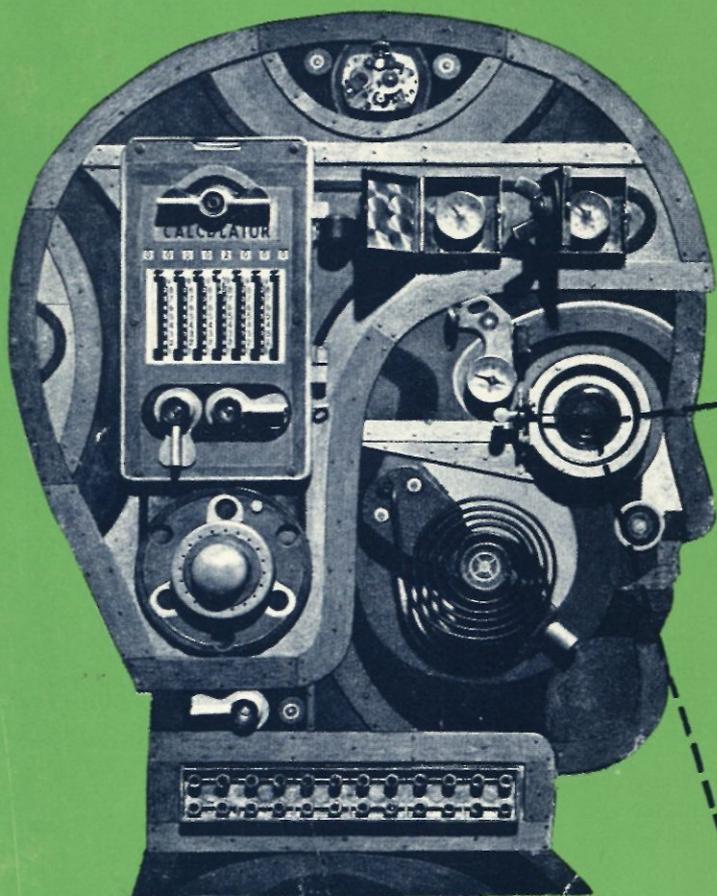
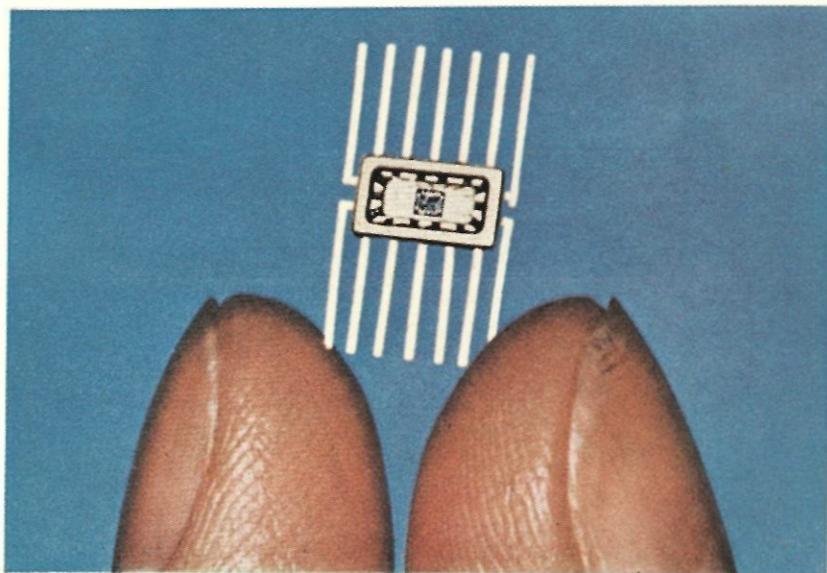


THE COLORADO ENGINEER

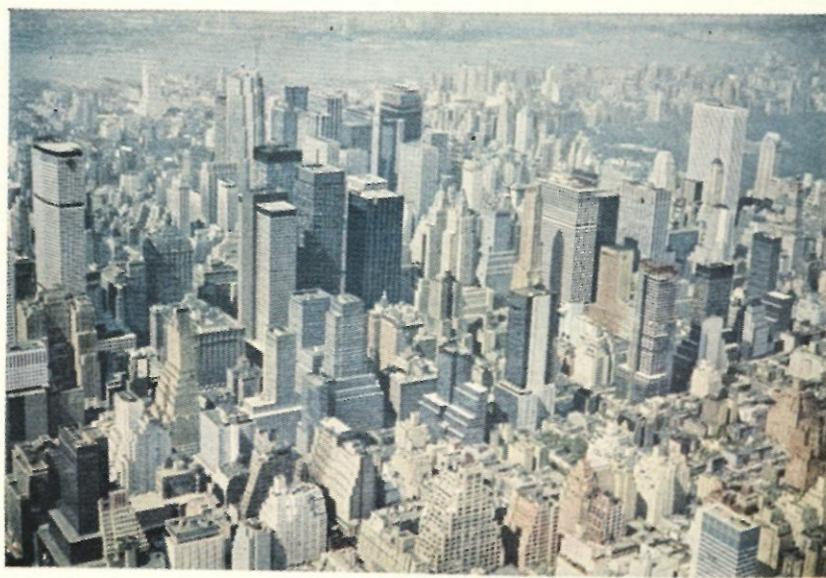


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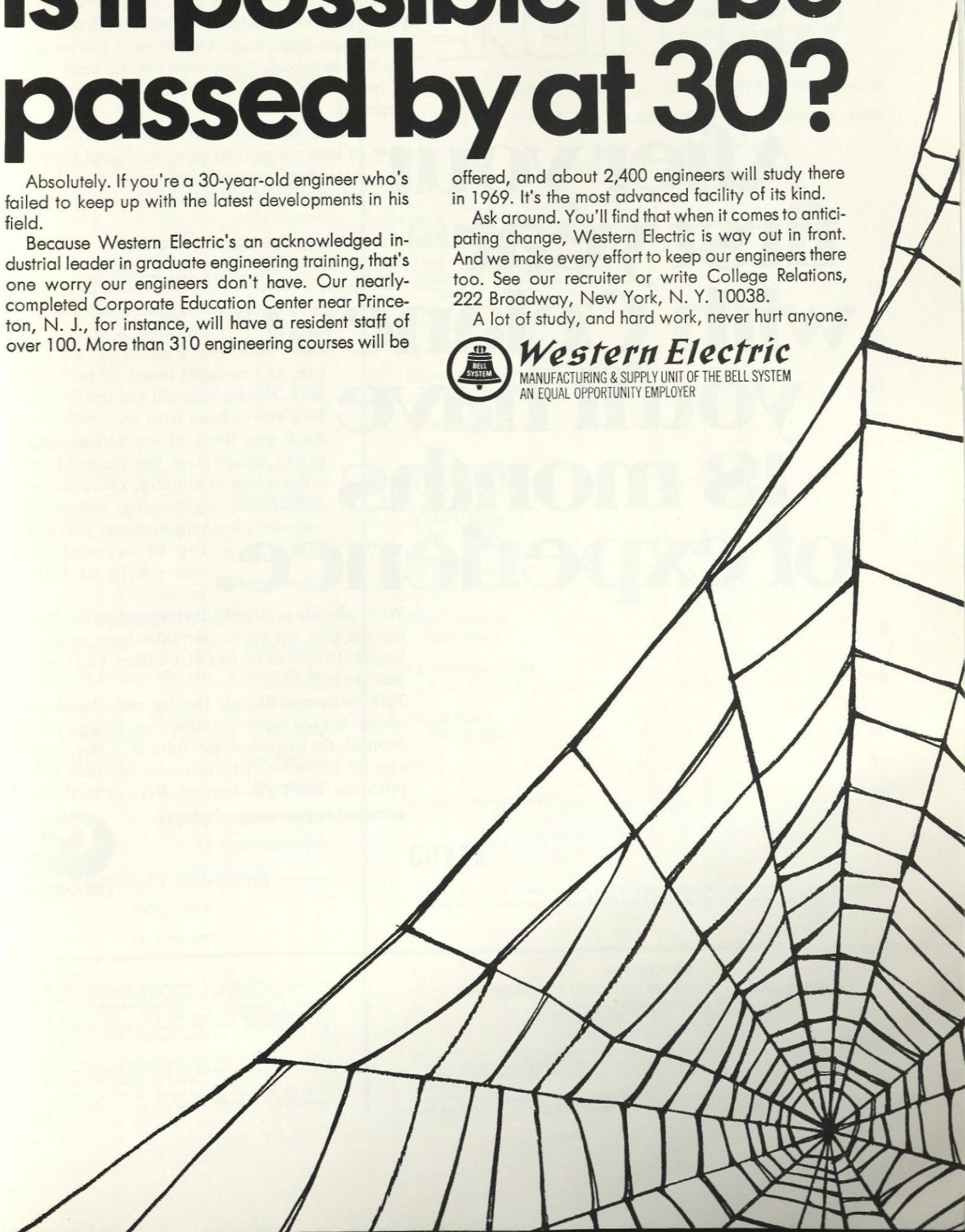
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The needs are obviously immediate and urgent. And Anaconda is growing and diversifying here at home, in Latin America and Canada. In as many ways as we know how to provide these basic building blocks on which our economy grows. In ways we like to think make us one of the great natural resources of the Americas.

But metals alone don't make the company that mines and fabricates them a great natural resource.

What does it is people. And the skill, imagination, and determination they bring to their work.

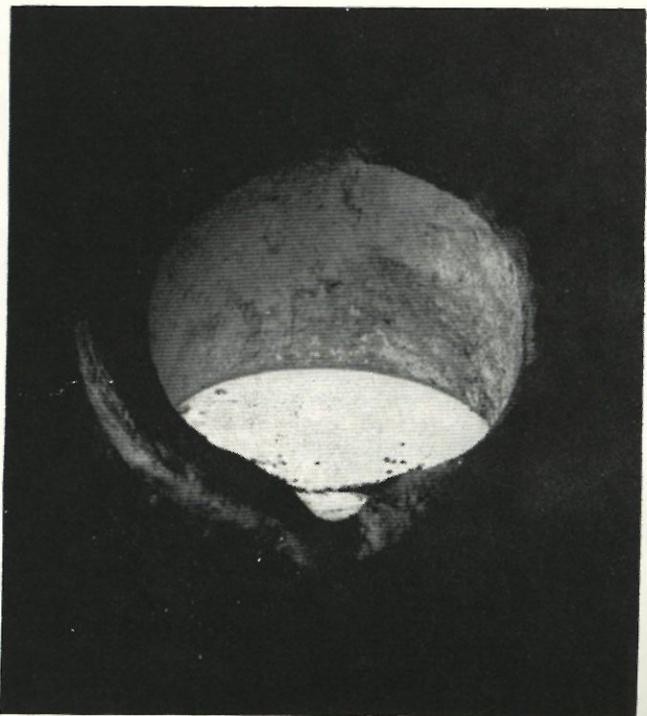
Without these qualities, metal lies hidden, useless. And can never reach the potential necessary if we are to answer these problems at all.

That is why Anaconda has a commitment. To back the creative energies of our human resources with our faith in the future, and our money, to meet the growing needs for metals.

In the last 10 years we invested \$750,000,000 for new plants and equipment. There will be another \$650,000,000 in 1968-1972. Plus, we have research on a global scale. A whole new western exploration headquarters in Salt Lake City, and an extractive metallurgical research laboratory in Tucson. Staffed with specialized scientists, geophysicists, metallurgists, mining engineers and other highly trained individuals. This is the kind of backing we give to our people.

And the people we need are numerous. Teams of earth scientists, metallurgists, mining engineers. Fabricating, marketing and financial specialists. All the sort of dedicated people that know their work is vital and important.

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ECMA Comments

"We think that the ENGINEER should be something to get excited about. Well maybe not exactly excited, but at least the Magazine should be an integral part of an undergraduate engineer's four year life at Villanova. The fact remains that at present, it isn't.

The Villanova Engineer, Oct 1968

"Pressure on the individual comes not only from business but from all organizations including government. Organizational control cannot come from outside the organization. Rather, there is an increasing responsibility placed upon the people entering the organization to be well rounded individuals who will not become dominated by it.

Manhattan College Engineer, Oct 1968

"For all undergraduates let this selection of future goals be a matter of concern and importance. . .The university will provide us with the means of attainment. But the ambition and drive is a personal matter. It is difficult enough to attain a goal which one desires. A goal not well chosen will prove impossible to attain or unsatisfying when attained. Choose well!!

Kansas State Engineer Feb 1968

"Machines should work. People should be free to enjoy living.' I would advocate this as the social imperative of Engineers for our times."

California Engineer, Oct 1968

"Each year we see able students fail in their academic programs because they put too much time into extracurricular activities or attempt to engage in too many activities. At the same time, we see other students who fail to take proper advantage of the opportunities afforded here for self development through activities. The problem always is that of making the correct decisions and of scheduling one's time properly."

Iowa Engineer, Oct 1968

"There is nothing wrong with a person avoiding military service, as long as he does not support the pressing of others. But to agree with injustice as long as it doesn't effect you is the cheapest form of hypocrisy."

