TECHNOGRAPH

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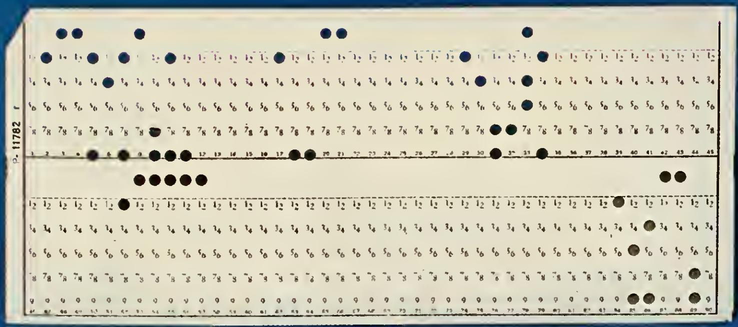
The captain commands a Westinghouse computer



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THE ILLINOIS TECHNOGRAPH

Volume 79; Number 6 March, 1964

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COVER: Computor in abstract. Design by Bob Huff, sophomore in architecture.

WHY NOT GLORY

Each year at St. Pat's Ball twelve engineering students are honored by the College of Engineering as having contributed the most to the College through their extra-curricular activities. They are knighted as Knights of St. Pat which is meant to be the highest honor given in the realm of student engineering activities.

Unfortunately, little note is given to the Knights. Few, other than those who are immediately involved, are aware of the selection procedure, and even the selection procedure itself is not well defined. The result of this lack of organization is that the honor of being knighted has been lost. Under the present selection procedure the chosen Knights are not necessarily the **most** deserving, but are those among the most deserving who happen to get nominated.

Since only the nominated students are interviewed, the present inadequate nominating procedure corrupts the whole system. This year only 17 students were nominated out of a possible forty-seven. Five of those were council nominees, two TECHNOGRAPH nominees, and only the ten remaining were nominated by the societies. One hopes that ten students are not all that should be considered from the 20 societies, each entitled to two nominations. Much of the problem here was that the only publicity or notification that the societies received from the sub-chairman of St. Pat's Ball in charge of selecting the Knights was a mimeographed sheet giving sketchy instructions for that society to nominate two Knights. Not only were the instructions scanty, but they reached the societies and Council immediately before Christmas vacation—too late for adequate handling before the January 15 deadline and at an ideal time to be lost or forgotten.

Council's good intentions to find their five most qualified candidates for their nominees somehow went astray also. It found, as it had found every year before, that the members had given no thought to the nominations and did not know who was eligible. Also members not present and other eligible students in the college, but outside Engineering Council, were not considered.

Bob Seylor, President of Council, is aware of the problems and is taking steps similar to those suggested below to reorganize the entire procedure. TECH submits the following as the appropriate means to reestablish the honor of being a Knight of St. Pat: (1) prepare a well-defined written set of criteria for choosing Knights of St. Pat, (2) define a system for recognizing leaders, nominating candidates, and making the final selection of Knights, and (3) provide for the selection of a chairman of the nominating and selecting procedure that will give the position the prominence it deserves.

The only problem then will be to insure that the conditions prescribed are followed. This is the job of the Knights chairman. At present, this person is a sub-chairman of St. Pat's Ball. This implies that choosing the Knights is no more important than selecting the band. In fact, the selection of the Knights should not be a function of the Ball at all. Honoring the most active engineering students is certainly important enough to be a direct function of Council instead of a remote function. TECH suggests that the chairman of the Knighting be chosen in the same way as the Chairman of Open House and the Chairman of St. Pat's Ball—by petitioning directly to Council. It should also be understood that a significant part of the chairman's job is to adequately publicize the selection procedure and those chosen.

These simple steps will provide an organization that will truly **honor** the student leaders in the College of Engineering and present a favorable picture of the College to the rest of the University through the publicity given the Knights. WWC

The Good Olde Days

The good old days were days of inventions, yes sir. We had some of the world's best ideas for real progress back then. Why, back in 1931 Technograph ran an article on a new-type vehicle that should have swept the country overnight:

The prospect of a new era of transportation has been opened by the successful trial of the new ro-rail motor cars in London. These vehicles, as the name implies, travel on the road as well as on the rails. It is hoped to speed up, by a door-to-door service, both freight and passengers. It would be very convenient to the manufacturer, who wished to ship a few tons of material over a distance of two hundred miles, to load up a truck that would take his material over roads and rails to his customer's door, without having to waste time loading and unloading at rail heads.

Unfortunately, the country decided too many of the finer things of life, e.g., teamster strikes, railroad strikes, and stevedore strikes, would have to be sacrificed to use these vehicles.

We were inventive back in the good old days. Oh yes. Back in December of 1930 we ran an article on a little project up in Canada:

"A concrete block the size of a nine-story building dropped into the river much the same as a cardboard is blown in a storm," reported the December issue of Popular Science Monthly. "Water was thrown several hundred feet into the air, roaring like a mighty geyser." Thus a large diverting dam was placed in position in a single operation in the Saguenay River, Canada. It is considered one of the most daring engineering feats of recent times. After months of preparation the job was completed in about six seconds. Models were made of the large "plug." The "plug" was a large obelisk ninety-two feet high, forty feet wide and forty-five feet thick and contained 5,500 cubic yards of concrete weighing 11,000 tons. The probable falling was studied by means of slow motion pictures of the models as they dropped into place. The "plug" landed within one inch of its expected landing place which shows the thoroughness and accuracy of the preliminary studies.

They were real engineers back in the good old days, all right. Why I know a certain golfer-engineer who can't even put a puny little 1¾ inch sphere within 50 yards of a small flag much less put a 11,000 ton concrete block within an inch of where he wants it.

No indeed, modern youth just doesn't understand the science of engineering. Why just last week a small freshman came up to me and asked. "Beau, do they have any electric generators in Heaven?" Naturally, I set him straight as best I could: "Of course not," said I. "It takes an engineer to build an electric generator."

NEWS NOTES

Foreign Engineering Pen Pals

Americans who are interested in science and engineering will be able to correspond with people with similar interests in other parts of the world as part of the largest international pen pal project ever enacted.

The project will be conducted by The Parker Pen Company at its Pavilion at the New York World's Fair, opening April 22. Visitors to the World's Fair will be able to sign up for the program and immediately receive the name and address of their overseas' penfriend from an electronic computer.

Registrants can select the language in which they wish to correspond, the area of the world to which they desire to write, and can choose from a comprehensive list of subjects about which they would like to write.

Persons interested in the project but not planning to attend the fair can receive information and registration forms by writing to The Parker Pen Company, Janesville, Wisconsin.

Junior Engineering Technical Society Summer Programs

Each summer the Illinois Junior Engineering Technical Society sponsors three two-week programs in engineering and applied science for specially selected high school students. The programs are structured so that participants will obtain a clear picture of engineering and, at the same time, be exposed to actual intellectual challenges in diverse subject matter.

The students do engineering experiments and individual and library research. They receive lectures on the different fields of engineering, instruction in mathematics, experience in doing engineering problems, and a general orientation which includes tours of industrial plants and discussions of the opportunities available in the engineering profession.

Program dates will be July 26-August 8, at Bradley University, Peoria, resident program; July 26-August 8 at the U of I, Urbana, resident program; and July 30-August 14 at the U of I Undergraduate Division, Navy Pier, Chicago, commuter program.

In the residence program, a fee of $80 will be charged per participant. This includes the cost of supplies, insurance, room, and board. The cost of the commuter program will be $30. Several scholarships are available.

Application forms may be obtained from the State of Illinois JETS Headquarters, 217 Transportation Building, University of Illinois, Urbana, Illinois.

New Award for Outstanding Senior in General Engineering

The H. L. Marcus-L. B. Phillips Award will be given to an outstanding senior in General Engineering in recognition of scholarship, character and activities. The donors of this award are Michael Phillips, G. E. '63 and Judith Ann Phillips, his wife.

Besides being rather unique in that the award has been established by so recent a graduate, another feature relates to dedication of the award. H. L. Marcus and L. B. Phillips are the fathers, respectively, of Mrs. Michael Phillips and Michael Phillips. In setting up the gift, Michael Phillips stated:

> "This award is given in honor of the above two fathers, who, like other fathers, have been the inspiration and the motivation of their sons and daughters throughout their college years. It is with gratitude that both my wife and I share in honoring two great men . . . our fathers."

All graduating seniors in a given year with all university averages of 3.5 or better are eligible to be considered for the award. Fifty per cent of the rating is to be based on extracurricular activities, 10% on activities outside the direct university community, 10% on professional organizations, 20% according to a rating of each candidate by his fellow graduating seniors, and 10% according to

appraisal of the students from faculty rating sheets.

