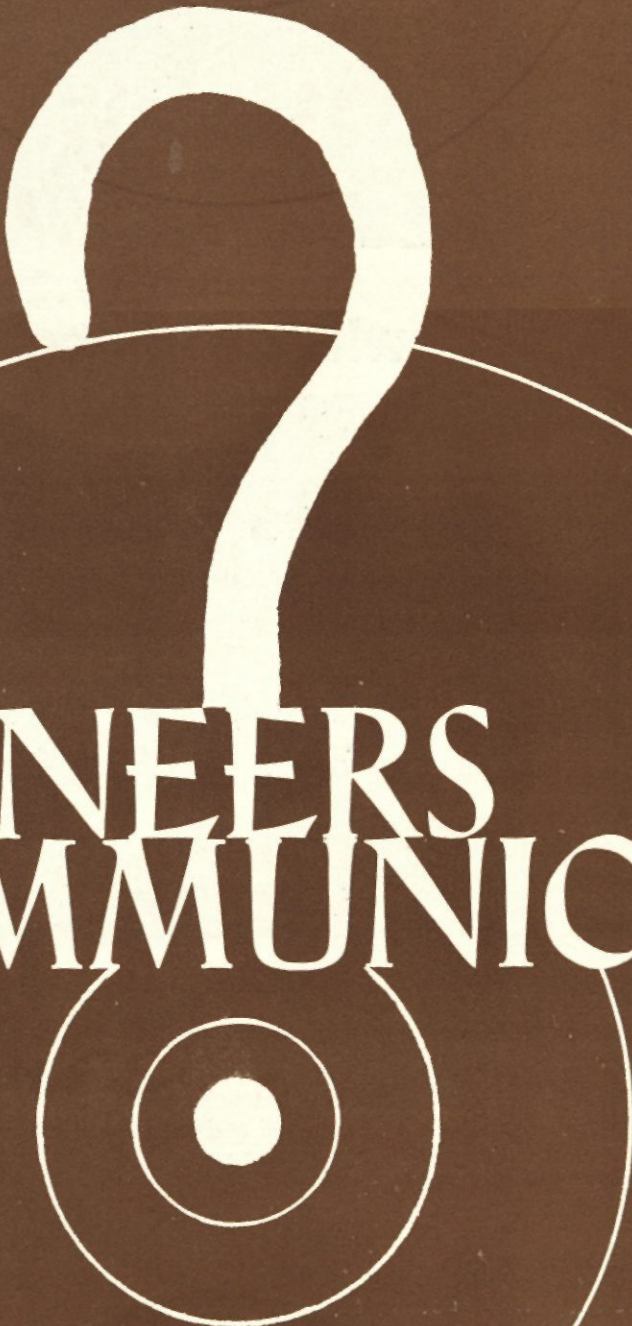


The
COLORADO
Engineer

NOVEMBER 1968

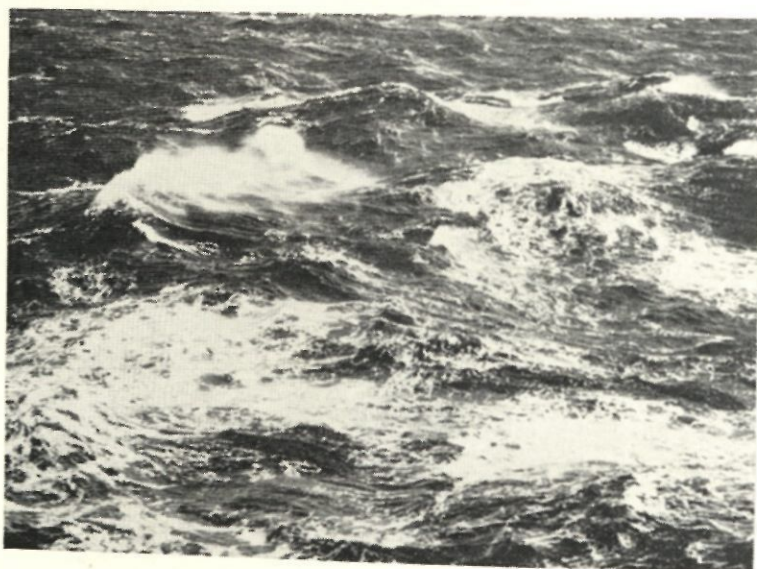


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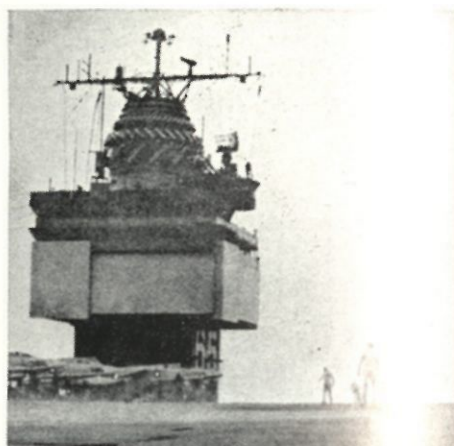
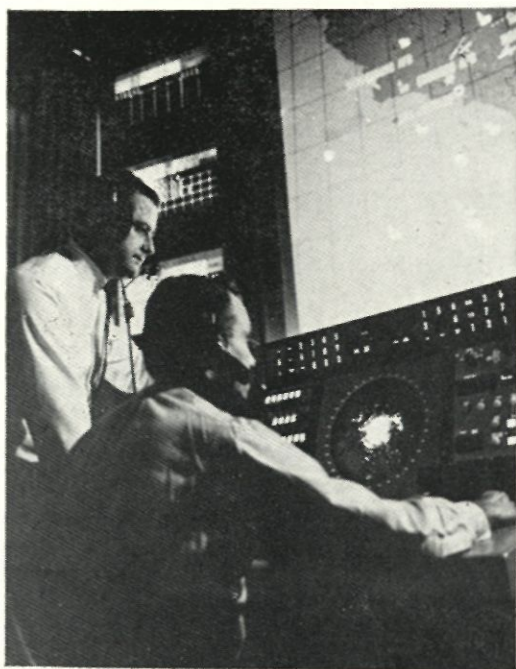
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NOVEMBER, 1968

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COMMUNICATION

An inability to communicate is indeed a handicap to the otherwise reputable engineering profession. This problem must be evaluated before it begins to greatly impair the contributions of engineers to society.

Communication inadequacies can be exemplified by mere observation of a single college of engineering. The typical engineering student is unaware of his surroundings. An awareness is essential if the student is to develop intellectually and emotionally into the practical engineer today's industry demands.

The principal objective of this magazine and its sponsor, Associated Engineering Students, is to familiarize the student with engineering college life and professional engineering. However, unless the student realized that this magazine is a method of communicating that belongs to him, he will find it very difficult to familiarize himself with his surroundings.

How many students feel at ease around faculty members—their only contact with the demands imposed by industry today? How many engineers in industry are aware of the demands of society?

Many of the social ills of today's society are a result of a communication deficit. The engineer must make this one of his prime responsibilities. He must very thoroughly evaluate himself as an engineer in today's society, and honestly decide if he needs to expand his horizons as an individual. He must not allow the increase in technology to thwart his growing mind and stifle his potential for becoming a useful individual.

—Randy Lorange



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FOREST PRODS, PAPER & FILM —Olinkraft, Inc. —Ecusta —Film	West Monroe, La. Pisgah Forest, N.C. Covington, Indiana	Carbonizing Paper Fine Printing Papers Specialty Paper Products Cigarette Paper & Filters Cellophane Kraft Bags Kraft Paper Kraftboard Cartons Corrugated Containers Olinkraft Lumber	ChE Chemistry Pulp & Paper Tech. IE ME Mathematics Business Adm. Accounting	Marketing Process Engineering Plant Engineering Research & Dev. Statistician Systems Engineering Production Management General IE Design and Development Accounting
WINCHESTER- WESTERN	East Alton, Ill. New Haven, Conn. Marion, Ill. Kingsbury, Ind.	Sporting Arms Ammunition Powder Actuated tools Smokeless Ball Powders Solid Propellants Safety Flares Franchised Clubs	Ind. Tech. IE ME Mathematics ChE Accounting Business Adm. Marketing Personnel Mgt. Physics Ind. Mgmt.	Production Control Purchasing Manufacturing Plant Engineering Sales Financial Analysis Personnel Marketing R&D

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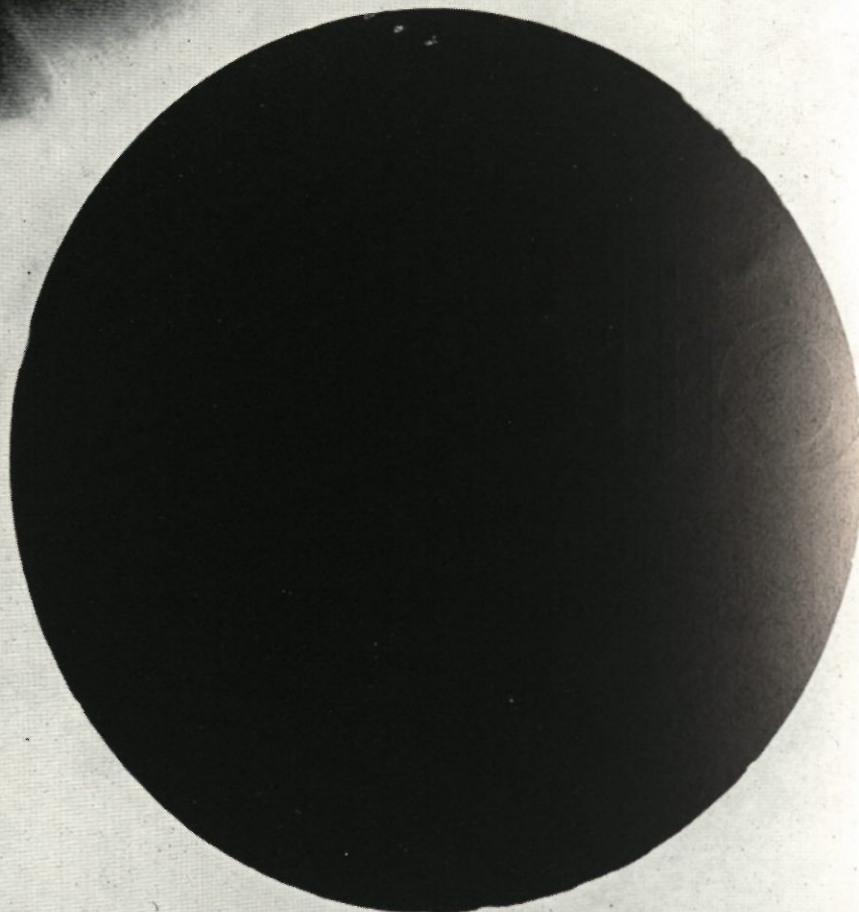
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WHAT IS YOUR OBLIGATION?