The Polytechnic Engineer, April 1968

"Immediately the need for a greater breadth in engineering education in the future becomes apparent. This breadth, while important so that engineering graduates can assume their role as college-educated citizens in our society, is equally important for the engineer to properly perform his duties."

The Florida Engineer, Oct 1968

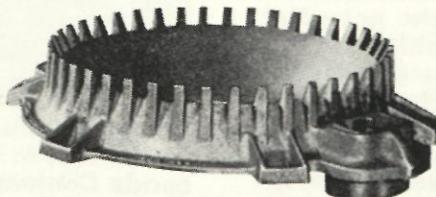
FREEDOM OF SHAPE...

One of the outstanding advantages of Malleable Iron Castings

Casting is the simplest and most direct way of creating form and shape with metal. Casting offers almost unlimited freedom to the designer. A cast design is not restricted by sizes or shapes of mill stock, accessibility of tools, withdrawal allowances for dies, or other limitations. Complex shapes, interior cavities, and streamlined contours, which would be difficult or impossible to create with other methods, are simple with a casting.

For instance, consider the complexity of creating the dozens of teeth, lugs, holes and collars on this pipe repair clamp. It

would be prohibitively expensive to produce by any method other than casting. By using the casting process for economy,

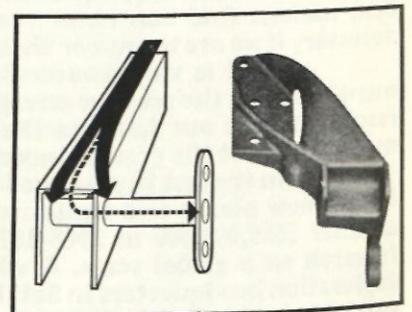


and Malleable iron for strength and ductility, these clamps combine service and value.

The design freedom made possible by

casting also helps to make parts stronger. Metal components tolerate loads better if they are designed to distribute stresses efficiently. Sharp corners or other abrupt sectional changes tend to restrict the uniform distribution of these stresses. The corner thus becomes a logical site of fatigue failure. In a casting, it is a simple matter to round out corners, blend sections and taper connecting members to achieve a design which will distribute stresses.

The illustration shows how stresses "set up" at sharp corners. A much smoother transfer of stresses was achieved when this part was switched to a Malleable casting (shown on the right).



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LET'S BE CONSISTENT

EDITORIAL

It's amazing how certain people can sometimes put on such an infallible air of open-mindedness and knowing wisdom in this great "marketplace of ideas", dear old C.U. Ah yes, freed from the repressive drudgery of the struggle for economic security, we, the younger generation, are developing new insights into the configuration of the utopia that could be so easily implemented, if only everyone else also knew where it's at.

Many of us proclaim an inherent fallacy in the concept of a structured, dogmatic approach toward passing judgement on the words and actions of people. Pope Paul's decree on artificial birth control, for example, is the type of event that is to be seriously questioned.

While this idea of considering each situation as a separate entity is to be applauded, people who preach it should be careful not to violate its principles. Specifically, certain members of the editorial board of the *Colorado Daily*, on December 13, denounced Richard Nixon's choices for his Cabinet, claiming them to be "rubber-stamp yes-men". The fact is, these men have not yet had a chance to demonstrate their ability to perform in their new positions. Yet they have, as a collective group, been judged unworthy of their appointments.

In another editorial on December 11, the *Daily* criticized the majority of the students at this University for not having attended the December meeting of the Student Assembly, accusing them of complacency and of obsession with petty, selfish affairs. While this indictment may indeed be accurate in many cases, there probably are many students with a different set of priorities as to what use they should make of their time on weekday nights. To be sure, there is a lot to be said about the power of the Assembly to effect necessary change in the University. Perhaps more students should go to the meetings, especially if they disagree with the way the meetings are being conducted. But a person cannot be called complacent for doing something more meaningful to himself because somebody else thinks it shouldn't be that way.

In the same vein, the *Daily* is not hereby being judged to be totally off the track. Much clear thinking comes off its presses. But its members should be more consistent with their own principles.

Clint Davis

You might not be aware that this is a magazine which expresses ideas of today's engineering students. It can't be purely technical nor wholly editorial. Every engineer, with whom I've talked, is unhappy with some facet of engineering education or the profession itself; yet none of these people are willing to take the time to think about improving its present status. If you are dissatisfied with what is around you, sit down and write an editorial for the *Colorado Engineer*.

As a last resort, just think about the role of a student-run magazine in an engineering school; then, come in and talk to us. We might put you to writing about current engineering problems.

Randy Lorange



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FIRST HONORS INSTITUTE

My thanks to Dean Peters and Editor Randy Lorange for the opportunity to again report on the activities of my office. These can be quickly summarized by saying: "We continue to place emphasis on programs to stimulate interest in engineering careers in our high schools...we continue to work closely with industry in developing programs of continuing engineering education and the promotion of good relations...and last, but certainly not least, we dedicate much of our time and effort to student development, improved teaching, and student activities within our college.

Last summer we initiated a new high school careers program—the "First Annual High School Honors Institute in Engineering." I want to comment on this program for two reasons; one, just to let our readers know a little about it, and two, because it exemplifies one of

many programs in which our students can actively and meaningfully participate.

Financed by grants from industry, a three-day program was organized around the presentation of four courses, "The Urban Environment"; "Principles of Engineering Design"; "Modern Electronics and Communications"; and "The Science of Flight". The curricula were designed and the courses, including laboratories, were conducted by our college of engineering faculty. The program was rounded out with departmental seminars, a keynote address, college student and industry panel discussions, field trips, and an evening of entertainment. Two hundred thirty high school juniors, nominated by their teachers on the basis of high academic achievement in mathematics and science and their interest in science and/or engineering, were invited to participate. In addition, twenty prominent members of industry and twenty high school faculty members were invited and attended all three days.

Twenty-eight of our students from the College of Engineering volunteered their services. Most of these served as "group leaders". Each group leader was given responsible charge of eight to ten of our high school student guests. The group leaders then lived with their charges for the entire program—they slept in the same dormitory wing, ate all their meals together, attended lectures, laboratories, and other sessions, and even helped with the homework of their charges if needed. The impact of their efforts and their contribution to the success of the program can best be summarized, I think, in the following sample quotations of comments received from the participants:

High School Students: "To me the program was great mainly because of our group leader...He got us thinking and got us to ask questions."

"I thought the group leaders—especially mine—were very fine."

High School Instructors: "Our student leader...did a very good job with our group."

"The group leaders were very well chosen."

An Industrial Participant: "The group leader was outstanding in his ability to identify with his charges and at the same time present engineers as responsible, concerned members of society."

To these I add my own congratulations on a job well done and our most sincere thanks for their time and hard work.

Professional people are active people. Industry needs and is looking for professionals. Their best indicator of your professional potential is in your past performance. The best place to start is here and now. There are many opportunities and activities at all levels of involvement in which you can contribute and be active. Here in our college planning for next year's Honors Institute (August 17–10, 1969) is under way; Engineers Days committees are just getting formed; February 15th is the next High School Campus Day; AES and the Colorado Engineer still need workers. We should also ask...are we as engineers making our presence felt in ASUC and other activities outside our college? Interested? See me or call at the AES office.

Don't let your professional development be found wanting in service and activity—get involved—set your patterns for the future now. You will probably be surprised at how much you learn from these experiences, and, from the many comments I have received from students who have participated, you will probably find your involvement highly rewarding. Think, too, of the benefits to your College and to your profession if everyone participated.

Best wishes for a happy, productive and active New Year!



GEORGE J. MALER
ASSOCIATE DEAN

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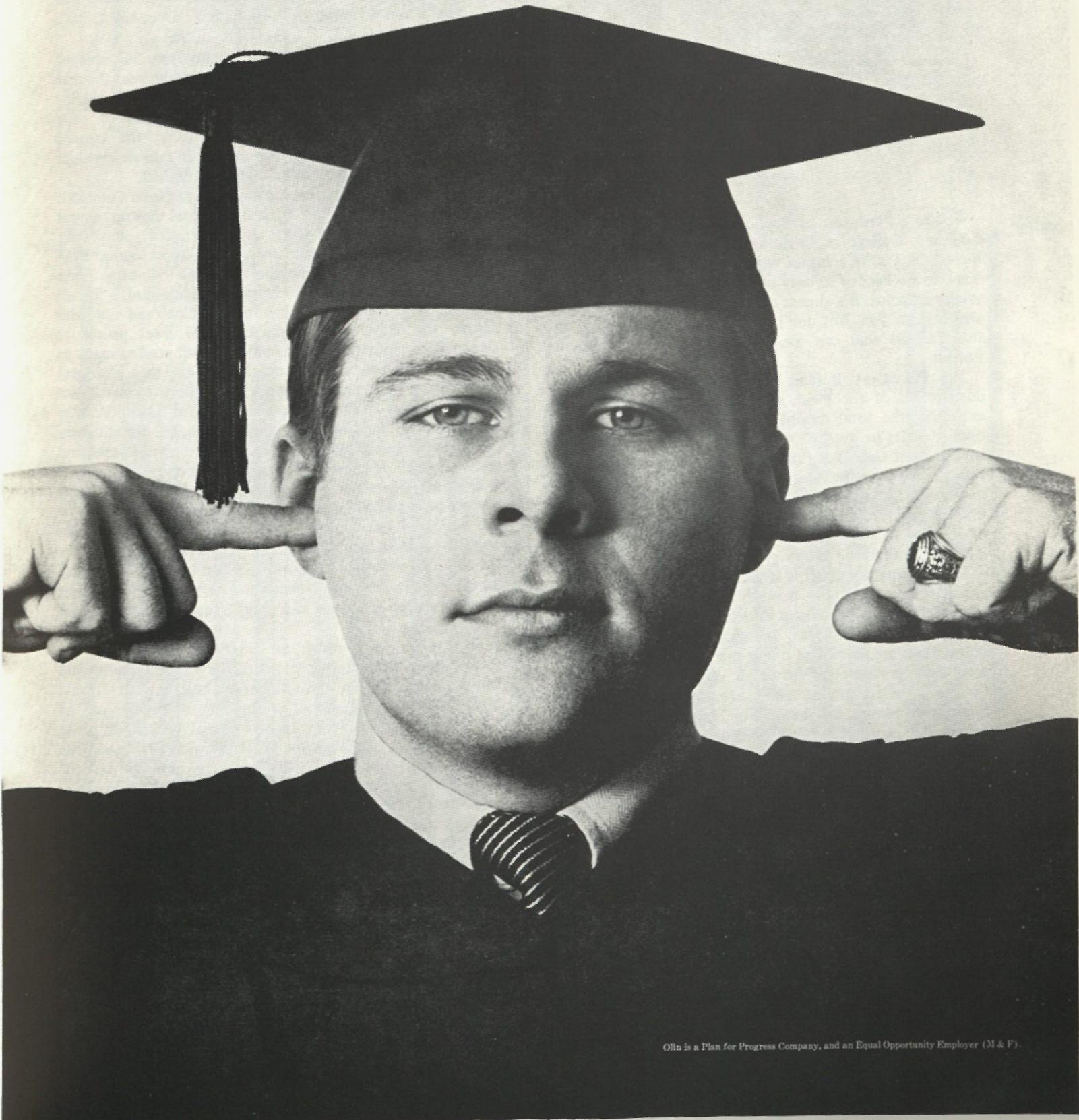
The reason we're telling you all this is that the competition to get you is awfully tough.

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COLLEGE TO COMPANY

Lou Ann Fischer

You're a Freshman or Sophomore in the University of Colorado, College of Engineering, and you don't have a major! Or, you're a Junior without any idea of where you want to be headed in only one short year from today! If you're a Senior, it's almost too late for this article to be of any help to you. But don't despair, there is one place on this Campus that can assist all of you—the Placement Bureau.

The Placement Bureau has a library containing the descriptions of the locations, products, jobs available to engineers, the total number of employees, the pay and opportunities in over 1500 companies. Anyone can go to the Stadium Gate Ten, climb the stairs to the Placement Bureau, and go in the door marked 'Sign up Room'. You're now in the library, but if you have no specific company, or even no specific field in mind, how can you find anything of interest to you? This is where the College Placement Annual comes to the rescue.

The Placement Annual is large, thick, yellow and white, and soft-bound. Thumb through it. In the front are the introduction and soft-soap articles, then the book is divided into these sections: in alphabetical order all major occupations are listed and under them are companies who hire these professions; then each state and province of Canada is listed, under which are their cities and the companies found in them. For example, choose an occupation—say, Chemical Engineering. Under that heading several pages of companies are found. Choose a company—say, Dupont. On the library shelves under Dupont is a foot-long section filled with material, and a pamphlet entitled "Chemical Engineers at DuPont." If you want to know what a typical day is like for an engineer at DuPont; read the pamphlet.

If you want the "Bigger Picture", the Placement Bureau has three graduate students who can fill you in on the occupational hazards, pay and opportunities in any field in which you might be interested. Of course there are many other sources for occupational information—the Lower Division Advisors found in the Engineering Administration Office, the professors that major, or even an Engineer who works in that field.