The award will be presented each spring, and will consist of from $75 to $100 in cash plus an individual wall plaque. A permanent plaque will be mounted in the Transportation Building next to the Fraser Award Plaque.

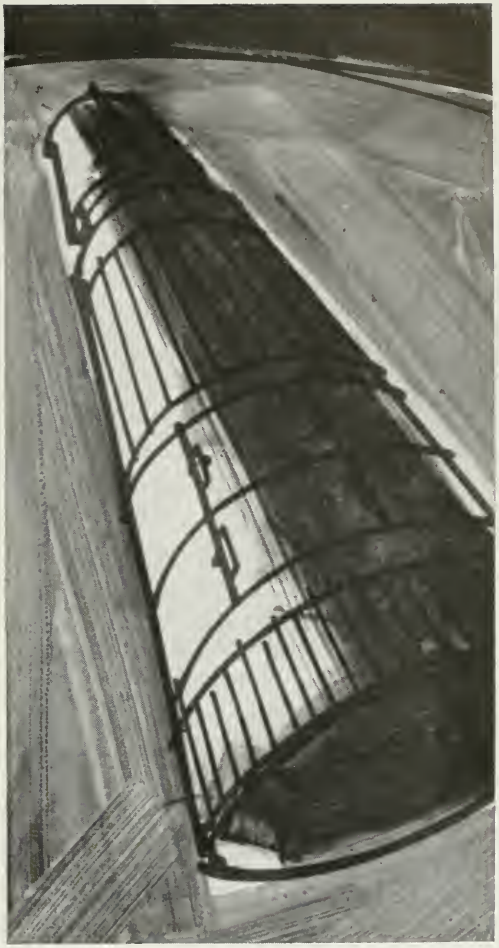
St. Pat's Ball Presents Ralph Marterie

The Illini Room on March 14 will be the site of this year's St. Pat's Ball, the annual social event sponsored by the students of the College of Engineering. Music will be provided by Ralph Marterie and his Marlboro Orchestra. Marterie's performance will feature his famous "Pretend," "Blue Mirage," and other million record sellers.

The program for the dance will include knighting of the Knights of St. Pat and the crowning of the St. Pat's Ball Queen. The knighting ceremony, although conducted in a light-hearted manner, is actually a distinct honor recognizing outstanding service in engineering activities.

The queen of the Ball will be chosen from the 5 semi-finalists early in the evening. Selection will be determined by vote of the students attending the Ball.

A few remaining tickets are available in the Illini Union box office. This year's Ball promises to be the best yet, so get your tickets now.



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MEET PLATO

by Gary Daymon

In the near future a number of U of I undergraduate engineering courses may be taught without an instructor. Little if any homework will be required, and students will be able to complete their courses in less time than by conventional instruction.

Meet PLATO. PLATO (Programmed Logic for Automatic Teaching Operations) is an ultra-modern computer-based teaching system designed and perfected by the Coordinated Science Laboratory (CSL) at the University of Illinois. Professor Donald Bitzer, director of the PLATO system, and other members of his group have defied many traditional rules in education to apply the science of learning to the art of teaching.

In fact, PLATO defies the most fixed and outmoded idea in education —the idea that a school should be built as a group of cells, each holding one teacher and 25-30 students; this idea dates back to a formula in the Babylonian Tamud in the third century AD when all instruction was done verbally.

To describe PLATO as a machine would not do justice to its superhuman teaching techniques. Actually, PLATO communicates quite intelligently with students, so let's let PLATO tell his own story.

"First of all I don't need to point out to the undergraduate engineer the many shortcomings of conventional classrooms. When you go to class, one of three things often happens: Your instructor merely duplicates the text on the board in a fashion even more boring than the text (you catch up on last night's sleep); your instructor fills five blackboards with strange formulas which you don't even know what the symbols stand for (first your mouth drops open and then your eyes drop shut); or your instructor is a fair chap, yet some 'know-it-all' on the front row keeps asking stupid questions and no one else can participate in the classroom discussion (you go home and complain to your roommate).

"The problem here is simple. Conventional university classrooms lack the necessary element of 'feedback' from student to teacher. An instructor doesn't know if you are absorbing what is being taught, nor do you know until that fatal hour exam. As a result, the most fundamental learning theory of psychology is violated: the more often a person is right and the quicker he knows it, the faster and better he learns.

"I use a combination of the latest learning theories of psychologists, including feedback, to provide a number of teaching advantages missing in today's classroom. For example, I work individually and independently with each student; I give you logically arranged information in tiny, easy-to-digest, bits of only a sentence or a short paragraph at a time; I ask questions and grade your answers immediately at each step along the way . . . i.e., immediate feedback; I answer your questions promptly, and I let bright students move ahead while I give slower students additional help. Above all, however, each student completing my course must know all the information presented; no one can get behind in the information learned, only in the length of time it takes.

"Grades? Funny you should ask, but I keep a thorough record of your every movement through my course. A human instructor can glance over your performance in moments, and if he likes, he can statistically analyze the job I am doing and improve my teaching as more data becomes available.

"Here, I'll show you how I am moving education into the twentieth century. I use one central high-speed general-purpose computer, my electronic brain, to individually instruct up to eight seperate courses with a total of from one to 1,000 students. My teaching capacity is limited only by the number of student stations constructed and the speed of my electronic brain. Right now I have only two student stations; however, 18 new stations are being constructed by CSL to duplicate a classroom situation.

"The photograph at the top of this page shows a typical two-student station. Each station consists of a keyset for the student to communicate with me and a TV set which displays my questions and words of wisdom plus the student's answers and other information from his keyset.

"The keys on the keyset (figure 1) are of two types, those used for inserting constructed responses to my questions and those used by the student to control his progress through the lesson material I make available to him. By using a supplementary keyset, or relabeling buttons on the main keyset, the student can use figures such as electronic circuit elements as well as numerals and letters. Consequently, when I teach courses such at network synthesis, the student can construct diagrams of electrical networks by pushing a sequence of buttons. Each student controls my presentation of the lesson material by using the 'logic' buttons on the right side of the main keyset. These buttons are labeled 'renew,' 'erase,' 'judge,' 'reverse,' 'help,' 'continue,' and 'aha'."

"Figure 2 shows the overall hookup for a typical two-station student setup. My computer controls two sources of information which are superimposed on the student's TV screen: a central slide selector and the student's electronic blackboard. All student stations share the same slide selector which consists of 122 slides containing the text material. Although my computer switches the slide selector from student to student, there is no noticeable delay on the student's TV screen because of the rapid access time of my computer.

"I have a separate electronic blackboard for each student. It is a write-read storage tube which portrays characters, diagrams, and figures from the computer. Also portrayed are the student's own answers to questions and other material which is generated in the course of the lesson and cannot be prestored on slides.

"Before I begin teaching a course, a human 'reads' in the proper program (teaching rules) into my central computer and inserts the correct slide bank into my slide selector; both processes take only a few seconds. I can, therefore, be prepared to teach a new course in seconds without any hardware changes whatsoever.

"A complete set of my teaching rules is referred to as a 'teaching logic.' So far, I have been programmed to teach by two types of teaching logic: a tutorial logic and an inquiry logic. In a class taught by the tutorial logic, I present facts and examples first and then ask questions covering the material. With the inquiry logic, I present general problems to the student and then he must use his own initiative to search for, request, and organize appropriate information to arrive at the correct answer.

"A study of the schematic of my tutorial teaching logic (figure 3) will illustrate the teaching sequence and general student-computer communication techniques I use. The main text sequence is designed for those bright students who can grasp the material fast. It contains logically arranged information on slides or 'pages' in tiny, easy-to-digest bits of only a sentence or a short paragraph at a time. Questions are also included; see figure 4. After studying a 'page,' the student

Figure 1. Students "type" their responses on a keyset to communicate with the central computer. A newer keyset will be in operation soon.

must correctly answer all of my questions to demonstrate that he is ready for the next text sequence. A student answers the questions by using his keyset and 'typing' out his answers which are written by the computer in the appropriate place on the student's TV screen.

"After submitting his answers the student then pushes the 'judge' button, and my electronic brain immediately grades and writes an OK or NO beside the student's answer on the TV screen as shown in figure 4. In this way the student knows immediately if he is right or wrong without my revealing the correct answer.

"If a student answers all questions correctly, he can go on to the next main text page by pushing the 'continue' key. In this way the bright student can move straight ahead.

"If, however, a student has not fully understood the main text and cannot correctly answer a question I have asked him, I give the student one of three choices: he can 'erase' his wrong answer and submit a new one for judging, 'reverse' the page to review previous pages which still contain his correct answers, or ask for 'help.' Trying to 'continue' without answering all questions on a page makes it necessary for me to ring a bell indicating a fault and to record a 'finger trouble' on the student's record.

