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wisconsin engineer

• *In this issue:*

Engineers Recruiting, Researching, Re-cycling

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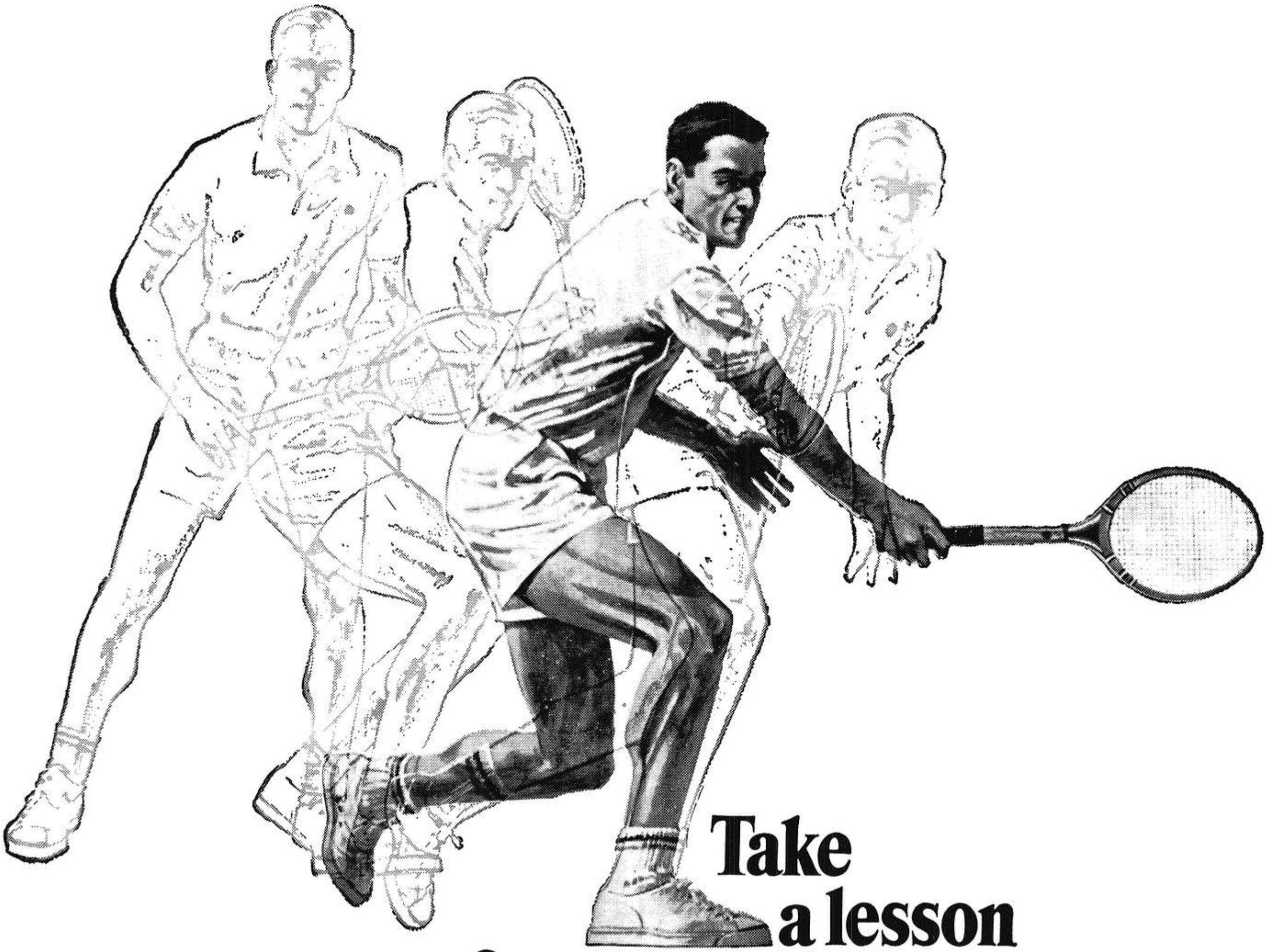

ENGINEERS—TRANSFORMING THE HOPE OF TODAY INTO THE REALITY OF TOMORROW

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wisconsin engineer

Keeping with the second half of our series on current trends in engineering education which was begun in our March issue, we present an illustration showing the opportunities available to today's engineering student. Educational benefits and practical application are yours for the asking in the Cooperative Education program conducted on the University of Wisconsin-Madison campus. *(For further information, see pgs. 6-7)*

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A New Awareness

"Engineers who design and produce new and useful things are also social revolutionaries. Discussion of the radical social change they have produced is likely to shock engineers for they are natively unaware of the profound transformations to which they have contributed throughout history."

Dr. Melvin Kranzberg
History of Science & Technology
Case Western-Reserve University
Annual Meeting of Engineers' Public Information Council

Caught from behind, engineers are also being called to account for the results of technological advance. Dr. Kranzberg said, "there is considerable pressure on the engineering community and on the business community which employs most engineers to make certain that the work is used for the welfare of the entire community, not just in the interest of a select few."

In recent years, engineers have been expected to adopt a larger, more activist role in the society they so profoundly influence. If engineers are to accept responsibility for the consequences of the changes they bring to the world, they must also be capable and willing to express their concerns regarding the direction of technology. The capacity to present a thoughtful and eloquent point of view is essential. Major decisions in cases such as the California Water Project, where charges of fraud and misrepresentation have been raised, can no longer be left to political machines and technical illiterates.

All levels of engineering are beginning to feel the need for expressive concern. Engineering colleges throughout the country are initiating curriculum changes to stay in tune with the expectations of students. But these changes are moving slowly. Some express satisfaction with the current situation. According to some students and educators, there are still too many cookbook-style laboratories, repetitive problem-solving dogwork and mathematical pomposities in much engineering study. Students must be capable of lobbying effectively for constructive improvements.

A practical application of this sort of expression can be seen in Dr. Kranzberg's proposal that "engineers can provide technical alternatives and explain the trade-offs in economic and social costs for prospective benefits. Through the newly emerging art of Technology Assessment, engineers can inform the public and participate in the political process as technical experts . . . (An engineer) must look not only at profit-loss figures but also at human and social consequences; he must look to second and even third-order effects."
even third-order effects."