Most students are interested in the salary each major is offered. For every job offer handled through P.B., the company sends a carbon copy of the job offer letter sent to the student. The P.B. pools this information for each major and sends it to The College Placement Council in Bethlehem, Pennsylvania. The Council then compares all salary offers nationally, and sends the results back to each P.B., categorizing salaries by field and type of company, (Final Report, June 1968) average, high and low offers. A quotation from their "Salary Survey", typifies the tone of the report.

"The dollar average of offers to technical students rose 6.5% this year to \$767, compared with a 7.3% gain the previous season. The nontechnical picture is similar. This year's average went up 7.0% to \$657 as against a 7.7% gain in 1966-67.

At the very beginning of the Senior year the student should sign up with the P.B., because interviews start the first week in October. For the price of five dollars, one obtains the College Placement Annual, twenty copies of their Personal Resume, Recommendation forms, the current salaries, and the privilege to sign up for an interview with as many companies who come to campus as desired.

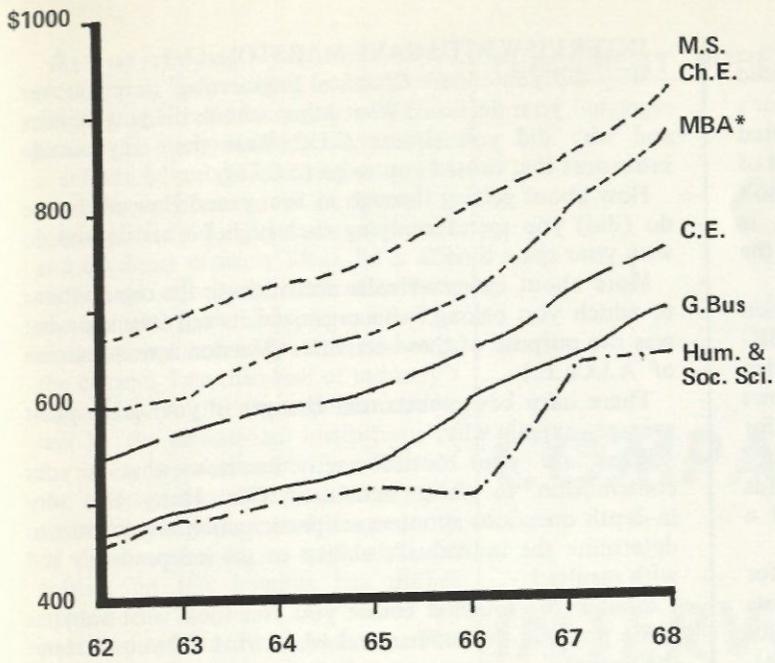
Only ten percent of these companies are from Colorado! All companies notify the P.B. of their arrival time on campus and expect to interview any interested perspective employees. What are the men like who conduct the interviews? For an engineering oriented company, their campus representative is likely to be middle-aged, a former engineer who has gone into administration, and one who enjoys the travel and opportunity to meet people at Universities. Sometimes one company will send as many as three interviewers, one will usually be from their personnel Department to answer the specific questions on things like pensions plans, insurance, and relocations. Occasionally a company will send a recent alumni who, though still very green in engineering, will still know the professors and general layout of the school's curriculum personally.

The interviewers will often ask a Professor to lunch to discuss how relevant the education the student receives is to the needs of the company, what the company is doing as applied to what they're teaching. This is also an opportunity for the interviewer to "Second" his first impressions after an interview—"Is Joe Smith really such a windbag?" or "How does John Doe get along in a group situation, he seemed like a loner?"

The tools with which an interviewer works are the Recommendations from professors, the personal resume, and the interview. When the student in beginning to prepare himself for the "job-hunt" at the start of Senior year, he takes the recommendation forms and mail-back envelopes to the professors of his choice. If he doesn't know the student well enough, he will usually refuse to fill out the form, steering the student to someone who is more familiar with the student's ability. The professor mails these forms back to the P.B. and they are placed in the students file. The file is available—to the student, by Colorado's Open File law, but if a student is unsure of his recommendations the file should be the last place to "check-up" why not just ask the person who wrote it?

The Personal Resume will be put by into the company file at the P.B. by the student when he signs up for a half-hour interview with the company. But before a student signs up, a great deal of preparation should already have been done. The P.B. has financial reports—is the company growing, stagnant,

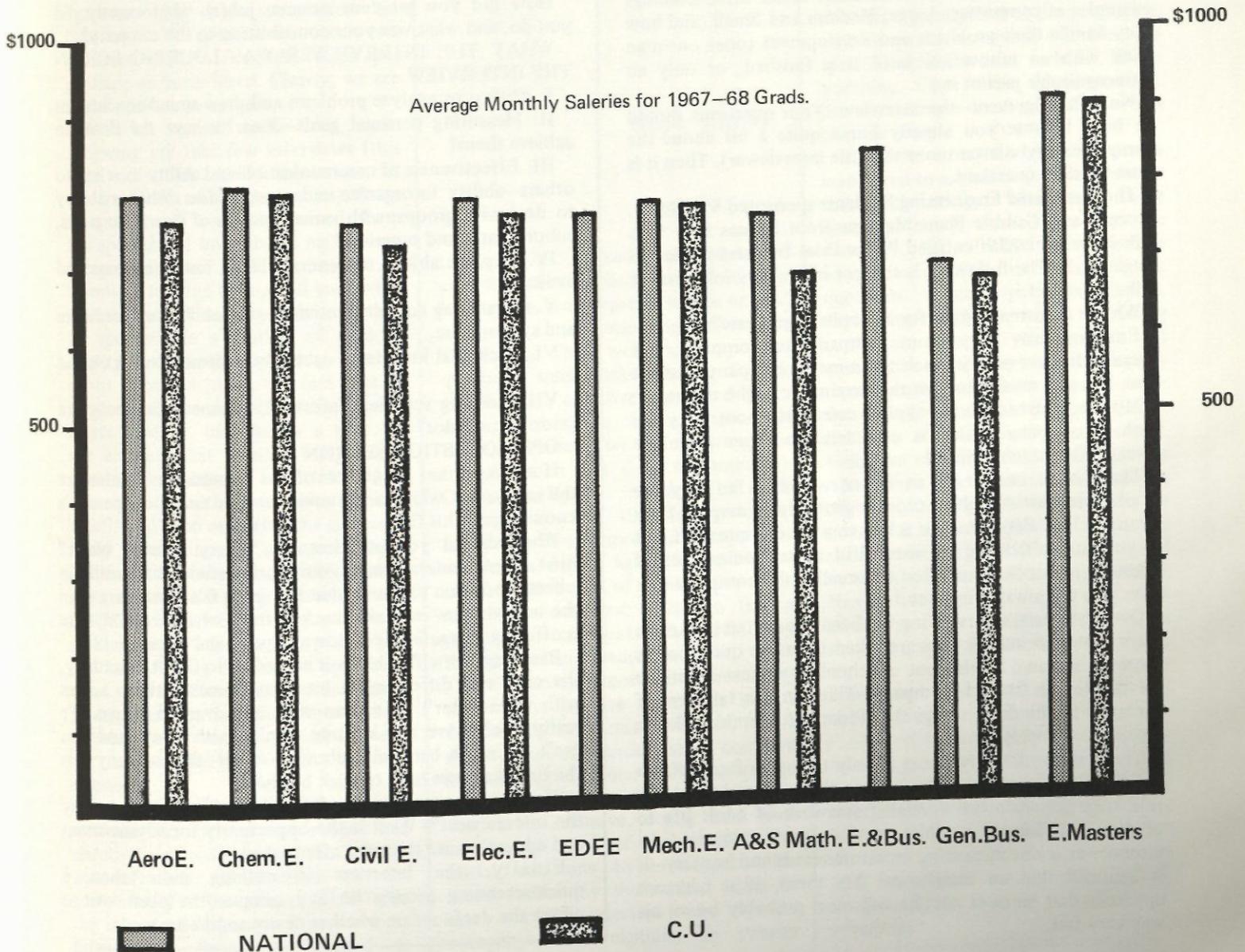
(continued on page 14)



*Non-Technical Undergraduate Degree

These graphs were compiled from the Placement Bureau's Salary Survey book. More details are available at the Placement Bureau. The graph at left compares salaries for different professions over the past few years as compiled by the Council of College Placement Salary Survey.

The bar graph below shows the 1968 national average in comparison to CU's average of salary offers. The figures for CU are generally lower than the national average because the demand for jobs in this region has exceeded the supply; thus, businesses do not try to compete for engineers with higher salaries. This does not reflect on CU's engineers on the national job market.



(continued from page 12)

too big, too small? What are its stocks selling at as opposed to last year, what rating is given its convertible bonds? Poor's Company Register lists all the companies in the United States, their executives and directors. For a first hand feel of the "Big-wigs" in the company, check in the several "Who's Whos"—in America, in your field, in Science, in the West, in the East, (American Women?) all available at the Engineering library.

The P.B. found that students don't give enough attention to the "LITTLE GUY", small companies have BIG advancement possibilities, but often students don't even sign up for interviews with them. Who makes the cans food comes in? Continental Can! Did they have any engineers bidding for openers in their interview schedule? No! Then there's Anchor Company, one of the two or three organizations that builds cooling towers. If you're Sales oriented, that's almost a monopoly.

Personal preparation is a must. Make a few lists for yourself before you start the "job-hunt." List your interests in the industrial field—Sales and Management, quality control, product development, research and development, process control, urban planning, sanitation, structural evaluation, power (the neglected field) and so on. Next list your good and bad points—what are the qualities that will sell you to the interviewer? Then list under three headings examples of companies—Large, Medium and Small, and how they handle their problems and development (does one man stick with an innovation until it is finished, or only an unrecognizable part of it.)

Now the big event—the interview. Your questions should be brief because you already know quite a bit about the company (maybe even more than the interviewer). Then it is time for their questions.

The Associated Engineering Students sponsored Vic Husty, Proctor and Gamble Plant Manager from Kansas City in a talk November 25th entitled "How Does Industry Select its Engineers?" The following is the gist of his very informative talk.

What is industry looking for in a college graduate?

Emphasis may vary from company to company, but overall, they are pretty much the same. A company must fit you, but you must also give the maximum to the company.

Most employees have a typical career of about 40 years with a company—which is considerably longer than the average American marriage!

There is no benefit to an interviewee than to play the whole interview straight. Students generally underplay their strong points. Confidence is a key to a good impression, but if you are misleading or untruthful about some facet of yourself, it can only hurt you eventually—the company that hires you will always find out.

Over the years, interviewing has been conducted in various ways, but now interviewees are asked the same questions as those of a man 15 years out of school. Interview questions are tailored to fit each company. Those in this talk are, of necessity the kinds of things that Proctor & Gamble asks its prospective employees...

The system of interviewing is only trying to find out the individual's accomplishments rather than his potential. At this stage a person has enough framework of adult life to predict his future conduct with some certainty. An interviewer is not measuring moral standards and honesty—it is assumed that an interviewee has them. If it becomes apparent that he does not, he will most probably be on his way very fast.

INTERVIEW WITH DAVE MARSTON, Ch.E.

Why did you choose Chemical Engineering? Have you ever regretted your decision? What other schools did you consider and why did you choose C.U.? Were there any outside influences that caused you to go to C.U.?

How about getting through in four years? How much time do (did) you spend studying each night? What do you do with your spare time?

More about extracurricular activities—in the organizations to which you belong, who organized its activities and what was the purpose of these activities (Marston is vice-chairman of A.I.Ch.E.)

There have been substantial changes in your grade point average—explain why.

What are your outside activities now—what is your contribution to these activities? (Mr. Husty asks very in-depth questions about exact participation here in order to determine the individual's ability to act independently and with results.)

What is the toughest course you ever took, what was your grade point in that course and why—what did you do about the grade?

What do you want to do when you graduate?

How about Uncle Sam? What is your status with the draft, ROTC programs, etc.?

How did you get your summer job(s)—what exactly did you do, and what was your contribution to the company?

WHAT THE INTERVIEWER WAS LOOKING FOR IN THE INTERVIEW

I. Ability to analyze problems and draw sound conclusions.

II. Measuring personal goals—does he have the drive to achieve them?

III. Effectiveness of communication and ability to relate to others—ability to organize and present ideas. What is ability to deal with groups, with various points of view, also peers, subordinates and superiors?

IV. Explore ability to generate ideas, resourcefulness and ability.

V. Organizing complex activities—the ability to coordinate and systematize.

VI. Technical knowledge—actually is demonstrated on the job.

VII. Keeping superiors informed, openness, can recognize priorities, candor?

OPEN QUESTION SESSION

How important are grades—of 1st importance. Grades are the means by which an interviewer can measure a person's knowledge of his field.

What should you put down in "salary desired" blank? First, don't underestimate your worth—students are really in a better position to know what the going salary rates are than the interviewers—we take our key from what everybody else is offering. It's safe to put down "open" and discuss it.

Base pay—how flexible is it according to G.P.A.? Actually, the only real difference in base pay comes between a man with a bachelor's or a man with an advanced degree. We really don't have any latitude to play with salary—and you can't do much bargaining about it either—the company sets the limits and we have to stick by them.