"If the student asks me for help, I break the main sequence down into even smaller, easier-to-absorb bits with further pertinent textual material and additional questions designed to help him solve the main text question he could not answer. After he completes the help sequence, I return the

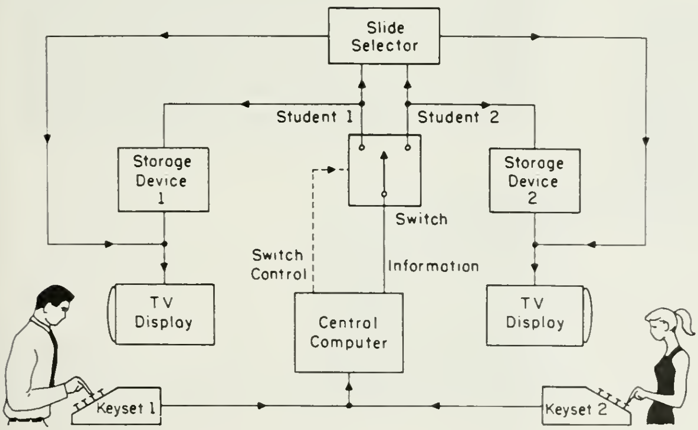


Figure 2. General organization of a typical two-station PLATO system. One central high-speed general purpose computer, the electronic brain, controls two sources of information, a central slide selector and the student's electronic blackboard. Although the computer is continuously switching from student to student, the computer's rapid access time eliminates any noticeable delay on each student's TV screen.

student to the main sequence and the question he could not previously answer. The student should then be prepared to answer the question correctly.

"If the student still cannot answer the question and asks for help again, I merely provide him with the correct answer to the problem and let him go on. At first I provided only one help sequence for each question, but improvements in programming for my lessons have been made, and several help sequences are available dependent upon the kind of mistake the student has made in answering a question.

"Some students push the help button, then half way through the help sequence they suddenly 'see the light.' In a case such as this, the student can press the 'aha' button to get back to the original question he could not answer in the main sequence. If the student was overconfident, however, and still cannot answer the question, another request for help will take him to his previous place in the help sequence where he broke off with an 'aha.'

"I use this feature to enable the student to progress with flexibility; he is not required to bore himself by going over material which he does not think he needs. I restrict the student's freedom only by not allowing him to go on until he has successfully solved all problems in the main sequence. This is what I meant by my earlier statement that everyone completing the course must know all of the information in my main course.

"While the tutorial logic serves extremely well for many purposes, I often find it desirable to turn over more control to the student and allow him to ask me questions also. I accomplish this with the inquiry teaching logic.

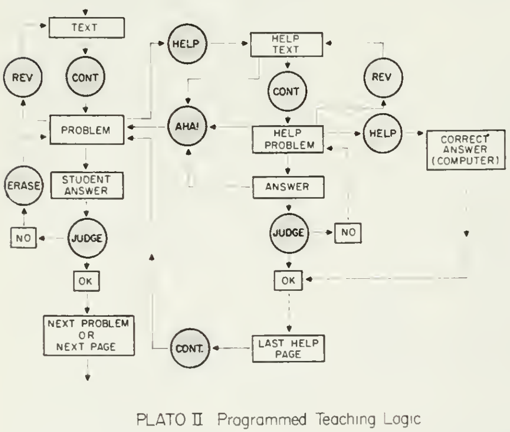
"With the inquiry logic I provide the student with a simulated laboratory situation where he can use his own initiative to construct and carry out proper experiments to answer the questions I ask. Here, the student exerts almost complete control over his movements through the lesson material.

"To get from any point in the program to a position in the laboratory setup, the student uses a button on his keyset labeled 'lab'; this button makes it possible for me to present the student with a complete choice of simulated laboratory situations from which he selects the proper one. The remaining buttons on the special keyset, which is the smaller keyset on the right in figure 2, are relabeled so the student can communicate his specifications to me for the experiment. As the student constructs an experiment, I normally draw the requested experiment on the student's blackboard and show the significant results.

"For example, look at a portion of my course designed to teach students about the density of materials and their buoyancy in liquids. Figure 5 shows one of a great many sequences of events that could occur while I am teaching with the inquiry logic. The student is free to select an object to be placed in a container filled with a liquid. The object and the liquid are chosen from a list I present on the student's TV screen. He can measure the volume of liquid displaced into the overflow container or determine the weight of the object suspended in the liquid.

"Included in the list of objects that can be weighed is the overflow can and its contents, thus allowing the student to use Archimedes' Principle. In the example shown in figure 5, the student is attempting to determine the density of a crown, one of the objects available in the simulated laboratory.

"The student initiated the experiment by pushing the 'lab' button. Then, by pushing the button labeled 'I' the student chose the crown which my electronic brain immediately drew on his electronic blackboard. Next, the student chose alcohol as the liquid in which the object was to be placed. I then drew the liquid levels in the overflow can and overflow container, printed the volume of overflow, and showed the position of the object in the liquid. Since the crown sank in the alcohol, the 45 cc of overflow volume represented the volume of the



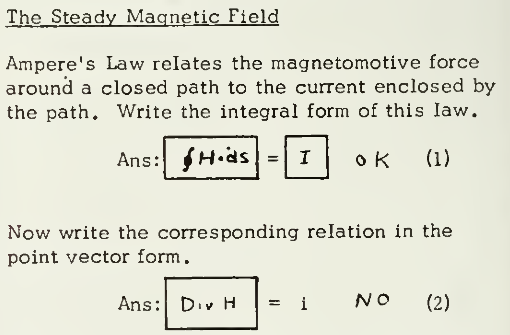


Figure 3. To the left is shown PLATO II's tutorial logic containing a main text sequence designed for bright students and a series of help sequences for those students who require assistance. Each student must know all the information presented; no one can get behind in the information learned, only in the length of time it takes.

Figure 4. Above. After studying a main text or help "page" on the TV screen, a student submits his answer and the computer immediately judges the answer.

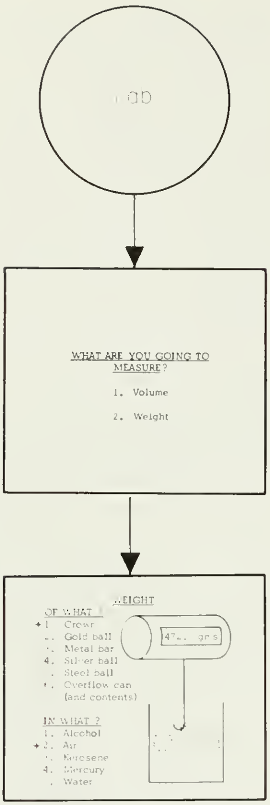


Figure 5. With the inquiry teaching logic, PLATO presents students with a simulated laboratory situation where the student can use his own initiative to construct and carry out proper experiments to answer the questions asked by PLATO.

crown. In a similar manner, the right-hand side of the figure illustrates the sequence of events that occurred when the student measured the weight of the crown in air. From the results of these two experiments the student was able to compute the density of the crown.

"As for the records I keep of a student's progress, they include the time it took him to perform each operation, the number of times he requested help, the number of times he asked for help—help when no help was available, and whether he studied the problem more or asked me to supply the answer.

"One copy of these records is immediately available in the form of a printed sheet for a human instructor. The records may be also stored on paper or magnetic tape for reinsertion into the computer so that the human preparer can at a later date analyze the difficulty of the main sequence, the effectiveness of the help sequence, or the inquiry sequence chosen.

"Unfortunately, many people (mostly those whom I have never taught) criticize me for creating conformity and killing creativity. True, literature, philosophy, and similar topics do not seem so readily adaptable to programming; however, there is no reason why I cannot teach virtually every factual subject and basic skill. To date I have been programmed for a variety of factual material from grade school subjects to technician courses to advanced college courses. More sophisticated programming for me will offer more opportunity for student creativity even within my system.

"Once a student learns the necessary facts and skills as quickly as possible, he is then free to do creative work. Certainly an undergraduate engineer who completes a year of network theory in two months has more time for creative work. And all studies and comparisons done by CSL indicate that I teach students faster than the conventional classroom. In addition, I can also take the trivia out of today's teaching, thus giving teachers more time and energy to give students individual attention, to encourage original thinking, and to keep themselves abreast of their field of interest.

"As shown by the laboratory example I used to illustrate my inquiry teaching logic, I can simulate on the student's TV screen a multitude of laboratory and similar situations. Don't misunderstand me, however, because I know that all kinds of laboratory experience should not be replaced by pushing buttons!

"In one study, nevertheless, an inquiry logic was prepared by CSL and I tested it on first-year student nurses. I presented the student with a hypothetical patient and allowed her to elicit information about him, experiment with treatments on him, and check the results of experiments in order to discover the proper treatment and nursing care. I'm proud to say I didn't lose a single patient! Results of the course showed that the post-test scores of the students were highly correlated to the number of experiments the student performed.

