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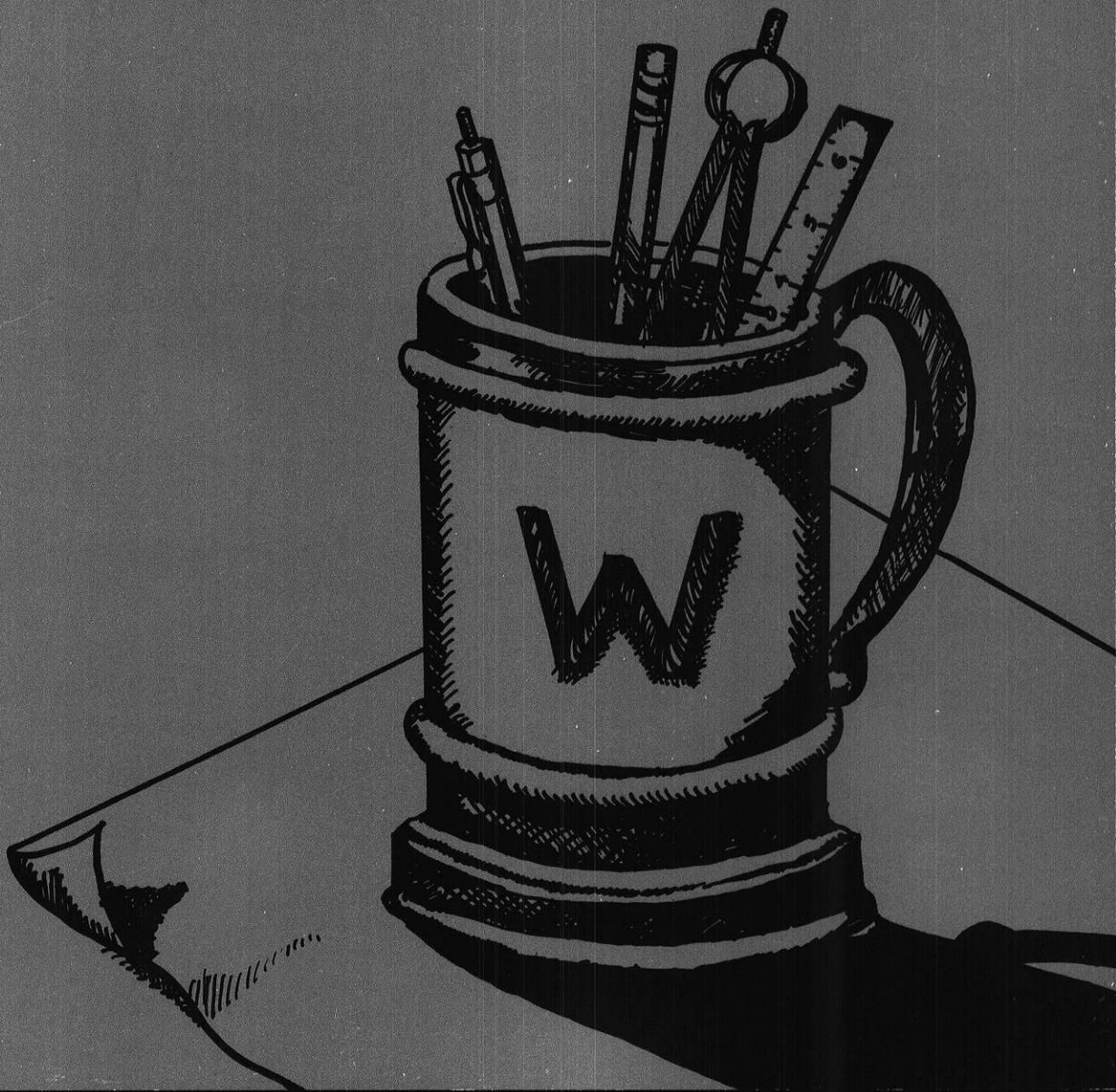
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# wisconsin engineer



**One U.S. airport has its own  
mini-subway system for  
passengers;  
another has its own "el."  
Who designed and built  
both systems?**

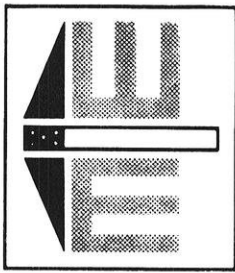
**That well-known subway and  
el builder, Westinghouse.  
You bet we're hiring.**



If you can't wait for the recruiter,  
write today to George Garvey,  
Westinghouse Education Center,  
Pittsburgh, Pa. 15221. An equal  
opportunity employer.

**You can be sure... if it's  
Westinghouse**





**Albert Einstein:**

*"The concern for man and his destiny must always be the chief interest of all technical effort. Never forget it among your diagrams and equations."*

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# wisconsin engineer

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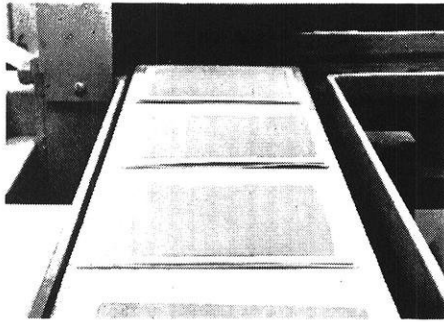
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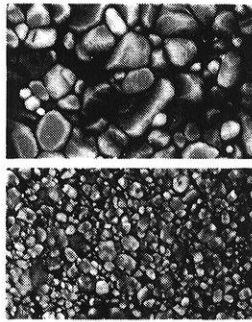
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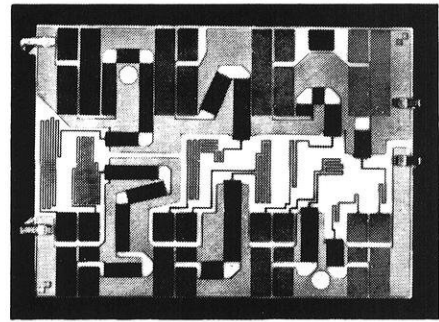
# WESTERN ELECTRIC REPORTS



1500° C furnace was specially designed to fire these new substrates. The relatively low temperature results in smooth substrate surfaces for practically fault-free thin film bonding.



Electron micrographs show the great difference in grain size between new ceramic material (lower) and the previous material (upper).



Thin film integrated circuit shown here is part of a resistor network. It is one of many that benefit from the improved substrate. Metal leads on sides are bonded by thermocompression to tantalum nitride resistor film.

## Smoothing the way for perfect thin film bonding.

Aluminum oxide, or alumina, is considered to have the best combination of properties for thin film circuit substrates. Until recently, however, the bonding of metal elements to gold-coated tantalum nitride resistor film on alumina was somewhat unpredictable.

Now, an advance at Western Electric has made it possible to get practically fault-free bonding of these materials.

This new perfection in bonding came through the development of finer grained alumina substrates.

The process has four basic steps: milling, casting, punching and firing.