What are questions most often asked of the interviewer by the interviewees?—What is the opportunity for advancement and education are the most often asked.

Finally, the interview is nothing more than a quick-screening process on any campus—the plant visit is where the decisions on whether or not to hire are made.

As I sat reviewing my first interviews, I could not help feeling confident in recalling what had been made very clear to me—that the graduating engineer has a definite advantage over industry this year. The engineer is the backbone of industry. Not only is he the originator and developer of many ideas, he is also easily and effectively diversified into management, sales and personnel. The need for engineers is present; and so is the demand. Less than half of industry's required quota of new engineers can be met by the educational institutions of the nation. Approximately four-fifths of the companies interviewing on campus are seeking engineers; and the majority of these are seeking so many that the balance on this campus has shifted upward to between five and ten positions available per graduate. This compliments the fact that the average starting salary for the CU engineer is much higher than those from most other engineering schools. Building the ego even higher is the speculation that industry will spend close to two thousand dollars in plant trips per graduate engineer hired. Clearly, we are in the position to bargain.

As I sat several weeks later, again reviewing my first few interviews (this time with a "Bite Me" letter in front of me from each of the companies), those forementioned concepts moved from the spotlight of my mind to make room for generalities of a different nature. A company in a tightening and somewhat unstable period is going to be reluctant to speculate in a market of random quality assortments unless an overall profit is certain. Also, the fact that in many cases the interviewer will be a direct superior, or possibly a peer, to the engineer that is hired brings forth personal speculations on attitude and character from the man who decides whether to drop or pursue the graduate. Many companies, I am sure, have sacrificed their representative for a few days in hopes of coming across a safe bet. This cost is slight in comparison to picking names off a list for plant visits and later finding half of the applicants unacceptable. Even though a deficiency of engineers exists, each company must reconcile its economic relation between the number and the quality of new engineers.

I entered my first interviews with the attitude that the company's mind had already been made up, and that all that was left was my decision on the acceptability of the company. I felt that the interviewer's questions were a mere introductory formality designed to

PLACEMENT BUREAU:

COMPANY INTERVIEWS

Keith Black

initiate a relaxed atmosphere. I answered these politely and as directly as possible, being careful not to expand into any time consuming answers or discussions. There were more important questions to be asked—mine. To this end I quite effectively pursued (once popping questions for an hour and twenty minutes after taking care of the formalities in less than ten minutes). Occasionally I would find the representative on the defensive, but rarely was he stumped and never was he obnoxious. I now have a complete list of the attributes of these companies, each of which have failed to find a position compatible with my background and future needs.

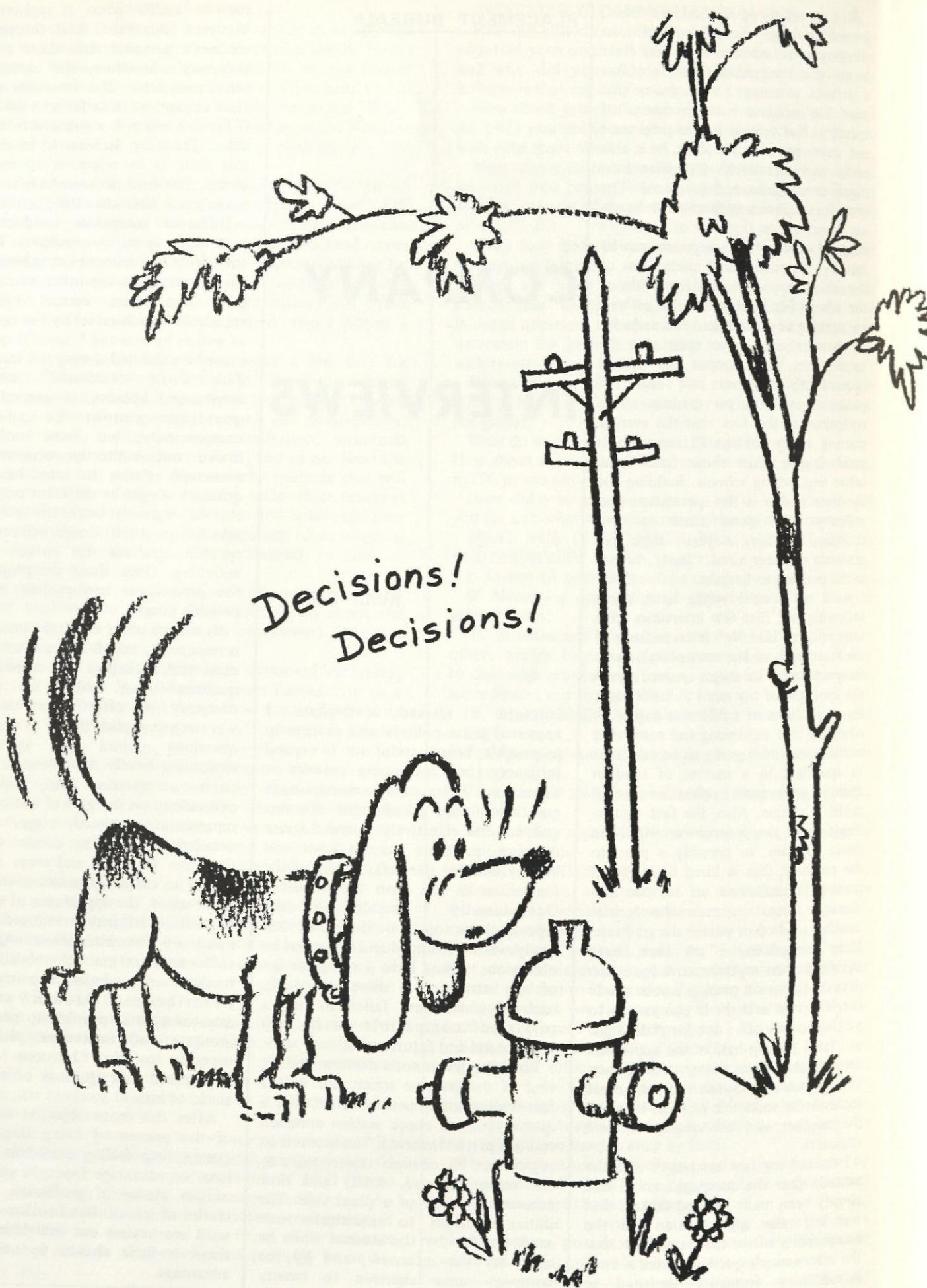
The interview is not a decision making tool in the positive sense, nor is it a fact-finding instrument. Rather, it is a quality control check station common to both parties involved. The intent is to search out all obvious rejects prior to the more intensive, costly and time consuming check of a plant visit. The initial decisions to investigate were made earlier: by the student when he signs for the interview, and by the company some eighteen to twenty

months earlier when it registered to interview this year. And through the student's personal data sheet and the company's brochure, the initial facts were presented. The interview should then expand on these facts to determine if further action is warranted from both sides. The only decision to be made at this time is to reject or to examine closer. The final decision to hire will be made much later after the plant trip.

Different companies conduct their interviews in various fashions. It may vary from the interviewer asking all of the questions to the other extreme. In any case, since certain minimum standards have been set by the company as well as by you and I, specific qualities must be exhibited during the interview. The word "exhibited" must be emphasized because, in general, these questions cannot be answered unequivocally, but must rather be drawn out indirectly, observed and evaluated relative to some base. The qualities sought by different companies also varies greatly, but as the interviewer asks his questions, trends will reveal the specific qualities for which he is searching. Once these are pinpointed, the interviewee can project his best possible image.

If, on the other hand, the interviewee is required to ask all of the questions, he must still anticipate and exhibit those qualities being looked for by the company. An effective but dangerous way to accomplish this is to center the questions around past experiences, explaining briefly the reason for asking such a question. Any spark of enthusiasm on the part of the company representative should trigger a more detailed display. The danger arises in that this is a trial and error method. Unless an extreme amount of discretion is exercised, the appearance of trying to oversell oneself may be induced into the mind of the interviewer. An acute self-examination of abilities and methods of presentation is imperative. Nevertheless, through an ultra awareness, it is possible to portray an accurate and impressive picture far superior to that by one who is unprepared and ignorant of what lies ahead of him.

After this more objective evaluation of the process of being hired, I still cannot help feeling confident that we have an advantage from the standpoint of our choice of profession and our choice of school. But I realize now that until we expose our individual worth, there is little chance to utilize this advantage.



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FACULTY COMMENTS:

THE HEN OR

THE EGG

Which Comes

First?

B. W. Lorange

Mr. Lorange is a practicing Architect and Engineer in Denver. He received his Engineering degree from this University and has returned this year as a visiting lecturer for the Architectural Engineering Department.

The role of education is to produce human beings who are trained and motivated in fields of endeavor commensurate with their objectives. In our sophisticated society, instinct does not prepare man even for the role of motherhood. Perhaps it was sufficient for the man-ape, but not for the current species.

The ultimate objective of the Educator is to assist every Student to develop real strengths, knowledge, understanding, skills, attitudes, and habits of life to sustain him in a manner of living that is personally rewarding and socially beneficial, states Dr. R. M. Cochrane, a national educational consultant. While it is the objective of the Educator, it is the purpose of the Student to acquire all, and do it in the shortest time.

The missing element in the Educator's objective and the student's purpose is, too often, the omission of exposure. The Educator knows it, or senses it. Generally they are totally capable of conveying Knowledge and Skills related to any field or "manner of life" you select to sustain you. The problem posed for the Educator is that he did not make the selection of the field for the Student. Students need exposure to the field before, during, and after their selection. Frequently, the student at University level has made an election of his field before he has made adequate exposure. The unexposed student relies upon the Educator to supply him the motivation for his training. Exposure develops motivation. Exposure comes from both the Professional Educator and the Professional practitioner, the HEN and the EGG, but which comes first?

Of recent years the Educators at university level have broadened their activities to embrace accelerated research programs. The acts are laudable in that it extends the Educator into the Practitioner-Researcher. Research is an important segment in all fields, especially Engineering. In private practice, however, it is generally not openly shared. But the Educator-Researcher has inherited the problem of technical paper production. "Publish or Perish" has become the philosophy, or battle cry, of the universities.

A half generation of Research-Educators have become so conditioned to the "Publish or Perish" environment that they assume, "Doesn't everybody?". The answer is both, "yes and NO" for reasons best understood by the Professional Practitioner in private practice. For instance: an Engineer in private practice who has researched and perfected a technique which produces perfectly developed working drawings with a combination of partially trained draftsmen (or women) and mechanical apparatus at greatly reduced expense to

himself is not about to publish a "Paper" on his discoveries. Not while he can reap an economic benefit. But more general than this is the simple fact that the private practice pressures do not afford the time to publish items of interest. You would be impressed, though, with the wealth of advanced charts, graphs, knowledge, information, and etc. that is shared openly by all personnel in the Private Practitioner's office. Also the Private Practitioner's work is often executed for a client that wants desired data on a particular project in order to deliberate possible alternatives. Feasibility studies are legally privileged information, as are most all engineering services, unless or until the client clears it for his use with the public. The point is that the Engineer in private practice is researching, writing, and producing the product of inductive and deductive reasoning every day. But his works publications of reports, feasibility studies, and specifications are not conceived for public consumption as such; yet the thought processes going into their conception are identical to the Researcher only acting under the "publish or Perish" idiom.

How is this applicable to today's engineering student? It alienates his exposure. The "Publish or Perish" idiom, as maximal measurement of achievement for Educator qualifications, has produced a miasma on reality. The near impossible barrier has been generated to the employment by Universities of the old experienced Engineers from the field. Occasional lectures and seminars are arranged by the Educators for Student exposure which of themselves are excellent. However the development of real Strengths, Knowledge, Understanding, Skills, Attitudes, and Habits can only be assimilated from both the Educator and the Private Practitioner. The need exists for another meter by the Universities to evaluate teaching talents and embrace achievements. Students need extended exposure today at the University level from both the Educator and the old experienced Private Practitioner to be effectively trained and motivated.

It matters not which came first, the HEN or the EGG. You need them both to have the other. And a more balanced arrangement of eggs for breakfast with a fowl for feasting is preferable to the palate than a constant diet of only one or the other.

Incidentally, the Egg came first.