DEAN MAX S. PETERS

It is distressing to observe the disruption caused at some of our universities by an amazingly small fraction of the total students on the campuses. The public press makes great headlines out of these incidents, and most of the general public fails to recognize that by far the majority of the students are too busy with their schoolwork and other activities to have any role in the highly publicized disruptive actions other than as spectators. In several of the universities where particularly violent demonstrations have occurred, I have received information directly from the Engineering Colleges proudly pointing out that almost no engineering students were involved in the demonstrations because these engineering students were too busy with studies and other functions. I must tell you that I do not consider this as praise for the engineers at those schools.

The catch phrase one might use in attempting to reason with the small minority of students who are disrupting discussions with their loud outcries is—"To be heard—you must be willing to listen." To our engineering students and to the majority of our students who, in my opinion, have the ideas and the views that truly make sense for our future, I suggest that the following might be an appropriate motto:—"To be heard—you must be willing to listen and then speak out."

Another phrase which some persons feel should be considered by the disrupting minority groups is—"Rights versus responsibilities." This is a very high-sounding quotation, but I would suggest that a more appropriate quotation for our responsible students who have not found time to respond to the vocal minority might be—"Rights versus responsibilities and obligations." I would be proud to hear what our engineering students would say if they decided to recognize their responsibilities and obligations by "listening and then speaking out."

Max S. Peters

Dean

These fingers once trembled uncontrollably.

The affliction, Parkinson's disease or "shaking palsy." Its cause, a bit of diseased tissue deep within the brain—making the hands tremble uncontrollably.

For years, doctors tried many ways of destroying the troublesome spot. Today, in carefully selected patients, operations for Parkinson's disease are performed safely and successfully with a new type of surgery based on cryogenics—the science of extreme cold—that was pioneered by Union Carbide.

Working with surgeons at Saint Barnabas Hospital, New York City, Union Carbide designed equipment by which the intense cold of liquid nitrogen, at 320 degrees below zero F., is applied with pinpoint exactness to the diseased tissue. Instantly frozen and destroyed, the uncontrollable trembling ceases.

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CONFORMITY

ARTHUR MONTEVILLE

When you hear the word conformist, what do you picture in your mind? There are several ways you might picture a conformist—one might be the person to whom you look up because he is always very fashionable and seems to fall in with all the best people. The other picture you might form is that of someone very dull who may seem to have no mind of his own. Everyone has laughed at the so called "yes" man in big business, but how many of us have become "yes" men in our own day to day living?

What makes people conform? Is it fear that there is no longer any individuality to be found in modern man? Fear, I say, because how many of us have been afraid to do something due to the mere fact that we're scared we might be called abnormal, odd, or strange. Why are we so afraid to be out of the ordinary? From the time we're old enough to think a little on our own, we are carefully molded into believing that if we don't act like the rest of the group, we are queer and are something to be laughed at. We may question why we have to act like everyone else; and our answer may be, "In Rome do as the Romans," or "You have to fall in and get in step."

This may be fine to tell a child when he is four or five years old, but when do we tell him differently or do we ever? How far in life should one be guided by the rules and customs of the land, or do we always need these rules as guidelines to fall back on? Which leads me to ask still

another question: Is it possible in this day and age to ever become an individualist? I answer this question with a yes but maybe not as some would call one an individualist.

What Is a Nonconformist?

The man I call an individualist is such a man as Robert Frost's poem about two paths so well defines—those who travel the beaten path are the conformists, and those who travel the path less traveled are the individualists. How little we think of the words unique and extraordinary when we hear the word unconformist. Why? Because we are taught very young to have a bad taste in our mouth after saying such a word.

I don't think of a nonconformist, or an individual, as one who has to dress uncommonly. Nor do I believe he has to live in a special part of town to distinguish himself as an individualist. For example, he may distinguish himself by inventing new and time-saving devices or as the President of the United States. These men are true nonconformists, true individuals that were not happy to be just one of the gang. These are the men the United States has always prided itself with, such men as Nathen Hale, Abraham Lincoln and Billy Mitchell are only a small fraction of the men I could name as true nonconformists.

Let us take a look at how these men showed themselves as individualists. In early September 1776 Nathen Hale heard of Washington's request for a dependable, experienced man to

go among the British, then entrenched on Long Island, and discover their plan for attacking New York. Nathen Hale then showed himself to be an individual, a nonconformist. He volunteered for the assignment and reassumed the character of a schoolmaster with his Yale diploma as part of a natural disguise. On the evening of September 21 he was captured and later convicted as a spy. Before he was to be hanged, he was commanded to say some last words. It was then that he spoke prayerfully for American freedom: "I only regret that I have but one life to lose for my country." Nathen Hale had truly left the ranks of the group to become one of the all-time great individualists.

There Is a Price to be Paid

Billy Mitchell, who thought it better to speak out for an air force and safety devices than to think of what it would do to his military career, allowed himself to be court-martialed to dramatize the necessity of an air force and dramatize that American men were going sent to their deaths in ill-equipped airplanes. Through his efforts the American public became awakened to reality of the conditions existing in the military.

Abraham Lincoln, 16th president of the United States, was born in a log cabin near Hodgenville, Kentucky. Abraham's father, Thomas, had practically no education and could barely scrawl his name. Was Abe a conform-

(Continued on page 15)

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Talk to our Representatives
W. L. KLASSEN
J. W. YANT
December 12, 1968



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(Continued from page 13)

ist or a nonconformist? One look at Abe Lincoln and anyone would know that he could never be a conformist; he just didn't look the part. So it was that as a nonconformist, a man of lowly birth, he would rise to tower above all men. Although the process of ratification of the thirteenth amendment to the Constitution which abolished slavery throughout the United States had not been completed at Lincoln's death, an amendment Lincoln had long hoped for, the adoption of the amendment was assured.

The Beat Generation

It isn't such men as I have named that have caused the fear of being called a nonconformist. No, it was not those men but a small group of so called nonconformists that have sprung up in our midst. This is the group of nonconformists which have given rise to ideas of an individual or one that stands out to be looked upon as strange, unusual, or odd. These are the ones responsible for the so called beat generation. Beatniks, that is what they call themselves. The beatnik's purpose is merely to be "different from" the bulk of humanity. The driving force for the beatnik is one of negativity rather than positivity. He is running *away from* a life that he does not like instead of entering into an existence he feels to be superior for the betterment of his being.

I don't want to be understood as saying everyone should be a nonconformist, but I am saying if you do conform, know what you are conforming to and why you are conforming. I say this because during the Korean conflicts there was a blot on the American record of individualism. The communists would segregate the few leaders and the result was complete chaos. On the march, in the temporary camps, and in the permanent ones, the strong regularly took from the weak. There was no discipline to prevent it. Many men were sick, and these men instead of being nursed by others were ignored or worse. With the lack of leadership thirty-eight percent of the Americans—2,730 out of 7,190—died in captivity.

So, ironically, upbringing and social experience that stress being a good guy and getting along with the group

lead to abandonment when the group is threatened or disrupted; togetherness ends in isolation. Some men were so shocked by the collapse of the group relationship that they withdrew into their little shells of seclusion to protect themselves from reality. They could no longer associate themselves with a group to set their standard of values, to think for them and thereby they lacked the resourcefulness to live under these conditions.

I am not saying the services should tell men to act as they please, but I am saying that each one should be taught why he is part of a group. Thereby once he understands his position in the group, he will then see himself as an important and distinct part — an individual.

This leads me to the question: What does an individual gain in a group? An individual can gain quite a bit from a group if he can belong to the group and still maintain his individuality. This at first may seem to be paradoxical, but if he strictly adheres to his own standard aided by those qualities of intellect, or human understanding and of a moral character that enable a man to inspire and to manage a group, he cannot help but remain an individual and likewise a leader.

You may now ask, "If one has all these qualities, why even belong to a group?" "No man is an island," and no man is without failures; therefore, even a leader may at one time or another call upon the group or even upon the group's moral code to get him over the rough periods of his life. This brings to mind a poem by Amy Lowell, "Patterns," in modern free verse. The narrator, a woman of seemingly strong character, is against the rules of fashion and moral code of the era. She talks of the day when she'll marry and be released from some of the rules. She becomes informed that her fiancée was killed in action. She, heartbroken, finds strength in the rules she once scorned. She can go on with the help of the rules where without them she might have fallen spiritually.

The importance does not lie in being a conformist or nonconformist but rather in having a well-founded and well-based reason for being one or the other.

