the difficulty encountered here; if one were to purchase any of the better .22 caliber hunting rifles and make the same test at 50 meters, he would be very lucky to cover the entire group with a silver dollar.

In order to achieve the required accuracy, several refinements have been made over the standard, off the wall, hunting rifle. Most striking of these is the barrel. The target barrel weighs in the neighborhood of seven to eight pounds. The added weight does two things: it adds stability when holding the rifle and damps out harmonic resonance in the barrel itself as the shot is fired.

This heavy, and greatly refined barrel is attached to a tight, well refined action, which is simply an assembly which feeds, fires and ejects the cartridges.

A trigger assembly is, of course, needed; in this case, a very sophisticated trigger mechanism, one capable of safe and consistent release at pressures as low as 1.5 oz. Now take the completed assembly, fiberglass it into a laminated, temperature and moisture stabilized stock, add sights and the result is Figure 3, a free-rifle, net worth about $350. Pictured is an Anschutz Model 1414 belonging to Donald Kelly of the University of Wisconsin team. This particular rifle is of German manu-

(continued on next page)



Free-rifle with accessories

facture and it is one of the best available. Several American rifles are quite good also. The Remington 40-X and the Winchester Model 52 series are the leaders. The latter is the type supplied by the University, average price with sights and attachments about $200.

This is an appropriate time to examine the ammunition used, as the best rifle performs only as well as the ammunition it fires. Generally any match grade ammunition is satisfactory. The muzzle velocity is in the neighborhood of 1150 feet per second, plus or minus 5 feet per second. The weight and shape of the projectile is controled also, although not to the degree the velocity is. A box of match grade ammunition might cost $1.75 as compared to $.75 for standard grade.

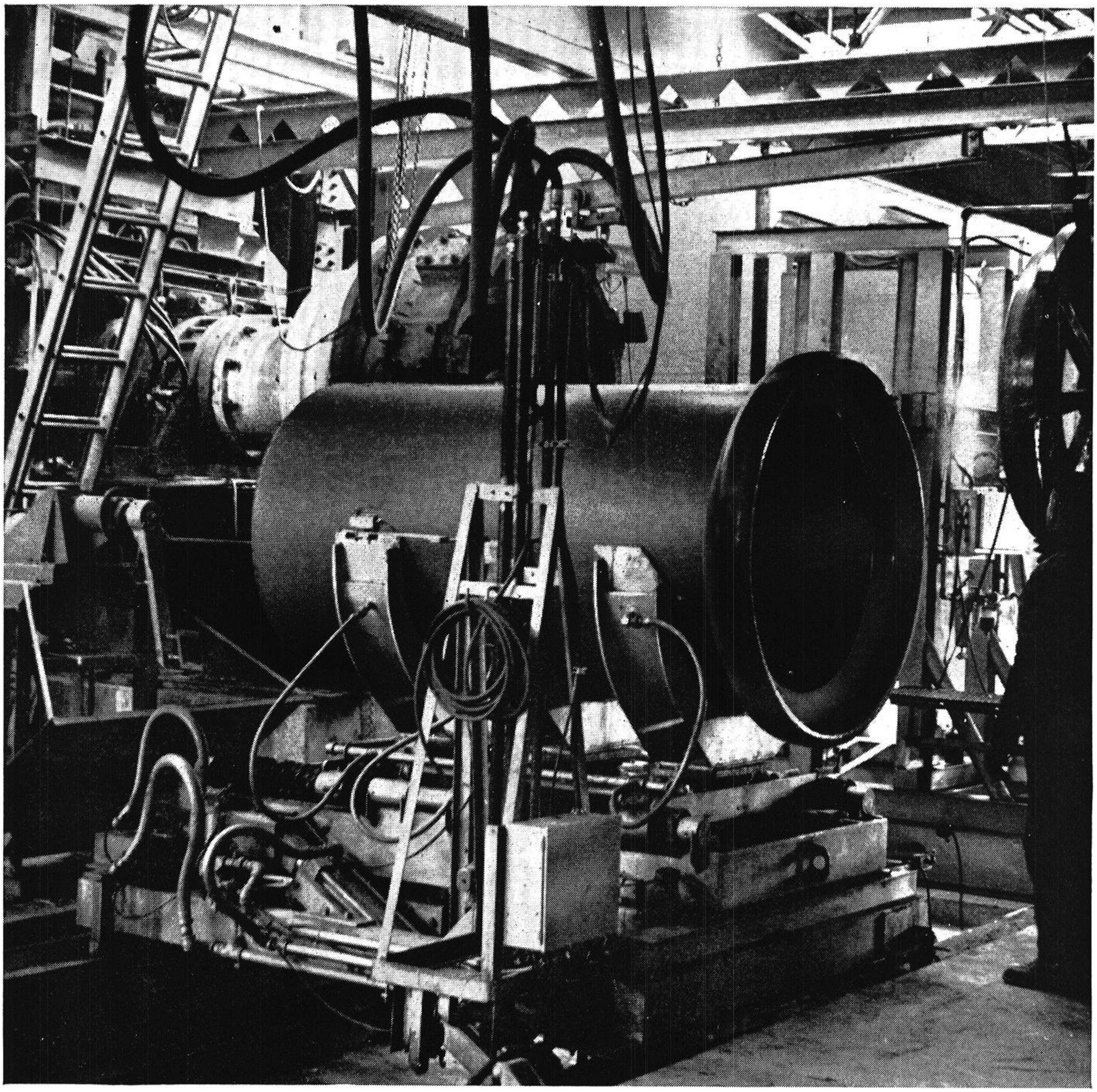
Now we have seen what is required both mechanically and physically to hit a .008 inch dot at 50 feet, thus enabling the reader to become an Olympic champion.