It is being asked when corporate or government engineers, scientists, and other professionals should dissent. Ralph Nader advocates protective legislation to safeguard professionals who invoke ethical objections to their employers' practices. Not only must engineers question the direction of their profession, they must be able to articulate their convictions.

With increasing social consciousness, and ever greater demands for "true professinalism" that expects ultimate responsibility to society, engineers are called upon to interact with those outside their profession. Effective communication with social scientists, economists, and politicians is required. It is a relationship that is more crucial than ever before, and can be maintained only through public discussion in layman's terms.

New efforts, showing genuine insights into social significance, are ushering in a new era. It is now the individual engineer's resonsibility to step from behind technical ambiguities and speak to the rest of society.

DON JOHNSON

Metallurgy Wants You!

or

Maxwell the Magician

by Christy Brooks

"Solid state" may not be the best term for the engineering situation in this country, with the total need for engineers increasing while the total supply of engineers decreases nationally.

However, Professor George Maxwell of the Metallurgical Engineering department at the University of Wisconsin makes positive and productive use of the solid state concept in a recruiting-educational program for high school students throughout Wisconsin.

"The program has helped," Maxwell said. "The enrollment in the metallurgy department has held even, which is unusual with other departments down, and I know several students who came to Wisconsin because of our high school demonstration."

Maxwell developed his program three or four years ago, travelling in the state and ocassionally as far south as Chicago to reach approximately 11,000 high school students. His lectures and demonstrations center around solid state transfer. Without being complex, the demonstrations are meant to intrigue high school students who receive little engineering education.

"I start off with the most common demonstration, showing the transfer of properties in irons by changing its length at a critical temperature," Maxwell said. "Then I'll take a piece of steel wire spring and transfer it to a soft state with heat, a brittle state by cooling, and then back to its original car spring form."

Maxwell also likes to demonstrate a phenonmenon often occuring in out space. By taking two pieces of steel or frozen mercury, he removes the oxide layer on the metal, a process comparable to cosmic rays sucking away oxygen in the vacuum of outer space. The metal pieces are then free to be attracted to one another and they stick together as if magnetized.

"It makes it clear how the Empire State Building could be built in a few hours in space," Maxwell said.

Another demonstration in solid state change seems to involve a bit of magic, "But it's really a very simple concept," Maxwell said. "I form the letters of a name—usually the name of the school I'm at—in a heated wire. The students, of course, haven't seen me spell out the name, and I straighten the wire. When the wire is re-heated, it will go back into the form of the name." Maxwell smiled when he remembered some students' amazement.

Maxwell, who teaches undergraduate courses and three metallurigical laboratories at the University, decided on his career without the help of any recruiting programs.

"I was always interested in gears and machinery, and I came from a heavy mining area in Montana," he said. However, he created his metallurgy program for high school students because, "the metallurgy department has always had a low enrollment and a somewhat bad atmosphere. The other incentive was to educate."

Maxwell explained that there are no pure engineering courses for high school students, although they get a smattering in some science courses.

"They have no concept of what engineering really is. A lot of them say an engineer is a physicist and chemist and scientist all enrolled into one, and that's definitely not true at all," Maxwell said.

He would like to see some engineering courses developed in high schools, and while he knows of none now, he mentioned the next best thing in place of engineering courses.

"We have a program called ECCP—Engineering Curricular Concepts Program—that brings high school teachers into our College of Engineering each summer." Maxwell said ECCP has expanded the vista of many high school courses.

Maxwell also supervises the Student Science Training program (SSTP) which began at the University last year. Sponsored by the National Science Fund, SSTP offers 20 high school junior men and women the chance to work with all aspects of engineering for nine weeks during the University's summer session.

Requests for the application for may be sent to:

Prof. George Maxwell
NSF Student Science Training Program
Dept. of Metallurgical and Mineral Engineering
University of Wisconsin
1509 University Ave.
Madison, Wis. 53706

Maxwell pointed out the one less-than-encouraging aspect of his recruiting efforts. "When I am recruiting, girls often seem more interested than the boys, but very few ever apply to engineering. We have only one woman out of 45 engineers in metallurgy, and I know of no women that has ever applied because of the high school program." Because of expanding job opportunities in engineering, he encourages more women to explore the field.

Engineering Education: COOPERATIVE EDUCATION

Get on the Payroll— As a freshman!

by DAVID L. GIFFEN

It was stated in 1906 at University of Cincinatti by Dean Herman Schneider. It's been at the University of Wisconsin for the past eight years. It offers opportunity for travel, money and worldly experiences and it's got Ken Biccum pretty enthused.

What is it?

It's the engineering cooperative education program - which unintentionally seems to be one of the best kept secrets in the College of Engineering.

"I first got interested in it when one of my students came up and asked me why we didn't have a co-op program," said Ken Biccum, an instructor in the Industrial Engineering department who has recently been looking into the possibility of expanding the program. "When I went to check on it, I was surprised to find that there has been a co-op program here for quite sometime," he said.

The cooperative education program is a plan which allows an engineering student to alternate semesters of study at school with practical engineering experience in a variety of areas. (See Graph One.)

Numerous companies participated in the co-op program. Generally successive work periods are spent with the same company and the student gains experience solving increasingly complex engineering problems in such areas as product design, service, manufacturing, research, development, and testing laboratories.

At the University of Wisconsin the co-op takes about five years to complete, including some summer school and approximately four semesters of work experience. Any student who has completed the freshman year is eligible to apply.

The fledgling engineer is brought into contact with company operating in his particular area of interest. If accepted by the company, the student, his advisor, and representative of the company get together and decide upon a work program. Besides being paid by the company (often very well), a co-op engineer enrolls in Engineering 001, Cooperative Education, for one credit.

The only other requirements are that the company report once a semester on the student and that the student write a short (10 to 15 page) report on his activities for his advisor.

The idea of spending extra time in school is not very attractive to most people, but consider some of the advantages . . .

A student in the cooperative program finds out exactly what it is that an engineer does and how it relates to what he has to learn in the classroom

"Most engineering students, even when they're seniors, don't really know what an engineer does," said Prof. George Sell, who coordinates the program in Madison.