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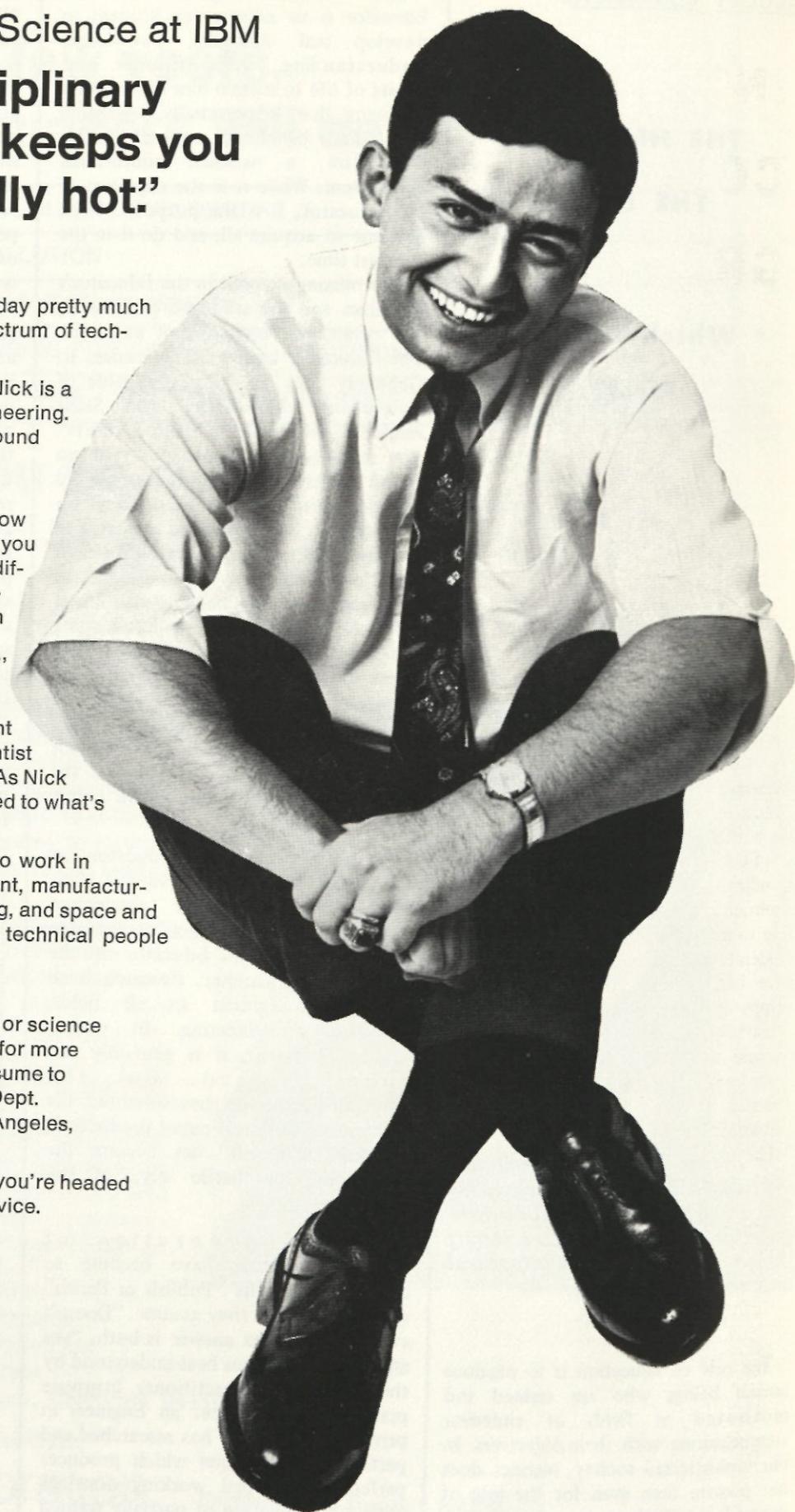
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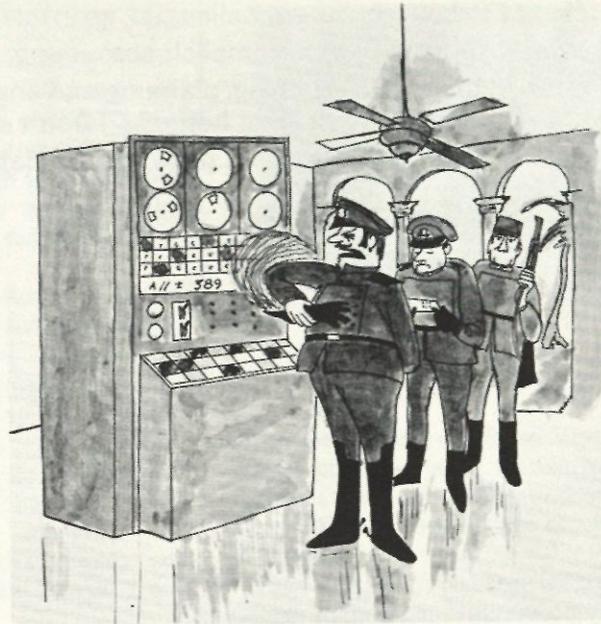
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INTERACTIVE COMPUTER GRAPHICS :

An Engineering Tool

Jay Schumacher



You lie, dog! You lie!

The University of Colorado Graduate School Computing Center has been awarded a grant from Control Data Corporation to support research in computer graphics. Work supported by the grant is increasing the usefulness of the CDC 282 display console for research and teaching.

Most engineering computer programs are written in algebraic languages, such as FORTRAN. An engineer, after spending several months learning an algebraic computer language, should be able to use a computer for problems of moderate complexity. Special languages have been written for some specific computer applications. These problem oriented languages help an engineer because they are very easy to learn. Some common examples of problem oriented languages are ECAP, STRESS, and MIMIC.

The normal method of operation for most computers is batch processing,

which is very awkward. Programs are submitted to a group of people who operate the computer. Since input programs for the computer arrive sporadically, and the computer runs only at one speed, there is usually a waiting period before the machine processes a job. The total time required for a job to go through the system is called the "turnaround time."

One way this difficulty has been removed is by using "time-sharing" systems. A large number of teleprinters or similar devices are connected to a central computer which is fast enough so that there is no waiting period for the people using the teleprinters. This situation allows a conversational type of interaction between man and machine. What are known as conversational and problem oriented languages can be used.

A picture generated by a computer is worth a thousand words of printed output. Graphic capabilities add a new dimension to interactive computing.

The hardware of the interactive graphics system consists of a CDC 282 display console, and a CDC 284 microfilm recorder. Both the display console and the microfilm recorder use cathode ray tubes (CRT's) for presenting the picture. The CRT's used for this purpose are sophisticated versions of the common television picture tube. Positions on the CRT's are specified by x,y coordinates as shown in Figure 1. A coordinate position is usually referred to as a "raster point."

There are approximately 10^6 raster points on the screens. The square useable CRT area is 11.5 by 11.5 inches on the display console and 2.5 by 1.5 inches on the microfilm recorder. The picture may be composed of points, vectors and symbols. Points may be plotted on any raster point. Vectors are lines connecting any two raster points. Symbols may be plotted in different sizes, shapes, intensities, and orientations as a string of characters beginning at a raster point. Curved lines are drawn with a number of short straight line segments.

The display controller receives data from and transmits data to the computer. The controller has a ferrite core memory in which data specifying a picture may be stored. The memory may be thought of as a long chain of cells containing plot commands.

(continued on page 23)

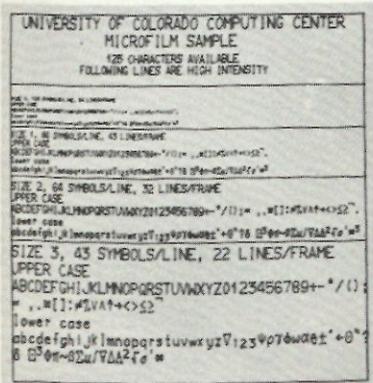


Figure 1

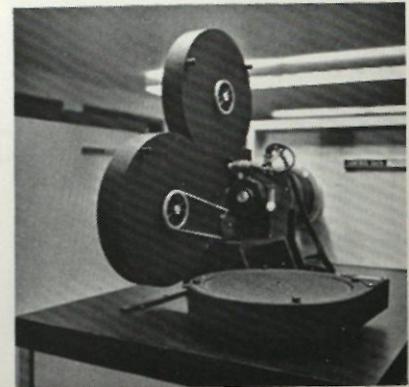


Figure 2

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(continued from page 21)

The microfilm recorder photographs a picture displayed on its precision CRT with a high speed camera using 35mm microfilm (see Figure 2). The picture on the recorder's CRT need only be drawn once per frame, so the computer sends the data directly through the controller and does not use the memory. The maximum speed of the camera is thirty frames per second.

The display console has, in addition to its CRT, a keyboard, a switch matrix, and a light pen which communicate with the computer through the display controller (see Figure 3). These provide a flexible link for man-machine communication. A picture is displayed on the console CRT by reading the data from the controller memory, and drawing the picture sixty times per second to prevent the image from flickering.

The light pen is a particularly interesting device (see Figure 4). It is merely a tube with a lens to aim any light which strikes it directly down the fiber optic cord. A small button on the side of the pen activates it. When the electron beam strikes the phosphor immediately in front of the light pen, enough light reaches the photomultiplier to trigger a light pen signal. The display controller then knows which memory cell contains the part of the picture at which the light pen is aimed, since the time required to sense the light pen signal is less than the time required to move from one location in memory to the next. The x,y coordinates of the light pen can then be read from the controller memory and sent to the computer.

In order to make use of the hardware potential, a large number of general programs have been written. Included in the group of programs is the plotting package which enables a FORTRAN programmer to specify a picture to the graphics hardware. This specification is the same for both microfilm recorder and display console. As data for the pictures is generated by the plotting package, it may be stored on a disk file to be filmed when the recorder is available. The microfilm driver is a program which retrieves data from the disk after termination of the users program and sends it to be microfilmed. The interactive driver provides the communications link between the console operator and the users FORTRAN program. Information on how to use these programs is available in the computing center library.

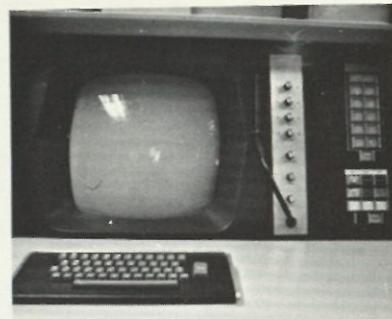


Figure 3

As the system was being developed several programs were written for test purposes. Two of these have proved to be excellent examples of the capabilities of the system.

The FLIGHT Program, written by George Richmond, demonstrates the use of the display system for a dynamic situation. The console operator acts as an airplane pilot with the screen as his "window" (see Figure 5). He sees an accurate perspective projection of an aircraft carrier on the screen. Instruments are drawn on the lower

(continued to page 24)

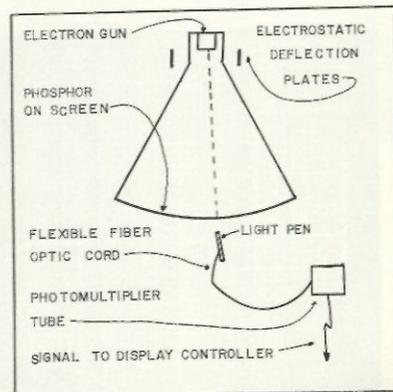


Figure 4

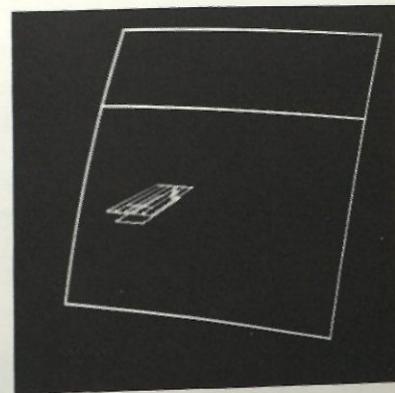


Figure 5

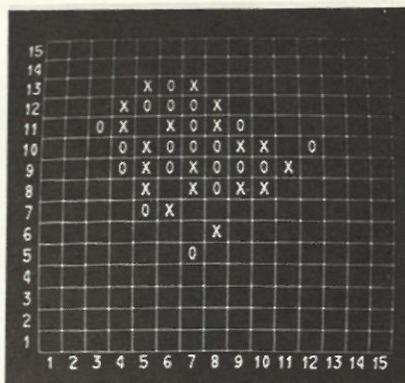


Figure 6

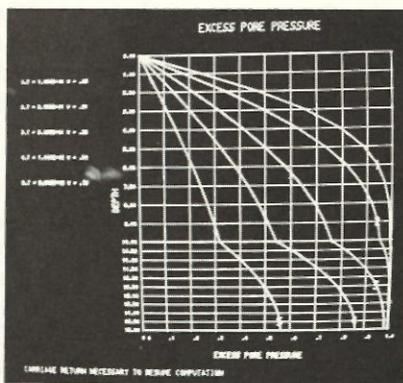


Figure 7

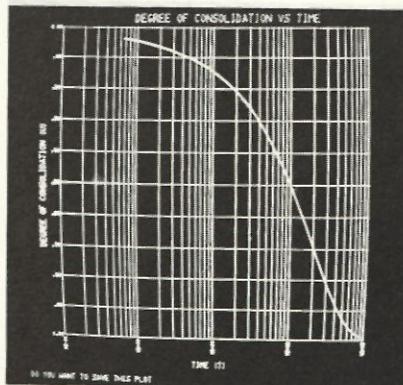


Figure 8

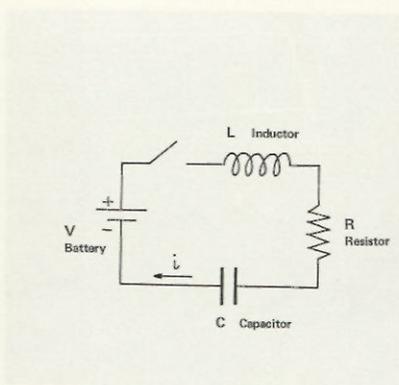


Figure 9

(continued from page 23)

portion of the screen. The switch matrix is his control system. The display is constantly moving, and the pilot must guide the airplane with his controls, hopefully to a successful landing.