During milling, alumina is combined with magnesium oxide, trichlorethylene, ethanol and a unique deflocculant. For 24 hours, this mixture is rotated in a ball mill. In a second 24-hour period, plasticizers and a binder are included.

The deflocculant plays a major role by dissipating the attraction forces that exist between the highly active alumina particles. This prevents thickening, which would ordinarily make an active alumina mixture unworkable.

The 48 hours of milling is followed by casting. When the material comes off the casting line, it is in the form of a flexible polymer/alumina tape, dry enough to be cut into easily handled sections.

After casting, a punch press cuts the material into the desired rectangles or

other shapes. Holes can be punched at the same time.

Finally, because of the use of active alumina, the material is fired at an unusually low temperature which results in smooth substrate surfaces for reliable thin film bonding. The finished substrate is then ready for the various processes of thin film circuit production.

In developing this new process, engineers at Western Electric's Engineering Research Center worked together with engineers at the Allentown plant.

**Conclusion:** This new way to produce substrates is a truly significant contribution for thin film circuit production.

The ultimate gain from this smoother substrate is for communications itself. For through the achievement of nearly perfect bonding of metal leads to tantalum nitride, thin films can be produced with even greater reliability and economy.



## Western Electric

We make things that bring people closer.

# How to Beat the Madison Housing Game

by Charlotte Mullen

“If you want to be a Badger, just come along with me” . . . but watch your step! The joys of the University of Wisconsin are many, but so are the pit-falls. One of the biggest is food and housing. New students should learn as much as possible before making any decisions. That glittering surface you see on a modern apartment building is apt to be only a tissue-thin veneer of brass covering cheap plasterboard. Food is expensive; clothing is expensive; life in general . . . is expensive, in Madison. So, with these pessimistic warnings it is useful to research into this problem with a table of certain basic types of Madison accommodations.

The first question to be asked in seeking housing is whether one wants a room or an apartment. The rooms listed in the table are the dormitories, the Chi Phi fraternity and the Rust Schreiner Co-op. All of the others are furnished apartments.

Rooms have the advantage of being in a building which is adequately by the management and take up the least amount of time and energy of the tenant. One problem is that privacy. It is often non-existent, especially when two people share one room. Apartment complexes on the surface are modern and attractive. In reality nearly all are built poorly, with shoddy workmanship and planned obsolescence in the not too distant future. They are usually crowded, with two per bedroom, and noise travels freely through the tissuepaper walls

and between floors. Service on poorly maintained appliances is also hard to exact and is usually a long time coming. There are some very good apartments, usually houses broken up into several units, which can be very inexpensive and well maintained. But to find these, one almost has to inherit them from friends who are leaving. Vacancies in these buildings usually are never advertised to the general public because of their popularity. “Slum” apartments are usually cheap, very small, and have absolutely no maintenance from the landlords.

Upon reading the table of housing costs, many differences can be seen in the types of pay plans. The dorms have different prices according to the specific meal plan (different numbers of meals per week, etc.). There are advantages in the dormitory pay plan because it is paid in a lump sum including food. For purposes of personal financial budgeting these are already paid and the problem of making sure money is there to live and eat from month to month doesn't have to be faced.

Apartments have several pay plans. Generally, the cheapest is the yearly lease. This presents problems if one doesn't stay for all twelve months because a renter must either find someone to sub-lease for the summer months (at a loss) or must pay the rent alone. For that reason a nine-month lease is preferable but more expensive per month. Many apartment managers also charge a \$10 delin-

quency fee for failure to pay the rent on time, and breaking a lease before the contract has expired can lead to legal "hassles" and almost always a loss of money.

What costs and peripheral expenses are those which don't appear in the table? Many! Often, one must pay extra for added conveniences such as in Devine Towers where an extra \$10 is added to the rent for the view from the apartments on the ninth floor and up... \$10 to view the top of the Memorial Library! Also, prices increase with proximity to the campus, such as the "rip-off" from the on-campus apartment buildings because they know people will pay for the location or at least for finding housing at a late date. Foreign students who arrive on campus with no housing often end up forced into these because nothing else is available. Another "rip-off" to remember is that apartments always include a security deposit; that is, money in advance to pay for damage which may be done during the tenancy. This may be from \$50 to a full month's rent (paid before moving in.) Any or all may or may not be refunded upon leaving. This is up to the discretion of the manager.

Electricity and telephone can be another hang-up to be aware of. Deposits must be paid for each to begin service if a tenant has not previously had service under his name in Madison. Also, the telephone company charges a \$10 installation fee for starting service. One pitfall to beware of is that it is up to the individual to contract for service

installation and occasionally one must pay the bill of the previous resident before service will be started. This can be refunded eventually through perseverant "badgering" of the electric company. It can be a bit of a shock to face since it often must be paid by the person whose name it is under whether or not he made the calls. Failure to pay ensures a bad credit rating necessitating signatures of trust-worthy phone owners if future phone service is sought.

What about other types of room and board which may be found but aren't included in the table? There are a few somewhat popular types which freshmen usually don't opt for, but which can be considered. One of the more conventional types is a room in a private residence. These may be strictly on a monthly rental basis or in exchange partly or in full for services to the family. Many families in Shorewood will rent out a room to a student in exchange for yard work, snow shoveling, chaufferring, or even babysitting evenings. These may include food, and often include permission to use the family car for personal needs.

Renting a house is usually beyond the means of the average student but is extremely nice as far as privacy is concerned. It is hard to find much under \$150 and these are usually on the outskirts of town. This is only a base fee... the extras add up fast. Besides gas, electricity and telephone one must also pay for heat and air conditioning as well as maintenance of the house and grounds (there are



Dormitory residents let their minds run free when it comes to de-sterilizing their rooms.

	BEDROOMS OCCUPANTS	COST/MONTH / PERSON				EATING FACILITIES	UTILITIES TO PAY
		SEMESTER LEASE		/ MONTH LEASE			
		9 MONTH	12 MONTH	9 MONTH	12 MONTH		
DIVINE TOWERS	1 BDRM	\$200	\$180		KITCHEN	ELECTRICITY TELEPHONE	
	2 PEOPLE	\$210 *	\$190 *				
THE REGENT	2 BDRM/4	\$90			KITCHEN	TELEPHONE	
	2 BDRM/2	\$125					
	3 BDRM/3	\$100					
UNIVERSITY COURTS	1 BDRM		\$93	\$98	KITCHEN	TELEPHONE	
	2 PEOPLE 2 BDRM/3		\$70	\$73			
DORMITORY	1 BDRM 2 PEOPLE	\$110 to \$135			SEVERAL MEAL PLANS	NONE	
A MOUND St. APARTMENT	2 BDRM 3 PEOPLE		\$65		KITCHEN	TELEPHONE	
CHI - PHI FRATERNITY	1 BDRM 1 PERSON				\$28/MON. for Din \$19/MONTH for lunch	NONE	
RUST SCHREINER COOP	1 BDRM 2 PEOPLE				ALL MEALS INCLUDED	NONE	
UNIVERSITY HOUSE	1 BDRM 2 PEOPLE			\$80	KITCHEN	ELECTRICITY TELEPHONE	

\* 9<sup>th</sup> FLOOR AND UP  
NOTE: ALL OF THESE APARTMENTS ARE FURNISHED





Walking to Van Vleck from Theta Chi takes 15 minutes. Add 10 more minutes for trekking to the Engineering campus.