"One exceptional feature of my teaching system is the computational resources of a large-scale, fast, digital computer for large amounts of necessary but routine calculations required in many advanced engineering courses I will teach. When a student presses a "calculate" button on my keyset, my electronic brain could turn into a floating-point desk calculator. In some courses I may be able to offer a graphing feature in which I can draw a graph of the student's equations when he provides the necessary data. In addition, I can control movie projectors, tape recorders, or other special equipment through my 'special effects' switch.

". . . Oh, one last thing. The student can eat the apple for the teacher!"

And thus the computer-based teaching machine has broken a 500 year spell in education. Not since the textbook was made possible by the invention of moveable type 500 years ago has such a new teaching development of such significance emerged.

Although the research and development of PLATO has been quite expensive, computer-based teaching machines may someday become a standard item in every school; Professor Bitzer has estimated that a PLATO system with 1000 student stations would cost twenty cents per hour per student. One computer could control teaching machines in many schools at the same time and also be available to process administrative work and catalog and locate books in the school library during other parts of the 24 hour day!

PLATO is not a toy. It is a most promising solution to a problem created by a nation which is producing students faster than it is producing schoolrooms and qualified instructors. Those people who continue to oppose any form of science or technology in education should read Plato's Phaedrus where Socrates tells of an ancient Egyptian ruler who criticized the written alphabet, a technological invention of the time: ". . . For this invention will produce forgetfulness in the minds of those who learn through neglect of memory . . ." ♦♦♦


TELEPHONE MAN-OF-THE-MONTH

Semi-Conductor Lasers

by TOM GRANTHAM EE-LAS '67

In the three years since the first working model was constructed the laser has captured the imagination of several hundred industrial and educational research laboratories, including the University of Illinois' Electrical Engineering Research Laboratory.

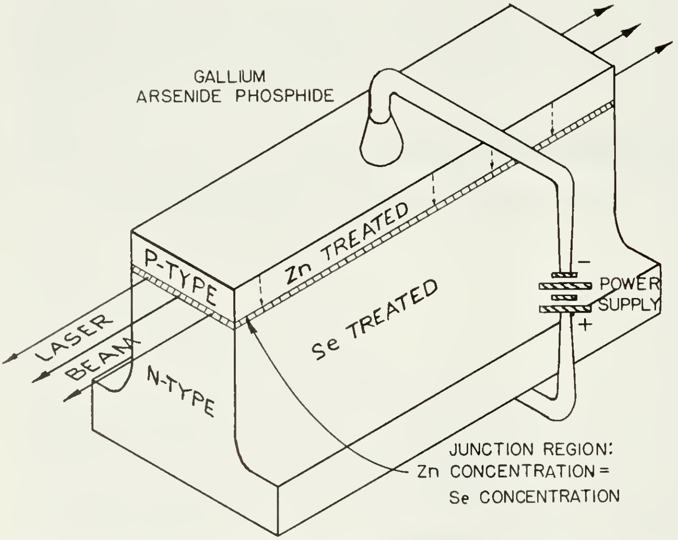
The laser (light amplification by stimulated emission of radiation) is a device for producing a powerful beam of light with waves that are monochromatic and coherent, that is, are all of the same wave length and are all in step, or lined up, crest to crest and trough to trough. This beam was first produced by energy in the form of photons of light emitted by electrons dropping to lower energy levels.

The best known laser device is the ruby crystal. A synthetic aluminum oxide rod containing .05% chromium and having partially silvered ends. In producing the beam of intense light the chromium atoms absorb light energy from a powerful flash tube coiled around the ruby rod. The light energy from the flash tube raises the atoms in the crystal to an excited state from which they drop to the ground state in two steps. Almost instantaneously, the atoms degenerate to the metastable state, releasing energy to the crystal lattice but emitting no light. The second drop, to the ground state, occurs haphazardly in the next few thousandths of a second.

If a photon of light collides with an electron in any energy state, the electron will either (1) give up energy to the photon or (2) absorb energy from it. If the electron happens to be in an "excited" state, it will be stimulated to give up energy to the photon, and if the electron is in a "relaxed" state, then it will absorb energy from the photon. It follows then that while in the metastable energy state, an atom in the crystal will emit a photon and fall to the ground state if it is hit by a photon from the flash tube. Of course an atom in the ground state also can be raised to the metastable state by the same sort of photon.

For laser action to occur, there must be more atoms in the upper state than in the lower in order for the emission of such photons to prevail over their absorption. Now, if a large number of atoms can somehow be activated into the higher energy level (metastable), then the first few photons haphazardly emitted will spring the trap door of the metastable stage, instantly releasing a tremendous number of photons, all of the same wave length and all in step. It is possible to excite more atoms into the metastable level by making the pumping light of the flash lamp stronger. The photons then emitted reflect back and forth between the ends of the ruby rod until the beam is powerful enough to suddenly flash out.

The ruby crystal was the first successful laser device, but since its discovery many more materials have been used to produce similar coherent beams of light. All laser materials must have an upper energy level into which atoms can be pumped and a lower level to which they will fall with the spontaneous emission of photons. More recent devices, include other solidionic lasers similar to the ruby, which are pumped by a flash lamp; noble gases, which are pumped by a gas discharge; and a new tube known as the semi-conductor P-N junction diode laser, which is pumped by a direct application of electric current.



To create P and N regions in a single crystal, the ends are given different chemical treatments. Zinc is allowed to diffuse into one end of the crystal, producing electron "vacancies" or "holes." Selenium forms electron dense molecules in the rest of the crystal.

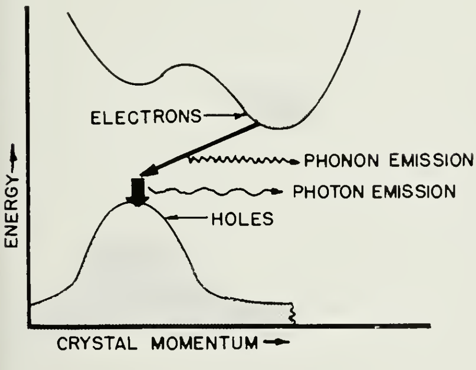
The semi-conductor laser differs from the ruby and noble gas type lasers in several respects other than the manner of pumping. This new laser device offers 10% to a possible 100% efficiency rather than the 1% efficiency characteristic of ruby and gas rods. The semi-conductor laser makes use of broad energy levels rather than sharply defined levels. The free electrons travel between levels rather than among the atoms.

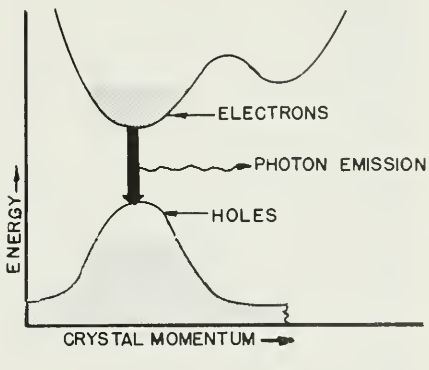
The P-N junction diode laser utilizes a semi-conductor crystal, such as gallium arsenide phosphide. The ends of the crystal are given different chemical treatments to create the P (positive) and N (negative) regions. The P region is formed by allowing zinc to diffuse into the crystal. The diffusion of the zinc into the crystal stops along a fairly well-defined surface. The rest of the crystal is treated with an element such as selenium. When the zinc combines with the molecules of the crystal, electron "vacancies" or "holes" are formed in these molecules. Selenium combines with the molecules of crystal to form electron "dense" molecules. These two different types of crystal molecules meet along the plane of the zinc diffusion.

If free electrons are fed into the N region, they travel to the junction of the bands and drop into the "holes" of the P region, emitting photons to produce the laser beam. Because very large numbers of excited electrons are produced when a current flows, only a small diode is needed, and because nearly all electrons shot across the junction contribute useful photons (resistance losses only), it is very efficient.

Professor Holonyak shows the laser device he invented to Tom Grantham, a sophomore in electrical engineering. The actual semiconductor crystal is smaller than the point of a pencil and must be examined through the microscope at the left.

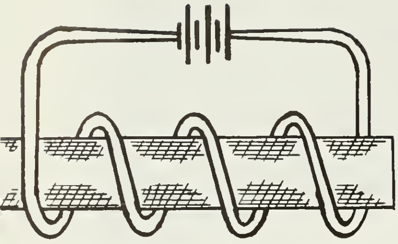
At the U of I, Professor Nick Holonyak, Jr. heads a group that is studying this semi-conductor type of laser. Professor Holonyak, a graduate (EE) of this university, developed the first junction diode to produce a visible laser beam while he was working at General Electric. Dr. Holonyak has produced a tiny semi-conductor device 1/100 inch long, 1/50 inch wide, and 1/100 inch high, which produces any wave length between 6400 and 8400 angstroms. It is very efficient, requires little equipment to operate, and changes operating current cycles at a much higher speed than previous lasers. In addition to his work, Dr. Holonyak is teaching a graduate course on the laser and hopes to be able to teach undergraduate courses in the coming semester.