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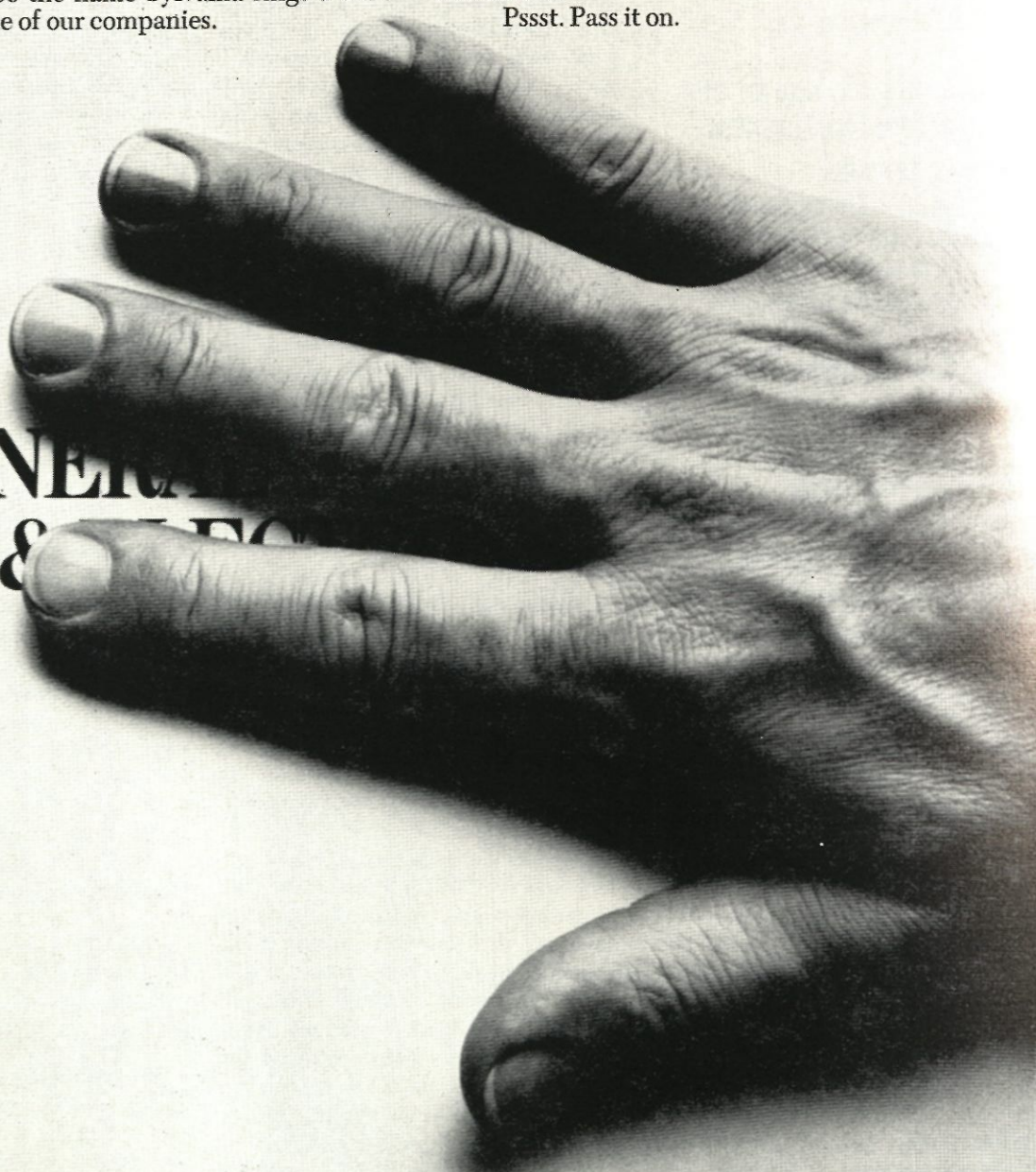
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The Engineer:

A SOCIAL FORCE

DR. CHAS. F. JONES

This is a speech presented by Dr. Charles Jones, President of Humble Oil Company, at the ECMA Convention, April 5, 1968. (Reprinted from The Humble Way.)

For a profession based on known and reliable scientific laws, and proud of its strong inclination toward the practical, engineering is subject to a surprising amount of self-analysis. Perhaps because our technical capabilities have come so far and so fast, engineers seem to be given to persistent introspection about themselves.

I view this tendency toward self-examination with encouragement, and I plan to engage in some soul-searching of my own about the engineer, his professional personality, and his environment.

Leadership

All of us who are associated with engineering can take a genuine pride in the past accomplishments of our profession and its contributions to our total society. But I would like to address myself primarily to the present and the future, recognizing that new dimensions are being added to our society at a dramatic rate, and that it is essential that new dimensions also be added to our profession if the engineer is to retain his vital role.

Briefly stated, my thesis is this: I believe that the modern-day engineer is not providing a standard of guidance and leadership—especially related to the human effects and social consequences of his technology—that is commensurate with the impact of his work and the importance of his profession.

The ancient engineers had no such problem. The pyramid-building engineers of Egypt, for example, were attached to the Pharaoh's household, and answered only to royal commands and the royal ego. But engineering today serves the masses. Engineers are ultimately responsible to the whole of society, in an age of unprecedented sensitivity to such accountability.

By virtue of what he knows and his professional application of that knowledge, the engineer is a social force. By reason of the enduring effect of his work, the engineer bears a social responsibility to see that he does not, while solving a technical problem, create a human one.

This responsibility is not being fully met. I think that this is partly the result of forces that are beyond the engineer's direct control; but I think it is also partly his own doing. And I believe that his failure to meet this responsibility is resulting in his slow but steady removal from the policy-making atmosphere where leadership is exercised.

Politically Oriented Questions

One of the root causes of this development is the tremendous expansion of technical knowledge, which has imposed the necessity of specializing and sub-specializing the engineer. No longer do we have the da Vincis and the Michelangelos, who were painters and sculptors as well as

builders; gone are men such as Sir Christopher Wren, who was a professor of astronomy as well as a master designer. These were men whose knowledge and interests encompassed their entire environment, and they were representative of an age when physicians could also be philosophers, and astronomers could be artists. But today, when we know more than ever, we are faced with a frustrating paradox: the further engineering horizons extend, the narrower becomes the view of the individual engineer. The engineer is rapidly becoming someone who works on pieces of a puzzle, and if this trend is carried to its extreme he will ultimately find himself operating in a technological straitjacket—totally confined to executing the means, without being able to discern the ends.

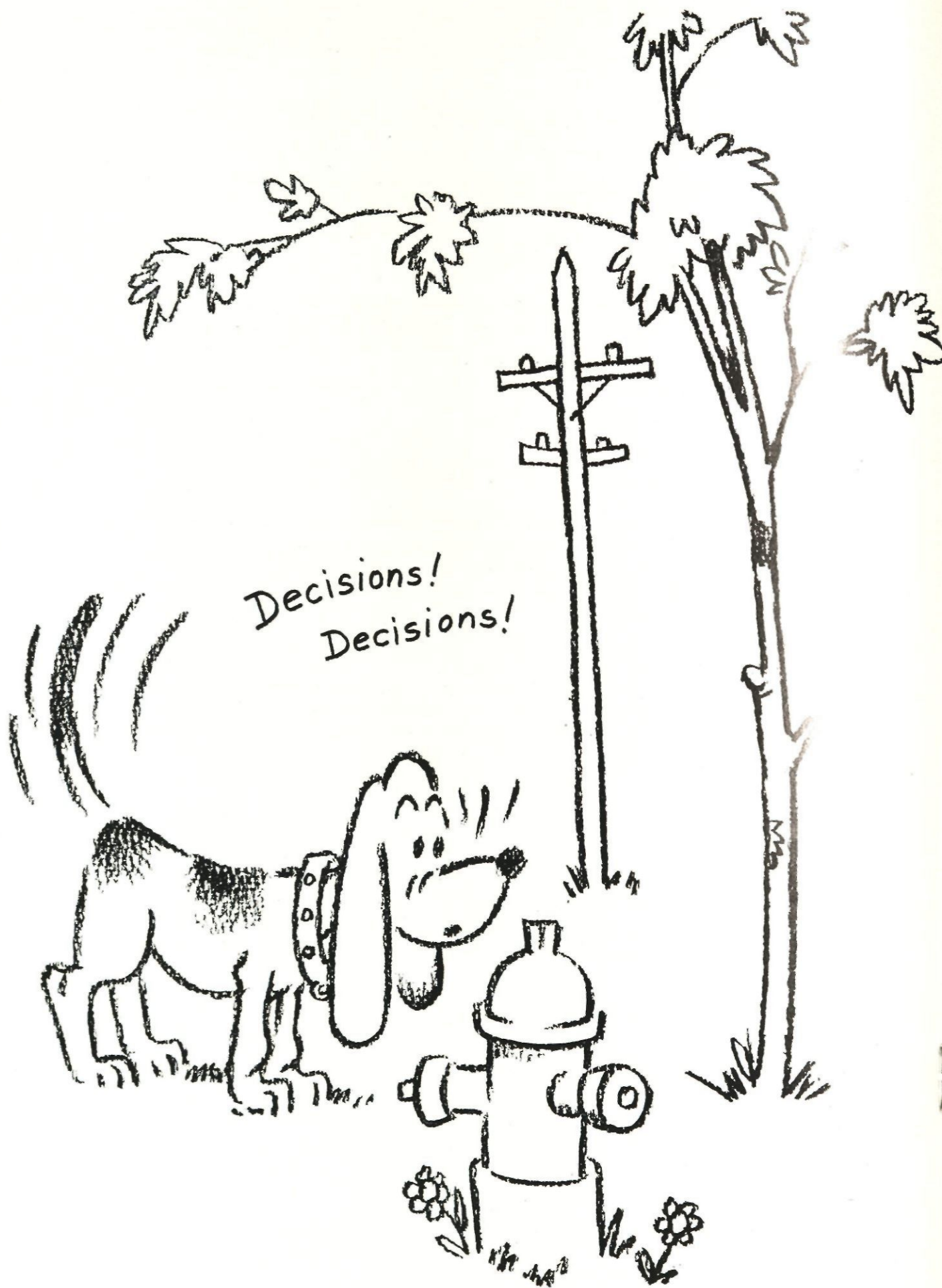
Coupled with this is the engineer's repeatedly demonstrated reluctance to involve himself in the search for solutions to complicated, troublesome, politically oriented questions of public policy. The net result is that the engineer, master of technology, is often isolated from a view of the social consequences of his acts.