This tastefully decorated living room resides in the Chi Phi fraternity.

laws requiring grass cutting, garbage removal, and snow shovelling). In a typical Wisconsin winter heat may cost as much as \$45 per month, and air conditioning in summer may be as much as \$15 per month.

One type of housing becoming more prevalent is that of the commune. These are often transient and seldom last beyond the school year, but can be extremely cheap where numbers of people are involved (an inverse proportion to privacy). Unless the group of people in the commune are good friends the situation can be pretty bad. Everyone divides the labor and costs equally. Things must be fairly regimented, just as in a co-op, so that no one is taken advantage of. One of the biggest problems comes from friends coming to "crash" and sharing the kitchen privileges without contributing anything financially to them. Another problem is that of members who "rip-off" valuable belongings and then "split" leaving the others to pay his share of the rent.

Also not mentioned in the table are unfurnished apartments. These tend to run about \$10-\$15 cheaper than furnished apartments. If they include both a stove and a refrigerator. These are becoming harder and harder to find on campus. Cheap furniture can be found by going to such "charity" stores as **Saint Vincent De Paul** or **Goodwill** which sell cheap used furniture. There is a problem trying to move the furniture (as U-Haul trucks and trailers

are expensive to rent) and in getting rid of it when one moves out.

For those living in housing not including kitchen facilities or a food contract, eating can be an expensive proposition. Alternatives to eating in restaurants include the **Green Lantern** a rather popular food co-op. The Wisconsin Union offers an economical dining contract in its cafeteria. Food-buying co-ops are coming into vogue in Madison among apartment dwellers on the near eastside. The eastside co-op is run by its members on a weekly plan where each person gives that week's buyer his list of food for the week. The buyers go to different stores finding the prices for buying in quantity. Thus, for acting as a weekly buyer a set number of times, one obtains supplies at a considerable savings.



**University Courts is noteworthy because of its large apartments and sound permeability.**



**Conversion of houses into apartments is quite common in Madison; this Mound Street example performs its function well.**



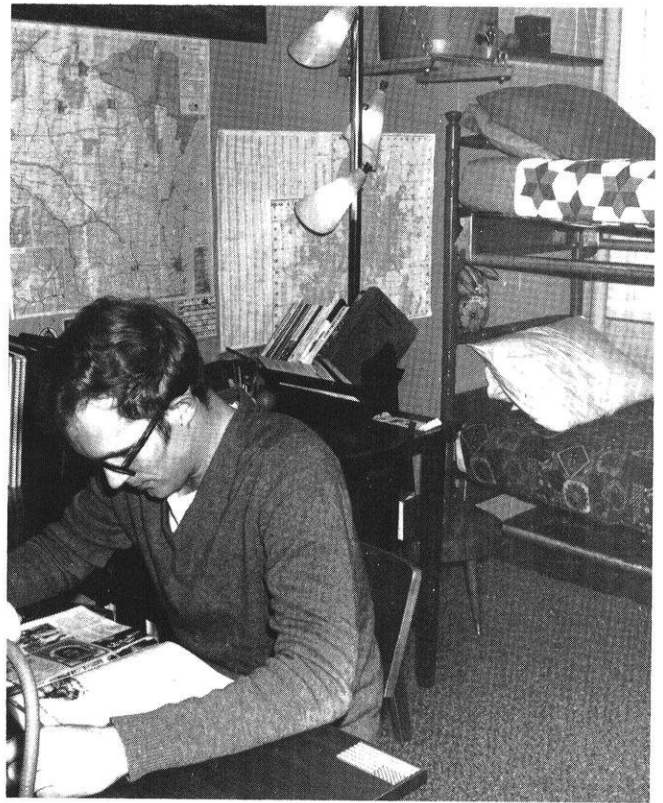
**Devine Towers offers short walks to campus and high prices.**

For those living in housing not including kitchen facilities or a food contract eating can be an expensive proposition. There are, however, some good ways around eating in restaurants. The **Green Lantern** is a rather popular food co-op, providing fairly cheap food. The Wisconsin Union offers a popular dining contract which is quite economical as well as having quite reasonably priced, good food for sale in the cafeteria. Food-buying co-ops are coming into vogue in Madison among apartment dwellers on the near eastside. The eastside co-op is run by its members on a weekly plan where each person gives that week's buyer his list of food for the week and the buyers go out to different stores finding the best specials and cheapest prices for buying in quantity. Thus, for lending one's services as a weekly buyer for a set number of times one gets the advantage of supplies at a considerable savings.

So much for the purely financial aspects of housing. Dormitories usually have their own social schedules of planned events, as do the fraternities if one has a social membership. A few include dinner parties, picnics, blind dates, beer parties, and dances. Most apartments have nothing organized, but being coed in nature courses spontaneous parties among neighbors have a tendency to occur. One thing tending to regulate one's social as well as financial life is the car. Madison being a widely scattered city with poor transportation facilities, a car can have certain advantages in that cheaper

food and housing is found far from the campus area. Also four of the popular movie theaters are located considerably off campus. Unfortunately, one loses most of the financial advantages of a car in parking fees. Many apartments charge an average of \$10 extra per month for off street parking, and parking on the campus is nearly non-existent. Even street parking, should one be lucky enough to find any, is regulated by the winter alternate side parking for snow removal, and failure to move one's car to the appropriate side of the street can mean a \$20 parking ticket.

These have been just a few of the many things to know and take into consideration in seeking accommodations in Madison. There are undoubtedly many not mentioned, but the main ones have been stressed, if possible. For all you future U. W. students, happy hunting . . . and "rots-a-ruck."



Inexpensive living costs mark the Rust-Schreiner Co-op.



Several former fraternity houses have been turned into co-ops.

# Can you make this part without a drawing?

Casting is so versatile that a designer can often develop complex components that are almost too difficult to draw . . . That's why many prototype steel castings are developed directly from models.

Take this high-speed refrigerator impeller. Worthy of a sculptor's efforts, it not only looks good, but must perform faultlessly. . . And it does, at 12,500 rpm in subzero temperatures.