The University of Wisconsin Team

Briefly let's take a look at the University of Wisconsin team and its performance in the last Big 10 match held in Madison Dec. 7, 1968, against the University of Indiana and the University of Iowa.

As mentioned earlier, the teams consist of six members. Each team is allowed to throw out its lowest score, counting the top five competitors. Thus, each team has a possible 3000 points. In the last match the University of Wisconsin won with 2723, the University of Iowa was second with 2652 and Indiana was third with 2624. Individually Wisconsin members were led by Jim Halman (Ag. Science) firing 565 out of 600. Other scores in order were: Tom Schoenleben (ME) 555, Sid Jones (ME) 546, Don Kelly (EE) 531, and Jim Patch (EE) 526.

Team coach, M. Sgt Kenneth Lamb, though satisfied with the team's performance, expressed hope for even higher scores in the future, as he feels this first match was just a shakedown. If this is true, the University of Wisconsin, and its technically orientated rifle team, will be in order for national recognition.



Who knows . . . we may form a company band.

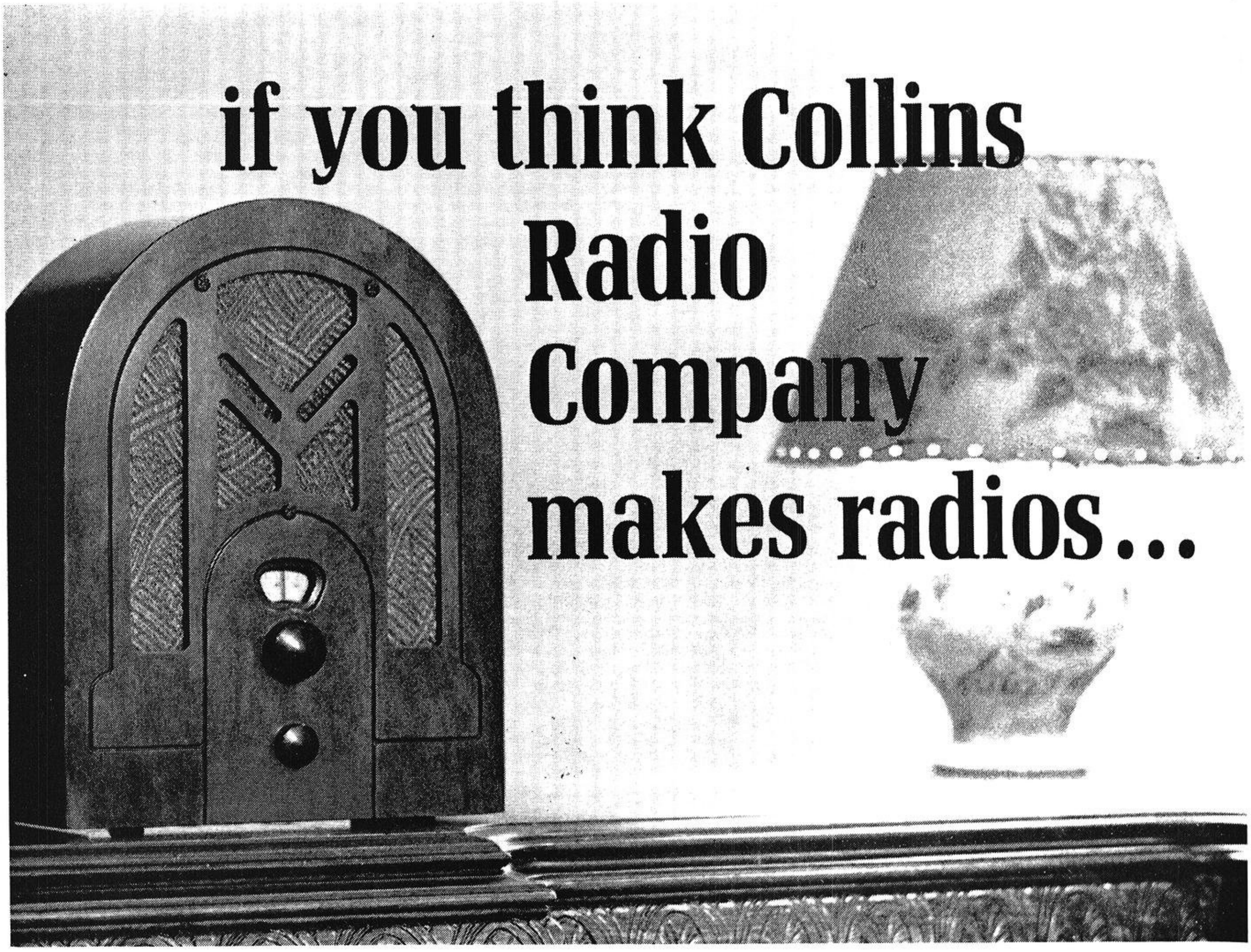
Polygon and Course-Instructor Evaluation

by JoAnn Albertson

On alternate Tuesday evenings, the 22 engineers comprising Polygon Engineering Council convene to discuss pertinent campus problems. Early last fall, Polygon sent five engineering students to the first Big 10 Engineering Conference at the University of Michigan at AnnArbor. The delegation, headed by Polygon President George Doremus, came back "fired up" with various ideas borrowed from other universities. Probably the biggest "thing" they brought back was course-instructor evaluation, which has been in existence on the UW Engineering campus for a number of years. But the evaluation idea they brought back is much bigger. From the University of Illinois came a "book" of critiques on instructors and courses. And this is what Polygon has in mind for the University of Wisconsin.

Of course, course-instructor evaluation is really not original. WSA did this on a small scale last spring, and had plans to enlarge it this year. Polygon's current President, Jay Walters, then WSA senator, introduced an amendment to the WSA reform bill to set up a Course-Instructor Evaluation Committee in WSA. This bill calls for an all-university evaluation to be published in the spring. To carry out the evaluation in Engineering, Polygon set up its own evaluation committee, headed by George Doremus, to get the evaluation started.

The Polygon committee drew up and tried out several types of evaluation forms at the end of the first semester in several test classes and will choose the best for general use during the spring. The form chosen for general use will then be set up so it can be computer processed. Around 12-weeks time this spring, all courses and instructors will be evaluated, and results compiled. The results will be reported in terms of general trends which will be given to the WSA committee for publication with the all-university evaluation.