Social Environment

This is happening at the very time when we urgently need professionals of exactly the opposite stamp—engineers who are skilled in their specialties, but not limited by them; who recognize the extent to which man is concerned with matters of mind and spirit, as well as with his material well-being. This growing preoccupation with the quality of life, not merely the quantity of abundance, dictates that no act of the practicing engineer can be considered apart from its effect on our physical and social environment. For example, the industrial engineer who designs a plant without incorporating adequate measures for control of air and water quality is neglecting a factor that should be as much a part of his plan as a consideration of the strength of materials or the laws of mechanics.

The engineer in industry, in the day-to-day performance of his job, is in a position to exert a progressive influence. For it is in the routine conduct of business that he has the best opportunity to reconcile the application of technology with the people whom it affects and serves. This is not always done.

(Continued on page 20)



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(Continued from page 17)

There are many examples, in industry and elsewhere, of what might be called the engineer's "target fixation" on his slide rule, and his failure to integrate the needs and reactions of people into his systems analysis. One current example of absorbing interest to all of us can be found in our cities. No one could accurately say that the engineers are responsible for the urban crisis; but undeniably engineers have avoided taking a leadership role in the search for solutions to these problems.

Nowhere are the full capabilities of our profession more desperately needed than in our cities. Yet one is tempted to ask, in all seriousness, "Where are the engineers?"

In the functions of city planning and urban renewal—unquestionably activities in which engineering skills can be used to great advantage—engineers have largely abdicated to a group of planning consultants whose training and orientation are somewhat divergent from that of our profession.

And now comes the "urbanologist," a new diagnostician of urban ills, who is still more removed from the world of the engineer. The word itself is a cross between Latin and Greek, and the practice of urbanology seems to incorporate something of both research and application. Facing problems where knowledge of no one discipline will be enough, urbanology appears to be an effort to combine in one individual some of the qualities of the city planner, the educator, the sociologist, and the politician. Urbanologists are found in the academic community, where they analyze the pathology of city life through a growing number of campus centers for urban studies, and in the governments of some of our largest cities, where some of them occupy prominent administrative positions.

Conspicuous by Absence

But here, too, the engineer is conspicuous mainly by his absence. So, although he has been a major instrument in building the parts of the city—its offices, industrial plants, transportation facilities, housing, and schools—the engineer's influence has been consistently overshadowed in the deliberations where it is decided how the parts will fit into the whole. Since he seems disinclined to occupy those difficult offices which are re-

sponsible for seeking solutions, he is becoming less and less a voice in the decision-making process. He is being asked chiefly to implement, not to initiate; to meet emergencies, not to prevent them.

I am convinced that if our formidable urban and other large-scale social problems are to be solved enduringly and with the most effective utilization of our financial resources, the engineer must reassert his capabilities in a leading rather than a supporting role. He must not only continue to answer "how" and "how much," he must begin to ask "why?" When he begins to ask—and to answer—the "why" questions, he becomes a useful and much-needed participant in the formulation of urban policies. If urbanology is part of the answer to the urban situation, who is more qualified, basically, to become an urbanologist than the engineer?

Systems Approach

The magnitude of the problem underscores this need. The published speculation of the costs of rebuilding our cities—or building new ones—varies somewhat wildly from the billions of dollars into the trillions. One source estimates that we will have to build an equivalent of "100 Clevelands" by the end of this century. No one is quite sure whether we should build completely new, pre-planned cities or whether we should adopt methods such as the British "grid" system of self-contained neighborhoods adjacent to existing metropolitan areas. But whatever method or combination we undertake will have to be tackled with the "systems approach" to problem-solving—a process at which the engineer, by training, is at his best.

With this background, and with his healthy respect for "hard data" gained from the process of inductive and deductive reasoning, the engineer is in a position to make a valuable contribution to the decision-making process. The engineer is not hesitant to ask, "What are the facts?" This is a hard question, but it must be faced. Engineers are also willing to face up to the need to set priorities according to the cost-versus-benefit principles of engineering economics, a process that is especially important in dealing with problems of a widely fragmented nature such as control of air and water pollution. And the engineer is in a

position to judge, and offer advice on, the total cost of a project—its long-range economics as well as its short-range expense. In sum, the engineer does not look for an idealized solution—for a magic number—because he knows no such thing exists. He can bring a tough-minded practicality to a conference table that is all too often dominated by other factors.

An Inability to Integrate

The fact that the engineer is *not* more in evidence at the policy-making level can be attributed in some degree to his own peculiar Achilles heel—an inability to integrate engineering practicality with human and political reality. Like the man who was unable to see the forest for the trees, the engineer has on occasion shortsightedly produced benefits for one segment of the urban population at the expense of creating blight for another—for example, in building an urban expressway he may displace large numbers of people and disrupt traditional neighborhood patterns if he does not make compensating adjustments. In a crowded urban landscape, problem-solving calls for creativity and sensitivity to social values as well as attention to engineering fact.

Skill in Communicating

Not only must the engineer be able to perceive the social manifestations of his technological acts; he must also be skilled in communicating his ideas and winning acceptance for them. The ability of an engineer to implement his insights is limited by his success in persuading others toward his point of view. He must be willing and able to involve himself in the painstaking—and often painful—process of explaining his views to others less familiar with the technical aspects. Frequently, this means getting involved with conflicting views in the political arena. But it must be done.

The engineer has much to contribute, and for this reason he should get out of the wings of our urban theater and back onto center stage. He will be more exposed there, and the critics can be exceedingly demanding, but as a topflight technical practitioner and a citizen-leader that is where he belongs.

He has little time to make this adjustment. The Rand Corporation, using the views of experts in six major areas of human activity, has issued a report which attempts to visualize

what the world will be like at specific points in time, namely in the year 1984 and in the year 2000. Their forecasts strongly suggest that we will have created biosocial systems having to do not only with medical advances, housing, community development, and pollution control—but also with their coordination into large-scale social systems such as vast metropolitan complexes.

If the engineer is to play his proper and responsible role he must be ready, and if he is to perform effectively he must prepare effectively.

Engineering Education

First, his basic educational credentials must be in order. This involves not only a superior technical preparation but also a fuller and richer grasp of the humanities and the social sciences. Our engineering schools have in recent years placed additional emphasis on these subjects. But there is more to this than merely the proper curriculum. I strongly suspect that today, just as in my day, there is a tendency for some students to feel that if a course is nonengineering, it is nonessential. The effects of superficial attention by the student to such subjects tend to manifest themselves several years later when he is a practicing engineer. Then he finds that he needs more than a passing grade or a superficial acquaintance with the humanities—he needs a well-developed sense of the world about him, a well-grounded instinct about human reactions.

A second major factor in the engineer's preparation is the level to which he carries his education. A new report by the American Society for Engineering Education pointedly indicates that the minimum requirement for entry into the engineering profession is rapidly becoming the master's degree. Only ten years from this date, two out of three bachelor graduates will go on to a master's degree, and one in seven will go on to a doctorate.

In view of the increasing demand for training at the doctoral level, I am convinced that there is need to restructure graduate programs so as to allow those who are not primarily research-oriented to obtain advanced

training more suited to their field of interest. In no way do I demean research; but responsible surveys show that only five per cent of engineering bachelors will become doctorates working in research in industry or government. Engineers seeking advanced degrees are not a small group with narrow interests centering primarily on research; they are, instead, interested in preparation for all of the engineering function including design, development, and management. Given the temper of our times, I submit that it is extremely important to offer encouragement to those who want to achieve a doctorate in engineering which is oriented toward application rather than research. I do not suggest that we abandon the engineering laboratory; only that we redefine it. If ever there was a laboratory genuinely worthy of the engineer's full talent and commitment, it is the total material balance we find in the American city.

Exemplified by the emergence of the urbanologists, our urban problems are demonstrating that the traditional dividing lines of the educational disciplines are proving somewhat inadequate in producing people qualified to cope with these crises. New interdisciplinary activities are emerging in the sciences, and I hope that we may shortly be producing engineers of a hybrid nature—for example, a "social engineer" who applies engineering techniques, systems analysis, and new tools such as the computer, telecommunications, and teaching machines toward the solution of social problems.

But whatever road tomorrow's engineer takes, given the speedily changing state of technology it seems clear that continuing education on a career basis will have to become an entirely new dimension of his development. He cannot dare to become what Bernard Shaw referred to disdainfully as "a prosperous man of business, who probably never read anything but a newspaper since he left school." On the contrary, the engineer will no doubt need to follow what has been called the "dual ladder" concept—an "academic ladder" of degrees, and after graduation a "career ladder" of study either in or out of the formal

academic atmosphere which includes an updating on social as well as technical issues. There is already a sabbatical pattern in the academic world, and it is entirely possible that some such pattern may need to be instituted in industry. So great is the continuing addition of new knowledge to the engineer's arsenal, that industry bears a responsibility to provide an environment within which the engineer's development will be sustained and encouraged.

Much, obviously, will be expected of the engineer. It might seem that he will have to be, figuratively speaking, faster than a speeding bullet and able to leap over tall buildings with a single bound. Not so. I am convinced that his overriding problem will not be our expanding technology; never has he had such tools to work with. If the ancient engineers could leave to us the extra-ordinary legacy of the pyramids—using, according to the Greek historian Herodotus, only the lever, the roller, and the inclined plane—then surely we, with 5,000 years of accumulated knowledge plus the computer, can shape our world for the benefit of all just as they shaped theirs for the ego of royalty.

Conclusions

I think, rather, that the engineer's sternest challenge will be within the framework of the intangible—the areas of human understanding and social awareness. Never have the engineer's professional contributions been so exposed to review and critical appraisal by the society he serves. If he is to serve best, he must improve his sensitivity and skills in human communications.