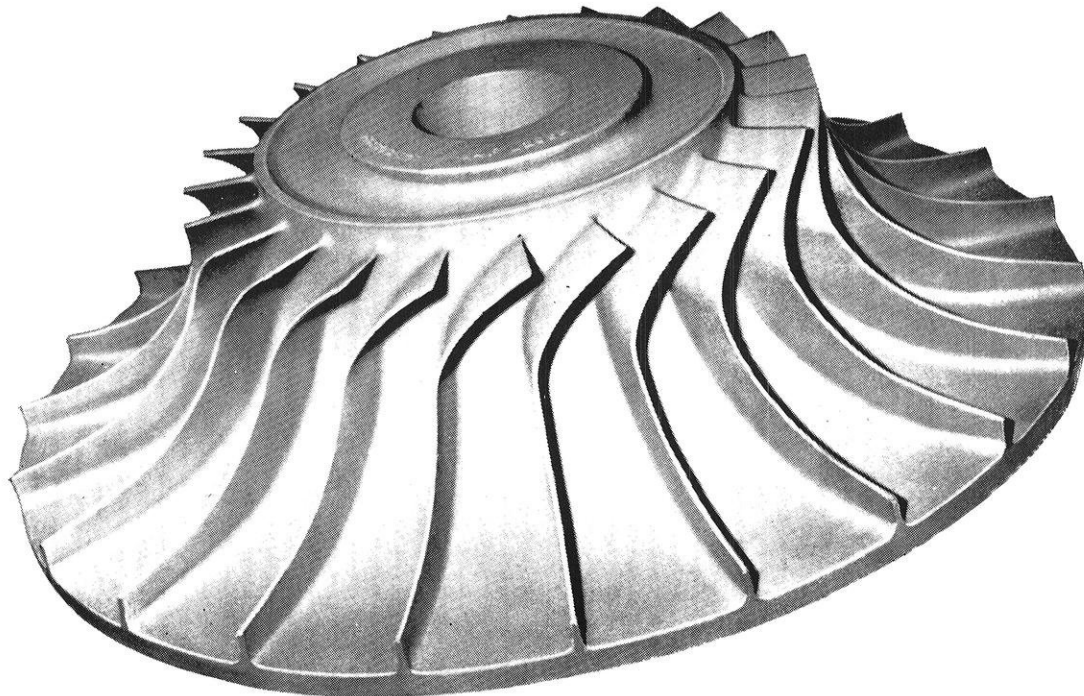
*Cast-steel* permitted the designer to choose the right composition for maximum toughness at low temperatures, without com-

promising for machinability or weldability. Cast in a ceramic mold, the impeller has fine surface finish and close dimensional tolerances, thus eliminating costly machining.

Want to know more about *cast-steel*? We're offering individual students free subscriptions to our quarterly publication "CASTEEL". Clubs and other groups can obtain our sound film "Engineering Flexibility." Write Steel Founders' Society of America, Westview Towers, 21010 Center Ridge Road, Rocky River, Ohio 44116.



## **STEEL FOUNDERS' SOCIETY OF AMERICA**



***Cast-Steel  
for Engineering Flexibility***

# Women in Engineering: Pressures, Problems and Prospects

by Lois B. Greenfield

Assistant Professor, General Engineering

To the average young woman, the idea of undertaking a career in engineering is far-fetched, if not down right ridiculous. "What, me an engineer?," she is likely to ask, and then continue, "That's a career for men!" She may say this, even when she has demonstrated an interest and skill in solving problems, an aptitude for mathematics and science, and a high degree of curiosity, to say nothing of a desire to help solve the problems currently faced by society. Why does this happen?

One reason for the small number of women in engineering is the fact that girls who do well in mathematics, chemistry and other science courses in high school are discouraged by their parents, teachers, guidance counselors, and friends, from even considering such a career. In some schools, girls are not permitted to enroll in courses such as industrial arts, or engineering drawing. Girls are encouraged instead, to enroll in courses leading to such "feminine" careers as secondary school teaching of mathematics or science, nursing, or home economics.

Again, from the time of their birth, little girls are given dolls or toy stoves, or dishes with which to play, never tools, or building blocks or construction sets. And the young girl who is not satisfied with this division of toys, or games, is derisively labeled "Tomboy!"

But are girls inherently less likely to be good engineers than boys? Not at all. Given the very small number who enter the field, girls experience about the same degree of success as boys. The stereotype that engineers must be rugged he-men working outdoors in all kinds of weather, is just not accurate. Brains are unquestionably more important than brawn in contributing to engineering success.

Can a woman combine a career in engineering with marriage and a family? One has only to cite the familiar example of the late Lillian Gilbreth, internationally known industrial engineer and fabled mother of twelve children in *Cheaper By The Dozen* to realize that such a professional career can be combined with the usual woman's role. In other countries, the Soviet Union for example, approximately one-third of the professional engineers are women. And, the emerging nations, needing to utilize all the talent they possess, are successfully accelerating the number of women in engineering and scientific fields.

What of the employment prospects for women in engineering? Prospects are excellent, not only because industrial firms are under pressure from the federal government to recruit more women, but also because the projected demand for engineers to the year 2000 rises sharply. The number of engineering students currently enrolled in college will barely replace the engineers who will die or retire during that time.

As the problems of society are multiplied, and as they increase in complexity, engineers will be required to tackle them. What other group of professionals have the tools to reduce air pollution, help increase food supplies, solve the problems of mass transportation, develop better and cheaper health-giving machines, and create a better world? Young women with appropriate aptitude and interest should not reject the possibility of becoming engineers. The engineering profession will need all the skilled, dedicated young people it can educate, to work on these problems in the years ahead, and it will welcome them without regard to their sex, color, or creed.

# If it doesn't shrink on their backs, why should it shrink on yours.

Animals wear leather all their lives. And they don't worry about rain or dirt or cracking or hardening.

But as soon as they lose their hides, that's when the trouble can start. Without protection, baseballs can shrivel up, mini-skirts become micro-skirts, size 9 shoes become size 8.