Sometimes what an engineer does can be pretty interesting. Though no program is typical, an example might be in order.[1] Carl Konkel, a senior at Northwestern in Electrical Engineering, worked at NASA's Marshall Space Flight Center. His first assignment was in the Astronics Laboratory where he worked on the layout of a new version of the Saturn VFM receiver. Later, Konkel worked in the Program Development Directorate where new programs are studied for feasibility and preliminary designs are drawn up. In the Computation Lab, Konkel programmed an analog computer to simulate a dynamic flow problem and gained experience in operation of the skylab control and display panel. His most recent co-op assignment was being a station engineer at Siple Station, Antarctica.

Graph One

Typical Arrangements of Schedules for Cooperative Education Programs are as Follows:

	Semester I	Semester II	Summer Session
1st Year	School	School	Work
2nd Year	School	Work	Summer School
3rd Year	Work	School	Work
4th Year	School	Work	Summer School
5th Year	School	School	*Summer School

***Summer school during the 5th year is only required if an average of 16 credits is carried each semester. If the student is capable of carrying 18 or 19 credits or if he makes arrangements to obtain additional credits during his work periods, he will not need the final Summer Session.**

Co-op students were working on such things as the space shuttle guidance system and airport landing radar, space shuttle communications and docking procedures and Mars vehicle habitability studies.

No matter where they work, co-op engineers get all kinds of insight.

"I had a letter form one student who said that his co-op experience made him see which courses were of most benefit to him, what areas he needed more work in, and generally how the things he learned in the classroom applied in the real world," said Prof. Sell.

"Another student had about a two-point average when he went out on his first work experience," Sell said. "He came back fired up with enthusiasm and his grades went up to better than a three-point."

This higher grade phenomenon is supported by research done at the Georgia Institute of Technology. The study showed that where mean cumulative grand point averages are compared for comparable groups of co-op and nonco-op students, the co-op students performed better at all levels. (See Graph Two)

"Of course," Sell said, "there's the other side, too. One student went to work for Collins Radio and decided to get out of engineering altogether. It just wasn't for him."

The monetary aspects of the program shouldn't be ignored either. Since the companies generally pay quite well, the financial burden of going to school can be eased somewhat. Salaries vary, but generally start above the $500 per month level and escalate to around $700-to $800 per month by graduation time.

"One company, I won't say which one, paid $685 plus health services and all that, for a student with one year of school," Ken Biccum reported.

In addition, the co-op student has a jump on other graduates when it comes to getting a job. That extra year or more of practical experience can be parlayed into $100 to $200 more per month than the normal starting salary for engineering graduates.

There is no binding contract of any kind involved in the cooperative program. The student or the employer can terminate the program at any time. But, as can well be imagined, companies like to keep people in whom they have invested a great deal of time and training. Many industries have an extraordinarily high retention rate — Goodyear and LTV Aerospace, for example, end up hiring 94% of their co-op students after graduation.

"John Deere has a retention rate of about 80%, but they actually encourage students to look elsewhere for work," Biccum said."They say 'when you come to work for us we want it to be because we gave you the best offer'. They're that confident."

A good co-op program can be almost as beneficial to the school and the employer as it can be to the student. University of the Pacific, after instituting a major co-op program, increased its freshman engineering enrollment by 94% between 1969 and 1970.[2] One study showed that the ratio of people hired to interviews conducted it almost twice for co-op companies what it is for other companies.

With the decline in engineering enrollment and the increasing demand for engineers, the future of co-op education looks very good.

In 1950 there were 35 cooperative programs in the U.S., and in 1970 there were 197—a 463% increase. Besides this general trend, shortrange indications look good. When there are troubles in industry, as has been the case in the last few years, "frills" like the co-op programs are generally eliminated. Lately, employers mindful of the coming shortage of engineers have begun asking for students again.

Nearly all of the job opportunities are outside Madison. Goodyear, General Electric, the Beloit Corporation, Collins Radio and John Deere participate, to name a few. Recently requests have been received from several companies: a California firm which specializes in cooling towards, a small engine manufacturer in Minneapolis, a manufacturer of heating and ventilating equipment in Verona, and a manufacturer of automatic assembly equipment in Janesville. Things are definitely looking up for the cooperative education program.

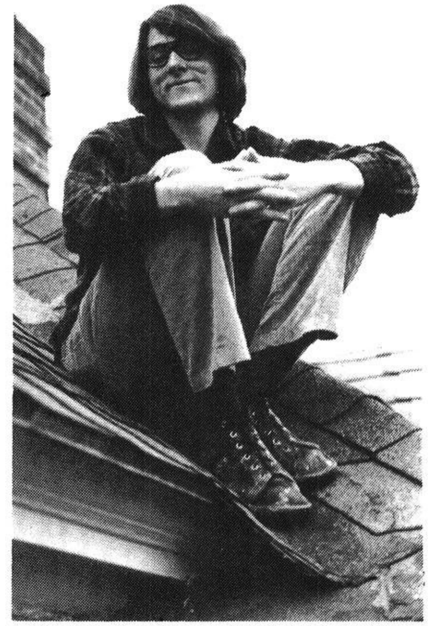
*****

As co-op programs go the Madison's program is rather small. On this campus there are about ten engineering students involved. This low number is partially attributable to the strict economic budget industry has been having recently, but mostly it is just because engineering students didn't know the program existed.

But now that you know . . . you can see Prof. Sell, Room 243 Mechanical Engineering for further information. Check out Cooperative Education for yourself.

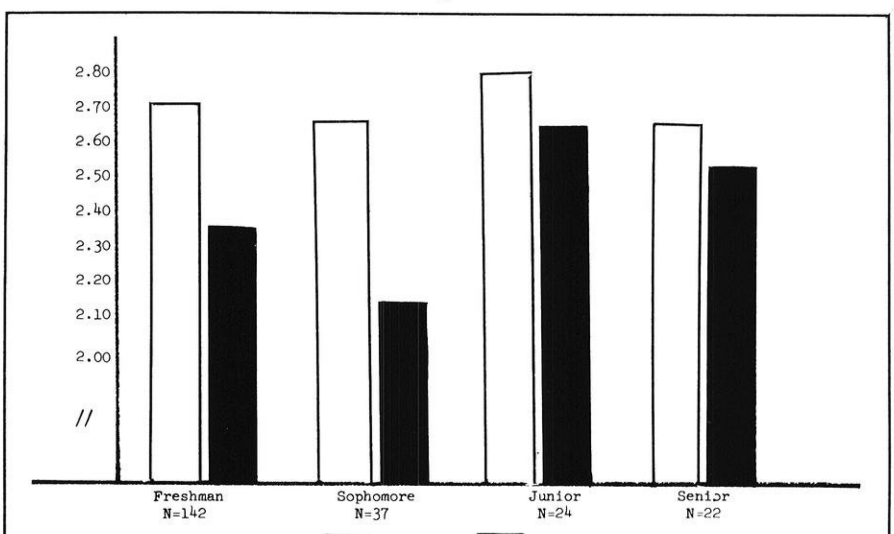
Sources:

1. Konkel, Carl, "A NASA Co-op Exper ience, *"Engineering Education,* April, 1971.
2. Heyborne, R.L., "Cooperative Education in Revitalizing an Engineering School," *Engineering Education,* April, 1971.
3. Marks, Edmond and James Wohlford, "The Co-op Experience and Its Effect On Undergraduates," *Engineering Education,* April, 1971.