The times demand not just an engineer, but a *whole man*, responsive to the laws of the *spirit of mankind* as well as to the laws of the universe. The American poet Edwin Markham, best known for his work "The Man With the Hoe," has been dead for a generation. But surely he must have had our times in mind when he penned these lines:

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If man unbuilted goes?
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WAS IT WORTH IT?

STUART UMBLEBY

The only national organization representing undergraduate engineers is the Engineering College Magazines Associated. Editors from approximately fifty engineering magazines similar to the Colorado Engineer make up the group. It was originally organized to improve magazines through exchange of ideas while setting standards for magazines to aid national advertisers. The article that follows is a speech delivered to the American Society of Engineering Educators by an editor of a member magazine.

You have asked me to speak to you on the question "Was it worth it?" I presume you recognize that a student today may use any platform he can get to tell you how things look from his side of the podium. I shall do that, but the question "Was it worth it?" can be interpreted several ways. It could also refer to my past experience as editor of a student

engineering magazine, in addition to my experience as an engineering student. I not only intend to answer that, but also to discuss whether or not "it is still worth it" today. Most of all, I assume that you want candor—which is what you are going to get. Much criticism can be leveled at institutions of higher education today, and critical thinking is the first step toward improvement. I realize that Universities are changing very rapidly and in some cases are making great progress, but further improvement is not achieved by patting oneself on the back.

"Was it worth it, those two years as an editor of an engineering college magazine?" If that is the question, I can answer it easily. I certainly learned more about engineering education than most students do. I learned more about the profession. I became familiar with several national organizations of engineers, including the Engineering College Mag-

azines Associated, the non-ASEE group that is usually referred to as ECMA, and the more recently formed Engineering Student Magazine Advisors' Committee of ASEE. To prevent confusion between the two, I shall refer to the first organization as ECMA and the latter as the ASEE committee. All in all I definitely learned more about engineers and engineering than the average student does, although I do not consider myself an expert on either subject. I suspect that I do know one thing better than you, which is, what some of the best students, including the magazine editors, are thinking and saying. That is partly what I want to tell you today.

Another way to interpret the question is, "Would I recommend that a friend in engineering become an editor of a campus engineering magazine?" Yes, I would, for two reasons. First, because having to write an editorial each month forces one to

think about the education he is receiving. In my opinion, this experience is worthwhile because I believe that engineering education today contains all the ills of contemporary education, possibly in their purest form, so naturally it needs all the thinking it can get from anyone who is willing to give it.

ECMA Student Organization

The second reason I would recommend that he take such a job is that I believe that learning about ECMA and this committee is also a valuable experience. At least one of them, ECMA, is an almost ideal example of what an organization should *not* be. Perhaps the same can be said of your ASEE committee. It is a different sort of organization from ECMA. For one thing, it doesn't pretend to be a student organization—and ECMA does pretend that it is. You people here could address yourselves to the differences between the two groups better than I can — for many of you belong to both groups.

I really don't know what your committee has done. I remember hearing several years ago something about an editors' handbook, but I haven't seen it yet. About two years ago this committee conducted a survey (which put into numbers what everyone already knew), but the resulting report has never been distributed. I have heard that a part of its original goal was to help to improve ECMA, but the magazines are not noticeably better, and ECMA is as lethargic an organization as it was before this committee was formed.

In telling this other student about being an editor, I would probably in-

clude some description of ECMA and your committee and the help they gave me as an editor. I would be hard pressed to think of anything at all, let alone anything positive. I would have to tell him that:

1. There was no national source of articles to help editors fill in the blank spaces in the magazine when writers didn't come through on time.
2. There was no regular publication to keep editors posted on significant programs at other schools such as:
 - a. special, experimental courses
 - b. new international work or study exchange programs
 - c. special conferences for students on topics such as energy conversion, cities, or ocean engineering.
3. There was not even a handbook to tell an inexperienced engineering student how to edit and lay out copy.
4. There was no strong national organization to assist editors in maintaining their freedom from faculty or administrative censorship.
5. There was no statement of editorial policy to suggest what features and what sorts of articles were most appropriate for the readership of a student engineering magazine.
6. There were no regular contacts with other national and international student groups.

With such a conspicuous lack of support one might well ask, just why *did* I become an editor of a student engineering magazine? The answer, quite simply, is that I felt I had something to say about engineering educa-

tion, and the magazine seemed to be the best vehicle in which to say it.

Perhaps in this respect, my motivation was unusual. It is obvious to anyone who has looked at engineering college magazines that most of them are not yet being very critical of college policy or the assumption upon which their education is based. At least in theory we have now gone beyond the notion that these magazines can ever successfully be slightly-less-well-done versions of *Scientific American*, *Popular Mechanics*, or *Machine Design*. Those of us who have worked on them understand very well that they can never be the authoritative voice on the latest development that everyone will want to read. They have a monopoly on only one subject, and that is what is happening on the campus. A very important part of that monopoly involves the educational policies the student-readers live with. Any discussion of those policies provides you, teachers and administrators, with the feedback you want and need. I suspect that the reason why student engineering magazines are not discussing this subject more than they are is because deans and faculty advisors on most campuses are not seriously encouraging them to do so. In addition, ECMA is such an ineffective organization that new editors do not have readily available examples of other student activists on which to model their behavior.

Editor's Thoughts

Perhaps I should give you some examples of what the best of your editors are thinking, though they may not yet be able to express these thoughts in their magazines. I leave it to you to decide what these comments say about how effective the magazines on your campuses are as means of communication between the students and yourselves, and what they say about the roles you have played as faculty advisors.

I believe that an increasing number of students, including the magazine editors, are coming to regard engineering education as inflexible, job-oriented, conformist, and, for the university, self defeating. Now I'll try to explain each of those adjectives and give you an idea of the sorts of comments that pass between many of your editors when they are together and you are not around.

The inflexibility of engineering

Engineering college magazines are not being critical of college policy

education is best shown by the fact that students frequently are unable to take courses they are genuinely interested in, because they have to take courses in which they have no interest. An educational system with an overly intricate network of requirements and prerequisites is more of an obstacle and a hindrance to learning than a help.

The things which students feel forced to do to survive, to get into a "good graduate school," or to eventually get a good job — things such as grade grubbing, use of files, and, in some cases, cheating — undercut the students' pride, self-respect, and intellectual integrity. He often realizes that he is being fashioned into a well-defined economic unit, not educated to lead a full life. Psychologist Joseph Katz, co-author of *The American College*, has observed the same phenomenon: "Officially college is dedicated to training independence of mind and character but, in fact, it asks students to do as they are told and encourages passive receptivity in classroom and homework." This emphasis on "conforming" costs engineering schools many of their best students.

The assumptions underlying engineering education are self-defeating because the net result, of course, is that students feel alienated from the formal operation of the university. In too many cases students feel that the important things they have learned at the university have been learned, not through its formal educational programs but, rather, in spite of them. An educational system which presupposes that it knows what is best for people who are supposed to be learning to think for themselves is defeating its own purpose. When an educational system imposes its will with negative sanctions it is simply using bad psychology. Rebellion rather than learning is the predictable result.

Lack of Correspondence

This whole analysis of what the better students think about engineering education assumes a lack of correspondence between the student's most deeply felt interests, the curriculum subject matter, and a lack of means of telling the faculty and administration what is wrong. This is where the college magazine could be an asset to the campuses. Just how there can be a conflict between a student's interests and his course work has been suggested by J. Herbert Hol-

loman: "Engineering education is largely irrelevant to the desires and needs of the kids being educated and is little connected to present and future engineering problems."

So engineering education today is suffering from basically two maladies — social irrelevance and neglect in teaching the skills of self development.

Dehumanization in a Technological Society

First the matter of social relevance: the aloofness of universities from community and society is a major cause of the present student revolt in this country. The situation in engineering has progressed to the point where the image of the engineer is of a person who creates social problems rather than solves them. Some academicians take a strange sort of pride in remaining aloof from the real world. For example, even though the country at the present time is gravely worried about dehumanization in a technological society, I suspect that reporters will find little that is newsworthy at this conference of engineering educators.

The issues of social relevance and self development are somewhat related. My own feeling is that a person who declines to consider how the enterprise he is associated with relates to society is something less than completely human. Colleges of engineering are not naturally inclined to teach a person to think in such terms. Most engineering students will say that they are in school "to learn what is expected of them" rather than to learn how to decide that for themselves.

You have built an educational sys-

tem which defines a goal and demands that people respond to it rather than one which teaches people to define their own goals. So what can administrators do? They should recognize that the greatest resource for improvement in any organization is the concern and energy of its discontents. Encourage them and you encourage indigenous institutional reform. Quick and appropriate moral support for any reasoned, honest proposals will both improve your institution and show the more lethargic students that criticism of existing policies is considered appropriate and desirable.

You should have the courage to let an idea stand or fall in the market place of ideas. Repression only breeds indignation. Encouragement of and responsiveness to new ideas should be considered an important part of leadership, whether it is for a college of engineering or for a national group dealing with student magazines.

No Internal Criticism

Because engineering does not encourage much internal criticism, it is no surprise that student magazines have the faults they do. Nor should you be surprised that you are seeing no discussion, no controversy, and no dissent in most of these magazines. You should feel concerned, however. Many of the students you are recruiting as editors are not satisfied with the educational policies they and their fellow students have to endure, but most of them do not yet have enough respect or enough contempt for you to be honest with you. I predict that they will soon be telling you, and I hope it is out of respect rather than contempt.

Engineering education is largely irrelevant to present and future engineering problems

Existing policies are rarely the product of the minds of enlightened men

Simply because there are some enlightened and far seeing men in the top ranks of engineering education does not mean that there is no reason for student discontent. Existing policies in any organization are almost invariably at least a little out of date. Existing policies are rarely if ever solely the product of the minds of enlightened men. They are, rather, a compromise between what would be most desirable and what is desired by men who have vested interests in the status quo.