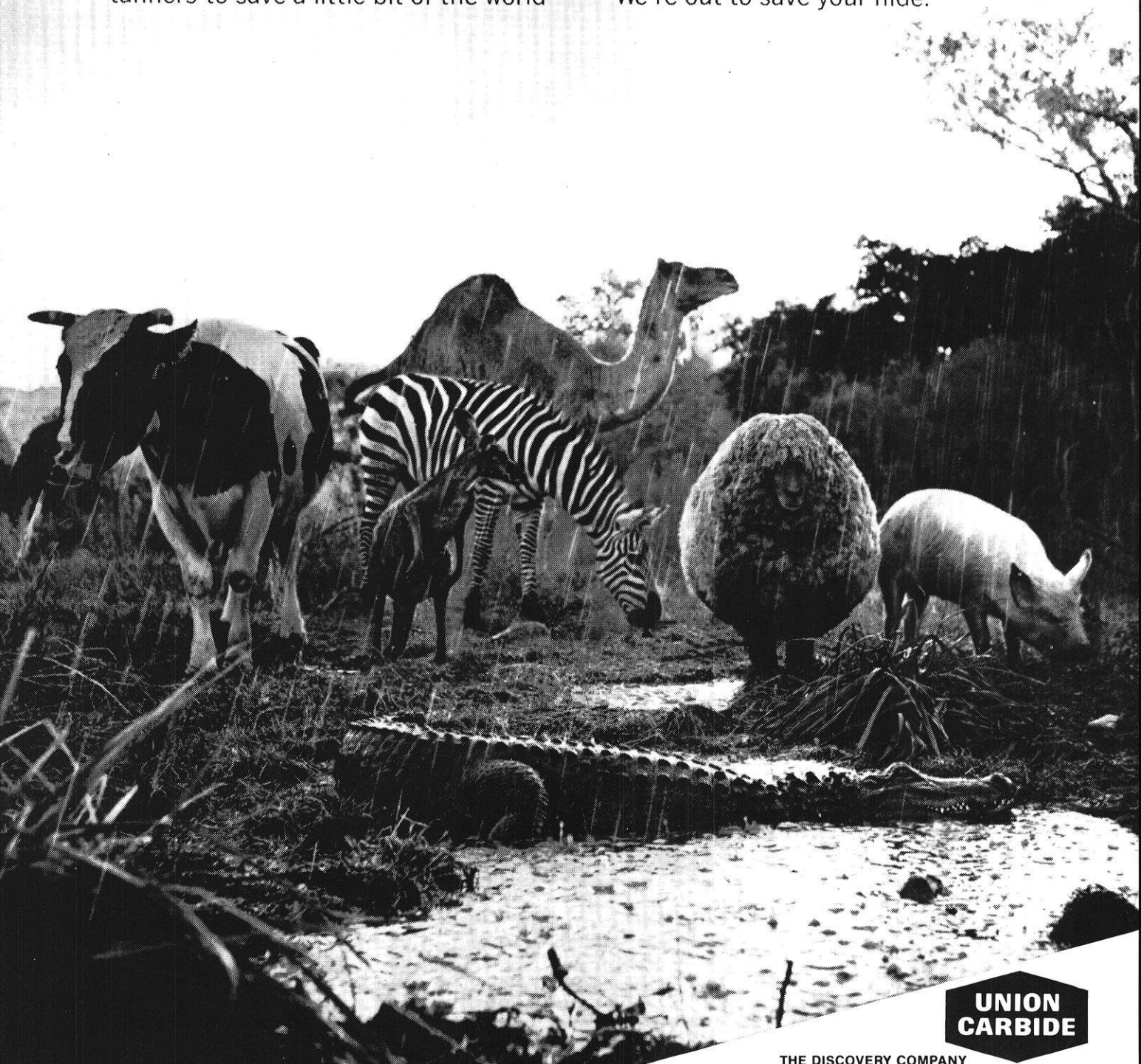
Union Carbide got together with the tanners to save a little bit of the world

from shrinking.

We took a little known chemical called Glutaraldehyde and refined it and designed it so it could be added to the tanning process.

To give you a leather that resists hardening. A leather that resists cracking. A leather that doesn't shrink at the sight of water.

We're out to save your hide.



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CARBIDE**

THE DISCOVERY COMPANY

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

# Hold this ad up to your ear.

Not a sound, right?

You won't get a peep out of any other stereo ads in this magazine, either. Just the same pretty pictures and technical facts.

That's why there's only one way to buy stereo. Go listen to it. If it's really good, your ear will tell you.

We say this because we're confident you'll be impressed when you hear a Sylvania stereo. Our stereos sound as good as they look.

Take the matched component system, MS210W, over on the right. That turntable is automatic, with cueing and anti-skate controls. It's precisely matched to a Sylvania solid state FM Stereo/ FM/ AM receiver.

Inside, where you can't see it, is a solid state amplifier that delivers 50 watts of peak music power to that pair of air suspension speakers. Which sound as good as standard speakers two sizes larger. Especially when they hit those important low bass notes. And since they put out wide-angle sound, you can sit almost anywhere in the room and get the full stereo effect.

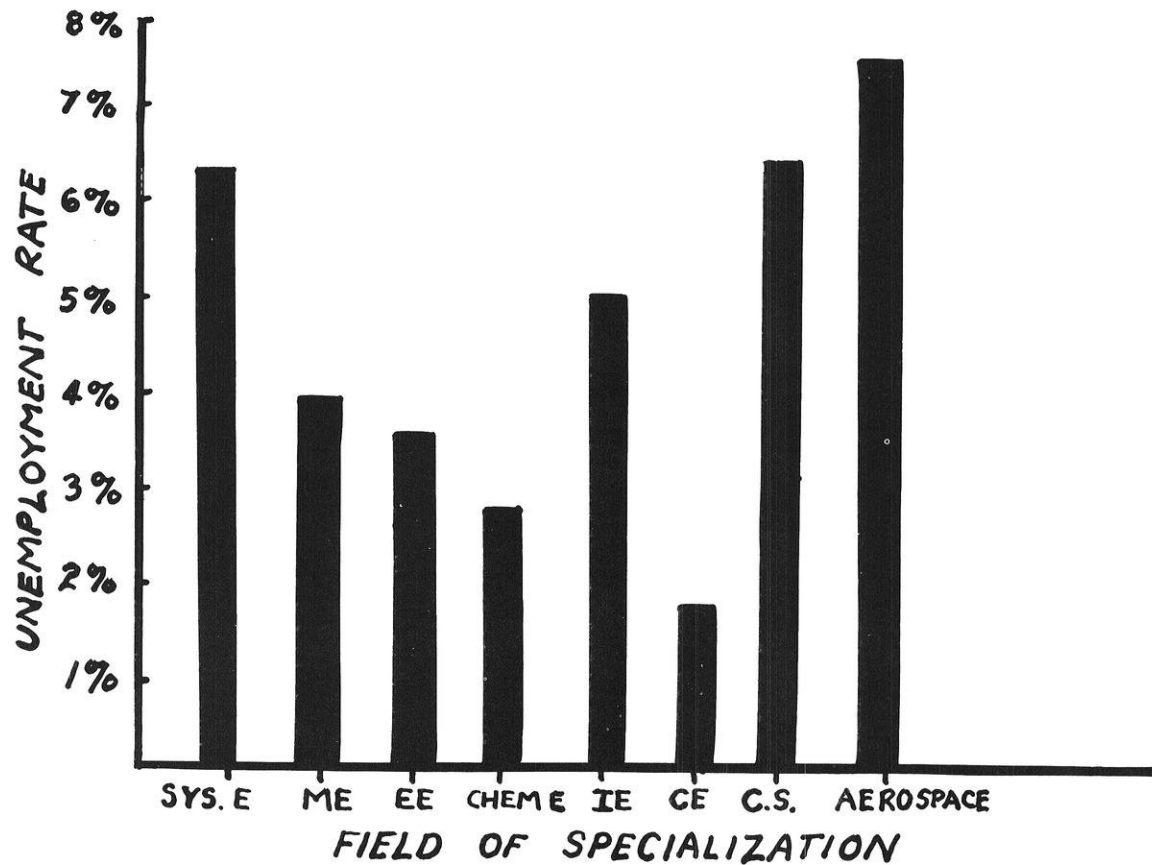
But don't believe a word you read. Hearing is believing. Go listen to a Sylvania stereo before you buy.

Then, when you hear our price, you'll believe.