The GOMOKU program was written originally by Sam Coleman for a course concerned with artificial intelligence. It was modified by Mike Forney for use with the interactive graphics system. Gomoku is a Japanese game played on a 15 by 15 grid. It is played the same as tic-tac-toe, except that five in a row are required to win. Before the display system was available, the program was run once for each pair of moves. This was impractical because of the turnaround time involved. It is currently being used (see Figure 6) with the console keyboard as the input device and is being modified to use the light pen.

One of the first engineering uses of the display console was for a soil engineering problem. The program is a sub-system for the analysis of the progress of settlement in a layered soil profile. Several interesting plots are generated by the program. Figure 7 shows depth (y-axis) plotted against the excess water pressure in the pores of the soil (x-axis) with time constant. Each curve on the plot represents a fixed time and is called an isochrone. The curves are discontinuous because the program is capable of handling problems where several layers of soil, each with its own properties, are involved. In this example, two layers were specified. Figure 8 shows settlement (y-axis) versus time (x-axis) with time on a logarithmic scale. A complete discussion of this program by Professor R.L. Schiffman and J.R. Stein is to be published in the near future.

Computer programs for the solution of ordinary differential equations have

been around for a long time, but interactive graphics has added a new dimension to their usefulness. Let us take an electrical circuit as shown in Figure 9. The ordinary linear differential equation with constant coefficients is

$$L \frac{d^2 i}{dt^2} + R \frac{di}{dt} + i = 0$$

The initial conditions at $t = 0$ are: $v_{ab} = 0$, $i(0) = C$, $di/dt(0) = V/L$. This equation may be specified to the program as:

```

DY(1) = Y(2)
DY(2) = -(PAR(1) + PAR(2) *
Y(2) + Y(1)/PAR(4))/PAR(3)
* ICCOMP
Y(1) = 0
Y(2) = PAR(1)/PAR(3)
* ENDIC
* OUTPUT
* PRINT TIME = PLOT (1) = T $
I = PLOT(2) = Y(1) $
DI = PLOT (3) + Y(2) $ D2I =
PLOT(4) = DY(2) $$
* END OUT
* PAR 100. 1000...05 1.E-6 $

```

The parameters which may be varied from the display are voltage (PAR(1)), resistance (PAR(2)), inductance (PAR(3)), and capacitance (PAR(4)). Any of the parameters may be changed and a new plot made in seconds. Figures 10 shows an overdamped case of current (y-axis) versus time (x-axis). Figure 11 shows the same problem with resistance decreased and inductance increased. The solution in this case is underdamped. The interactive situation allows the user to look at a variety of plots, get an intuitive feeling for the problem, and correct errors with ease. The graphic capability gives clear, easy to interpret results.

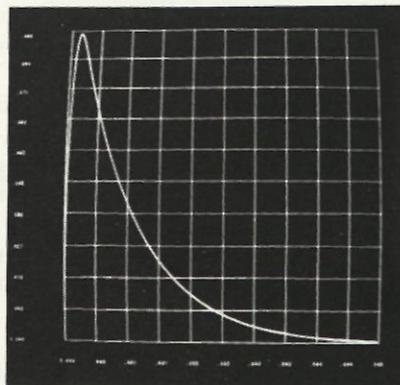


Figure 10

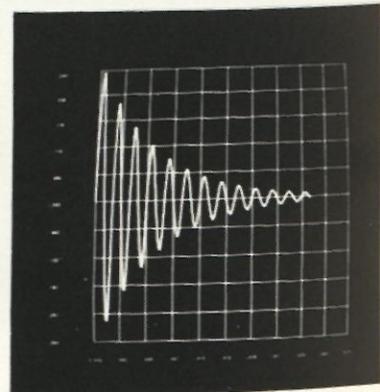


Figure 11

A project at the Institute of Behavioral Science under Dr. Kenneth Hammond is using the interactive display system to study cognitive (learning) processes. The project has progressed to the point where it is possible to describe and simulate a person's decision making policy in an intuitive or "quasi-rational" task. This may be thought of as applying probability theory to study how a person makes decisions when he has a number of factors of varying significance to consider, and he is not really sure of the relationship between the factors. A program written by Peter Boyle and Jack Wilson is being used for the study. Figures 12 and 13 show an actual experiment in progress. This program presents the subject at the console with a comparison of his intuitive decision making policy against the intuitive policy of another person. Such a study would have been impossible without the aid of a computer equipped with an interactive display system.

The display console has been used for classroom demonstrations. It should be interesting to see how it will be used in the future. In the computing center's

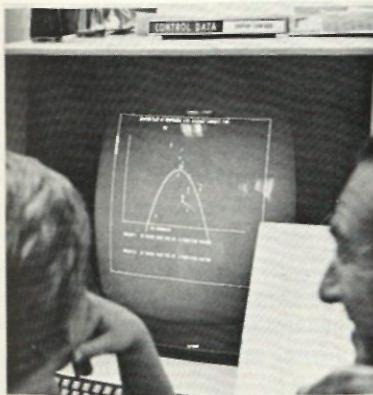


Figure 12



Figure 13

new facilities, the display console room will be connected with a classroom by a folding partition.

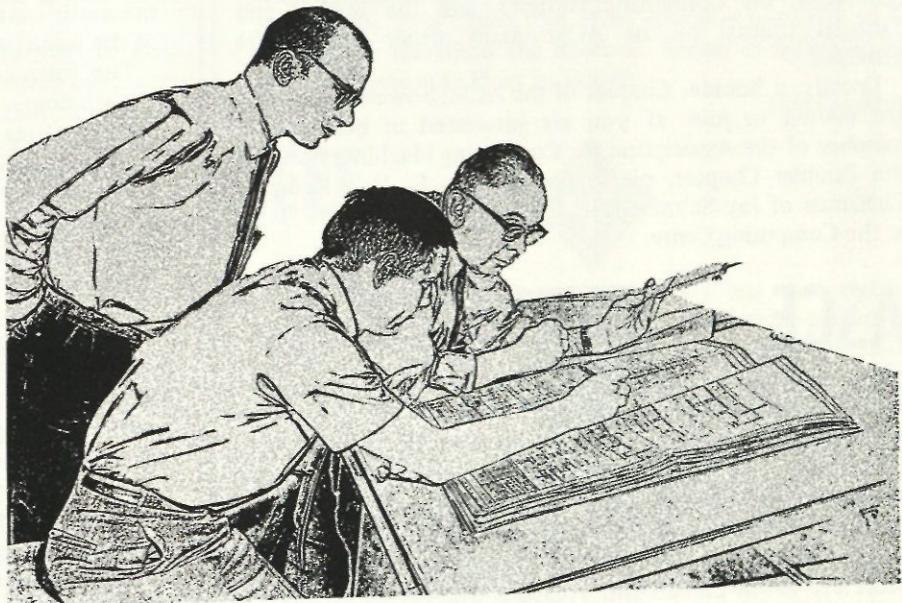
The system developed thus far has demonstrated the technical and psychological advantages of interactive graphics. Additional plans include a more powerful system, a data management package, and a more efficient interface with normal computer operations. Work is currently underway to adapt a number of application and problem oriented languages for use with the interactive

system. Included are ECAP, STRESS and MIMIC. A generalized text editing capability will also be available soon.

A college football coach was surprised to see a busty coed wearing varsity sweater. Stopping the girl, he growled:

"What are you doing with a varsity sweater? Don't you know you're not supposed to wear one unless you've made the team?"

The coed smiled, then cooed, "Well?"



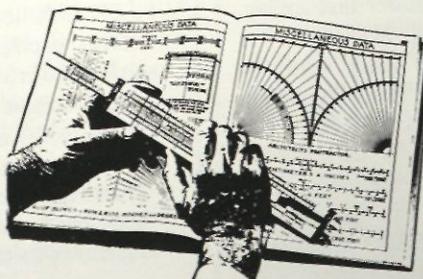
INTERESTING ENGINEERING IN PROGRESS

And why not? Companies scattered from here to Istanbul are depending on plans drawn up in Stearns-Roger's Denver offices. The projects include new chemical facilities, ore beneficiation, commercial power plants, special materials handling, unusual manufacturing facilities, aerospace assignments and many more.

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SOCIETY BULLETINS

ACM

The Association for Computing Machinery is a nationwide society for the computing community. The association offers regular membership to individuals who are in the field and student membership to individuals who are still within university community. Each member receives three publications from the Association: The Communications of the ACM, the Computing Reviews, and the Survey and Tutorial Journal of the ACM. Many other services are provided.

Locally, a Boulder Chapter of the ACM; however, students are invited to join. If you are interested in becoming a member of the Association for Computing Machinery and/or the Boulder Chapter, please contact Dr. E. Rex Krueger, Chairman of Jay Schumacher, Student Representative, both at the Computing Center.

George Richman

ASCE



This past year, the University of Colorado chapter of the American Society of Civil Engineers has had a very interesting and successful year. Our executive committee President Inge Freithem, Vice President Tom Ullman, Secretary Bruce Lindell and Treasurer Joe Pettus, planned a varied and extremely interesting program, including bi-monthly meetings and field trips to various industries.

Our first meeting last year had Mr. Dale Thompson from the Martin Company spoke on "The Civil Engineer's Role in the Aerospace Industry." Mr. Thompson discussed the role of Civil Engineers, and noted that many more are needed, especially for the Titan program, cape ground facilities and handling gear design.

In the second meeting, Mr. Thomas Donahoe from the Cast Iron Pipe Association discussed "Cast Iron Pipe." Mr. Donahoe showed two movies, one on manufacture of cast iron pipe and the other on the installation of cast iron pipe.

Mr. Ron Cowgill from Procter and Gamble spoke on "The Role of Engineering at Procter and Gamble." Mr. Cowgill discussed the many problems in expanding one of their plants while still operating.

In our annual Student Paper Contest, four students presented papers. James Harris, the technical division winner, presented "the Effect of Earthquakes on Tall Structures." This paper was printed in the Colorado Engineer last spring. The other technical paper was by Eling Mykebust on "Mountain Cabin." In the non-technical field was "A Forecast for Beer Consumption for 1980" by Hans Fuglerud. The grand prize winner was "Municipal Water Reuse" by Steve Work.

This fall semester, our first meeting had Mr. Raymond Girardo, a Research Meteorologist from the Bureau of Reclamation, spoke on "Atmospheric Water Resources

(continued on page 28)

AIAA

This Country needs aerospace engineers—thousands of them. It needs them to conceive, design, and build aerospace equipment for defense, for scientific research, and for transportation. It needs them to shorten travel time within the earth's atmosphere and make possible man's exploration of the universe.

The future of aeronautics and astronautics is exciting and challenging. It offers rewarding careers with ample opportunities for original contribution, and unlimited opportunities for advancement and security.

Aerospace engineering deals with flight in all its aspects—at all speeds and at all altitudes. It ranges from the design of submersibles for deep sea exploration, to an aerial "jeep" designed to hover a few feet off the ground, to complex spacecraft whirling 350 million miles through space to Mars.

The engineering profession can give an individual a sense of personal achievement. It will require hard work, as all significant accomplishments require hard work. The aerospace engineer belongs to a recognized and highly respected group, which earns good salaries and enjoys a comfortable standard of living.

Many of these engineers are members of the main aerospace engineering society, the American Institute of Aeronautics and Astronautics. The A.I.A.A. founded in 1963 by the merger of the American Rocket Society and the Institute of the Aerospace Sciences, is the principal aerospace technical society in the United States. Its 36,000 members, including the leading scientists, engineers and technical managers of the country's aerospace program, make it by the largest group of flight scientists and engineers in the world.

The objective of AIAA (logically) is to advance aeronautics and astronautics. It provides an effective channel of technical communication to all the members of the aerospace community, and thereby stimulates the personal development of individual engineers and scientists.

To do this AIAA schedules 20 national meetings and almost 500 local Section meetings annually. AIAA publishes the magazine *Astronautics & Aeronautics*, five journals, and the *AIAA Bulletin*. Each contains significant technical papers on basic engineering, system studies and technological achievements. The AIAA also has a Technical Information Service which publishes "International Aerospace Abstracts" and maintains a fully stocked technical library; including thousands of books, 40,000 technical reports, and almost 1,000 technical journals.

The society also recognizes outstanding professional achievement, through its program of awards and honors. It acknowledges responsibility to the general public which supports the aerospace program, and undertakes to help keep the public aware of aerospace progress and benefits.

Aerospace companies join AIAA as corporate members. By their participation they encourage company scientists and engineers to take an active part in AIAA meetings.