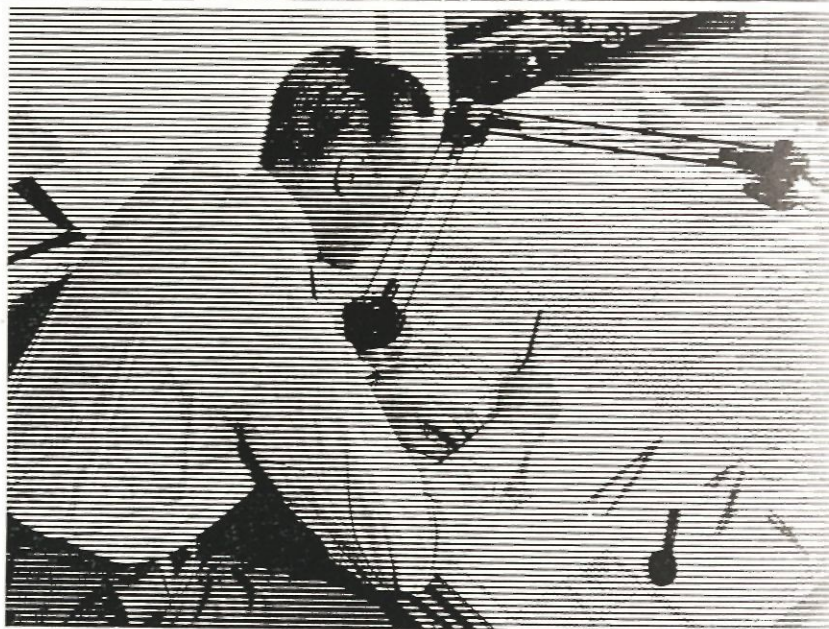
When I was the editor at Illinois I said what I thought in the magazine because we had a dean who would listen and respond. I would have said it in any case, but perhaps my comments had a different tone than they would have had if he had been unwilling to accept constructive criticism.

No Editorial Purpose

Like most colleges of engineering, ECMA is an organization of considerable potential which somehow isn't dealing with really pressing issues. The people responsible for forming this committee apparently had the same reaction at one time, but ECMA still appears to me to be a largely doing nothing organization without objectives and without a guiding philosophy. In its long history ECMA has not attempted to provide student magazines with any editorial purposes or reasons for existence. It has not provided the member magazines with the sort of help one expects from a national organization. It has not fostered cooperation among the magazines on the various campuses. But for some reason this committee has done very little to improve or reform ECMA.

I have given a lot of attention to engineering education and ECMA, and I would like to give your group equal time. But I really don't know what you people have been doing. Frankly I haven't seen much activity. I was around when your ASEE committee was started, and I heard remarks about helping the magazines, about getting ECMA moving again, and so forth. None of this seems to have happened.

Perhaps the major difference between the two groups is that ECMA has been doing nothing longer than your group has.



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I have heard that one of your committee's goals is to improve the faculty advisor's standing with his dean, which suggests that the job is not at present a prestigious one. I am not especially impressed with the resourceful indirectness of this goal, though I find this a characteristic line of logic in organizations of engineers. Two and a half years ago I wrote about NSPE as follows: "There are two ways to show you are professional. One is to say it with words, the other is to show it with deeds. Who will believe you in the first case, and who can disbelieve you in the latter?" There are also two ways to show the dean that you deserve respect as a magazine advisor, and the best way is to really deserve it. Perhaps belonging to an ASEE national committee, regardless of the committee's performance or lack of performance, carries with it some benefits that I am not aware of. Would one of them be that it impresses the dean?

Now that I have made this rather strong indictment, I would like to make a few recommendations. First, student editors should be regularly invited to your committee's meetings. In addition to the contributions they might make, they could write news releases about the meetings to send out to the student magazines. Second, ECMA should be an entirely student-run organization, with no faculty members in official positions. I have often heard it said that faculty members are needed in ECMA for continuity. I don't believe it. There are always editors at ECMA conventions I have met before. I don't believe the turnover is intolerably great, or any greater than in other student organizations. Nor do I believe that only faculty members can run ECMA. ECMA is the only student organization which has faculty officers, and it is the most ineffective student organization that I know of, and I have become familiar with quite a number over the years.

If you would like to hear what the student members of ECMA have done over the last few years as compared to the faculty officers, consider the following. The students have put out a monthly newsletter to communicate between magazines on a semi-regular basis. They have obtained free subscriptions to the NASA News Report for engineering college editors. They

have established contact with other student groups. They have worked to get policy resolutions passed. They have conducted interviews with Congressmen about technology and government which were sent to other student magazines. Students have also sought to get an industry scholarship for a former editor to work half-time on ECMA while in graduate school.

These things have not even been attempted by the faculty officers of ECMA in the fifty years it has been around, and your committee, during its few years of life, hasn't even been able to produce an editor's handbook.

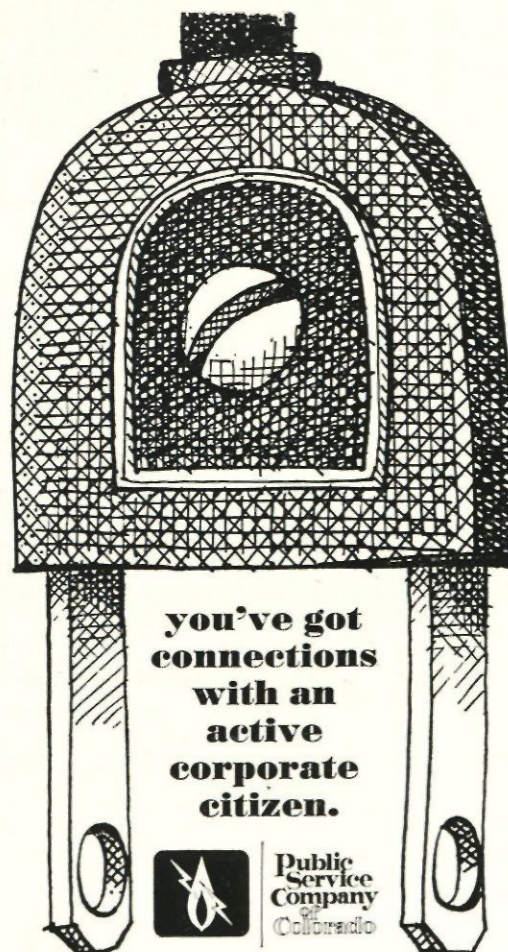
Communication

My last suggestion is that both ECMA and your ASEE committee should seriously encourage the student engineering magazines to become "real vehicles for communication between students and faculty." I put that phrase in quotes because it is the sort of rhetoric that both groups have used for years. In other words, both organizations should consider the possibility of actually becoming national organizations dedicated to improving

student journalism, rather than being dedicated to self-perpetuation.

I have tried to answer the question you posed to me: Is it worth it to be an editor of an engineering student magazine? My response has been that it is worth it in that it teaches one about problems of working with people to get something done and gives one experience in battling institutional inertia. It is not, however, worthwhile if one expects to be involved in an exciting, continuing, critical intellectual exploration with a group of uniformly outstanding, wiser men.

Now let me throw the question back at you. Considering the way ECMA and your ASEE committee are operating at the present time, is it worthwhile for you to be involved with them? If it is a worthwhile activity for a faculty man, one in which he can feel he is really making a contribution to a worthy goal, why aren't the magazines far better than they are? I suspect that all the student editors in the country would like to hear your answers to that question.



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THE ENGINEER AND TODAY

JEFFREY KOHR

Never before, as I recollect, has the United States been so divided as it is today. The people have been unable to unite under a common cause, thus strengthening the position of the United States. The big dividing point seems to be Vietnam. There are those who favor a quick victory, some deescalation, others escalation, and so forth. Many people wonder why we are in Vietnam at all, which brings up even a bigger dividing problem: that of the people supporting their government's decisions.

Two Courses of Action

There are times when the people disagree with a governmental decision. At this time there are two paths open for action. The first is through that principle on which our country is founded: Democratic Procedure. The second method involves demonstrations and at times violence. Here I would like to elaborate on these two paths, before discussing the Engineer's position.

The first is hard and slow, but it will get results in the long run. By voicing dissent to those in office they will feel the pinch of the voters. Therefore they will act to insure voter support. If this does not bring results the man can be defeated in the next election, thus giving someone else a try. This election problem forces a citizen to vote for a man qualified to carry out his ideas not one who follows only tired party lines. For the above reasons Democratic Procedure is the only path which guarantees the possibility of a change. However every voter must be informed enough to make the right choice.

The second path merely provides a

sounding block for the beliefs of a few. Most demonstrations cause noise but rarely do they bring about major policy changes. This is because they are caused by a minority of the people. Thus even though they cause noise they rarely are representative of majority opinion. At times demonstrations are crude and even interfere with rights of others. Now we are faced with a minority whose crimes against individuals are far more serious than the problems they protest.

Now I would like to view the Engineer's involvement in the above problems. In most cases the typical Engineering student is away from the action. He tends to be interested in studying and nothing else. The world seems far away and unattainable. For this reason he may never become aware of problems around him. He may even remain the same after college. If he does he will never truly make a contribution to his community or nation. Even though he has a good job it will not matter if the world falls down around him. Then when he does become aware it is already too late.

Engineer's Unawareness

The problem of unawareness of the Engineering student stems from the curricula of most Universities. They do not allow time to slow down and take a look at the outside world. Most Engineers are faced with the question of study or fail. The emphasis on grades has increased so much that many Engineers feel they can't afford time to do much of anything outside of studying. Here the Engineering School is missing the point. Besides producing educated men it must

round out the individual so that he may take a high position in today's fast moving society.