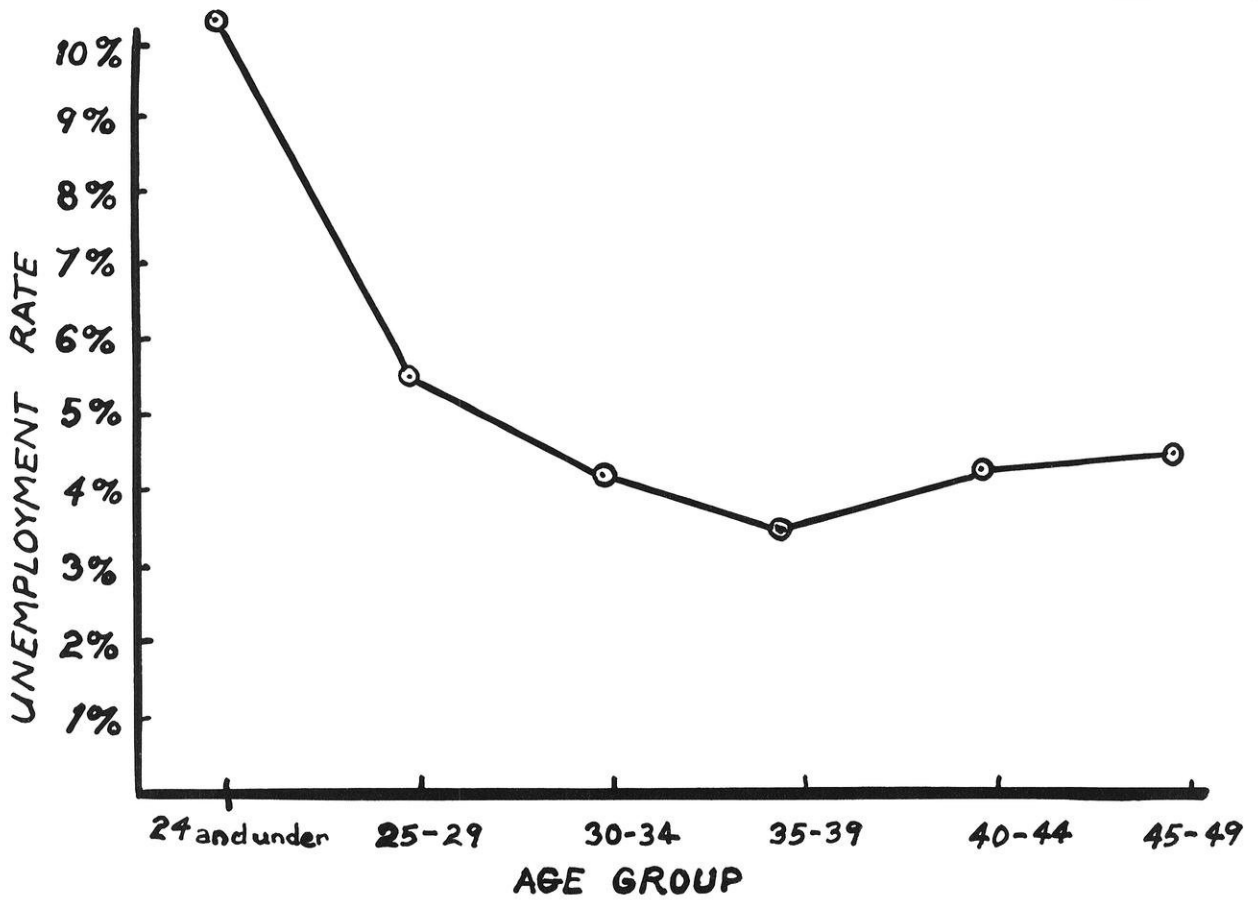
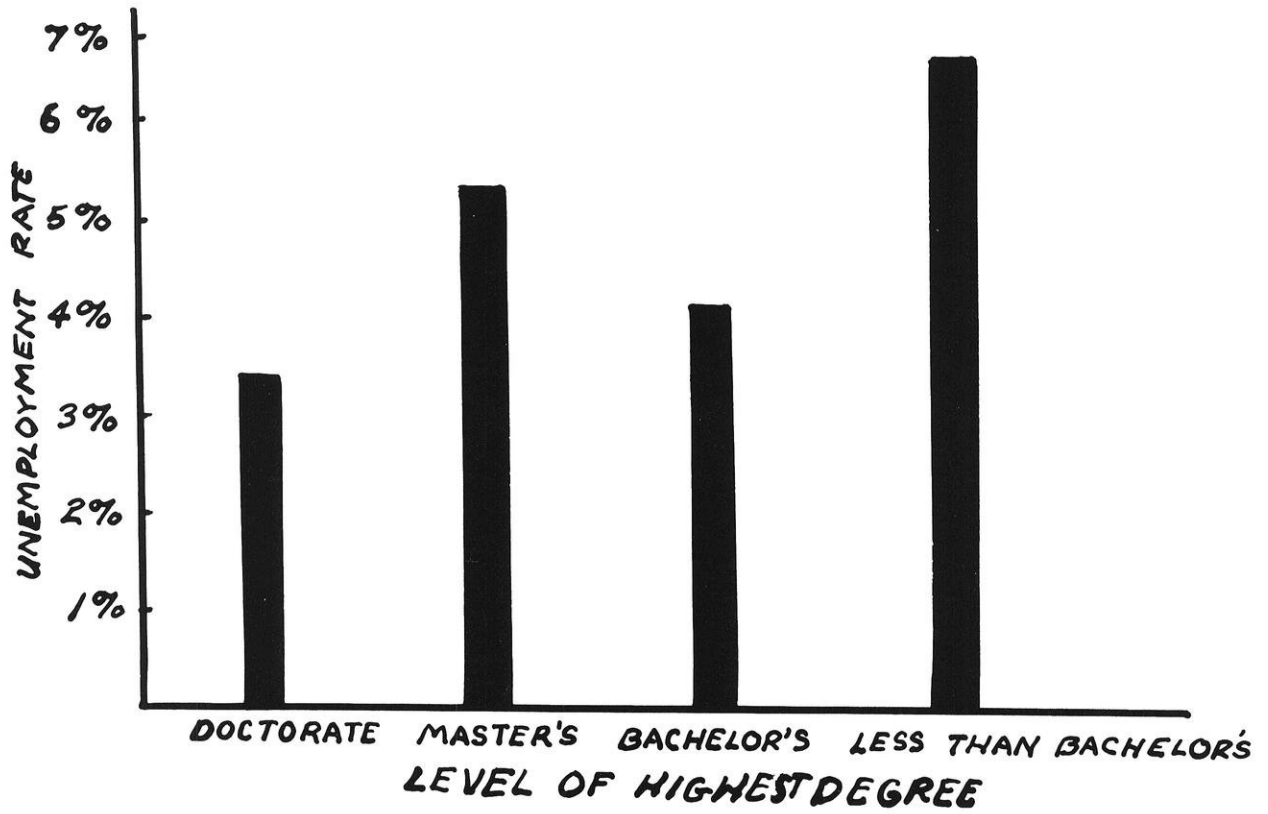