(continued on page 28)

ASChE



The Colorado University chapter of A.I.Ch.E. was off to a booming start this semester. The new slate of officers, President, Bob Brinkerhoff; Vice President, Dave Marston; Treasurer, Bob Ida; Secretary, Mary Uppendahl; and Program Chairman, Mark Keller called the first meeting in early October. Students who had interesting employment experiences over the summer were invited to relate their achievements to the group.

Two other meetings have been held since that time, including a joint meeting with the Civil Engineers. Interesting speakers have highlighted all meetings. A gala social event is in the planning for December which would indicate that a moderate amount of beer might be consumed in the near future.

The 61st Annual A.I.Ch.E. convention was held in Los Angeles, December 1st to 5th. It was attended by most faculty and a few students who agreed that it was a tremendous success. Colorado University was proud to have Dean Max Peters serve as national President of A.I.Ch.E. this past year.

Future plans for A.I.Ch.E. include the social gathering, a meeting featuring a talk from a representative of the Placement Bureau, and elections of new officers. All in all, it should be a heavy year.

Bob Brinkerhoff

ASME



The ASME student section at the University of Colorado has in the past strived toward better student-faculty relations such that presently ASME serves as the connecting link between students and faculty. This relation has enabled ME students to organize and participate in undergraduate seminars involving topics of mutual interest such as interviewing, opportunities in graduate study, etc.

Nationally, ASME holds, annually, a regional student paper contest at which oral presentations concerning technical subjects are made in such a manner as to be competitive with students from other universities. The winner of this contest is awarded a cash prize and a trip to the national ASME meeting in New York.

A few other activities of the AE student section include two annual parties for faculty and students, tours of local industries, and technical presentations made monthly by guest speakers from industries around the nation.

ASTME

The American Society of Tool and Manufacturing Engineers Student Chapter No. 67 was formed at the University of Colorado, February 16, 1967 and is the youngest student society in the College. The parent Society was founded in 1932 "to advance scientific knowledge in the field of tool and manufacturing engineering and to apply its resources to research, writing, publishing, and disseminating information."

The Student Chapter of ASTME was formed by and its present members consist of students of the Engineering Design and Economic Evaluation Department but is open to all students of the College.

The biggest event of the year is the ASTME On-Campus Conference which we sponsor and the Denver Senior Chapter No. 77 presents. This year the Conference will be held March 1, 1969 and the theme is "Man-Machine-Materials." One very important aspect of these conferences from the students' point of view is the opportunity to meet and talk with practicing engineers from all over the country.

The main objective of ASTME Student Chapter No. 67 is to present to the students not only the technical aspects of tool and manufacturing engineering, but also to inform the students of the obligation of an engineering career and help them find where they can get the best experience and training possible to meet these obligations.

To meet these objectives our monthly meetings include speakers from industry who cover topics like: Engineering Opportunities: a Practicing Engineer's View; Interviewing: What's it all About (with a panel of interviewers); etc. Tours include the new Coors Can Plant which is not open to the public; the Marathon Oil Research Center in Littleton; and the new Samsonite Plant in Denver.

Don Cauldwell

IEEE



The sometimes good and sometimes less than optimal programs of IEEE for the year 1968 was guided by Chairman, John Statford; Vice-Chairman, John Urnemoto; Secretary, Ted Trami; and Treasurer, Ted Roper. The fact that no one died from the coffee in the lounge indicates that the coffee makers, otherwise known as the officers, at least weren't vindictive toward the members.

Monthly lecture meetings were held over the past year with guest speakers from a variety of electronic firms. The lecture program did much to broaden our knowledge of how engineering really works as contrasted to the mass of theory we have been exposed to in the academic world. I must admit that a few lectures did add just a modicum of company propaganda. However, as in the past, this program was worth the time and effort and thus was well attended by the members, both students and faculty.

In some contrast to the EE's public image was our 1st annual spring dinner dance. Contrary to rumors of all EE's being studious, serious-minded, dedicated, and maybe a little boring, some of the students and faculty appeared to qualify for the title of "swinger"—even by arts and science standards. In fact everyone attending had a good time and the ladies weren't exposed to only engineer small talk.

Membership is at an all time high and the newly elected officers for 1969 have an active and participating society to satisfy. Our officers for 1969 are: Chairman, John Umemoto; Vice Chairman, Terry Allen; Secretary, Dean Bowyer; and Treasurer, Mike Miller.

One problem that stumped the outgoing administration was how to convince the sophomores and freshmen that joining IEEE and attending a few meetings did not necessarily mean that they would flunk out because of time lost from their studies. Perhaps the new administration will have better luck in this area. Come to think of it, maybe the freshmen and sophomores are responsible for the EE image previously mentioned.

A strong lecture program for the coming year has been established and Terry Allen is in the process of setting up tours to some of the local plants. Next year ought to be great; come and join us.

Research Program." Mr. Girardo mentioned the weather modification project the Bureau of Reclamation and other agencies are working on. Especially interesting is the future of weather management, an improvement of nature.

Mr. Robert Hugo from the Public Service Company spoke on the "Fort St. Vrain Nuclear Generating Plant." Mr. Hugo discussed the cost analysis, which goes hand in hand with engineering. A three way contract is formed between the Atomic Energy Commission, a researcher and a utility. The application was filed in 1966 and each phase has to be given approval by the AEC. Expected completion is in 1972, when it will be brought to full power.

The "Design of the Selah Creek Bridge" was the topic presented by three members of the Ken R. White company. Mr. Robert Whissen, Mr. Ernest Harris and Mr. Robert Moran talked about all aspects of designing the Selah Creek Bridge.

Mr. Adolph Zulian from the Colorado Highway Department spoke on the "Straight Creek Tunnel." This tunnel is part of the Interstate system and initially is one bore, but will have two bores when the capacity merits it. This tunnel will bypass Loveland Pass. Expected completion is the spring of 1971.

"Protecting Man's Environment and the Role of Engineers" was the topic presented by Mr. J. Floyd Byrd of Procter and Gamble. Procter and Gamble has fifty full time engineers working on pollution. Because of public opinion, the soap industry spent \$150 million and ten years on a new detergent ingredient. Man can help nature, but he must be careful not to disrupt nature's cycle.

The first field trip was to Coors Brewery. The new construction was visited which will double capacity. Also being built are six storage tanks which will triple capacity. Of course we stayed to sample the product.

The new Denver Convention Center was visited. The consulting office of Ketchum, Konkell, Ryun and Hastings was visited. They also were consulted for structural analysis of the Engineering Center. It was quite cold that day, but all found the Convention Center very interesting and educational.

The annual Ketchum Award Dinner was held at the Lamp Post. Our guest speaker was Oscar Jacobson (Ketchum Award 1941) who spoke on "The decline of an Engineer." After being on the job a while, the Engineer reaches a point where he either goes into teaching or becomes static. His decline starts and he goes into administrative work. The Menoher-Thoman award was given to Charles Roeder. Professor Kurt Gerstle received the Faculty Appreciation Award. The C.L. Eckel Award was presented to Stephen Constans. James Harris received the Milo S. Ketchum Award.

A picnic was held this fall at Lyon. Lots of food and fun was included for all. Volleyball and football were played, and beer was available for the tired players.

An interesting field trip was to Climax mine. A complete tour of the mine and the processing facilities was conducted. In all areas, the work being done was explained and many questions were answered.

Our year has been filled with many interesting meetings and field trips. We extend an invitation to all Civil Engineers to join and to increase your knowledge and see what new projects are being constructed. We look forward to the program being planned by our new officers, President: Joe Stucka, Vice President: Clint Davis, Secretary: Randy Lorange, and Treasurer: Maurice Murphy. Good luck to these officers in the coming year.

Bruce Lindell

To bridge the gap between industry and student engineers there are 97 Student Branches throughout the United States. AIAA Student Branches include lectures by leaders in the aerospace industry on such topics as paragliders, aerodynamic heating of lunar reentry vehicles, and development of the Phantom II fighter.

Student Branches organize field trips to industry and are invited to attend Regional Student Conferences where original technical papers by undergraduate and graduate student members are presented.

The local University of Colorado Branch strives to fulfill its obligation to C.U. students and industry. The content of the program varies from year to year but in general is the same.

The C.U. Student Branch usually has at least one technical meeting a month. Since the first organizational and membership meeting, the local branch has had a combined meeting with IEEE, and a meeting with Dr. Larry Davis of E. Bolland Associates, Inc.; who spoke on "Aircraft instrumentation in respect to atmospheric research, weather modification, and air pollution studies."

The local branch has also traveled to the Air Force Academy for a tour of their labs and facilities; and a meeting with this year's Von Karman Lecturer, Dr. William R. Sears, who spoke on "Aerodynamics, Noise, and the Sonic Boom."

Besides the monthly technical meetings being planned, students can look forward to tours of the United Flight Training Center at Stapleton, the F.A.A. Traffic Control Center in Longmont, and possible others.

All AIAA Student Branches are invited to compete in the 1969 Student Branch Competition sponsored by the Bendix Corporation. The competition was established in 1963 to encourage constructive group participation in a branch project with a well defined objective and well developed organization of the skills of the branch members to complete the project. This will be the first year that the local branch will attempt to enter into competition for possible awards of up to \$425. Also this year, individuals are encouraged to present their own individual research papers at regional conferences where they will compete for more cash prizes of up to \$150. First prize winners are then judged in the national contest, at which they can win up to \$500 and an expense paid trip to the Annual Meeting.

Of course local activities are not all technical. Each year the local branch sponsors its annual banquet, and annual picnic which provide a welcome change of pace from everyday scholastic activities.

AIAA takes part in E-days by sponsoring the paper airplane flying contest held in the aero lab. For those non-aerospace engineers who laugh at the idea, we challenge them to try it (and try to beat the Aeros).

Membership in the AIAA carries the prestige of association with the foremost aerospace engineers and scientist in industry, government, and education. The local University of Colorado branch, off to a good start, will try to fulfill this obligation to its members and to the University.

Jerry Justice

Two drunks wandered into a zoo and stopped in front of a lion's cage.

They stood watching the animal a few minutes and suddenly it let out a roar.

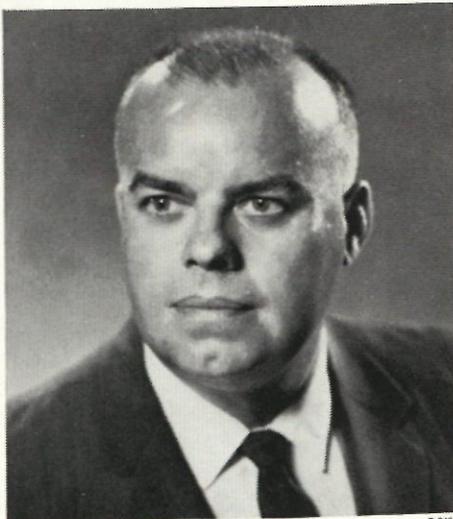
"C'mon, let's go," said one of the men.

"Go ahead if you want to," replied the other, "I'm gonna stay for the movie."

DO YOU THINK A BRIGHT ENGINEER-TO-BE SHOULD SPEND HIS MOST IMAGINATIVE YEARS UNIMAGINATIVELY?

NEITHER DO WE!
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**you
aim
too,
please!**



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A SHOW OF FORCE

Mike Colgate

The entire High Council of the Droog was in a state of violent agitation. Tentacles were waving wildly and mandibles were clicking spasmodically. Rumor had it that an important announcement concerning the scheduled and long awaited Mensansch of Kallendeses, the Annihilation of Earth, was to be made, and council members from all over Mars, even those in stages of incomplete estivation, were gathered in the traditional Chamber of the Droog. Also present were members of the minority, and much scorned, faction, the Scientific Caste for Brotherhood Amongst Worlds, led by the most brilliant of all Martian Scientists (all twenty-one of them) the Passenet Pfulwa.

Perhaps some background would be of service at this point. Four Martian years previously, after much debate and heated argument, the Council had decided that the rapid advancement of technology on the planet Earth was a serious threat to the stability and tranquillity of the five and one-half million years old Martian culture. The obvious solution, and the one that the council vociferously adapted, was to destroy the intelligent life upon the planet Earth. Now, after nearly nine Earth years had past, the Weapon of Annihilation was ready. The reason for the delay was that the twenty-one Martian scientists were unanimously opposed to the annihilation plan. Besides, most of the scientists were mere maintenance technicians, incapable of constructing so much as a mouse trap. The Martian civilization had stabilized nearly four million years previously, long before any competition evolved in the solar system, and investigative, or experimental, science had long since become a nearly extinct occupation. The extremely versatile and nearly indestructible machines provided everything a Martian could possibly want and required so little maintenance that only a token force, calling themselves scientists, existed for their repair. Passenet Pfulwas was, in fact, the only true scientist on the planet Mars, and knew it. Thus, he was able to delay the construction of the Weapon for nine years, all the while desperately trying to think of some way to prevent the Annihilation completely, while not being brave enough to face the Council's torture devices should he sabotage the project.