In indirect-gap semiconductors (left diagram) electrons in the conduction band cannot recombine with holes in the valence band without first losing crystal momentum in the form of a phonon. In direct-gap materials (right diagram), holes and electrons can recombine directly, generally with the emission of a photon. Because direct recombination is more probable, direct-gap materials have received more attention than indirect-gap materials.


THERE WILL BE AN EAGLE
DEPENDABLE ENGINES



SPEAKING ON LIGHT

by ROGER JOHNSON, EE '66

A narrow beam of cool, intense light, emitted from a ruby crystal laser device, may soon become the medium by which many channels of information can be transmitted over great distances simultaneously. For example, it may be possible to transmit numerous telephone or television signals at the same time by using a light beam as a carrier.

A University of Illinois laser research group, under Professor D. F. Holshouser of the Department of Electrical Engineering, is conducting studies on modulation of light at microwave frequencies, that is, placing information on a light beam. The group is also concerned with the detection of microwave signals that have been placed upon such a beam.

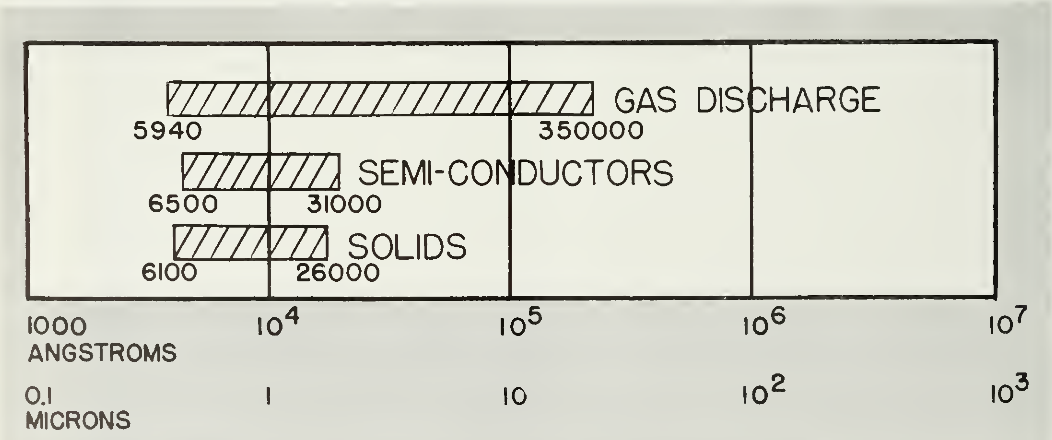
Coherent light can be directed to form a very intense beam which will diverge or scatter only slightly in traveling over large distances. For example, it has been estimated that a four inch lens used in conjunction with a laser could direct a detectable light signal to the moon.

Because of the low divergence property of laser light, such a beam would be especially applicable for carrying information in space communication or along enclosed light paths. It should be remembered, however, that such a light beam can still be reflected and refracted by clouds and fog. Bell Telephone is already considering future replacement of telephone lines with light networks.

The modulation of light at microwave frequencies is particularly desirable due to the large bandwidth capability of such a communications system. Electro-optic methods of modulating light at lower frequencies have existed for several years, but only recently have methods been devised for intensity modulation of light at microwave frequencies using the electro-optic intensity modulation Kerr and Peckel's effect. After extensive study of methods Professor D. F. Holshouser and Professor C. L. Gaddy have successfully modulated light with frequencies from 1000 megacycles to 1 gigacycle.

At the receiving end of such an optical communications link, a means must be provided for the detection of very low level light signals having modulation components over a large band in the microwave frequency range. For a detection scheme, Professors Gaddy and Holshouser have developed a photomultiplication system which acts as an amplifier for a photo-electron current produced by a modulated light beam and varying at microwave frequencies. This technique is called microwave frequency dynamic crossed-field photomultiplication.

These two distinguished U of I professors are continuing their research with the aims of improving existing techniques and equipment. ♦♦♦



Laser frequencies now extend from 5940 angstrom units in the yellow-orange range of the visable spectrum to 350,000 angstrom units in the infrared range. The chart above indicates the maximum and minimum frequencies produced by different types of lasers.

Technocutie

Miss Sheril Provines

Engineers, if you've been running around this campus with your head in logarithm tables, it's time you took notice and looked up. Up that is to Sheril. She's five feet ten inches tall and has been gracing our campus for two years. She's in Home Economics Retailing, and her major is engineers, especially tall blondes; she wants someone she can look straight in the eye about most matters. Asked about what she wants most out of life she replied, "A career of travel, money, and lots of excitement." Then she added with a twinkle in her eye, "and other things."

WPGU

Designed and built by electrical engineering students, WPGU is one of the best equipped radio stations in downstate Illinois.

by BILL LUECK

Before the end of this semester there may be a new sound on the air—the sound of WPGU-FM. Entering its eleventh year of broadcasting to the University Residence Halls on closed circuit AM, WPGU hopes now to expand its radio service to the entire University community and to the Champaign-Urbana area by establishing an FM station, capable of being received anywhere within a 30-40 mile radius.

What is WPGU? These are the call letters of one of the nation's largest, financially independent student-run radio stations. Called the "Student Voice of the University of Illinois," WPGU, operating on 640 kilocycles, provides continuous, round-the-clock radio entertainment to over 9,000 students living in more than 20 residence halls and one foundation dormitory, Newman Hall.

Broadcasting 24 hours a day, seven days a week while the University is in session, WPGU provides a well-balanced program of music, news, sports and special events. All managerial, technical, and operating personnel, over 180 in number, are enrolled as students at the University of Illinois.

Bill Lueck, sophomore in electrical engineering, places a tape on the large Ampex tape recorder used during unprogrammed broadcasting, for production work, and for recorded programs.

Extensive equipment, worth over $20,000, is now housed in modern facilities in the basement of Weston Hall. The station occupies ten rooms, including two fully equipped control rooms, an engineering workshop, two broadcast studios, an interview-taping studio, and a news preparation room containing a 24-hour teletype line from United Press International.

The record library, containing over 20,000 discs, is the largest in Illinois outside Chicago. Some records are received free from distributors, but the majority are purchased. Money for records, new equipment, including the FM installation, and for maintenance expenses is received from the sale of air time to local and national advertisers.

WPGU's Expansion

Strange as it may seem, WPGU has not always called Champaign-Urbana its home. The original equipment, some of which is still in use today, once functioned as part of a radio station in Galesburg, Illinois. During the time the University maintained a division at Galesburg, a student organization known as the Speech and Radio Club operated an intercollegiate broadcasting station known to its campus listeners as WINI. It used wireless equipment installed on the Galesburg campus by a Navy electronics unit.

In 1949, the apparatus was moved to Champaign and stored pending disposition.

In 1950, the Illini Publishing Company and the School of Journalism and Communications assumed supervision of the station, not yet known as WPGU and then operating on a rather irregular basis. University Trustees appropriated funds to purchase additional equipment for the new venture.

The station as it is known today got its start two years later when the University Housing Division agreed to take responsibility for overseeing the operation of the station by the student organization known as the Parade Ground Unit. The group incorporated its initials into the new call letters, and in the third week of December, 1953, WPGU was finally on the air for the first time with regularly scheduled programs.

The station's first home was one of the "temporary" wooden barracks type units, built in 1947 as part of an overall crash building program to accommodate the postwar college rush. One suite, consisting of four small rooms, was made available for radio station operation. Radio equipment occupied these quarters for twelve years. In 1961, WPGU moved into its permanent Weston Hall quarters.

At the present time WPGU broadcasts to the residence halls by an ingenious system called "carrier current" (closed circuit) transmission. Each hall complex is served by a low-power transmitter which feeds its signal directly into the power lines in the halls. Consequently, only radios in the halls themselves can receive the programs.

The residence hall system is served by eleven transmitters, each of which may be operated remotely from a panel in the main control room. Each transmitter is connected to the control room by a special telephone line. In normal operation, the program source, fed through the proper amplifiers, is applied to a splitter transformer which in turn sends an identical signal to each transmitter. Though normally each hall receives the same program, a special program may be sent to or received from each individual transmitter without affecting the others.

Many people have the idea that a radio station is a maze of strange devices and exotic circuitry. Actually the WPGU studios contain little more than a large number of switches and a set of amplifiers. An electrical engineer would have trouble finding a circuit even as exotic as an oscillator. Since the transmitters of WPGU are located outside the studios in the various residence halls, the main function of the studio equipment is to originate the program and amplify it a number of times before sending it to the transmitters.