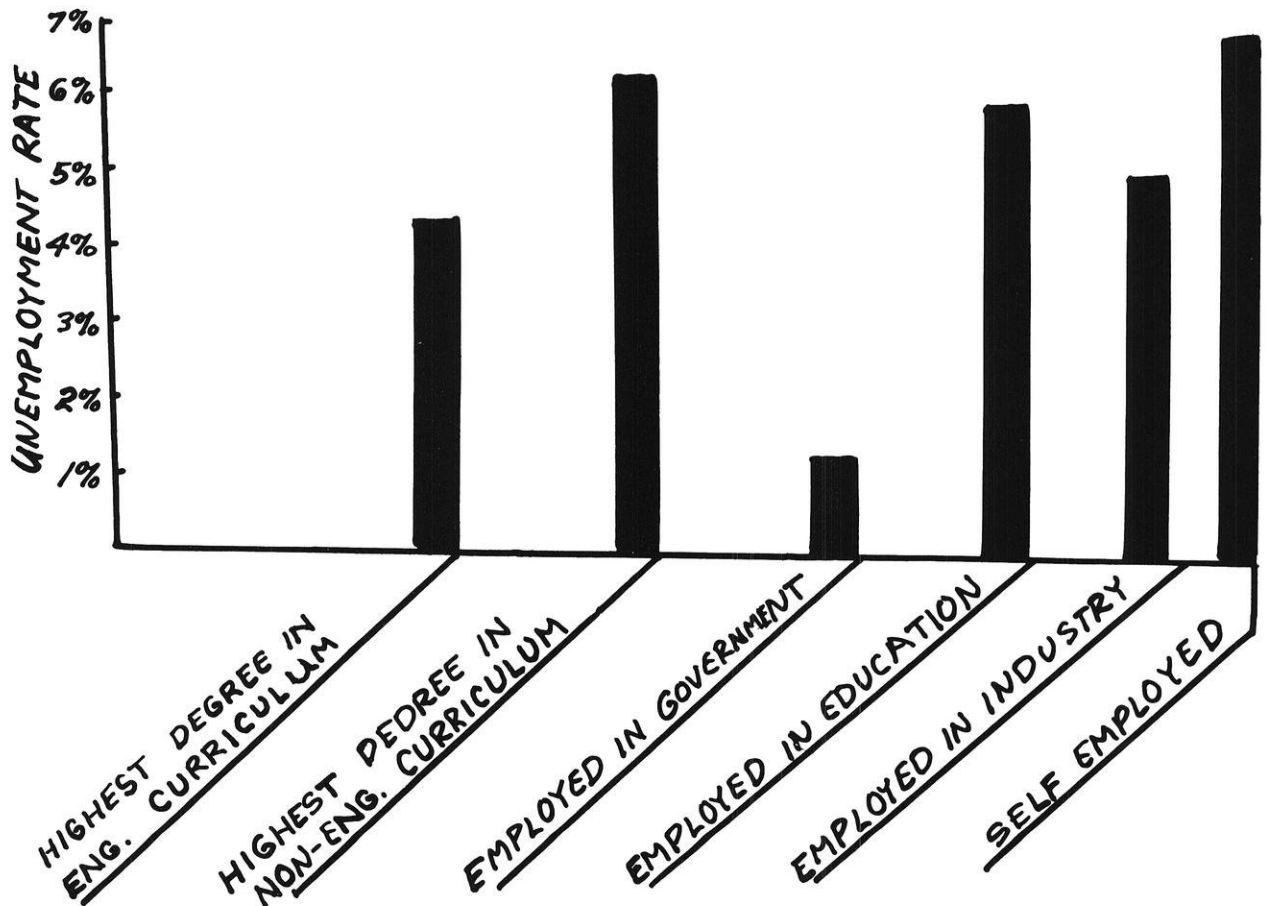
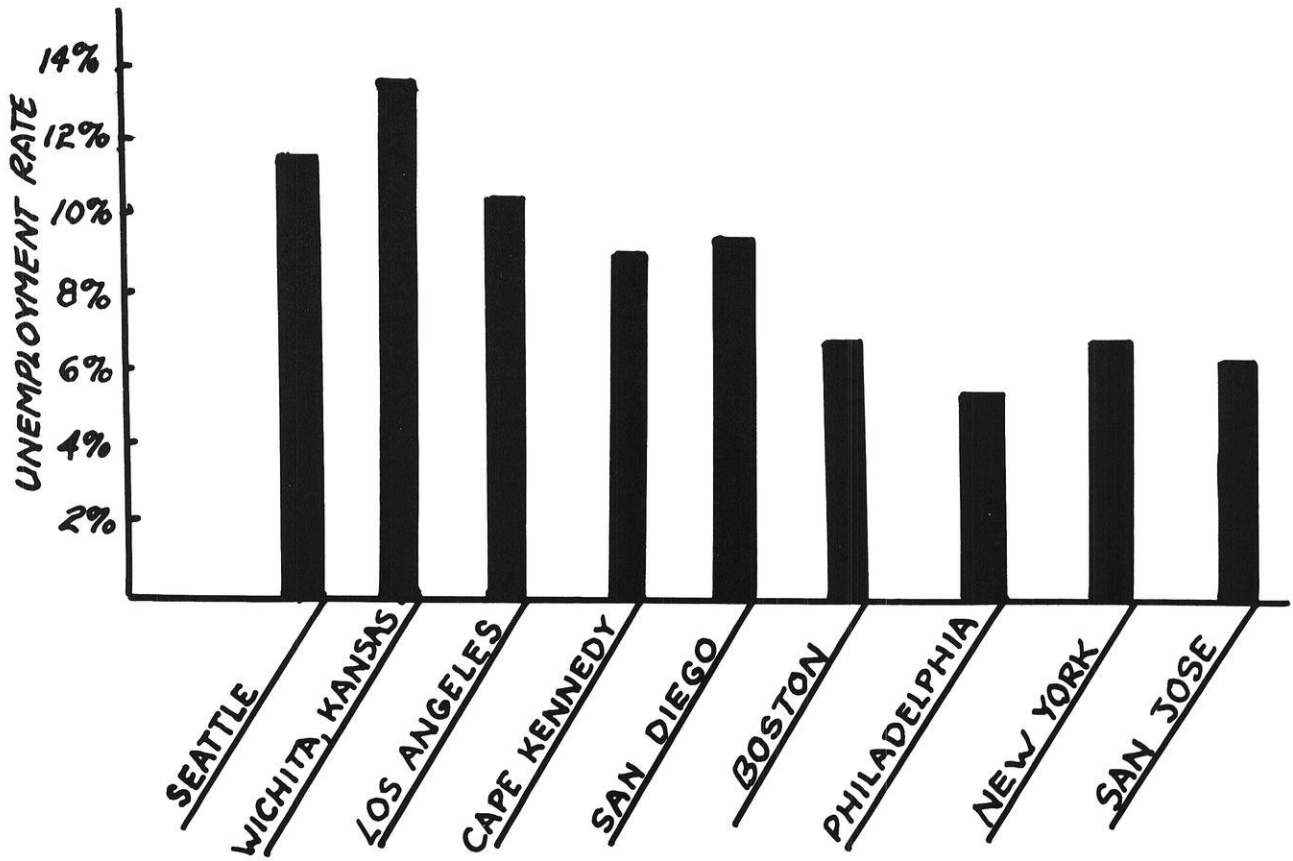
**GTE SYLVANIA**