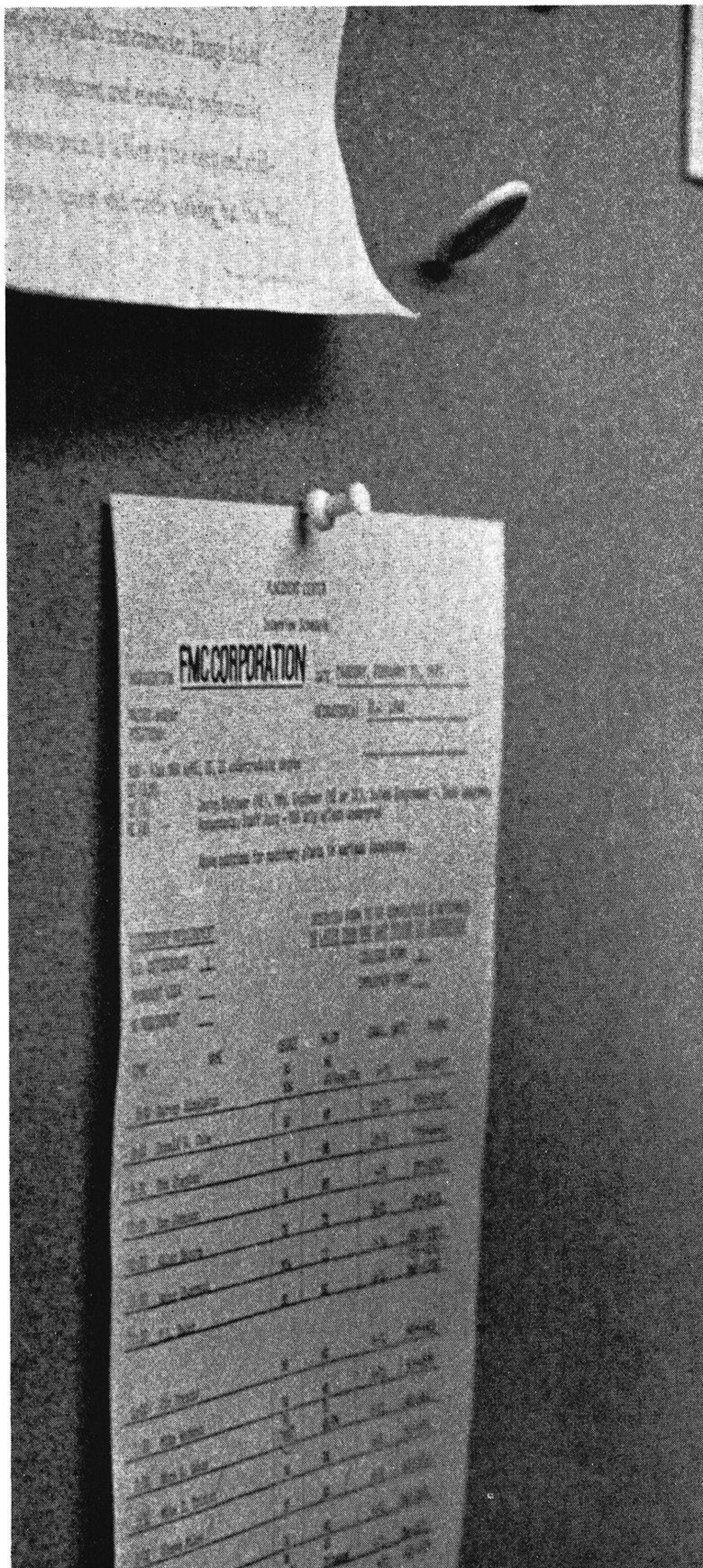
David L. Giffen is a senior majoring in psychology. David's home town is Milwaukee.

Graph Two



Academic performance of co-op and non co-op students.

Don't let our name confuse you.



Professor John G. Webster has a joint appointment with the Department of Electrical Engineering and the Instrumentation Systems Center has taken a more practical look at the field of biomedical engineering.

An instrument being developed here is an electronic sensing system to measure pulse. This is done by fitting a small ear clip over a patient's ear which has a light source on one side of the clip and a photo-electric cell on the other side. As blood is pumped into the ear with each contraction of the heart, the amount of light traveling through the ear lobe is decreased due to the relative opaqueness of the blood. The signal put out by the photo-electric cell is then amplified and displayed on an oscilliscope giving a visual indication of heart action without the inconvenience of the many electrodes required for a standard electrocardiogram.

Biomedical Engineers Strive to Help Humanity

Another biomedical instrument used in this lab by EE 462 (Medical Instrumentation) students, is the heart amplifier. Each time the heart contracts the muscle tissue gives out a small voltage on the order of 1 mV which can be measured across different parts of the body. As in the ear clip sensor, the signal from the heart muscle is amplified to approximately 1 volt and displayed on an oscilliscope. Small metal plates or suction cup electrodes are placed on the skin at various points to detect the voltage produced by the heart. The number of electrodes used has been reduced from 12, as in the older ECG system, to 3, in this present system. These leads are connected to a small battery-powered amplifier which employs integrated circuitry and has a high input impedance which rejects the 60 Hz noise produced by the overhead lights and wiring in the room. The heart amplifier has an estimated cost of less than $10.00.

The telephone transmitter works like the heart amplifier, but in addition to amplifying the heart signal the transmitter modulates the signal at approximately 1,000 Hz which then is transmitted over the commercial telephone network to a similar device at the receiving end. (See photo 1) The receiver then demodulates the signal and transfers the information to a standard ECG readout. In this way heart patients living far from a hospital can have their heart condition checked periodically over the telephone.