Programming

All live shows are programmed and presented by student announcers. An announcer usually spends the same amount of time preparing a show as he does giving it on the air. Record requests are made out at least 24 hours before a show. The records are obtained shortly before the show, are played, and then are immediately returned to the library for further use.

The ten newscasts heard daily on WPGU are prepared and read by student newscasters. In this case there is a much higher ratio of preparation time to on the air time than with a musical show. From thirty minutes to an hour may be required for a five-minute newscast. A newscaster must select a well-balanced set of items, including all the important national, international, state, and local stories, as well as the weather.

Controlling every program put on the air, as well as many recorded and production features, is the broadcast engineer, who receives his instructions from the announcer. He is in charge of the technical end of the show, spinning the records, controlling the program source, maintaining constant volume level, and numerous other technical duties.

Many engineers are also on the technical staff. The technical department actually keeps the station running and on the air, building and servicing the transmitters and maintaining the control boards, tape recorders, and other equipment.

Management

The control of WPGU is divided into six departments: the Information Department, the Program Department, the Commercial Department, the Office Department, the Engineering Department, and the Finance Department. The directors of these six departments plus the station manager comprise the Managerial Council, which meets weekly to discuss problems relating to the operation of the station and to determine the policies of WPGU.

The *Information Department,* under the supervision of a director, is responsible for the preparation of all informational material, for the assignment of air time to department members, and for the quality of the material presented over the air. Students in this department have an opportunity to meet and interview personalities, to learn to speak extemporaneously, and to interpret and broadcast news copy.

The activities of the *Program Department* are guided by a director who supervises all programming of a noninformational nature, executes certain policy decisions on program material, and keeps constant check on program quality in conformance with FCC and NAB (National Association of Broadcasters) regulations.

The *Commercial Department* has a two-fold function: to obtain the necessary revenue for the operation of the station and to train student staff members in the commercial aspects of radio broadcasting. The commercial manager heads this department

Controlling the program, the engineer takes all his instructions from the announcer.

The *Office Department* handles all matters pertaining to publicity, personnel, and magnetic tapes.

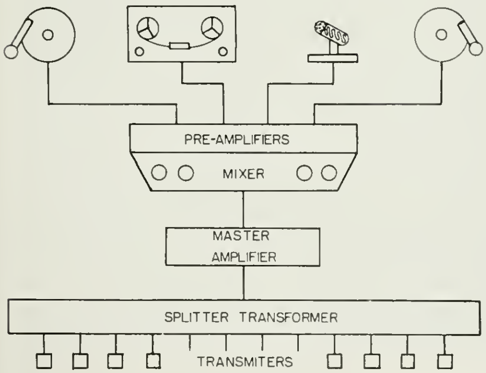
The *Engineering Department* has one main function: to provide the program and information departments with the necessary facilities with which to broadcast music, news, interviews, and special programs to the students living in University residence halls. The duties of the chief engineer include assembling a competent staff and, through his supervisors, constructing, maintaining, and operating the station equipment.

The *Finance Department,* headed by the treasurer, keeps all financial records for the station. He acts as financial advisor to WPGU's managerial council and as station business representative.

The organization and overall control of WPGU are the direct responsibility of the Station Manager. He must also decide on questions of policy, procedure, or rules arising between managerial Council meetings. In addition to presiding at these meetings, the station manager serves as the WPGU representative in all outside affairs.

Staffing

All departments at WPGU are always ready to accept new members. Absolutely no previous experience is necessary; WPGU will train students in their field of interest. Students interested in learning more about the station should stop in at the WPGU studios in the basement of Weston Hall, MRH, look around, and sign up if they wish. ♦♦♦



WPGU's system for broadcasting by remote, closed-circuit transmitters was designed by its own technical staff. The proposed FM transmitting antenna will be located on top of Weston Hall.

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Illini House

Needs Engineers

by BECKY BRYAR

To provide assistance and encouragement necessary to keep some primary and secondary school children in school, Illini House has been established. The House is actually five centers located in the Champaign-Urbana area and staffed by University students. While tutoring junior high and high school children who would ordinarily not go beyond secondary schooling, these University students provide an example of ambitious, conscientious young people who realize the need for continuing their education.

Sponsored by the Governor's Committee on Literacy and Learning, the local organization is part of a state-wide project in which ten Illinois colleges are presently participating.

Illini House has been operating for only a short time. Originally, two separate groups, the Men's Independent Association and Wesley Foundation, were working independently on similar projects. In the fall of 1962 the two groups decided to work together and the non-profit organization was given the title of Illini House, Inc.

At present about 120 college students spend one evening a week at the centers. These students provide tutoring especially in math and the sciences since these are the subjects now most needed on the high school level. Engineering students are particularly qualified because of the many courses they have taken in these fields. Five of our engineering students now helping in the project are Richard Heidenrich, Ceramic Eng.; Jim Buckingham, M.E.; Joe Salah, E.E.; Ian B. Thomas, E.E. (Ph.D. candidate); and J. Carl Tompson, C.E. Though some engineers are participating in the project, far more students with technical training are needed.

The job is glamorous (The centers are located in two schools, two fire stations, and a community center), exciting (What could be more exciting than a fire station?), and rewarding (There is no draft; participation is voluntary). So far, the results of the project have been promising. Several high school drop-outs have returned to school and will continue their education; many have been encouraged to work harder.

At present, student organizations have donated about $700 to Illini House, and this money will be used to provide financial assistance to students wishing further education or training. Of course any donations will be gratefully accepted.

Any students interested in Illini House are urged to contact Dean Hatch at 333-0480 for further information on the project. ♦♦♦

ENGINEERING ACTIVITIES CALENDAR

Professional societies, engineering honoraries, and any other engineering activities desiring publicity should notify Technograph, *room 48 EEB. A list of activities should be submitted one month prior to our publication date which is the twelfth of each month.*

SOCIETY	MEETING	LOCATION	AGENDA
Institute of Electrical and Electronic Engineers (IEEE)	Wed., March 25 7:30 P.M.	151 EEB	Mr. Harry Dwon from American Power Service Corp. in New York will speak on "Is There Anything New in Power Engineering?"
	Wed., April 15 7:30 P.M.	151 EEB	Mr. L. R. Nuss from Collins Radio Company, Cedar Rapids, Iowa, will speak on "What Does Industry Expect of a Young Engineer?"
American Society of Civil Engineers (ISCE)	Tues., April 14 7:30 P.M.	314 S I.U.	Joint meeting with Central Section of ASCE. Representation of Associate Membership awards to outstanding civil engineering graduates. Dean Everitt will speak on "Engineering—A Learning Profession." Dinner at 6:30 P.M. in 314n, Illini Union. Student Chapter members may obtain dinner at reduced prices.
Electrical Engineering	April		Senior Banquet. More information to come later.

ME Freshmen and Sophomores PI TAU SIGMA, ME Honorary Engineering fraternity is offering a free tutoring service. For an appointment or further information call 333-0755 or visit room 143 MEB.

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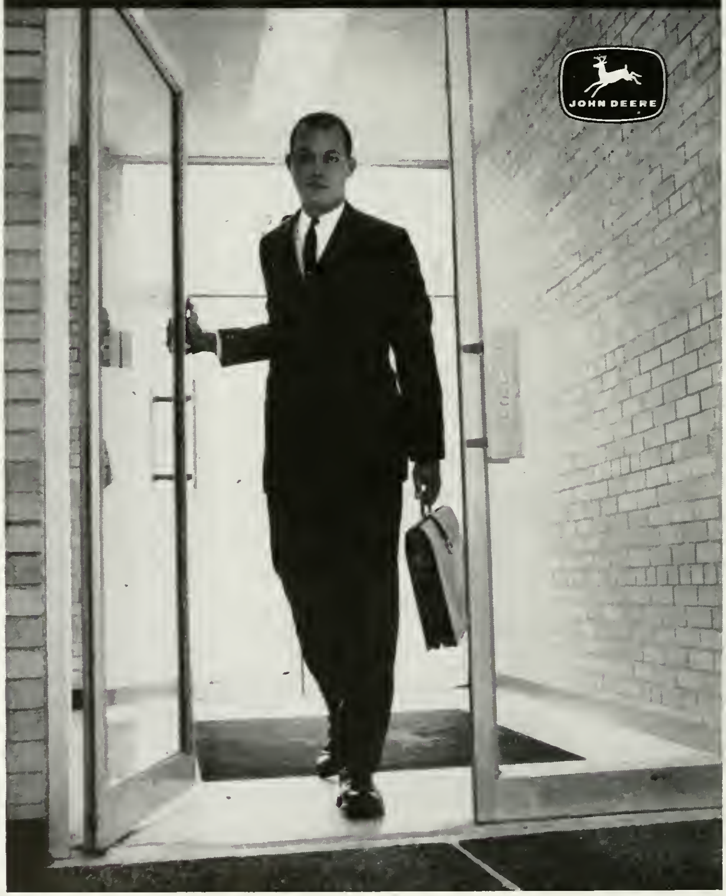


Alumnus:

Lyle E. Schaffer

Mr. Schaffer is in charge of purchasing and traffic for Pan American Oil Company, a western subsidiary of Standard Oil. A 1941 graduate, his career began as design engineer for Standard, and has included some surprisingly varied projects.