# EMPLOYMENT AFTER GRADUATION









# The Engineering Placement Office Views Future Employment

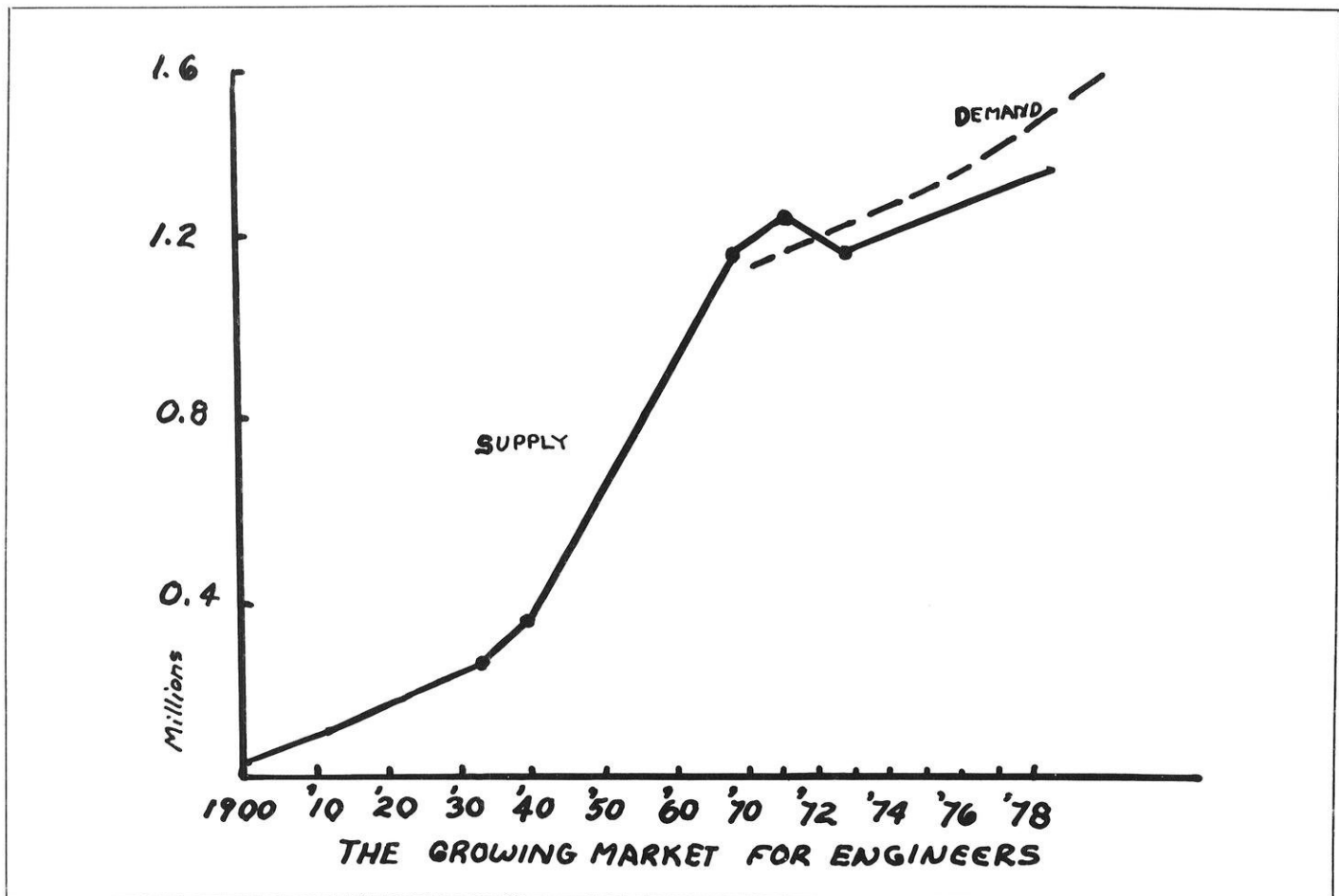
by James A. Marks

Today, an engineer with a bachelor's degree has opportunities that exceed those in most other occupations. While the current market in engineering jobs is slow, there are two very significant factors which must be considered.

First, the news media have generally distorted the current unemployment picture in engineering. One recent headline said "Engineering unemployment has doubled in the past year." Statistically true, but in fact the figures quoted showed a rise in unemployment from one and one-half percent to three percent. This is substantially less than overall unemployment. At the beginning level for new first degree graduates, unemployment is far less in engineering than in any other discipline.

Secondly, overall trends must be considered. For several years the annual output of engineering graduates in the United States has been barely equal to normal attrition because of death and retirement. Further, engineering enrollments have leveled off for the past several years. Thus, the number of graduates each year will remain the same until about 1975. There will be no increase in supply to compensate for any economic growth.

The graph below, modified from *Fortune*, June, 1971, tells the story. However, in 1975 the supply will drop below that shown in the graph, probably about 25 percent, simply because freshman enrollments in engineering dropped that much in the Fall of 1971.





Miss I. Slovonsky is by profession a chemical engineer. Kodak hired her last year because she seemed too good a chemical engineer to pass up. The assignment she drew has to do with environmentally safe disposal of wastes from photographic processing. Engineer Slovonsky's duties often require discussions with the crews that install heavy equipment. Sometimes young engineers have been known to encounter a certain resistance from crew chiefs. Tact and finesse are important in getting a job done.

EASTMAN KODAK COMPANY  
Business and Technical Personnel  
Rochester, N. Y. 14650



*An equal-opportunity employer*

# HOW CAN A FOUR-INCH CERAMIC CYLINDER HELP PREVENT A MUGGING?

By itself, there's no way the cylinder we're talking about could prevent a mugging. Or any other crime.

But if you build a light bulb around it, it can. And has.

A few years back, General Electric engineers built a light bulb with a ceramic filament called the Lucalox® lamp. Then they built a streetlighting system to use it.

Purely as a feat of engineering, that was pretty good. Because it's the most efficient source of white light ever invented. It gives off twice the light of the best mercury system... without any extra electricity.

But, engineering aside, it's even better. When Lucalox went up in four of the highest crime areas of Washington, D.C., the

crime rate went down for the first time in years. Down 32%. And we expect to hear similar figures from the more than 90 other cities now using Lucalox.

It's a clear example of how a technological innovation can help solve a social problem. A lot of times, the effect of technology on society is rather direct.

That's why, at General Electric, we judge innovations more by the impact they'll have on people's lives than by their sheer technical wizardry.

Maybe that's a standard you should apply to the work you'll be doing. Whether or not you ever work at General Electric.

Because, as our engineers will tell you, it's not so much what you do that counts. It's what it means.

GENERAL  ELECTRIC