The "Engineering Method"

It now becomes a matter of desire on the Engineer's part to become a part of the world around him. He is slow to learn but approaches everything in an orderly manner. Each point is thought out fully until he not only knows something but he has ideas of his own. Here I would like to point out the most important thing an Engineer learns: the "Engineering Method." This is the process of looking at a total problem and being sure of the answer after exploring every possibility. In fact if an Engineer applies this method to today's problems it will make his entire education worthwhile. Now he becomes a true member of society. In fact he can and, in many cases, will take an active part.

Now in relating all of this to the problem of what path to take, the Engineer would decide on Democratic Procedure and would become active in its application. Therefore the Engineer becomes active in governmental operation. He becomes aware of problems and decides what action to take. He realizes that politics affect him directly and has some desire to have his say. In conclusion, the Engineer who becomes aware and applies himself will be much better off than the one who stays in his own baliwick; afraid of what might happen if he steps out into the real world. I cannot help but think the latter type is missing out on the fullness of life.

FINALEXAM

What company was responsible for the following engineering innovations?

The transistor _____
Radio astronomy _____
Negative feedback _____
High Fi and Stereo _____
Synthetic crystals _____
TV transmission _____
Magnetic tape _____
Sound motion pictures _____
Microwave relay _____
Electronic switching _____
The solar battery _____
Telstar _____

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Engineering and Science at IBM

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"The attitude here is, if you're good enough to be hired, you're good enough to be turned loose on a project," says Don Feistamel.

Don earned a B.S.E.E. in 1965. Today, he's an Associate Engineer in systems design and evaluation at IBM.

Most of his work consists of determining modifications needed to make complex data processing systems fit the specialized requirements of IBM customers.

Small teams

Depending on the size of the project, Don works individually or in a small team. He's now working with three other engineers on part of an air traffic control system that will process radar information by computer.

Says Don: "There are only general guidelines. The assignment is simply to come up with the optimum system."

This informal working environment is typical of engineering and science at IBM

Don sees a lot of possibilities for the future. He says, "My job requires that I keep up to date with all the latest IBM equipment and systems programs. With that broad an outlook, I can move into almost any technical area at IBM."

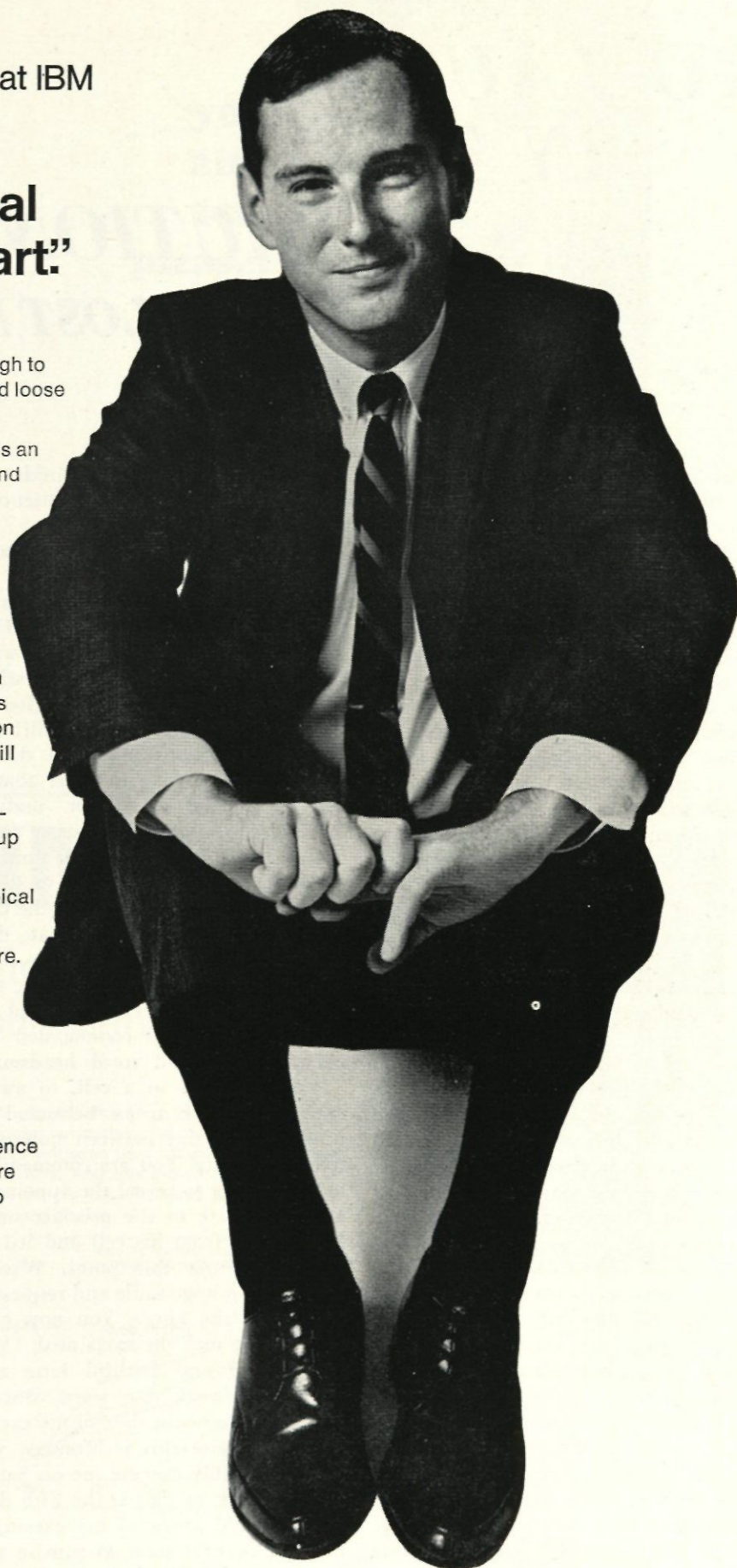
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TO LAUGH IN THE EXECUTIONER'S FACE (OR I'M SORRY I LOST MY HEAD)

MIKE COLGATE

In the bright, misty long ago—back in the golden age when everyone was simple and happy and princes and princesses were thicker than secret service men at a Humphrey campaign speech—a handsome young man answered an ad placed in the “Royal Gazette and Herb Growers Weekly.” The situation was a common one. As the reader is probably aware, the unhappy plight of most princesses in those days was that, although they were *all* beautiful without compare, most were eternally sad and unsmiling. Many a tale has been repeated from that time about kings and queens scouring the land for someone or something to make their daughter smile. The reward for accomplishing that feat was generally the beautiful princess’s hand in marriage and a share of the kingdom. The punishment for failing, however, was more often than not, death at the hands of the royal headsman. Despite this grim, and rather gruesome, more than probable eventuality, if we are to believe all the stories currently being told, young men flocked by the thousands to try their particular joke or antics and young men died by the thousands, beheaded on the block. It was precisely such an errand, and such a probable fate, that the young man with which this story concerns itself was undertaking in answering that ad.

Wycliff (the young man’s name) had to wait in line for several days before it was his turn to perform for the princess and lose his head. That’s right—lose his head. Fate being what it is and beautiful, but sad, young princesses being what they are and probably always will be, Wycliff

failed to arouse even a twinkle in the princess’s eye and was sentenced to death at sunrise.

Wycliff, however, seems to have had at least a slightly greater will to live and certainly more ingenuity than his unfortunate predecessors. The king, known far and wide as a wise and benevolent ruler, asked Wycliff if he had any last requests. After a period of deep thought, Wycliff replied, “Yes, your majesty, I do. I humbly request that, in order that I may not need to suffer unduly through worrying, your majesty command that I be executed at sunrise sometime within the next five days, but that I should *not* be told the day of my execution until that day arrives.”

The king, carefully considering the request, decided that there could be no harm in it and commanded his palace guards and royal headsman, “Take this man to a cell, to await execution. He is to be beheaded at sunrise, some day between now and five days hence. You are commanded to do nothing to reveal the appointed execution date to the prisoner until he is taken from his cell and led to the block.” At this point, Wycliff broke into a huge smile and requested to address the king. “You now cannot execute me!” he exclaimed, “You are a wise and faithful king and would not break your word. Since I am not to know the date of my execution, and since this is Monday, you cannot possibly execute me on Saturday morning, as that is the fifth day, and I would know of my execution on that date as soon as sunrise was past on Friday. Similarly, I cannot be executed on Friday. Since I have

proved that I need not even consider Saturday, Friday is effectively the last day and a similar argument prevents that from being the date of execution. For, you see, if I am still alive past sunrise on Thursday, I will know that Friday is the date, since it cannot be put off until Saturday without violating the terms of the agreement. Thus, Thursday can be considered the last possible day, but an identical argument holds in that case, eliminating Thursday, and the same for Wednesday and Tuesday. Since sunrise is already past today, you cannot execute me at all, and still abide by the terms of our agreement!”

The king said nothing, but had the smirking Wycliff placed in a cell as previously ordered. He languished there for two days, humming to himself and glorying in his cleverness, until Thursday morning, just before sunrise, the guards came completely unexpectedly into his cell, hauled him out, and held him as the headsman lopped off his head.

The story above introduces the most maddening paradox I have ever encountered. It has preyed on my mind for over five years, until I decided I must present it to the readers of the “Engineer” in hopes that someone would be able to explain it.

The proof offered by Wycliff, above, can even be formulated into a seemingly perfect mathematical induction proof:

In this case, to use an induction proof, we must prove that if a particular day can be shown to be a day on which the execution cannot take place, along with all the following days, then the *previous* day is also an impossible day. Proof: If a particular day, say the *n*th day, is shown to be im-

$n+2$, etc., then we must show the $n-1$ day to also be impossible If the n th day and all following days are impossible then the $n-1$ day must be the last possible day, if it is possible. But, by the argument Wycliff presented, above, if the $n-1$ day is the last possible day, then it can not be used for the execution, because as soon as sunrise was past on the $n-2$ day, Wycliff would know that the $n-1$ day was the day of the execution, in direct violation of the agreement. Therefore, the $n-1$ day must be designated as impossible, along with all the following days. In the specific situation involving Wycliff, Sunday and all following days can be designated impossible days by the terms of the agreement. Q.E.D.