This is not his first appearance between Technograph's *covers. Some of you* still *stuck in Rhetoric 200 may recall that Mr. Schaffer was once this magazine's Technical Editor.*

This time he discusses his career and offers some familiar but nonetheless worthwhile advice. RB

The first two projects assigned to me as a neophyte engineer involved structural steel design and reinforced concrete. That was when I found out you couldn't stop studying just because you were out of school. I had to learn fast, with some help and tutoring, admittedly, in such things as moment distribution which I had hardly even heard of up to then. Fortunately, the structures didn't collapse, and I have continued to work for the same company and its subsidiaries.

During World War II our refinery at Whiting, Indiana, was the site of one phase of the Manhattan project. I served as one of the three engineers assigned full time to this part of the atomic bomb development, finding it fascinating and frustrating trying to deal with new problems and materials which had never been dealt with before.

Since I am now in charge of purchasing and traffic for Pan American, Standard's exploration and producing subsidiary in Tulsa, I shall have to confess that after some interesting years in engineering, I have joined fellow engineers who have wandered from the path and turned to other specialized work wherein my prior training and experience is, nonetheless, of value. Dealing with the many facets of administration and organization, I still had to keep learning. I received a lot of assistance in this when the Company sent me to M.I.T.'s Senior Executives' Program. Those courses helped me fill in some gaps of which administrative jobs had made me aware; I had studied a lot at Illinois about stress and strain on metals, but not on people. The director of the M.I.T. program phrased the objective in part "to humanize the scientist"—a very important job.

Like any red-blooded American alumnus, I cannot resist the opportunity to generalize from my experience in giving advice to present-day students. I would suggest that the engineering student should try to set his sights and curriculum on as broad a basis as possible, taking as many electives as he can outside his direct field in business and social sciences and humanities. The top executive of a major oil company recently remarked that the number of professional and managerial people in his organization had increased thirty percent in the last decade, and that forty-five percent of these were originally trained in one of the engineering disciplines. These people need some acquaintance with fields such as business administration, economics, accounting, etc. This, to me, emphasizes the need for the student to receive a truly liberal education. In the eloquent words of John Henry Cardinal Newman taken from "The Idea of a University," "A liberal education is the education which gives a man a clear, conscious view of his own opinions and judgments, a truth in developing them, an eloquence in expressing them, and a force in urging them. It teaches him to see things as they are, to go right to the point, to disentangle a skein of thought, to detect what is sophistical, and to discard what is irrelevant. It prepares him to fill any post with credit, and to master any subject with facility."

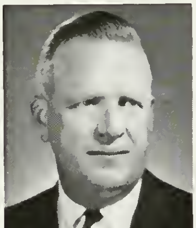
THESE GRADUATES THRIVE ON CREATIVE CHALLENGES...THEY'

PROJECT MANAGEMENT
V. H. Simson
Iowa State University—BSEE—1948

MANUFACTURING ENGINEERING
R. A. Busby
University of Michigan—BSME—1952

DEVELOPMENT ENGINEERING
R. P. Potter
University of Illinois—BSME—1959

There's an exciting challenge ahead for yo



K. M. Nelson, Manager—Industrial Control Sales, discusses the functioning of Cutler-Hammer's automation teams, and how creative graduates contribute to pioneering developments.

For over sixty years Cutler-Hammer has been a key contributor in planning automatic systems—now called automation.

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How do they meet this challenge? By working with customer engineers and consultants to isolate cost problems in manufacturing and warehousing operations. Then, by applying their individual disciplines and creative ingenuity to build common-

STUDENT RATINGS

by H. L. WAKELAND, Assistant Dean of the College of Engineering

A little over a year ago, I wrote briefly in the Technograph (October, 1962 issue) about the personal ratings made on engineering students by staff members. This brief article brought a number of comments from students indicating that they viewed the practice with different emotions—surprise—suspicion—approval—and from a few, a feeling that their personal rights were being trifled with.

However, the most alarming fact apparently was that engineering undergraduates simply did not realize this procedure existed. At the expense of risking some repetition, it seems wise to review the procedure since the College never intended it to be conducted in secret or to be surrounded by suspicion. In addition, forewarned could be considered as forearmed.

Each year the staff members in the College of Engineering are requested to submit personal rating on each of the upper class undergraduates they have in classes. Specifically, the ratings include a ranking on each of the following traits and any other pertinent comments.

personality	cooperation
judgment	appearance
industry	self-control
initiative	leadership

The ratings are made on an A, B, C, D, E scale and a composite of all the ratings given by various instructors are combined to provide an average rating. The results become a part of the student's college record in the Associate Dean's Office and are on file in the Placement Office but are not recorded on transcripts or any other official University records. They are generally available to prospective employers but are not otherwise available. The student, of course, may see the composite ratings at any time.

Some students feel that the College has no right to perform this function as personal characteristics are not an outgrowth of the training they have received in the classroom. It is true that personal characteristics are affected more by a person's childhood environment, housing conditions, religious beliefs and student activities rather than by classroom activities, but this doesn't abrogate the school's responsibility to witness and record the student's attitude and personal habits.

The greatest single reason for persons being fired from their jobs is the lack of personal traits or characteristics as opposed to lack of physical or mental ability. If you cannot work harmoniously with others—if you can not cooperate effectively—if you fail to use judgment—if you lack initiative or perseverance—whatever mental capability you may have could be useless to your employer.

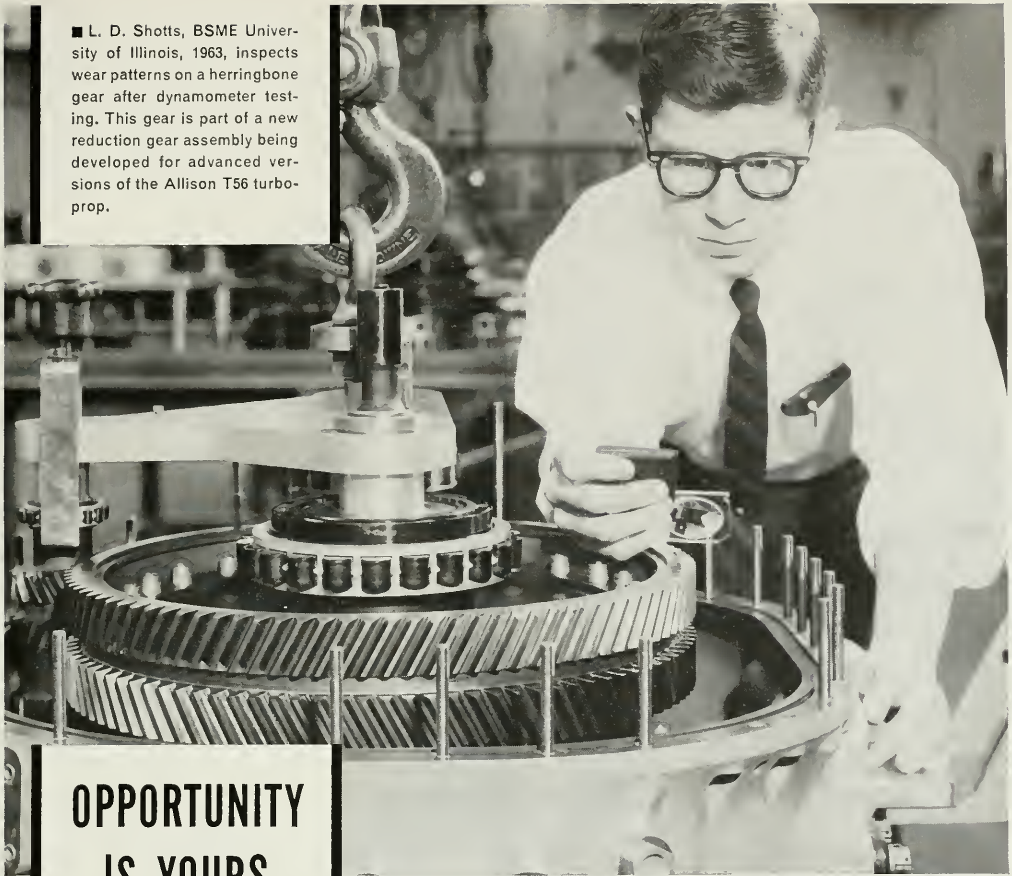
The College of Engineering is not interested in producing "educated knuckleheads," persons who have the sole ability of manipulating facts and figures without regard to sociological or economic consequences. Rather we strive to produce a wholly educated person, though we are the first to realize that time and facilities do not allow us to fully obtain this goal. The engineer's literary skills are as important as the mechanism he may design and his personal characteristics as important as his mental capabilities.