The Council meeting was called to order and, to his great surprise and dismay, the Passenet Pfulwa was requested to "sit" on the speaker's platform. The purpose of the meeting was explained by the Council Chairman as follows: "One hundred days ago, the Planetary Observation Machine reported that two orbiting radio sources were detected entering apparently stable orbits about the planet Earth. This in itself is nothing strange, as the Earth creatures have been orbiting artificial satellites for some time. The Machine, however, reports a peculiarity. Both of the sources appear to be orbiting with a period identical to that of Earth's natural satellite, although one of the sources is substantially closer to Earth than the other, with the natural satellite's orbit between the two artificial ones. That the sources are in stable, elliptical orbits about Earth is unquestionable. The Machine reports that, through application of the ancient science of astrophysics, this situation is found to be impossible and requests that its computation banks be removed for overhaul. Passenet Pfulwa, you are hereby requested to divulge your ideas on this matter."

The Passente Pfulwa spoke thusly, "The machine is correct as far as it goes. By all the Laws of Gravitation, the period of satellite about the primary is distinctly determined by the size and shape of the orbit and to have three nearly circular orbits, as these two sources and the natural moon appear to have, of different sizes but the same period is unthinkable. There is an explanation, however, that the Machine is not equipped to consider. Those sources may be under continual propulsive drive to maintain them in the "impossible" orbits. I needn't tell you of the Council what a great energy source that would imply. These objects have been in "orbit" for one hundred days now. With the best energy source our science can boast, we could not possibly maintain such trajectories for more than two hundred and twenty days. I suggest, in the name of caution, that we observe these objects for some time more, for if they remain in their current situation much longer, it would suggest the energy Earth is capable of controlling and directing may be great enough to spell our own doom, should we initiate the Mensansch of Kallendeses!"

After due consideration, the Council agreed to the precautionary plan set forth by the Passenet Pfulwa. For a hundred days, then two hundred and finally five hundred days more the watch was kept, and still the radio sources continued in their "impossible" orbits. Finally the Council was forced to abandon the annihilation plan and initiate tentative plans for peaceful contact with the planet Earth. Shortly after that historic decision, the Passenet Pfulwa spoke in private to his closest friend. "The explanation which I gave to the council was, indeed, beyond the scope of the Planetary Observation Machine, but I greatly fear that the true explanation would not have been, had I not removed several key computing components from its memory shortly after the sources were first sighted. There is indeed a simple geometric arrangement of Earth, its natural satellite and the two radio sources which would allow all three of the satellites to have the same period with different orbits, without the necessity of extra propulsion."

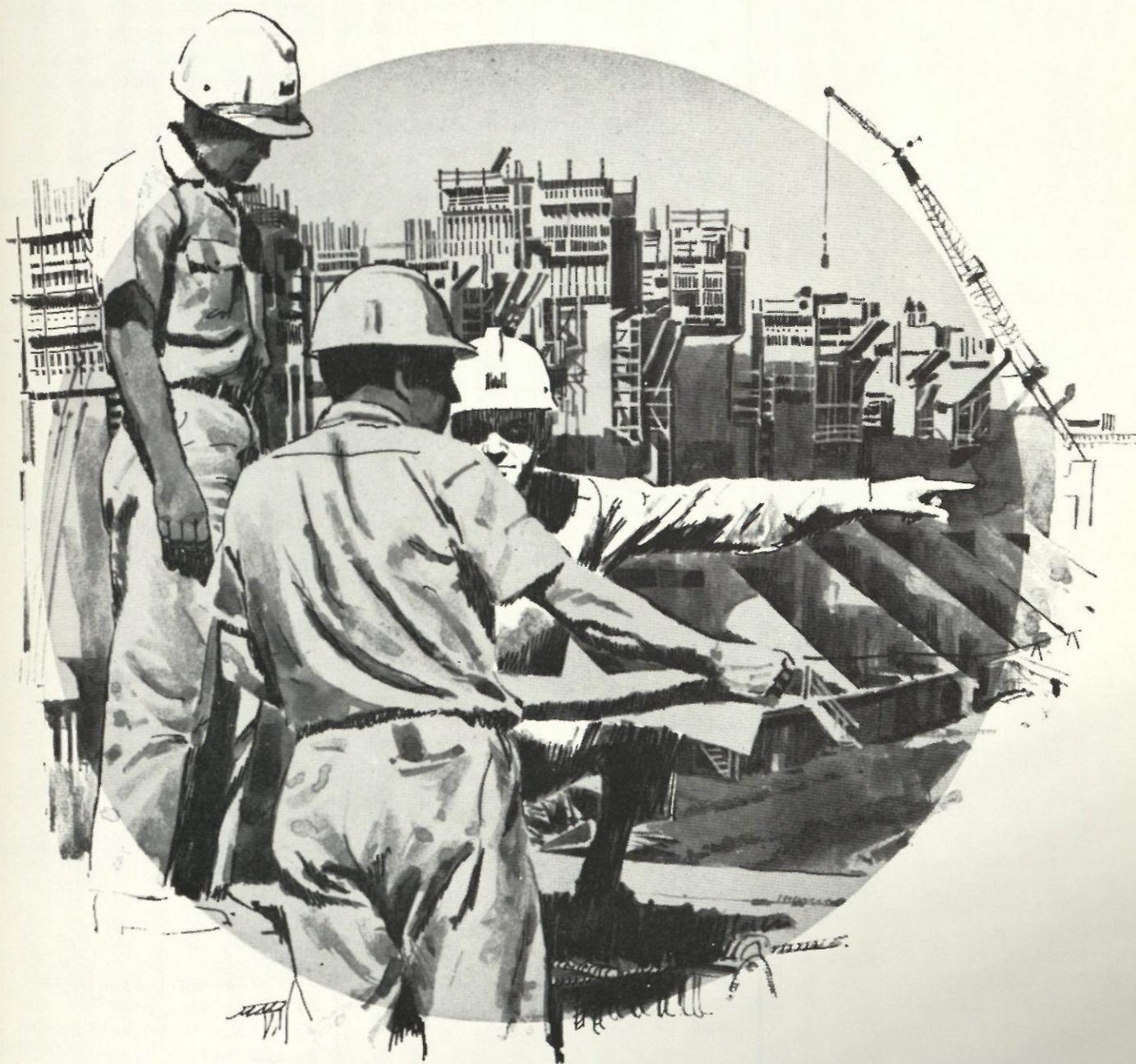
Question: To what geometrical relationship did the Passenet Pfulwa refer, and at what elevations above the Earth were the two radio satellites' orbits, assuming the Moons' orbit to be circular?

Next issue: The answer to this issue's problem and an attempted summary of the confusion caused by last issue's paradox.

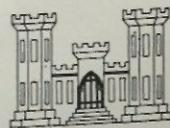
The Corps of Engineers is also the most professional, and the most active engineering/construction group. For the engineer who wants to be where the action is, the opportunities to take part in new, more advanced, extremely challenging engineering/construction projects will be virtually limitless. The Corps' activities today include the broadest sweep of professional demands — water resources development, huge

dam construction, navigation and flood control projects, construction of hospitals, family housing, manufacturing plants, missile sites—you name it! This is the organization for the engineer who wants to do things, plan things, become involved, grow—starting right now. If you're a doer, and you want to be where the action is, write to us today. We'll tell you all about the advantages of a civilian career with the Corps of Engineers.

Engineers: Practice your profession with the largest engineering/construction group in the world.



Corps of Engineers Department of the Army Washington, D.C. 20315



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CHIPS

Coed Mottos:

Freshman girl: Mother knows best.

Sophomore girl: Death before dishonor.

Junior girl: Nothing ventured, nothing gained.

Senior girl: Boys will be boys.

Some of us would gladly trade the cold war for a hot peace.

Then there was the porcupine who bent his quill trying to overpower a wire brush in a dark corner.

Latest love ballad: "I used to kiss her on the cheek, but it's all over now."

How do you catch an elephant?

Dig a hole in the ground, fill it with ashes, and line the rim with peas.

When the elephant comes to take a pea, you kick him in the ash hole.

Professor: "You missed my class yesterday, didn't you?"

Student: "Oh, no sir, not in the least."

The fellow who invented the sofa must be very rich: millions have been made on it.

After feeling his way around the lamp post several times, the sozzled engineer muttered, "It's no use; I'm walled in."

An elderly man approached a small boy and asked: "Tell me young man, do you have a fairy godfather?"

"No," replied the little boy, "but I have an uncle that we're all a little suspicious of."

Love—the delusion that one woman differs from another.

Salesman: "This sliderule is something you'll really need. It will do half your work for you."

Up and coming freshman engineer: "Fine, I'll take two."

Bachelor: A man who thought seriously about getting married.

C.E.: "Who's that?"

M.E.: "Oh, just a girl I used to sleep with."

C.E.: "No kidding, where?"

M.E.: "Chemistry lecture."

CU. . . a fountain of knowledge where students gather to drink.

Me: "I dreamed of you last night."

Coed: (coldly) "Really!"

Me: "Yes, then I woke up, shut the window, and put on an extra blanket."

Famous last words: "Hell, they don't flunk seniors."

What MECHANICAL ENGINEERS do at Kodak

They design new products and better performance into existing ones, figure out the best possible ways to manufacture the products; apply pure reason through mathematical tools to make physics serve—not oppose—human needs; create the right physical tools, the plants to house them, and the services to keep them functioning; get out into the field, showing customers how to get their money's worth, and bring back word on how to do better in the

future. Some typical assignments are in development of automatic and semi-automatic manufacturing equipment; production-line layout, precision tooling, and materials handling; design and development of control units and instrumentation devices; creative design of scientific, industrial, business, professional, and amateur photographic apparatus; economic engineering, cost analysis, and methods engineering; utilities and facilities engineering.

—and chemical, industrial, and electrical engineering assignments can sound equally impersonal

Yes, it is possible to draw a lifetime's pay without much excitement or satisfaction. If you don't mind it that way you'll be easier for the boss to handle. Just await instructions and carry them out to the letter, docilely.



This docile-looking Kodak engineer did not operate that way. That's why we brag about him below. There are others who would have made equally good examples.

Tell us about yourself with a note to

EASTMAN KODAK COMPANY

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Kodak

Van Putte is the name—Douglas—and plastics* is the game. While other Kodak engineers find strong interest in parts of the plastics market where a one-cent change in price can turn failure into success, or vice versa, Van Putte's work is having the effect of upgrading acrylic polymers into better optical materials than the great European lens makers of yore had for fabricating their precious jewels—and a good risk for upholding the public's confidence of reasonable success in picture-taking. Our engineers in the South, who work with plastics we make, spread themselves very widely into marketing activities; Van Putte, working with plastics we buy, has done himself equal credit by digging deeper into one circumscribed but important engineering topic than we think has ever been dug before. Van Putte, born (31 years ago), brought up,

*This word has taken on a broader, more diffuse meaning in certain non-technical circles of contemporary society. Actually, we do have other concerns than plastics, whether broadly or narrowly defined.

and educated in the North, likes working in Rochester just as much as the Southerners prefer their part of the country.

How it went: Always enjoyed math, of course. Master's in heat transfer and fluid flow. First Kodak assignment doing, logically enough, heat-transfer calculations. Bountiful supply of scratch pads, easy access to pencil sharpener and computer, no extra information on big picture into which calculations fit. Proves patience for eight months. Then manufacturing technology department on consumer-goods side of house decides it too could profit from a little campus-fresh sophistication in heat-transfer analysis. Van Putte overjoyed to accept challenge.

New single-minded assignment to learn all he can about injection-molding process. At least that's how the boss's boss now remembers the assignment. Van Putte remembers it a little differently. More like "Is it the temperature that's wrong in those lens-molding machines? The pressure? Or is it the flow rate?" On a certain lucky day,

after a year or so of continuing to scratch away for data on first one of these parameters and then another, Van Putte sells a program of fundamental studies with sensors for all the injection-molding parameters and on their relation to the parameters of optical performance in the photographic lenses produced. Thixotropic nature of polymer melt properly allowed for. Feels now in retrospect it took him too long to make his program pay off. Others take kinder view, drink toasts to Van Putte's health, look forward to next phase of his work wherein he educates injection-molding machines to know about the optical performance of the lenses they turn out.

Well known fact in industry that when a program turns out well, it was the big boss's idea. Van Putte crafty enough to understand that fact. Boss also crafty. Knows better than to call in a green young engineer and tell him to make a quantum jump in technology. Even if that's what he wants done.



Bob Nerad seeks recognition

But not just for himself.

Bob was Chairman of a special Jaycee project to select the "Outstanding Young Educator" in Schenectady, New York.

He began by rediscovering firsthand some of the vibrant situations that confront young teachers. With that background he was ready to coordinate the nominating and judging.

Planning and coordinating come naturally to Bob. As a Production Control Specialist with General Electric's Medium AC Motor and Generator Department, he keeps production lines running smoothly. Coordinating machinery, raw materials and labor is crucial to any efficiently run business.

With a mechanical engineering degree from Cornell, in 1962, and an MBA in personnel administration from George Washington, in 1963, Bob sought to plunge

directly into meaningful work. He'd had enough theory and simulations to last him for awhile.

At General Electric he found people that agreed with his thinking, and what's more, GE offered him immediate responsibility via the Manufacturing Management Program.

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