Another instrument of quite a different nature is the pressure transducer. It measures the pressure difference in breathing between inhalation and exhalation, and from this, the volume of air inhaled and exhaled can be measured. A mouthpiece with a very fine membrane inside is fitted over the patient's mouth and nose. (See photo 2) The passage of air through the mouthpiece is not restricted by the membrane but the membrane is set in vibration by the patient's breathing. These pressure-induced vibrations are converted into electrical signals, which are in turn analyzed by other electronic equipment.

Sherman Heller, 904 Engineering Research, is a graduate student in electrical engineering. He is developing a very interesting and ingenious device which is called a pupillometer.

His pupillometer tests the light reflex of the human eye pupil. It consists of a light-proof box which the patient is seated in during the experiment, a Videcon TV camera, an infrared light source, and a small computer. The camera tube has no memory, as does an ordinary TV camera, and is called an image dissector. It scans the pupil of the patient, whose eye is illuminated by the weak infrared source, to which the eye is not very sensitive. The tube can "see" the pupil against the rest of the eye and determine its diameter. Because the tube has no memory, it can sense very rapid changes in pupil dilation and contraction, and sends this information to the computer. The small computer was designed by Mr. Heller himself, as he wanted a device sufficiently small to be relatively portable.

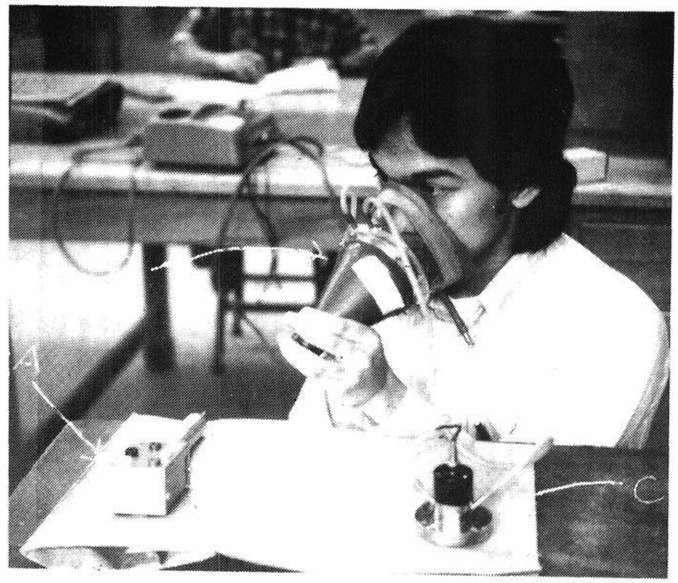


PHOTO 2

A. Plate Electrode
B. Suction Cup Electrode
C. Amplifier

PHOTO 1
ECG Telephone Transmitter

By exposing the patient to darkness for about 30 minutes, his eyes become about one million times more sensitive to light than they usually are during daylight hours. Only one eye is illuminated by the infrared source; the other eye is subjected to ordinary light whose intensity is under the experimenter's control. The two eyes are separated one each other by a card held against the face. The ordinary light source is varied in intensity and duration, and the dilations and constrictions of the other eye are measured by the camera and computer. By a phenomena known as consensual constriction, and dilation or constriction of one eye can be recorded by a proportional dilation or constriction in the other.

With this experiment, Heller plans to be able to determine the health of an eye, to replace the polygraph as a "lie detector", and to determine reaction of the pupil to decision making, concentration, or other mental or physical stresses.

Can biomedical engineers rejuvenate the housecall? There are devices available now that enable doctors to diagnose ECG's over the telephone and prescribe medication for the patient while he is hundreds of miles away. This would not have been possible if it were not for research in the many fields of biomedical engineering.

There are many grant-funded individual research projects in this field going on at the Madison UW campus. Most of these projects are headed by faculty members with students doing research under them. The Biomedical Engineering Center, which serves as a communication channel for biomedical engineers, is headed by Professor John R. Cameron, and it is partly responsible for the masters' programs, curriculi, and program coordination. Professor C. D. Geisler is one of the professors on the Biomedical Engineering Executive Committee. His specialty is neuro-physiology, and his main interest is the auditory system. He has used various computers, from mini-computers to highly sophisticated models, in his research, and has done physiological studies of the ears of cats and monkeys. He, like most of the rest of the biomedical engineering faculty, is involved in theoretical research.

How to Re-cycle an Engineer

by Ray Bial

Just seven years after receiving a bachelor degree, the typical engineer is already only half as effective as he was at the time of graduation. This "human obsolescence" of sorts has been attributed to expanding technological knowledge and to simple forgetting of information over time. Keeping up with rapid technological is particularly difficult in engineering.

In order to meet the engineer's needs for refreshing, updating, and broadening skills, the University of Wisconsin Extension—Department of Engineering has developed a variety of continuing education programs.

When an engineer leaves school, he finds that much of what he has learned is not used on the job. Intense specialization dictates that, in his job, he applies perhaps 10% of what he has learned in school. Consequently, he begins to forget what knowledge he is not directly using.

Thus, he is expected to be particularly well-versed in his specialized area. Job demands are heightened when he moves to a new job; or when he must handle management or other responsibilities not directly related to engineering.

The Wisconsin Engineering Extension programs are designed to deal with these individual needs of the working engineer. Most courses are short-term and are offered on weekends or during after work hours. The basic course format varies, ranging from independent studies (correspondence courses), institutes/work shops/refreshers, short courses, evening courses, residence courses, and independent studies. Individual courses may be elected freely or taken as part of a structured program through the recently initiated Professional Development Degree Program.

Most of the courses available focus on keeping up on the state of the Profession. In most coursework, emphasis is placed on practical application of principles and utilization of techniques, rather than on the more theoretical materials normally presented in the undergrad college classroom. Coursework in areas outside of engineering — such as quality control, financial operations, and manufacturing — is also stressed.

The Professional Development Degree Program seems to afford the best opportunity for developing a complete continuing education program. The degree does not itself fit into a masters or doctorate degree schedule. It is a post-baccalaureate program designed to meet an individual's objectives to perform better on his job. The only requirement for admission into the program is a bachelor's degree. Begun in the summer of 1970, as the first such program in the country, it is complete in that it attempts to give well-rounded direction to the development of the postgraduate engineers potential.