Though we do not specifically attempt to mold a student's personal characteristics, they are changed considerably through day to day class work and campus living. If an accurate method could be found to measure the effect a student's desirable traits have on his college grades, I suspect the correlation would be rather high. Your appearance and manner in class each day cannot help but be subconsciously recorded in your instructor's grade book.

In short, a person having desirable personal characteristics will be more successful as a professional engineer than another person having equal ability but lacking personal qualities. It is then natural that any prospective employer considers a judgment of a student's personal characteristics to be as important as his academic record.

The College considers the personal rating system to be a service to the students rather than to the prospective employer. If an employer asks for such information, he receives a positive and immediate reply which is far better than a reply of "I don't know." If the employer can contact each of the instructors you had in class he would receive the same information, but this is sometimes impossible. Two or three years after you leave school, several of the instructors you have had will no longer be staff members. In addition, such exhaustive efforts become very frustrating and time consuming to the employer and could actually be detrimental to you if he can readily obtain the information on several graduates from other schools whose applications he is considering along with yours.

If a student has a personal weakness, it is far better for the employer to know in advance for the benefit of both concerned. Efforts can be made to either strengthen the area of weakness or employ the student in an area where the weakness may not be critical. Remember, in view of the fact that you probably will not earn your own way for three to five years, the employer is as interested in your progress and retention as you are. ♦♦♦



THE FACULTY

Recently elected president of the Wenner-Gren Foundation for Anthropological Research is **Professor Heinz von Foerster**, widely-known for his work in electronics and cybernetics.

The foundation, established in 1941 by the late Axel L. Wenner-Gren, Swedish industrialist and philanthropist, supports research in all branches of anthropology and is noted for its interdisciplinary approach to the sciences of man. One of its grants which has had world-wide impact was for development of radio-carbon dating for archeology.

Von Foerster was born in 1911 in Vienna, Austria, studied philosophy and experimental physics in Vienna, Berlin and Breslau, and worked with industrial research laboratories in Cologne, Berlin and Liegnitz. He came to the University of Illinois in 1949.

As professor of electrical engineering he directed the Electron Tube Research Laboratory and in 1957 established the Biological Computer Laboratory where he directs research on problems of artificial intelligence, automat theory, mathematical biology, sensory prostheses for deaf and blind, and systems with mind-like behavior.

His recent publications deal with homeostasis, self-organizing systems, structure and function of nerve nets, and dynamics of cellular and human populations.

Since 1962 he has been a professor in both the department of electrical engineering and the department of physiology and biophysics.

He is consultant to National Institutes of Health, Brookhaven National Laboratory, U. S. Air Force Office of Scientific Research, and Aero-Medical Research Division of Wright Patterson Air Force Base.

* * *

A rocky gorge, accessible only by native dugout canoes, has been chosen as the site of a 400 ft. high irrigation and power dam to be built on the island of Panay in the Philippines. **Dr. Don U. Deere**, professor of civil engineering and of geology, and **Dr. Ralph B. Peck**, professor of foundation engineering, are consultants on the project, which will permit two annual rice crops instead of one in a very fertile area.

* * *

At the 33rd annual meeting of the American Association of Physics Teachers, the Distinguished Service Citation was conferred on **Professor Robert Hulsizer**, department of physics.

The citation given Professor Hulsizer, who has been at Illinois since 1947, praised him as "stimulating teacher, gifted researcher, competent physicist, and capable leader." Specific accomplishments included in the citation were, among others, his development of physics curricula for students in the liberal arts college, his service in the development of a teachers guide and an outstanding film on the Rutherford atom, his role in the development of the physics part of the Graduate Record Examination, and his contributions to conferences concerned with the improvement of physics teaching.

* * *

For the third year in a row the American Society of Civil Engineers has recognized the University of Illinois Civil Engineering Department with multiple awards for its research work. Research Prizes have been awarded to **Dr. Mete A. Sozen**, professor, and **Dr. Houssam M. Karara**, associate professor.

Dr. Sozen, on the civil engineering faculty since 1953, was awarded the Research Prize in recognition of "an outstanding contribution to the knowledge of the strength and behavior of prestressed concrete members."

Dr. Karara was recommended for a Research Prize in recognition of "an outstanding contribution to the knowledge of aerotriangulation and photogrammetric engineering."

Both Sozen and Karara received A. Epstein Memorial Awards for faculty achievement in 1961.

* * *

Dr. Bernard I. Spinrad, senior physicist in the reactor physics division of Argonne National Laboratory, is serving as a visiting professor of nuclear engineering this semester. He will teach a course in nuclear space propulsion, advise students on thesis topics, and work with the staff on program development in thermonuclear and nuclear space areas.

His reputation is international. He is chairman of the European-American Committee on Reactor Physics, and in 1955 and 1958 was consultant to the United States delegations at the Geneva conferences on peaceful use of atomic energy.

* * *

The world's largest betatron "atom smasher," 340 million-electron-volts, went into operation in 1950 on the University of Illinois engineering campus. With this betatron flaws 1/16th of an inch deep and as narrow as 5/1000-inch can be seen in metal twenty inches thick.

BRICKBATS 'n' *Bouquets*

To the Editor:

After reading the article in the February issue on the history of Talbot Laboratory and materials research at the U of I, a question occurred to me.

With over 20 engineering buildings north of Green Street, why is only one—Talbot Laboratory—named after a noted U of I engineering faculty member? Is it because we do not have or have not had any other faculty members worthy of this honor?

Are honorable names reserved for buildings south of Green? The names Lincoln Hall, Gregory Hall, David Kinley Hall, Bevier Hall, Altgeld Hall, Burrill Hall, Smith Music Hall, Mumford Hall, and even McKinley Hospital give the campus a distinctly personal atmosphere.

I believe the engineering college has had many notable faculty members worthy of such a distinction. As new engineering buildings such as physics and civil engineering go up, why not consider naming them for men such as Bardeen, Seitz, and Newmark?

Harry Gaertner

We agree with your suggestion to consider noted faculty members as possible names for our new engineering buildings. Certainly Bardeen or Seitz Hall has more asthetic appeal than Physics Building. In reference to south of Green, however, it must be recognized that many of their buildings were named after noted people other than faculty members. Perhaps that would also be another consideration. *Ed.*

To the Editor:

The suggestion put forth in last month's editorial (*Who's Up Front*) is a terrific idea! For a long time undergraduate engineers at the U of I have needed an authentic way to find out about their faculty's achievements and background.

I never really thought about the problem until I was interviewing for a job last week. (I'll graduate in CE this June.) I was delighted when one of my interviewers mentioned several top faculty members in the CE Department—men I had had as instructors. Unfortunately, I felt like a moron when I suddenly realized that I didn't know these men had participated and were still actively participating in a number of the nation's top construction and research projects. The interviewer mentioned several projects which I had never once heard my instructors or anyone else mention in connection with the U of I.

It is, of course, too late to improve my attitude toward my instructors, yet I can easily imagine the increased enthusiasm I would have had toward my courses had I only realized the significance of my instructor's training, background, and prominence in their field. It would be nice if other undergraduates could capture this enthusiasm early in their college career.

Richard Barton

WE MAKE INDUSTRIAL ENGINEERS SWEAT

Might as well scare off the ones who wouldn't like it. Some of the unscared will in a few years be referred to as "they" when people say, "At Eastman Kodak, *they* can afford to do it this way—"

The reason we can afford to do things the best way is that we are successful. The success can be attributed in part to a fear worth fearing: of failing to deliver the best possible performance that the customer's hard-won dollar can buy.

Sheer devotion on the part of the work force, though beautiful to see, will not of itself deliver the goods. Somebody must first come up with a sensible answer to the question, "Exactly what is it you want me to do, mister?"

Thus a young industrial engineer may find himself acting as his own first subject in a study he has set up to find the physical and psychological conditions that best favor alertness against film emulsion defects. If he saw the need, sold his boss on his approach, and has earned the approbation alike of the pretty psychologist who will be running the experiment, the industrial physicians (who study what is humanly possible, feasible, and healthful muscularly and perceptually), the cold-eyed man from the comptroller's office, the Testing Division chief (who has dedicated his division to the descent of an asymptote), and the inspectors (who will find a month after switching to the new method that at home they are shouting at their kids less often)—then we know ways to make him glad he chose to learn the profession of industrial engineering at the company which the leaders of the profession often cite as its ideal home.

Naturally, industrial engineers aren't the only technical people we seek. Not by a long shot.

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