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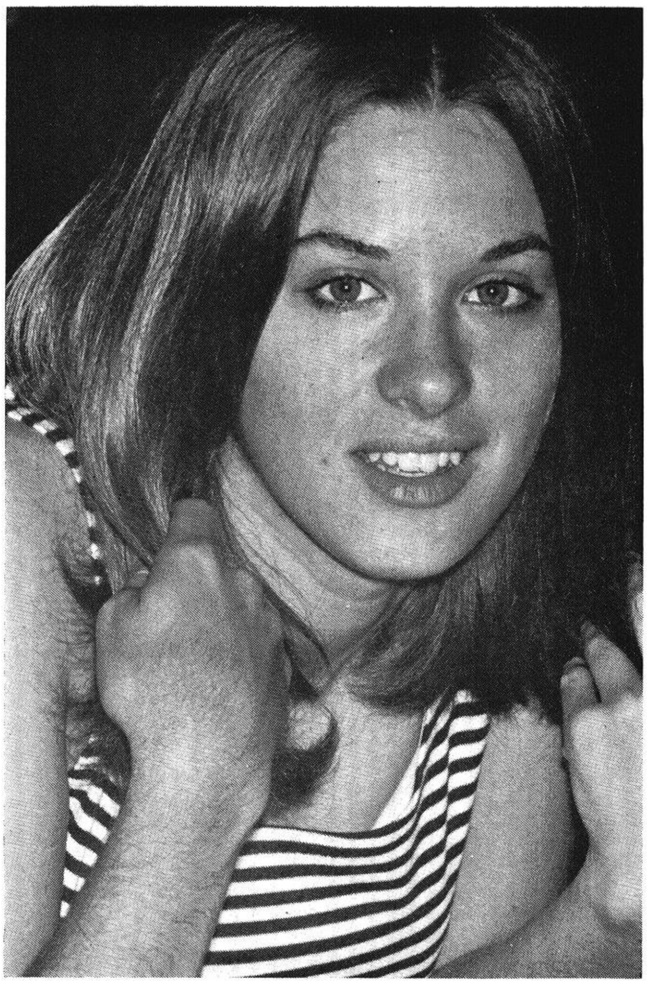
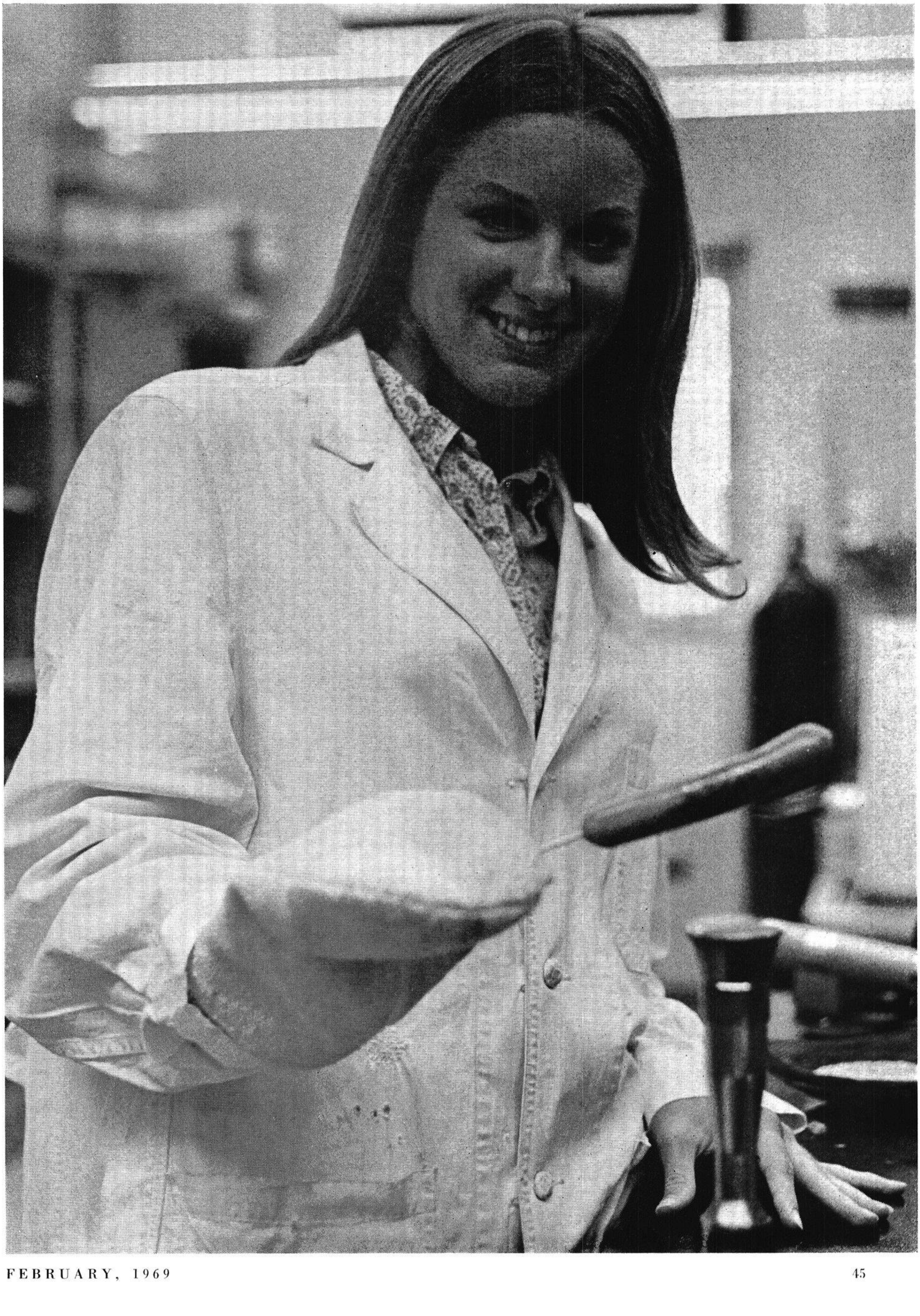