The operation of the program is perhaps best illustrated through a case study. For example, the case of P.D. Davis, an employee of ZAP Industries, Inc. Assume that he is a senior design engineer with a B.S. degree in mechanical engineering.

In order to update and improve himself, P.D. Davis, in conjunction with an academic advisor, established a set of personal objectives. He wanted to: (1) review engineering principles, (2) acquire a Professional Engineering Registration, (3) expand materials and applications knowledge, (4) understand basic statistics and computer science, (5) develop some fundamental background on systems and management techniques.

On the basis of his objectives, P.D. selected a curriculum which he felt best suited his needs. He had a wide gamut of courses from which to choose. His professional interests drew him to such courses as Thermoplastics, Probability and Statistics, and Value Engineering for Profit Improvement. But, he also found time to take elective courses in elementary German and economic history of the U.S.

To complete the degree, he will be required to compile 1200 hours. The hours are based upon actual time spent in coursework and outside study. Accumulation of hours is spread over four areas: (1) technical updating (refreshers, fundamentals), (2) technical advancement/upgrading (new technlogy and applied science),(3) professional electives (supplementary technical, managerial, and business topics), (4) outside interest electives (humanities, language, science, general knowledge).

Coursework may be taken at the student's own speed. However, there is a maximum limit of seven years. A degree will also not be awarded within three years after a student receives an undergraduate degree.

Extension programs, and especially the Professional Development Degree Program, seem to carry enhanced value because they are tailored to the needs of the working student. They are premised upon the notion that, while still in school, an engineer has some idea of his area of specialization — whether electrical, mechanical, chemical, etc. — and of what he plans to do with his degree. But this sort of foresight, no matter how well-planned, still borders on the speculative until the engineer finds from working exactly what the expectations of the job will be. With continuing education courses available after the fact, he is in a sense, allowed the luxury of hindsight and can return to school to pick up more specific skills and knowledge.

A second important point of continuing education, according to Professor William W. Wuerger of Engineering Extension, is to assist individuals in preparing for Professional Engineering Registration. Presently registration is not required by law, but in the near future, engineers may not only have to be registered but, like CPAs, they may periodically be held responsible for maintaining and upgrading their skills and knowledge. Pressures towards registration are particularly being felt through cases of products liability in which engineers are being help responsibility for their safety design of products and on projects. The Professional Development Degree is one avenue through which skills and knowledge can be sharpened.

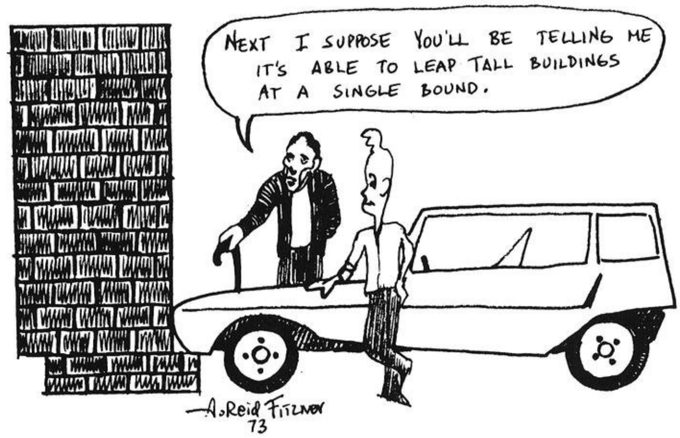
To qualify for the program, applicants must possess a bachelor's degree in either engineering or a related science which is approved by the admissions committee. Though grade point average does not influence acceptance, a college transcript must accompany the application. A resume from the present employer is also necessary.

There is no residence requirement for admission to the program. In fact, of the 150 student presently pursuing the degree at present, almost half live outside of Wisconsin. Two students reside in Hong Kong, and another makes his home in a Pennsylvania prison. However, at least half of the 1200 hours needed to complete the program must be taken at or through the University of Wisconsin.

While the Professional Development Degree Program is still young, programs of its nature may well represent the first step towards innovation in continuing education for engineering. Wisconsin's program has already been modeled by several other universities. The program is growing and will very likely provide the dominant theme in engineering extension programs at Wisconsin itself.

Ray Bial is a grad student in journalism and hails from Dunville, Ill. Ray spent two years in Baltimore as a social worker and coordinator for an experimental high school. He also has an interest in writing fiction.

Saga of the Urban Car



by Warren P. Brown

It is ten feet, six inches long, bright red, and the best laboratory twenty University of Wisconsin engineering students ever had.

It gets 40 miles to the gallon, can pass tough 1976 Federal emmission standards and meet a brick wall head-on or rear-on at five miles an hours without a scratch. The two passengers can walk away from a thirty-mile-an-hour crash.

The University of Wisconsin Urban Vehicle, prepared for the Urban Vehicle Design Competition (UVDC) at General Motors Milford, Michigan, providing grounds, has won prizes and recognition for safety features in the vehicle, the University of Wisconsin, and the students who worked on the project car.

The car itself has gleaned a great deal of attention in the press and at various locations where it has been shown, while the story of its learning opportunities is not as well known. The car actually is designed for the 1980's, says faculty advisor Prof. Andrew Frank (Electrical Engineering), even though the project only puts the students 3 or 4 years ahead of their contemporaries in terms of work experience on such a project.

When you build a car that's more than a car, a student learns more about engineering than engineering. "We're giving the students an opportunity to work on a problem directly related to social needs of the future," says Prof. Frank.

"Communication is a big thing," he said. "To convey ideas to fellow workers is tough for some engineers." Having a project such as the urban car not only allows the student to transfer his ideas from the drawing board to the real thing, but he learns how to express his ideas to his co-workers and the public.

Jim Winkleman was the student initiator of the UW project. What he and 450 other students from sixty-odd campuses were trying to do in the UVDC was design a car for the urban environment pollution. Safety, economic and compactness were stressed.The contest was sponsored by SCORE.

Involved in the project from the beginning, Winkleman worked out the basic approach with Prof. Andrew Frank.

They presented their project to Engineering Dean Marshall and the faculty for approval. At that point they got the go-ahead, funding in the form of a UW Stores account, and Prof. Beachley, of Mechanical Engineering to assist. By the Summer of 1971, five students had prepared a full scale mock-up.

In the fall more students were attracted by the car, curiosity stirred by a senior level design course and numerous independent studies.