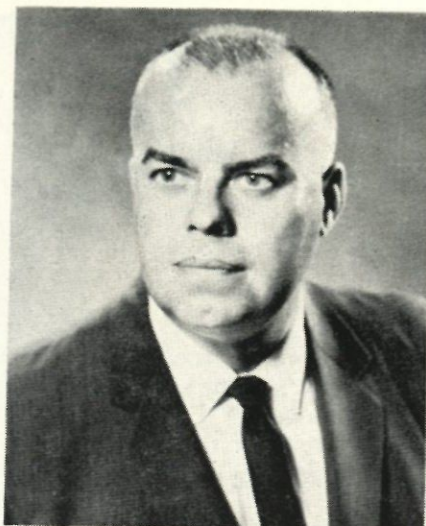
The fact remains, however, that Wycliff could be executed without warning and in strict accordance with the agreement he made with the king, on, say, Wednesday morning.

Any reader with an explanation for this paradox is invited to send that explanation to this writer:

Mike Colgate
Box 1525
Boulder, Colorado
80302

All seemingly adequate explanations will be printed in the next issue.

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aim
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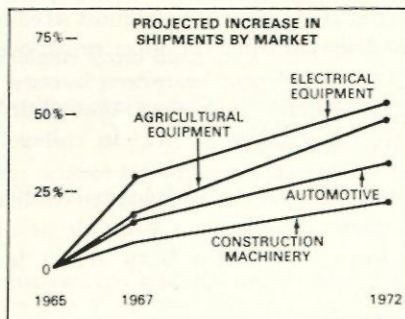
One of the outstanding characteristics of the Malleable Castings Industry.

The Malleable iron industry began its growth in 1826 with the development of a unique cast material by a Yankee genius named Seth Boyden. Malleable was heralded by pre-Civil War America as the iron which "could be hammered and shaped without breaking." But in time, as markets changed and technologies advanced, the material made the transition from wagons and cannons to cars and rocket heads, upgrading its applications from simple structural parts to highly reliable mechanical components.

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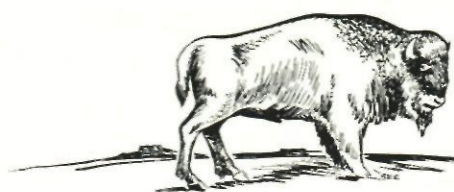


Currently, the average American new car uses 120 pounds of Malleable castings, some of which are shown above. Reading up, they include a connecting rod, bearing retainer, air conditioner clutch, joint yoke planet carrier, housing cover, non-slip differential case, and the calipers mounted on a disc brake.

For more information, write for a copy of "Malleable Iron, Material for America on the Move."

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Chips

Faculty advisor: "Let's not have any more jokes about sex, drinking, and profanity."

Joke editor: "Ok, I'm tired of putting out this magazine anyhow."

Irritated Prof: "If there are any morons in this room, please stand up."

A long silence, and a lone freshman rose.

Professor: "What, do you consider yourself a moron?"

Frosh: "Well, not exactly, sir, but I do hate to see you standing all alone."

Doctor: "How's the Engineering patient this morning?"

Nurse: "I think that he's back to normal. He tried to blow the foam off his medicine."

Discovered on the fall registration of a freshman engineer: Name of Parents: Mommy and Daddy.

Draftee: "One who's been given a Hershey Fellowship."

Patience may often be the inability to make a decision.

Many a man believes in dreams until he marries one.

A canny Scot was engaged in an argument with the conductor as to whether the fare was to be five or ten cents. Finally the disgusted conductor picked up the Scot's suitcase and tossed it off the train just as they were crossing a long bridge. It landed with a mighty splash.

"Hoot mon," screamed the Scot. "First you try to rob me and now you've drowned my little boy."

Lecturer: "If I talk too long, it's because I forgot my watch and there's no clock in this hall."

Voice from the audience: "There's a calendar behind you."

Buffalo — A rude animal that lets the chips fall where they may.

"May I have this dance?"

"I'm sorry, I never dance with a child," said she, with an amused smile.

"Oh, a thousand pardons," said he. "I didn't know about your condition."

If a bride always wears white as a symbol of purity then why does a bridegroom usually wear black.

College boy, pouring drinks: "Say when."

College girl: "Right after this drink."

A young woman with adventure in her soul joined a circus. Anxious to do everything right, she asked her employer for a few tips.

"I don't want to make any beginner's mistakes," she asked.

"Well, for one thing," replied the manager, "don't ever undress around the bearded lady."

Then there was the ME who stepped up to the bar very optimistically, and two hours later went away very misty optically.

Badger definition of a maternity dress: A slip cover.

Engineers are continually surprised to find that girls with the most streamlined shapes offer the most resistance.

A bachelor is a man that didn't have a car when he was in college.

Hear about the fullblooded Indian lass who says it isn't difficult at all to have fun with a beau and a few errors?

He: "Why do the most important men on campus always get the prettiest girls?"

She: "Oh, you conceited thing you."

Thermometers aren't the only things that are graduated and have degrees without having any brains.

A marriage counselor in Denver has been getting pretty fair results with a sign over his desk which reads: **LIVE ALONE AND LACK IT.**

Two hunters in Africa were caught by cannibals and put into a huge cooking pot. One man laughed hysterically. Annoyed, the other asked: "What's so funny?" The first one replied, "If they only knew what I was doing in their soup!"

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

Doctor: "Good heavens man, I will be right there. What are you doing in the meantime?"

Engineer: "Using log log tables."

Coed #1: "I caught my boyfriend necking."

Coed #2: "I caught mine the same way."

Progress: Exchanging old worries for new ones.

In a water safety class the instructor was quizzing on common sense in life-saving techniques.

"What article of clothing," inquired the teacher, "Would you remove last if you fell in the water with all your clothes on?"

One little freshman raised her hand. "The blouse," she said. "Air gets under it and acts like a buoy."

Say it with flowers, say it with sweets,

Say it with kisses, say it with eats. Say it with jewelry, say it with drink,

But never, oh never, say it with ink.



John C. Heiman,
a typical Kodak
industrial engineer

Elwood R. Noxon,
a typical Kodak
industrial engineer

What was crucial six months ago? Hard to remember.

Six months is a long time to a Kodak industrial engineer. Much happens. Men like these carry on as if the whole company—top to bottom and stem to stern, cameras to industrial adhesives, food emulsifiers to check microfilers—were a big laboratory for the practice of industrial engineering under the best of conditions. Management finds it pays to let them think so. Happy, they make their advance as strictly professional industrial engineers or hide their industrial engineer's insignia and use their skills to take over other functions in the organization.

Apart from the common denominator of an employer that appreciates industrial engineers and can always use more of them than we get, Heiman and Noxon lead very different working lives. Without assuring these gentlemen against the possibility that six months hence they will have traded specialties, here's the contrast:

Heiman is an accomplished simulation man, a thinker in Fortran, a builder of models for the big computer to manipulate.

He made a good score lately when given six weeks to overhaul the reasoning behind the design of a chemical manufacturing system that had evolved over the last five years as a multi-channel processing plant with problems in line interference and flexibility. He and a colleague, checking each other, spent three weeks writing a program that covered building size, reactor size, product flow, and auxiliary equipment. Debugging took another three weeks. All the while a third man was collecting experience data from the old production area.

The experience data were converted into Monte Carlo input distributions. Various configurations of the proposed production equipment were studied in thirty computer experiments, each simulating twelve weeks of operation.

Result: a system costing 3% more than the original but with 25% more capacity, plus proof that certain manifold connections between reactors wouldn't work.

Noxon works on mechanical goods. He pities industrial engineers who don't get to collaborate with their mechanical engineer partners right from when a project still consists of only rough sketches. He does get called into his projects that early.

His place is in the middle. At his extreme left is the design engineer who created the product idea. Next sits the manufacturing engineer, devising ways for the production boss to transform the idea into reality at the required volume. To the quality-control engineer at the other end of the table is entrusted the whole reputation of the company as it rides on the proposed new product. Between him and Noxon, the production boss awaits instructions. Noxon's job is to sell cost awareness right and left. Unless each of the five gets in his licks, there will be trouble.

Noxon can't stay in the conference room all day. The action is on the factory floor. In putting together job designs, learning curves, and space requirements for the 1970 line, he cannot ignore the ongoing commitment to 1969 product and the lively remnant of '68 production. And cost reductions had better continue when Noxon and his teammates study the "audit assembly" movies from initial production.

Industrial, chemical, mechanical, and electrical engineers who find their profession interesting and would like to practice it in a way that best suits their individual makeup should talk to
EASTMAN KODAK COMPANY, Business and Technical Personnel Department
Rochester, N.Y. 14650

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Kodak



Pete Drobach has a knack for getting to the root of a problem.

High school students John Magish and John Ripley would be the first to agree.

They're both student members of a "big brother" program that Pete sponsors. Each week, they spend several hours of their own time helping less advanced classmates with their studies.

Pete is more than a sponsor. He's also a consultant—particularly when they're stumped by the logic of a tough "new math" problem.

But when Pete graduated from Rutgers in 1964, it wasn't these youngsters with their homework problems that brought him to General Electric. It was the chance to help people in industry solve tough technical problems. A career in technical marketing at General Electric gave him the opportunity.

Today, Pete's an application engineer in steel mill

drives and automation systems. His ideas on how to apply products from many of GE's 160 separate businesses enable his customers to improve the efficiency and productivity of their plants.

Like Pete Drobach, you'll find opportunities at General Electric in R&D, design, production or marketing that match your qualifications and interests. Talk to our man when he visits your campus. Or write for career information to: General Electric Company, Room 801A, 570 Lexington Avenue, New York, N.Y. 10022.

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