Cindy Harris is a Junior in Zoology, brunette, 5′ 7″ tall, blue eyes; a combination that engineers really appreciate. Outside of classes, Cindy enjoys working at the genetics lab in the zoology research building. She is determined to be a scientist and can even make roasting a hot dog over a bunsen burner look professional.

Now a Madisonian, Miss Harris originally came from Harrisburg, Pennsylvania. She does not, however, claim to have had a part in the founding of that city. During the summer, she takes to Lake Mendota, sailing the Horizontal II. Now, in the dead of winter, chances are that she might be found out on the slopes as Cindy is also an avid skier.



JOKES

"Wanna sell that horse?"

"Sure I wanna sell the horse," the farmer replied.

"Can he run?"

"Are you serious? Watch."

The farmer reached over and slapped the horse on his posterior and the animal went galloping away. As the horse reached full speed, he ran smack into a tree.

"Is he blind?" the buyer gulped.

"Hell no," the farmer said easily, "he just don't give a damn."

Did you hear about the Chemistry student who spent two days at the lumber yard looking for his draft board?

"Number, hell," yelled the drunk into the pay phone. "I want my peanuts."

Chief: "When anything goes wrong around the house I always fix it."

Wife: "Oh, yeah? Since you fixed the clock, the cuckoo backs out and asks 'What time is it?' "

Chemical Engineer (moaning at the bar): "It's terrible, the cost of living has gone up to $4.18 a fifth."

Judge: "So they caught you with this bundle of silverware? Whom did you plunder?"

Thief: "Two fraternity houses, your honor."

Judge: "Call up the downtown hotels, sergeant, and distribute this stuff."

"It's not just the work I enjoy," confided the bus driver. "It's the people I run into."

The astronomy professor was lecturing. "I predict the end of the world in fifty million years."

"How many?" cried a frightened voice from the rear.

"Fifty million years."

"Oh," said the voice with deep relief, "I thought you said fifteen million."

"Did you make it home from the party all right last night?"

"Yes, thanks; except that just as I was turning the corner, some drunk stepped on my fingers."