Work on the real vehicle was started in December 6. By May it only needed the engine.

The hybrid engine is an integration of electric and combustion power. A Wankel rotary engine keeps two sources, an electric transmission and storage battery, charged. The electric motor, powered by either source, drives the car. The power plant is in the rear, while the front is devoted to controlled crushability. The students designed the frame, padding and tearable seat belts to take the impact of a crash.

The project vehicle costs over $40,000 though a production model would be expected to cost under $3,000.

The most valuable part of the project for the students was what they learned. One student, Glen Curtiss, then a junior in Mechanical Engineering, estimated that each student worked on the car from 10 to 20 hours a week.

"It is a real challenge," Curtiss said. "You can see what you are doing. I like it a lot better than a course." Scheduling those hours was a challenge in itself, Prof. Frank noted.

"I wanted the students to do it themselves. People underestimate their own abilities to do a job. The students had to get parts from individuals in industry and business, for free." Frank said. "You've got to sell yourself. The project forced the team to go out for the parts they needed," Frank added.

The students had to explain what they were doing, and what they needed to get it done. "They have to have gumption," says Frank, "to say, 'Look, now that you know what we want, can you get for us?' "

The students did get most of what they needed.

The Milwaukee company that donated the Wankel engine asked to remain anonymous like many other contributors. A local auto wrecker donated several parts while the team designed and built many components themselves. The front shock absorbers were an eleventh hour effort using water pipe casings, when commercial heavy duty shocks were found to be unable to cope with the 450 pounds of tractor batteries up front.

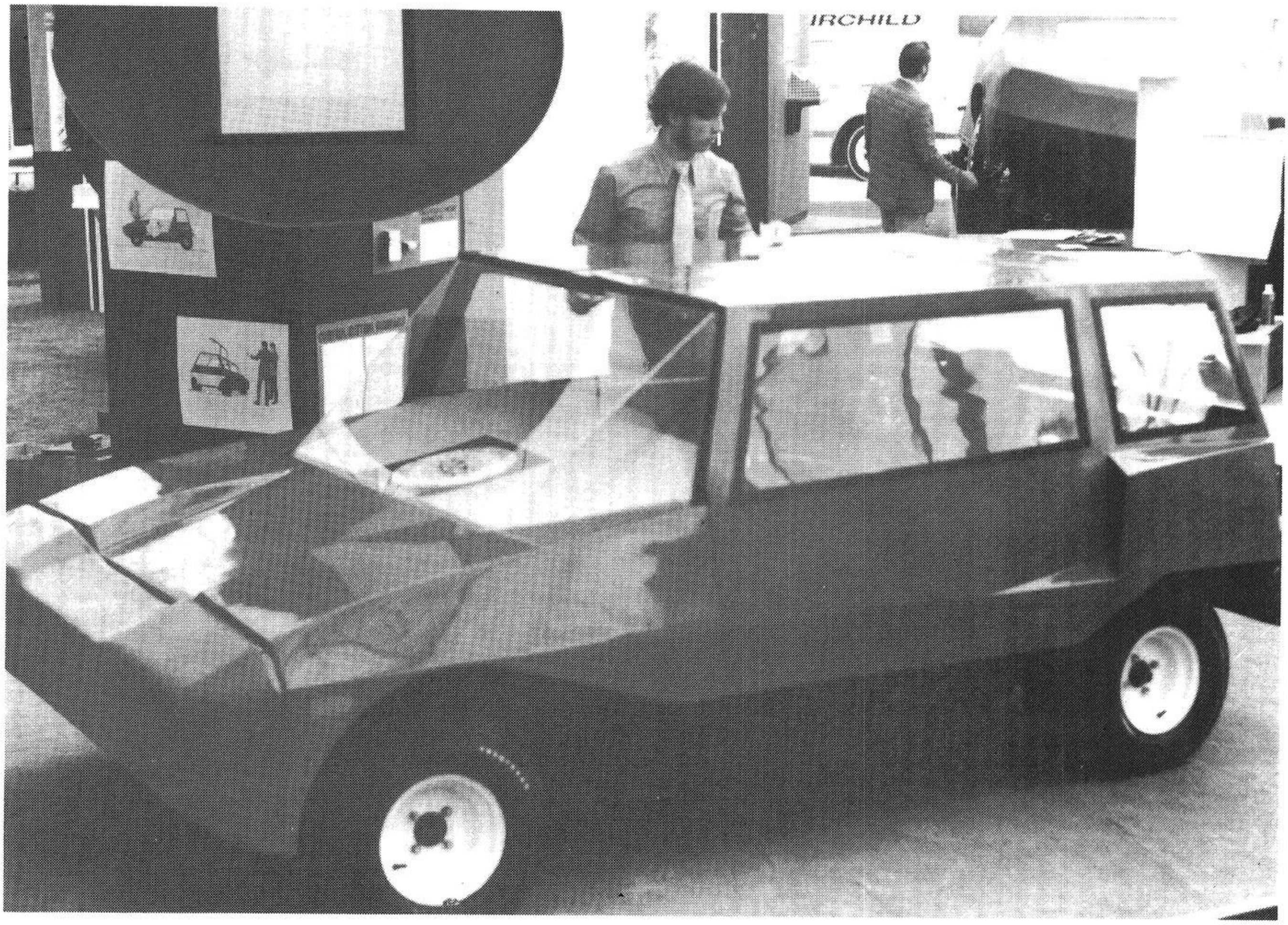
The team had to work long hours to meet critical stages of the project. The transmission from a wrecked Volkswagen had to be rebuilt at the last minute. Late on the last Saturday afternoon before competition and already past the planned time to leave for Detroit, the paint job was sabataged by a newspaper wandering across the parking lot. It had to be redone and departure, plans shifted to midnight. They left at 3:45 a.m., with a noon deadline at Detroit. Nine of the students and Prof. Beachley went with the car.

As important as learning about the car and engineering, Prof. Frank said, was the interaction among students on the team. "It had all the earmarks of a crash aerospace project; all the personnel management problems."

Some of the students didn't understand engineering, Prof. Frank said, until the project gave them the motivation. Having a real problem to deal with provided motivation to learn what they didn't know. One student who previously failing became one of the most productive members on the team.

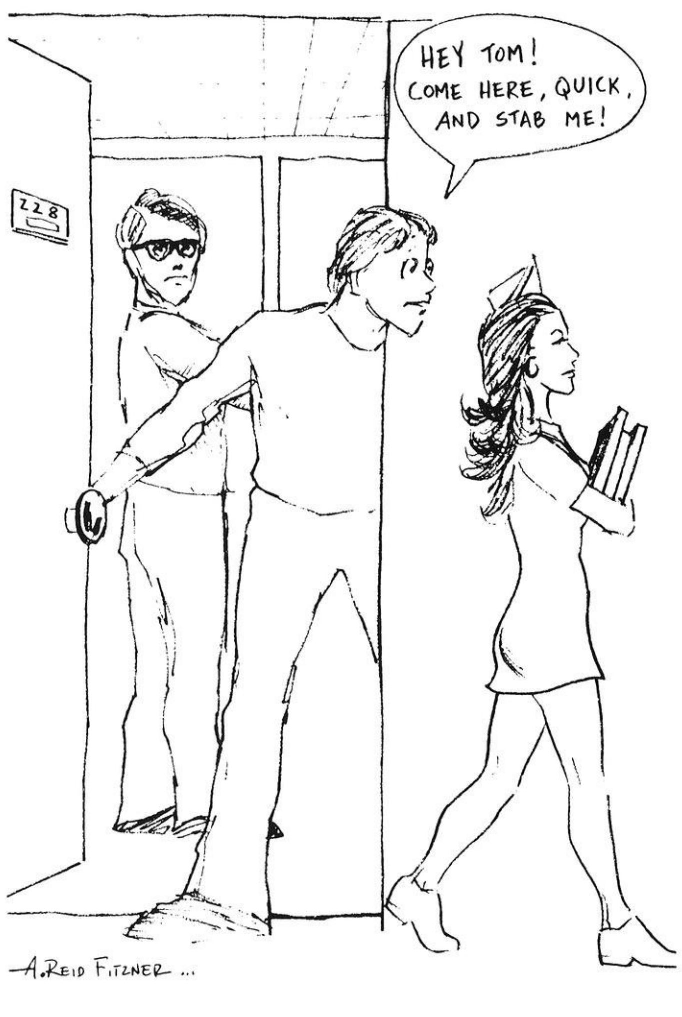
"Industry is definitely looking for students with this kind of initiative," says Winkleman, noting that the experience was a "definite benefit" in job hunting. Winkleman and a few others are still working on refining the car, though he will be moving on to other projects. He noted that there is a constant turnover of personnel on the project.

The key to the project, concludes Prof. Frank, is that the students have attempted to solve technological problems relevant to their own future. Engineers have to be socially aware, Winkleman added to contribute to the solution of pollution, overcrowding and other engineering challenges of the future.



Co-ed Dorm Set Up

For Engineers and Nurses



A new concept in dormitory living for undergraduate students, beginning with the 1973-74 school year, is being sponsored by the College of Engineering and the Division of Residence Halls of the University of Wisconsin — Madison Campus, with the cooperation of the School of Nursing.

Gilman House, an 80-student unit of Kronshage Halls, on the shores of Lake Mendota, has been reserved as a coeducational dormitory for undergraduate engineering and nursing students. Coeducational dormitories already exist on the Madison campus, consisting of all-male and all female floors in the same building. Gilman House will follow this same format.

Although engineering has been considered a predominantely male occupation, and nursing predominantely female, both fields are becoming increasingly attractive to the other sex.

College of Engineering Associate Dean Fred O. Leidel sees the new dormitory as offering exceptional opportunities for students to help one another. Freshmen will be assisted by upper-classmen living in the dorm, who have mastered the basic courses. Since both engineering and nursing freshmen sometimes have problems with courses such as mathematics and chemistry, they will be able to help one another. The concentration of students from the same fields in the single dorm area will enable faculty and staff and fellow students to provide meaningful and needed programs and services that would not be possible in a more scattered living arrangement. It is anticipated that much closer student-faculty relations will result.

Engineering and nursing students interested in participating in this coeducational experience in Gilman House, beginning in August 1973, should so indicate on their dormitory application, or should contact Ms. Judy S. Svoboda, Hall Adviser, Kronshage Hall, University of Wisconsin, Madison, Wisconsin 53706, Telephone 262-2386 (AC 608).

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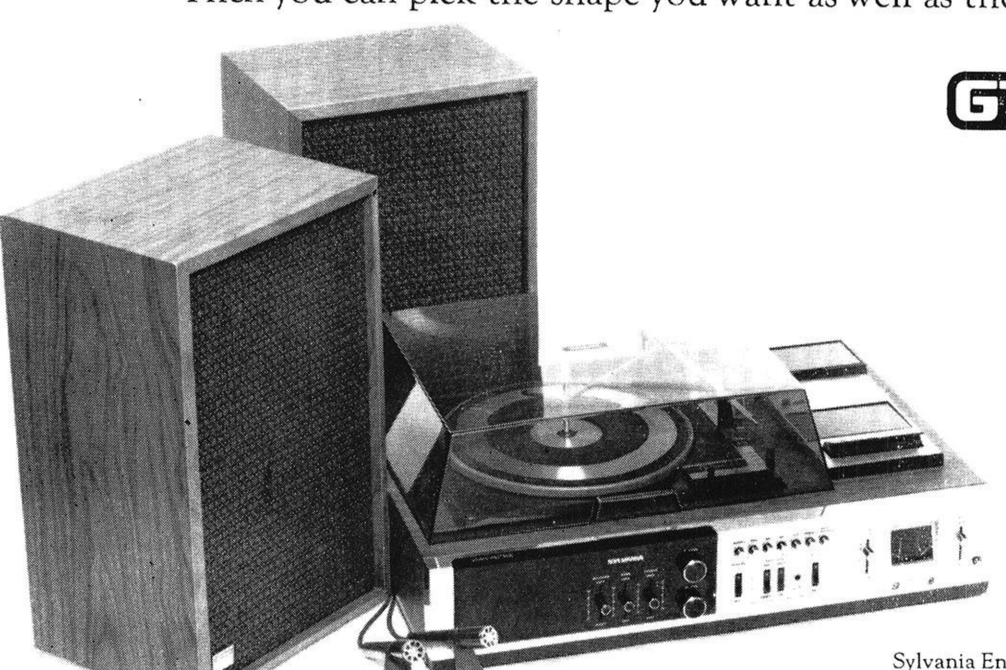

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