Advice to exhausted students: When wine, women and song become too much for you, give up singing.

A report being circulated in Munich has it that a thief recently broke into the chief propaganda office in the Russian Sector of Germany and made off with the complete results of next year's elections.

"Halt, who goes there?"

"American."

"Advance and recite the second verse of the 'Star Spangled Banner' ".

"I don't know it."

"Proceed, American."

Engineer on telephone: "Doctor, come quick! My little boy just swallowed my slide rule."

Doctor: "Good heavens, man, I'll be right over. What are you doing in the meantime?"

Engineer: "Using log tables."

The Industrial Engineer died after many years of faithful service, and his company arranged an elaborate funeral. The pallbearers were carrying the casket out of the church when suddenly the coffin lid popped open. The expert sat up and snapped, "If you put rollers under this thing, you can lay off four men."

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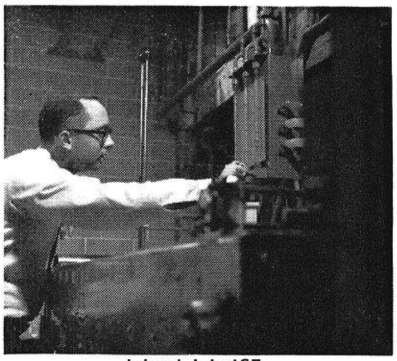
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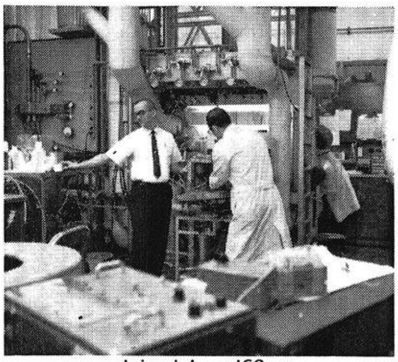
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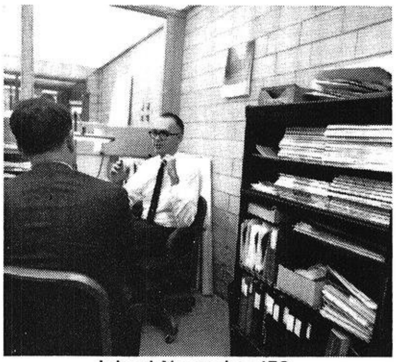
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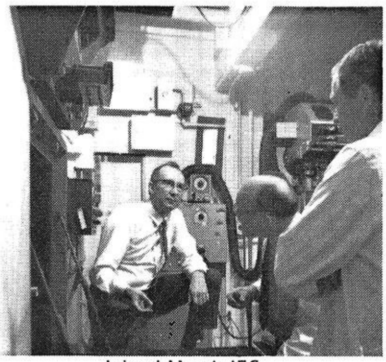
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The other column shows the work environments of other real Kodak chemical engineers who have chosen to broaden out into work more involved with people, as in administration and marketing. Perhaps this is the direction you prefer.

Drop us a line telling us in which column your picture belongs. A wrong answer now will not count against you.

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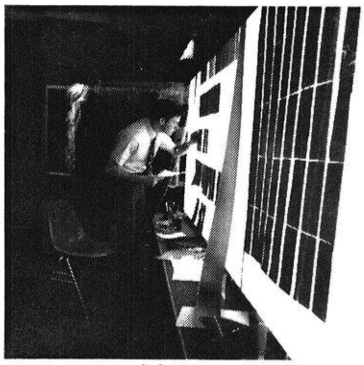
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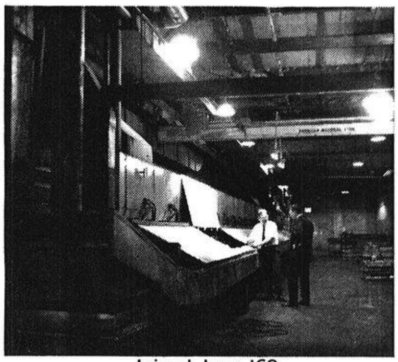
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